UNIVERSITY OF LJUBLJANA
FACULTY OF ECONOMICS

ANNE-MARIE YAZBECK

REENGINEERING OF BUSINESS FUNCTIONS OF THE HOSPITAL WHEN IMPLEMENTING CARE PATHWAYS

DOCTORAL DISSERTATION

Ljubljana, 2014

AUTHORSHIP STATEMENT

The undersigned Anne-Marie Yazbeck, a student at the University of Ljubljana, Faculty of Economics, (hereafter: FELU), declare that I am the author of the doctoral dissertation entitled Reengineering of business functions of the hospital when implementing care pathways, written under supervision of Prof. Dr. Maks Tajnikar.

In accordance with the Copyright and Related Rights Act (Official Gazette of the Republic of Slovenia, Nr. 21/1995 with changes and amendments) I allow the text of my doctoral dissertation to be published on the FELU website.

I further declare

- the text of my doctoral dissertation to be based on the results of my own research;
- the text of my doctoral dissertation to be language-edited and technically in adherence with the FELU's Technical Guidelines for Written Works which means that I
  - cited and / or quoted works and opinions of other authors in my doctoral dissertation in accordance with the FELU's Technical Guidelines for Written Works and
  - obtained (and referred to in my doctoral dissertation) all the necessary permits to use the works of other authors which are entirely (in written or graphical form) used in my text;
- to be aware of the fact that plagiarism (in written or graphical form) is a criminal offence and can be prosecuted in accordance with the Criminal Code (Official Gazette of the Republic of Slovenia, Nr. 55/2008 with changes and amendments);
- to be aware of the consequences a proven plagiarism charge based on the submitted doctoral dissertation could have for my status at the FELU in accordance with the relevant FELU Rules on Doctoral Dissertation.

Date of public defense: 19 May 2014
Committee Chair: prof. dr. Mojca Indihar Štemberger
Supervisor: prof. dr. Maks Tajnikar
Member: prof. dr. Vlado Dimovski
Member: Ian M. Graham, Full professor

Ljubljana, 19 May 2014 Author's signature:

SUMMARY

This doctoral dissertation analyses the effect of care pathways on the macro level of hospital organisation and hospital processes. The fundamental question that arises concerns the type of reorganisation of operations so as to improve efficiency or level of reengineering that a hospital requires when it introduces care pathways. The author sets out the general features of the effects of care pathways on hospital organisation, and goes on to illustrate this with a case study of a university clinic, Golnik Hospital, in Slovenia.

The author starts by outlining the characteristics of care pathways, taking an in-depth look at these characteristics. A care pathway can be defined according to the number of fragmented healthcare procedures it covers, as well as from a general viewpoint of the care provided from admission to discharge within a clinical setting and possibly beyond it. The author assumes that the fundamental characteristic of a care pathway is always the change from a patient's initial impaired state of health to an ultimate improvement in or return to full health, taking into account the potential side-effects of treatment under that particular care pathway. From the point of view of the typical production function in healthcare, a care pathway aims to achieve adequate success in treatment and care that is reflected and can be measured in an improvement in the patient's medical condition.

Hospitals use a variety of health services to achieve this: these are the outputs of the production process in the hospital and are associated with the use of various inputs. The relationship between inputs and outputs is determined by the efficiency of the activities undertaken at the hospital. This relationship is also decisively modelled by the redesign of processes within the hospital – that is, by their reengineering – and by adaptation to the hospital's organisational schemes. The author will demonstrate that there are different models of processes for different types of care pathway within a hospital.

At least three basic process models can be defined. In order to be effective, a hospital must, by means of reengineering, adapt the existing processes to the process models, taking the care pathways into account. This means that where a hospital provides healthcare services on the basis of a number of different care pathways, it has to implement a corresponding variety of process models. Within one organisation, any reorganisation must ensure reciprocal consistency between the process models in use and the forms of organisation that enable the necessary process models to exist. The author notes that the reciprocal consistency of different process models can only be secured by ensuring that different competencies are assigned for different functional units within the hospital, in terms of fundamental processes and managerial and support processes alike. In order for different functional units to acquire different competencies, they must be adequately staffed. Changing the competencies of different functional units also necessitates changes to the hospital's organisational scheme.

The author presents a general scheme of processes, along with a general organisational chart of the hospital.

The author shows that if a hospital implements these requirements consistently, it is not only successful because it uses care pathways, but is also effective because it organises processes.The effectiveness that the use of care pathways brings appears to place limits on efficiency, where efficiency can be the criterion for decision-making within the care pathway when healthcare principles themselves do not enable decision-making.

Key words: care pathway, reengineering, business functions, business processes, efficiency, effectiveness

POVZETEK

V doktorski disertaciji avtorica analizira vpliv uvajanja kliničnih poti na makro organizacijo bolnišnice in njene procese. Temeljno vprašanje je, kakšna reorganizacija procesov za boljšo učinkovitost oziroma kakšen reinženiring je potreben v bolnišnici, če ta uvaja klinične poti. Avtorica najprej pojasnjuje splošne značilnosti vpliva kliničnih poti na organisiranost bolnišnic, potem pa prikaže primer univerzitetne klinike v Sloveniji, Bolnišnica Golnik.

Avtorica tako najprej prikaže sistematizacijo kliničnih poti, pri tem pa izhaja iz različnih možnih sistematizacij. Klinične poti lahko razporedimo glede na vrsto zdravstvenih obravnav, ki jih zajemajo klinične poti, pa tudi glede na posplošitev orisa kliničnih poti in njihov namen. Avtorica domneva, da je temeljna značilnost kliničnih poti vedno sprememba začetnega bolezenskega stanja bolnika v končno zdravo stanje bolnika (ob upoštevanju morebitnih stranskih učinkov zdravljenja v skladu z neko klinično potjo).Z vidika tipične produkcijske funkcije v zdravstvu naj bi tako s kliničnimi potmi dosegali ustrezno uspešnost zdravstvenih obravnav, ki se kaže in tudi lahko meri v spremembi zdravstvenega stanja bolnika.

Da bi to dosegli, v bolnišnici uporabljajo različne zdravstvene storitve. Te pa so output proizvodnega procesa v bolnišnici in so povezane z uporabo različnih inputov. Odnos med outputi in inputi je opredeljen z učinkovitostjo dejavnosti v bolnišnici. Odnos med outputi in inputi odločilno oblikujemo tudi s preoblikovanjem procesov v bolnišnici, torej njihovim reinženiringom, in prilagajanjem organizacijske sheme bolnišnice. Avtorica bo prikazala, da različnim vrstam kliničnih poti ustrezajo različni modeli procesov v bolnišnici.

Avtorica ugotavlja, da lahko opredelimo vsaj tri osnovne. Da bi bila bolnišnica učinkovita, mora zato obstoječe procese z reinženiringom prilagoditi modelom procesov, ki upoštevajo klinične poti. To pa pomeni, da mora bolnišnica v razmerah, ko izvaja zdravstvene obravnave glede na različne klinične poti, uvajati tudi različne procesne modele. Ker to dela znotraj ene organisacije, mora z reorganisacijami zagotoviti medsebojno skladnost uporabljenih procesnih modelov in organisacijske oblike, ki omogočajo obstoj potrebnih procesnih modelov.

Avtorica ugotavlja, da je možno medsebojno skladnost različnih procesnih modelov zagotoviti le na ta način, da različnim funkcijskim enotam znotraj bolnišnice dodelimo različne kompetence, in sicer tako z vidika temeljnih procesov, kot z vidika managerskih in podpornih procesov. Da bi različne funkcijske enote pridobile tudi različne kompetence, morajo biti tudi ustrezno kadrovsko sestavljene. S spreminjanjem kompetenc različnih funkcijskih enot pa pride tudi do potreb po spremembi organigrama bolnišnice. Avtorica prikaže splošno shemo procesov in tudi splošno obliko organigrama take bolnišnice.

Avtorica pokaže, da bolnišnica, ki te zahteve dosledno izvede, ni le uspešna, kot sledi iz kliničnih poti, pač pa hkrati učinkovita, kot sledi iz procesnega organisiranja. Pri tem se uspešnost, ki sledi iz kliničnih poti, pojavi kot omejitev za učinkovitost, učinkovitost pa je lahko kriterij odločanja znotraj kliničnih poti, ko zdravstvena načela ne omogočajo odločanja.

Ključne besede: klinična pot, reinžiniring, poslovne funkcije, poslovni procesi, učinkovitost, uspešnost

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF DIAGRAMS

INTRODUCTION

'You can keep drawing squares and lines, but within these squares you must have people and they must be deeply involved with the business. If this does not happen, then the lines and squares and the diagrams mean nothing.' – Lord Forte

Much of healthcare[1] is routine. Healthcare resources are scarce, and it is their cost that is of greatest concern to most people (Folland, Goodman, & Stano, 1997, p. 13). A considerable amount of healthcare is elective and not always about emergency care. In emergency cases, the customer or patient has an agent (the doctor) to make or help make decisions on his or her behalf (Folland et al., 1997, p. 13).

Between 60 and 70% of healthcare services are provided in a hospital setting. Hospital finances are a current policy issue in almost every country in Europe, with the very existence of public hospitals being called into question. Hospitals cannot wait for policy to address the structural issues that drive healthcare costs; instead, they must apply management to improve organisational performance. In the past, hospitals were reimbursed fully for all operating and capital costs, but times have changed. Today, hospitals remain complex mechanisms made up of interrelating functions and with significant investments in the analysis, design, implementation and dissemination of good practice processes in healthcare (Crocker, Johnson, & King, 2007).

Effective management in healthcare organisations requires the integration of operational processes, the financing of healthcare programmes, and the provision of services for cost-containment and improvements in quality. Many hospital managers and healthcare staffhave related their experiences resulting from the increasing emphasis on patient safety, changes in the quality of care and the rising costs of healthcare. The focus is on the patient rather than the system and on the efficiency of processes, in order to meet the needs of the patient and, ultimately, the payer.

Parallels with the kind of process tool that a care pathway represents can be found in industry, particularly in the construction and automotive industries (Ohno, 1988), and countries have adopted this process tool in their hospitals. It is this innovation – the use of care pathways in healthcare – that has helped hospitals to manage their business functions, including their work and production processes or services. Some have argued that the adaptation of pathways to healthcare, particularly inpatient care, may help ensure the delivery of high-quality care and decrease the occurrence of medical errors (Trowbridge & Weingarten, 2011).

---

[1] Throughout this dissertation, the term 'care' is used as the overarching term for diagnosis, treatment, surgery, care and rehabilitation.

As an illustration, Trowbridge and Weingarten (2011) describe care pathways as a means of directing and streamlining processes and sequence-specific care so that they clearly specify the expected outcome. Langenbrunner and Wiley (2002, p. 172) report that many European countries have decided to shift from the traditional line-item approach towards a more service- or performance-oriented approach. This certainly has, to some extent, affected business functions in hospitals and the manner in which work processes have had to be reorganised or reengineered.

As Hammer and Champy (2003) point out, the reorganisation or reengineering of business process involves a fundamental reconsideration and the radical redesign of organisational processes in order to achieve major improvements in current performance in terms of cost, services and speed. They recommend that one look at complete processes and at the tasks that each function performs, rather than at the organisation of functional specialties such as production, accounting, financing, management, etc., and that organisation be reconstituted into a series of processes.

Good examples of the reorganisation or reengineering of business or work processes in hospitals can be found in the UK. In the early 1990s the National Health Service (NHS) decided to radically change the way work was organised and to place the patient at the centre of care. The UK was the first country in Europe to introduce and develop the concept of care pathways. Today, care pathways have been adopted and used throughout the NHS for acute hospital treatment, primary- and secondary-level care, in private practice and in the field of psychiatry. Over the years, countries as diverse as Canada, Australia, Slovenia, Germany, Italy, Belgium, the Netherlands, Denmark, Sweden, France, Spain, Romania and Mongolia, among others, have gradually followed suit.

Care pathways are also known as clinical outcome plans, care plans and practice standards. The Slovenian healthcare system first introduced care pathways in 2002, primarily as a tool for effecting organisational change and improving the quality of care.

The dynamics, attitudes and beliefs of healthcare professional groups are what chiefly affect reorganisation in healthcare organisations (Yazbeck, 2004). As Štruc (2006, p. 22) notes, it is up to professional and managerial staff to establish their own style of work, which means that they must be familiar with the factors that affect its design and choose appropriate techniques for enhancing the effectiveness of their work. One can therefore say that healthcare organisations are ‘healthcare enterprises’ which should be managed as healthcare ‘corporations’.

This dissertation addresses the use of care pathways in hospital settings. A care pathway is a tool that enables a multidisciplinary team to tackle patient care in a standardised manner, is designed on the basis of evidence, and has been developed within the local setting and resources of the healthcare organisation in question.

A care pathway may remain within the clinical settingor go beyond it into a different healthcare setting or the community, depending on the patient group or case-type involved. It enables variances from standard procedures to be tracked, maintains the autonomy of the healthcare professionals' decision-making processes, unifies clinical practice, continuously improves the quality of health treatment, and promotes teamwork.

Care pathways are developed locally and, even though they might deal with the same group of patients, differ from one organisation to another. They are developed from evidence-based medicine – i.e. the clinical guideline for a specific diagnosis or healthcare condition. Since local conditions may vary slightly, these clinical guidelines should be regarded as just that: as guidelines and not as absolute rules to be applied when organising the treatment of a disease or health condition. Clinical guidelines and care pathways strive to standardise the same case-type in order to ensure equality of procedures and thus also better comparability of results (Robida, Yazbeck, Kociper, Mate, & Marušič, 2006, pp. 11–15).

It is important for healthcare to remain affordable. It must do so while taking into account people's needs and ensuring that those with the greatest need receive more, maintaining equality of access for all at the same time (Kornai & Eggleston, 2001, pp. 48–65). Citizens are becoming better informed about their rights as patients, about competition and about the substantial investments being made in medical technologies. Patients want to know about the processes at play in their healthcare treatment and to a take a decision-making role on their journey through the healthcare system – or in our case, the hospital.

Care pathways can link and affect all the business functions of a hospital in different ways and to varying degrees. In this dissertation, the discussion is limited to five main business functions: sales, purchasing, operations, financing and organisation. The dissertationalso contains a case study and analysis of the use of a care pathway for community-acquired pneumonia (CAP) at the specialist respiratory clinic at the University Clinic of Golnik (referred to as Golnik Hospital in this dissertation) in Slovenia, where I discuss how a care pathway, as a process, affects the business functions of the hospital.

Defining the research and problem area

The care pathway is a relatively new tool that helps improve the processes and planning of health services, i.e. the healthcare delivery process, as well as the efficiency of operation of business functions. Researchers have found that the principles of the reengineering of processes within hospitals improve quality of care, increase patient satisfaction, increase employee satisfaction and improve performance (Booz-Allen & Hamilton, 1988; Dunnette, Hough, & Triandis, 1994). Evidence in support of reengineering processes has been reported in many European countries, including the UK (Hurst, 1995), the Netherlands (Bainton, 1995), Spain (Coulson-Thomas, 1996) and Sweden (Åhgren, 2001; Brodersen & Thorwid, 1997).

This dissertation proposes to present the features of care pathways and to determine their influence on the business functions of a hospital. I examine how a care pathway affects daily work processes within a hospital, and how it contributes to better and increased throughput of patients, improves the use of existing hospital beds, reduces the number of errors, improves the quality of care, reduces bottlenecks and staff overtime, and improves levels of satisfaction among staff. I then go on to examine how care pathways improve hospital efficiency in general – a major issue in healthcare. This is followed by a case study of the CAP care pathway at Golnik Hospital, a specialist hospital in Slovenia which has shifted from the traditional line-item approach to a more performance-oriented approach. It has 237 beds and treats 7,000–8,000 inpatients and 50,000 outpatients a year. Today, the second version of the CAP care pathway is in use, which demonstrates that a care pathway is a 'living' tool and one that evolves constantly in response to the needs and knowledge of the members of the multidisciplinary team.

At the core of this exploratory research lies the following question: which factors help to improve hospital patient care and treatment outcomes, reduce length of stay, hospital readmissions and mortality, improve admissions and discharge procedures, enhance quality of treatment, and reduce the cost of treatment under the CAP care pathway?

A care pathway certainly provides the best basis for calculating and determining the standard cost. It is logical to suggest that a care pathway is, by its nature, a good method of describing a patient's journey or course of treatment, and ensures the best health outcome within limited financial resources. In order to achieve good treatment outcomes, the system needs to contain structures and processes which can be measured on the basis of indicators (structure and process indicators). Based on the above observations, I examined the following hypotheses:

Hypothesis 1:
The hospital or the healthcare provider is required to radically rearrange its business functions and to employ the modalities and techniques of business process reengineering in order to introduce and implement care pathways. In other words, practical implementation of the theories underlying care pathways in an acute hospital setting requires an understanding and the adoption of business process reengineering techniques.

Hypothesis 2:
The first hypothesis is empirically tested; this leads to the conclusion that Golnik Hospital should, on the basis of the introduction and implementation of care pathways, focus on the reengineering of its business processes. If the first hypothesis is proven, it follows that Golnik Hospital should focus on the reengineering of its business processes.

Purpose and objectives

Given that no one has so far studied the changes in business functions that have occurred upon the introduction of care pathways in the Slovenian and other healthcare systems, this study will likely lead to a better understanding of the interdependence of the various business functions and work processes involved in care pathways. Furthermore, it may also facilitate the introduction and implementation of new care pathways in the Slovenian healthcare system by properly involving and engaging all the relevant staff, from management to clinicians and to members of other allied services.

The purpose of this dissertation is to study the use of care pathways so as to improve efficiency of hospitals and ensure better organisation of health service delivery and thus optimise and rationalise the use of hospital resources. Around 60% of total healthcare expenditure goes towards inpatient or hospital care. Improving business processes in hospitals should be one of the goals, thereby improving the efficiency and performance of healthcare systems in general. To better illustrate this concept, this dissertation will study the use of the community-acquired pneumonia (CAP) care pathway at Golnik Hospital, analyse its impact in comparison with the usual methods of care, and determine what changes are needed in terms of the hospital's business functions in order to improve efficiency and effectiveness in hospital performance. I will determine which business functions need to be reengineered at Golnik Hospital in response to the implementation of CAP care pathways, and how that reengineering should take place.

The dissertation will:

1. Define care pathways in general and identify the common models;
2. Discuss the business functions and processes of a hospital in relation to a care pathway;
3. Illustrate the impact of a care pathway on the business functions of a hospital and the requirement to undertake reengineering;
4. On the basis of a case study, define the CAP care pathway at Golnik Hospital and apply the theoretical findings;
5. Illustrate the influence of the CAP care pathway on efficiency and effectiveness in all aspects of the production function at Golnik Hospital.

From describing care pathways on a broader scale, I move on to a case study of a hospital in Slovenia, which operates a predominantly Bismarckian healthcare system. Here the national healthcare insurer and payer, the Health Insurance Institute of Slovenia (HIIS), is becoming increasingly less satisfied with the fact that the sole products of healthcare activities are services. Slovenia has a universal healthcare system, which means that almost all healthcare services are paid from mandatory healthcare insurance (Tajnikar & Došenović, 2004, p. 726).

The Slovenian payer is interested in the outcomes of healthcare services – the level of restored health that can be presented within or on the basis of a well-developed care pathway. In addition to restoring health to a patient, a care pathway gives a whole range of reliable information and data for multi-purpose use (Berginc Dolenšek et al., 2006, p. 33) These aspects are therefore also relevant because the HIIS, in Chapter 5 on Quality (second paragraph of Article 29 of the General Agreement for the Hospital for Contractual Year 2006), obliges providers to ensure the implementation of a minimum of two care pathways in a hospital setting (Zavod za zdravstveno zavarovanje Slovenije,[2] 2006a). This clause in the General Agreement has remained unchanged since 2006.

Research method used

The case study methodology is a way of establishing valid and reliable evidence for the research process, as well as presenting findings which result from the research. As Remenyi, Williams, Money and Swartz (2000, pp. 50–51) point out, 'the philosophy behind the case study is that sometimes only by looking carefully at a practical, real-life instance can a full picture be obtained of the actual interaction of variables and events'. A single case study may be sufficient when a well-formulated theory is to be tested (Remenyi et al., 2000, p. 181). This dissertation concentrates on one case study and tests the extent to which hospitals need to radically reorganise their processes so as to be more efficient and to perform better on the basis of CPs.

The Golnik Hospital case study allowed me to concentrate on specific instances in an attempt to identify the detailed interactive processes that could be important for understanding the implementation and interaction of CPs and business functions within the hospital. The case study enables the establishment of a broader view, a multi-dimensional picture and a greater understanding of the impact of CPs on business functions. It illustrates relationships, issues and patterns of influence between CPs and business functions of the hospital. Case studies in research have two distinct features: they can establish valid and reliable evidence and can be used as vehicle for a narrative description, and they can provide an explanation of the observed phenomena and demonstrate an understanding of the subject of the investigation in its context and environment (Remenyi et al., 2000, p. 164).

I base the case study on a specific CP in a specific hospital; the specific CP under observation is CAP CP ver.2 (for community-acquired pneumonia, a high-volume disease) and the hospital is Golnik Hospital in Slovenia. The focus of my case study is on understanding the interrelationships between the CAP CP and its impact on the business functions of the hospital, and on the possible interaction between the elements and processes of CAP CP ver.2. The main focus of the analytical work is on qualitative issues and enables a measure of observation of the interaction between CAP CP ver.2 and business processes. Qualitative

[2]*Zavod za zdravstveno zavarovanje Slovenije* is the Health Insurance Institute of Slovenia.

research on the use of CPs in relation to business functions provides substantial information on the procedural and implementation issues surrounding CPs within the hospital. Golnik Hospital also allowed me to interview the medical experts in charge of the development and analysis of CPs at the hospital. The data and information collected, alongside the various documents used in the wards by nurses and doctors (e.g. the medical chart, the nursing logbook, CAP CP ver.2), was used to analyse the impact of the CP on the business functions of the hospital.

The Golnik Hospital case study contributes in important ways to knowledge of the impact of CPs, business processes and functions. It helps us understand and explain the complex phenomenon of the relationship between CPs and business functions, and allows for a meaningful exploration of CP characteristics, such as the business processes of five distinct business functions (sales, purchasing, production, financing and organising), contributing towards a hospital that is more efficient and performs better. This case study addresses two different contexts: first, it explores and tries to understand the way in which CPs can affect business functions; second, it is used to develop a framework for the application of the evidence collected and the observations made into similar settings.

The case study process involved several steps: formulating the objective of the case study research in order to obtain evidence of how the hospital implemented and exploited CPs by means of a series of unstructured interviews which provided information on CPs. I used also a list of possible discussion topics depending on the development of the interview schedule. I prepared these topics to prompt the interviewee in case we ran out of discussion material. I focused on two key issues; first, on establishing how management and clinical staff understand the use of CPs and how they respond to it; and second, on finding out what and who is involved in the implementation of CPs, and how (i.e. are CPs implemented in much the same way as other processes and, if not, what are the significant differences?).

In the Golnik Hospital case study I first provide an introduction and background information, and then go on to describe the important sources of evidence: clinical documentation (medical chart, nursing logbook, CAP CP ver.2) and other documents (e.g. Golnik Hospital Annual Report, clinical guidelines for CAP, notes from the interviews with Golnik Hospital medical experts). Given that privacy is a primary concern in a hospital, direct observation of how CAP CP ver.2 and other clinical documents are completed was not possible. The internal validity of the use of the clinical documentation was provided by the medical experts at Golnik Hospital after the first round of interviews.

Scientific contribution

As mentioned, the originality of this doctoral dissertation lies in the fact that it is not possible to find, in the current literature, any analyses that examine a care pathway as a process within a hospital or similar healthcare provider that interacts with other processes within that institution, or observe the relationship between a care pathway and business functions.

The definition of a hospital as a combination of intertwined horizontal and vertical processes is, without doubt, an original contribution made by the dissertation. In the core flowchart of processes associated with the implementation of care pathways (Figure 25), I tied hospital processes to patient flow, the flow of services and healthcare products, and the flow of information. The starting point is always the patient's medical status and the end-point is the improvement in his/her medical condition, preferably in the form of recovery (and possibly including any side-effects of the treatment). The various typical elements of a business process, such as decisions, activities, waiting times, bottlenecks and similar, take place between the starting point and end-point of the horizontal process, which is normally observed as the outputs or the care pathway itself. It is at these intermediate stages that the vertical processes enter; many of the vertical processes may be considered to be core processes in the treatment of the patient, but are not seen on the care pathway.

The vertical processes represent fundamental processes in the hospital because this is where the production processes run. This involves the transformation of inputs (entering the hospital from the outside) into appropriate outputs, which can be hospital services and/or products. At the same time, these outputs represent inputs in the patient flow as a horizontal process that is described and institutionalised by the care pathway. Relying on the theoretical analysis of care pathways, I conclude that care pathways as horizontal processes within hospitals link up with the vertical production processes of a hospital, while from the point of view of the coherence of a care pathway with the vertical processes effective implementation of care pathways flow of crucial information must exist for the successful implementation of care pathways.

On the basis of my observation of care pathways and vertical processes (or rather, the business functions), the efficiency of a hospital, in the sense of achieving the best possible healthcare outcomes for patients, is linked to the care pathway (or rather, the horizontal processes). Hospital efficiency, whether technical, allocative or in terms of cost-effectiveness, is associated with the vertical hospital processes. Vertical processes can determine the success of a horizontal process and horizontal processes can determine the effectiveness of vertical processes.

The interdependence or intertwining of processes within the hospital illustrated in Figures 20, 21, 22 and 27 in the dissertation represents the core of the dissertation. It is methodologically possible to identify the role of certain processes and their definitions and, in particular, mutual interdependence by carefully studying the impact of care pathway implementation on specific business functions.

On the basis of clinical hospital documentation, I observed Golnik Hospital's operations, which allowed me to verify my first hypothesis. According to the first hypothesis, the implementation of care pathways has an impact on business functions and demands a radical transformation of a hospital's organisational structures, as well as calling for process reengineering and the reorganisation of the organisational structure of the hospital. This reorganisation will depend on the type of care pathway model – web, hub or chain.

It would be possible to implement care pathways effectively if specific units attached to its implementation found a place within the hospital's organisational structure. A triage entity has to be introduced because patients need to be assigned to the appropriate care pathway. Administrator or manager of individual groups that share similar care pathways between them will coordinate the work at the level of the individual patient. It is also important to establish a logistics unit for coordination between specific groups of care pathways, i.e. to coordinate the use of vertical processes within the hospital according to the timeframe of implementation of a specific care pathway for an individual patient.

In addition, an appropriate body dealing with the information should also be established within the hospital's organisational structure. This entity would retrieve data from the care pathway implementation process and, at the same time, provide care pathway managers with relevant information. Another entity would also be needed for appropriate analytical services to process information on the implementation of individual pathways, along with a development department responsible for updating care pathways, particularly in response to the development of health technology.

Care pathway implementation also necessitates certain changes to the organisational structure in terms of vertical processes. It requires appropriate administrators or managers of individual vertical processes through which it would be possible to coordinate interaction between horizontal and vertical processes within hospitals. It also calls for an adequate and centralised supply department for purchasing inputs and all the other services obtained by hospitals from outside. It demands the adjustment of financial services in such a way as to enable the collection of information on any actions taken within care pathways as a process. The financial department should also provide operators or managers of care pathways with relevant information on the cost aspect of their decisions. Finally, a care pathway calls for an adequate customer service unit capable of informing patients of the implementation of the care pathway with regards to his/her treatment. Patients would thereby receive proper information about the type and quality of services offered by the hospital.

It is important to observe the hospital as a process organisation, where care pathways take the form of one of the business processes within hospitals and take up different coordination mechanisms. The interrelated processes within hospitals require a flexible form of organisation that allows for rapid changes of activities within processes and the appropriate replacement of inputs by taking into account changes in the technology of treatment. It is crucial to properly understand the impact care pathways have on processes and organisation within a hospital in terms of effective treatment, as well as on the technical and allocative efficiency of a hospital. Healthcare outcomes can be improved through the use of care pathways, at the same time reducing the costs of patient treatment and making better use of resources (human, financial, equipment, etc.). Taken together, this will also depend on the type of healthcare system in which the hospital functions.

In order for a care pathway to have a specific impact on the organisation and processes of a hospital, and furthermore on a hospital's effectiveness and efficiency independent of the main hypothesis, it is important for that care pathway to be properly planned. I raise an important point: the need to understand and plan care pathways in the form of a process. Processes need to be adjusted to the type of care pathway, which normally depends on the health technology. A care pathway also needs to take into account the time dimension of implementation and to provide relevant variations that occur in relation to the defined points in time within the care pathway; it must clearly show the steps of improvement in the patient's state of health at every point within the process. A hospital in which care pathways are implemented has to be familiar with the cost aspects and cost generation of any specific care pathway at every point and for every decision. Care pathways need to contain well-defined points at which vertical processes that evolve from within or outside the hospital can enter. They need to express all information on their implementation in an appropriate manner. Information gathered should enable a proper analysis of the implementation of the care pathway.

I support my hypothesis by stating that care pathway implementation requires major organisational changes within a hospital, as well as the appropriate reengineering of processes, and therefore of business functions, in order to improve the effectiveness and efficiency of hospitals. I conclude that, in order to achieve this goal, it is necessary to create appropriate care pathways, and verify this using the practical case of community-acquired pneumonia. The research approach allows the author to define the organisational and procedural changes which are necessary at Golnik Hospital in order to ensure that the implementation of the care pathway for the treatment of community-acquired pneumonia is as effective and efficient as possible. The approach used allows one to define changes in the design of CAP CP ver.2 at Golnik Hospital, which could enable the desired impact of the care pathway.

Structure of the doctoral dissertation

This dissertation comprises seven main sections, in addition to the introduction and conclusion.

The starting point of the first section is the definition of a care pathway: what it is, how it is used, when it is used, and how it is developed and implemented within a clinical setting. I then provide the internationally accepted definition, describe how a care pathway is structured, and give examples from the literature of the most widely reported evidence-based effects of the use of care pathways across the world, which include the alignment and rationalisation of diagnostic services within an episode of care, a reduction in a patient's length of stay on the care pathway, and the effects care pathway use in improving healthcare outcomes and the quality of care; I also examine the implications of care pathways for malpractice claims, the effect on organisational development in terms of improvements to the work of and communication between different professional groups within the team in charge of a patient on a specific care pathway, and how care pathways affect the planning of hospital facilities and assets.

I then describe the care pathway information system, specifically: how the information path provided by a care pathway can affect the information held by a hospital, the information provided to the patient, medical record files, costing, billing and supporting documentation, and so on. In the last subsection of this section, I discuss how care pathways are used for the management of financial resources in some countries – that is, how they can be costed and made to contribute towards better financial management.

Despite an extensive review of the literature, I have not been able to come across mention of the effects care pathways can have on a hospital's main business functions or business processes. Therefore, in Section two I examine and analyse the common structure of the coordination mechanisms (chain, hub and web) that are taken up by care pathways in response to the characteristics of a specific patient group. Using the care pathways available in the literature as a basis, I then distinguish the most common care pathway models and categorise them into four typical care pathway models: Models 1, 2, 3 and 4.

Section three continues with a case study of Golnik Hospital, a specialist pulmonary clinic in Slovenia. This provides a setting for an examination of a care pathway for community-acquired pneumonia (CAP CP ver.2), a common and high-volume disease. I describe the hospital in brief and discuss the recording of CAP in an inpatient setting, with a focus on the use of CAP CP ver.2 within that setting. This is followed by Section four, where I dicuss the impact of a CP on the business functions of a hospital. I discuss how and to what extent a care pathway, as a process, influences the business processes of a hospital. By a general illustration of organisational business functions and processes is provided, where I define and develop the concept of the care pathway as a business process, describe the types of process existing within organisations, and examine the processes that occurred within healthcare service providers. Section five is about care pathway impact on business processes in the hospital.

Section Six discusses business functions and processes in hospitals. I discuss the business functions of a hospital and how they may or may not be influenced by the care pathway. I begin by outlining the two most common healthcare models found in Europe, from which I then draw my care pathway models. This is followed by a description of how these different care pathway models influence the five most important business functions of a hospital: sales, purchasing, operations, financing and organisation. The key point to understand here is where, how and to what extent each of the different coordination mechanisms and each of the four different models care pathway models have an impact on the processes of each of the business functions. Depending on the model, a care pathway identifies some of the processes and activities, and has a direct impact on a specific business function. In a number of other cases, a care pathway can have an indirect impact on some of the elements of a business function, or have no impact at all on business functions, especially on the vertical processes. All four care pathway models will provide information on the horizontal processes (outputs) of patient care, but may not be able to provide any information on the vertical processes (inputs). This is the main contention of my dissertation.

In Section Seven I describe CAP CP ver. 2 as a process and observe it from the point of view of a process based on the modelling of business processes. I look at the impact of CAP CP ver.2 on the vertical processes and on the business functions of sales, purchasing, operations, financing and organisation, focusing on what the care pathway observes or identifies and what it lacks.

1 DEFINING THE CARE PATHWAY

Care delivery cannot today be considered in isolation – it must be harmonised around the holistic needs of the patient (Walsh, 2004, p. 111). Traditional forms of service delivery have tended to be based around organisational structures. With the development of medicine and health service delivery, care pathwaysenable care delivery to be provided in an integrated manner and not in isolation. Hereafter, I use CP as the abbreviation for care pathway where required.

This theme will be developed further in this section, where I present the CP as a product, define it, illustrate the elements that comprise a CPand present the structure of a CP document. I then present the reported effect of the use of CPs and illustrate how CPs are used as the basis for managing financial resources.

Care pathways, also known as clinical pathways, care maps, integrated care pathways or critical pathways, are used worldwide for a variety of patient groups (Bandolier, 2003; Barbieri et al., 2009; Hindle & Yazbeck, 2005; Lemmens, Van Zelm, Vanhaecht, & Kerkkamp, 2008; Sermeus & Vanhaecht, 2009; Panella, Marchisio, Demarchi, Manzoli, & Di Stanislao, 2009; Panella, Marchisio, & Di Stanislao, 2003; Pearson, Goulart-Fisher, & Lee, 1995; Lodewijckx et al., 2011; Trowbridge & Weingarten, 2011; Vanhaecht, De Witte, Depreitere, & Sermeus, 2006; Vanhaecht, De Witte, & Sermeus, 2007b; Van Herck et al., 2010). The first systematic use of CPs took place between 1985 and 1987 at the New England Medical Center in Boston, USA in response to the introduction of Diagnosis-Related Groups (DRGs) in 1983, where a reference length of stay and a budget were assigned to each DRG (Vanhaecht et al., 2007a; Vanhaecht et al., 2007b; Zander, 2002). Similarly, Lodewijckx et al. (2011) report that in Belgium and the Netherlands, the emphasis is on cost-containment, on developing patient-centred care and on achieving better clinical outcomes. Many of these CPs take the form of checklists of tasks and goals.

By the late 1990s more than 80% of hospitals in the USA were using at least some pathways (Pearson, 1999). In Europe, pathways were first introduced in the early 1990s in the UK (Bower, 2009; Hindle & Yazbeck, 2005; Panella et al., 2009; Vanhaecht et al., 2006; Zander, 2002). In the UK the emphasis is on improving the quality of care and integrating services that reflect the patient's journey; CPs act as a model to ensure that guidelines and best practice/clinical evidence are implemented where available (de Luc & Todd, 2003, p. 12). Furthermore, in the UK, CP documentation often replaces individual patient clinical records, while the KCE Report (Devriese et al., 2005, p. 41) observes that the majority (69%) of hospitals in Belgium use a supplementary document for their CPs: in only 36% of the hospitals is the patient record replaced by the CP document. In 17% of the hospitals the CPs are supported by IT resources.

Pathways began to come into use across the world between 1990 and 2000 (Hindle & Yazbeck, 2005; Vanhaecht et al., 2006; Zander, 2002), shifting the focus towards patient-centred healthcare, albeit healthcare that provided administrative efficiencies and contained costs. What varies is the local or national context in which the CP is implemented.

CPs bring together all professional groups involved in patient care, allowing them to arrive at a consensus about standards of care and expected outcomes for selected patient groups, and to undertake provision of care that is common to other patients with the same condition.

It should be possible to plan out a CP for patients with the same medical problem: setting out the stages patients should reach with the passage of time and defining outcomes which can be measured to assess progress. This is normally undertaken as a multidisciplinary exercise and allows for individual variances within the pathway depending on factors such as age, social status and other health problems (co-morbidity). The result is an agreed plan of care which achieves the standards set by all staff for patient care. All information is normally kept in a single document that does not need to be written out anew for each new patient (Walsh, 2002, pp. 81–82). Mc Nicol (1992) argues that pre-planning routine care frees up time to deal with individual problems as they occur and, moreover, means that much care is predictable and routine (Layton, 1993).

1.1 Definition

The literature still presents a number of different definitions, which is mainly the result of confusion between concepts that are similar only in some particulars: clinical guidelines, protocols and CPs (Currie & Harvey, 2000; Every, Hochman, Becker, Kopecky, & Cannon, 2000; Kitchiner, Davidson, & Bundred, 1996; Lodewijckx et al., 2011; Morris, 2000; Trowbridge & Weingartner, 2001). CP definitions may vary only slightly in context and language, but the most commonly used and most comprehensive definition is the one provided by the European Pathway Association (2011):

‘A CP is acomplex intervention for the mutual decision making and organisation of care processes for a well-defined group of patients during a well-defined period. The defining characteristics of CPs include:

1. An explicit statement of the goals and key elements of care based on evidence, best practice, and patients’ expectations and their characteristics;
2. The facilitation of the communication among the team members and with patients and families;
3. The coordination of the care process by coordinating the roles and sequencing the activities of the multidisciplinary care team, patients and their relatives;
4. The documentation, monitoring, and evaluation of variances and outcomes; and
5. The identification of the appropriate resources.’

As noted, there are many alternative terms used for care pathways. Indeed, Lumsdon and Hagland (1993) produced a list of 33 terms; these included clinical pathway, integrated care pathway, integrated service pathway, care packages, care map, carepath and critical path. Different countries have their own language-specific terms, e.g. *klinična pot* in Slovenia, *itinéraire clinique* in France and *klinischen Pfaden* in Germany. In the international literature, ‘care pathway’ is the term most commonly used. Since CPs originated in the concept of managed care to provide cost-effective, patient-focused, multidisciplinary and collaborative care (Laxade & Haile, 1995), most languages have opted to find a translation or expression that takes into account all these concepts. According to Kitchiner et al. (1996), a CP defines the expected course of events in the care of a patient with a particular condition and within a set timescale.

CPs are structured according to time intervals during which specific goals and the expected progress are indicated, together with guidance on the optimal timing of appropriate investigations and treatment (Coffey et al., 1992). A CP is usually unique to the particular institution in which it is developed because it will reflect details of care, which vary among institutions, and current practice (Gray, 2009, p. 26). This is mainly because of locally available resources, such as human and financial resources, facilities, capacities and so on.

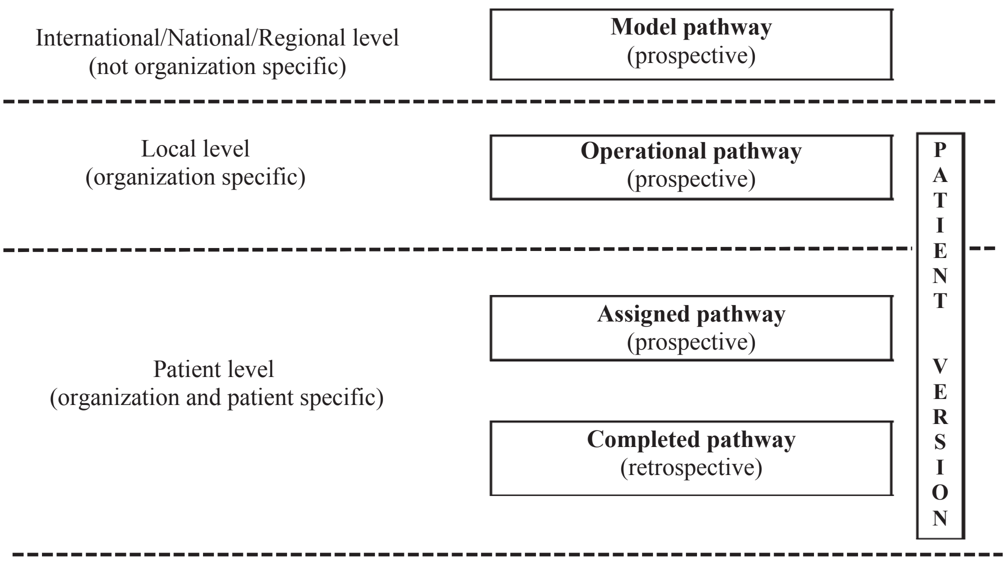
1.2 The CP product

According to Vanhaecht, Panella, Van Zelm and Sermeus (2010), as well as being a concept, a model and a process for improving quality and efficiency, CPs can be described as a *product*. Buying pathways without translating them and adapting them to a specific organisation and team could be unsafe and ineffective. The ‘pathway product’ is mostly regarded as a file in the patient record (Campbell, Hotchkiss, Bradshaw, & Porteous, 1998; Whittle, McDonald, Dunn, & de Luc, 2004), and is discussed below.

According to Vanhaecht et al. (2010), there are **five types** or **four levels of aggregation of pathway products**: model pathway, operational pathway, assigned pathway, completed pathway and the patient version of the pathway, which is a combination of the operational-assigned-completed pathway in a simplified and more patient-friendly language (see Figure 1). More specifically, these are described as follows (Vanchaecht et al., 2010):

- The **model pathway** is the most aggregated level, is based on available international and national evidence, and is not organisation-specific;
- The **operational pathway** is developed by a specific organisation, takes into account the information from the model pathway, and is organisation-specific;
- The **assigned pathway** is the pathway used for a specific patient and is based on the operational pathway and adapted to the needs of the individual patient;
- The **completed pathway** is the path that can be reviewed *ex post facto*, i.e. after patient discharge. The difference between the completed and the operational pathway provides information about the variances and level of compliance in the key interventions made along the path (Panella et al., 2009);
- The **patient version of the pathway** aims to inform and involve the patient and his/her family regarding the process of care. Most of the time the patient version is based on the model and operational pathway, and can be used as an instrument of communication between the patient, his/her carer and the multidisciplinary team (Vanhaecht et al., 2007a; Vanhaecht et al., 2007b; Vanhaecht et al., 2010).

Figure 1: Four aggregation levels of the pathway product



Source: K. Vanhaecht et al., An overview on the history and concept of CPs as complex interventions, 2010, p. 121

Different **models** or **coordination mechanisms of pathways** describe the methodology used to support the process of improving quality and efficiency, and are put into effect on different aggregation levels. When using or translating these methods, two issues are important: the level of predictability of the care process and the level of agreement between the members of the multidisciplinary team (Lodewijckx et al., 2011). Vanhaecht et al. (2007) present three different CP coordination mechanisms (Figure 2):

- **Chain models** orthe **coordination mechanism** are used for highly predictable care processes with a high level of agreement between the team members. Pathways can be used as time-task matrixes (on day-by-day, half-day or hour-by-hour timings), e.g. CAP, knee replacement, natural delivery;
- **Hub models** orthe **coordination mechanism** are used for less predictable processes such as internal medicine, rehabilitation, psychiatry and palliative care processes. A key person or case manager will lead the organisation of the care process and may use chain models for the highly predictable sub-processes;
- **Web models** orthe **coordination mechanism** are used for unpredictable care or care processes in which it is necessary to hold daily team meetings in order to organise and structure the process. In web models the ‘time-task’ matrix can be changed into a ‘goal-task’ matrix. Examples are complex diagnostic admissions or pathways for patient groups with several important co-morbidities.

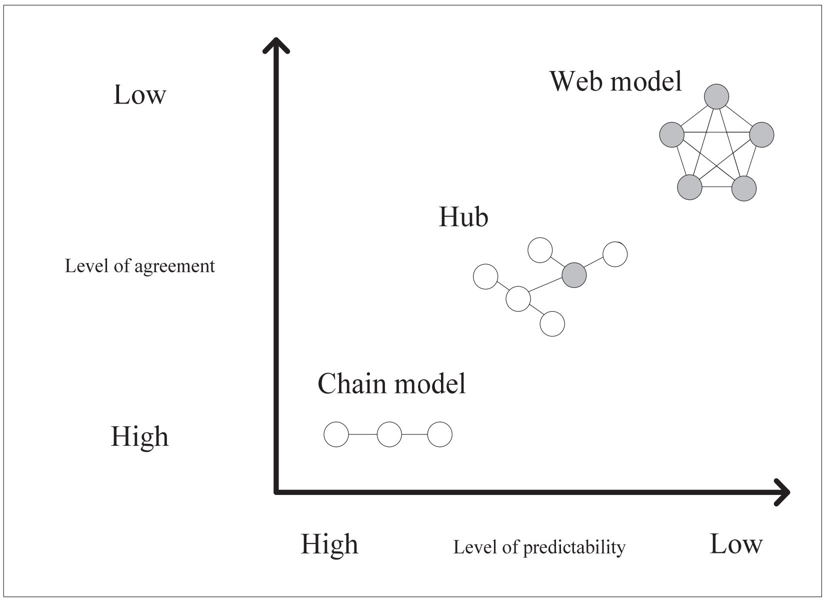
Different professional groups need to interact and decide how to organise the care process and determine who is responsible for it. How this challenge is managed will also depend on the level of agreement and predictability, as illustrated in Figure 2. Chilingerian and Clavin (1994) describe the concept of temporary teams, where a temporary team is formed for every patient, under the supervision of a clinical lead (normally a medical doctor) and in which the team members are detached from their own professional group or service.

The temporary teams may become focused teams (stroke team, total knee team, palliative care team, etc.). The interdisciplinary CP team needs to focus on common goals, describe the different roles of the team members, and determine the communication and coordination mechanisms and processes that will be used (Lodewijckx et al., 2011).

CPs are used in various ways. One instance is where pathways are used as one of the tools to structure or design care processes and improve them within the patient-centred care concept (European Pathway Association, 2012; Hindle & Yazbeck, 2005; Vanhaecht et al., 2006; Vanhaecht et al., 2007a; Zander, 2006).Patients may, for example, need to see many different professionals on different days and in different departments. CPs place the patient at the centre of care.

A second instance is where CPs are implemented as a method for monitoring processes and processing time in a wide range of healthcare systems, primarily to improve the efficiency of hospital care while at the same time maintaining or improving quality (Bandolier, 2003; European Pathway Association, 2011; Hindle & Yazbeck, 2005; Lodewijckx et al., 2011; Trowbridge & Weingarten, 2011; Zander, 1988).

Figure 2: Different models of pathway coordination mechanisms



Source: K. Vanhaecht et al., An overview on the history and concept of CPs as complex interventions, 2010, p. 119

Third, the development, implementation and evaluation of CPs constitute one of the structured care methodologies alongside (for example) guidelines, protocols and case management (Campbell et al., 1998; Degeling, Maxwell, Kennedy,& Coyle, 2003; Hindle & Yazbeck, 2005; Pearson et al., 1995; Lodewijckx et al., 2011; Trowbridge & Weingarten, 2011; Zander & Bower, 2000).

In addition, CPs encourage both professionals and organisations to view the 'patient's journey' from a different perspective and to identify how the coordination and consistency of care can be improved (Middleton & Roberts, 2000, p. 6). However, generally speaking, it is the development and implementation of a CP that is the main method of (re-)organising a care process (Barbieri et al., 2009; Marchisio, Ferraccioli, Barbieri, Porcelli, & Panella, 2006; Panella et al., 2003; Panella et al., 2009; Pearson et al., 1995; Van Herck et al., 2010; Sermeus & Vanhaecht, 2009; Vanhaecht et al., 2006; Vanhaecht et al., 2007; Vanhaecht et al., 2007a; Vanhaecht et al., 2009a; Vanhaecht et al., 2009b).

CPs are primarily regarded as tools for designing care processes, implementing clinical governance, streamlining delivered care, improving the quality of clinical care, and ensuring

that clinical care is based on the latest research (De Luc, 1999; De Luc, 2001). The concept of CPs has been described as a tool or 'complex intervention' that is then transposed into a document (Campbell et al., 2007; Panella & Marchisio, 2003; Panella et al., 2007; Panella et al., 2008).
According to Vanhaecht et al. (2009, p. 117), clinical process innovations are central to the ability of organisations to negotiate the challenges of cost-containment and improvements to quality; and as Nedelko and Potočan (2013) point out, an organisation must create and maintain appropriate conditions for an innovative working environment. It is because of this complexity that it becomes clear that pathways are more than just a piece of paper or a file in the patient record (Vanhaecht et al., 2006).

The aim of a pathway is to ensure that evidence-based care is delivered to the patient by the right individual at the right time and in the right environment, helping to reduce unnecessary variances in treatment by optimising the use of resources and improving risk-adjusted patient outcomes, and enhancing the quality of care (Colucciello & Mangles, 1997, pp. 53–54). The following elements need to be well understood and taken into consideration when designing a CP:

- patient type or group;
- episode of care;
- method of care;
- variances from the usual method of care;
- multidisciplinary collaboration.

A*patient type* or *group* is a group of patients with similar clinical symptoms and requiring similar treatment, services and resources. CPs are developed for high-volume and/or high-risk patient groups whose diagnosis, interventions, timelines and outcomes can be predicted (Currie & Harvey, 1997; Middleton & Roberts, 2000). In other words, a patient type is a group of patients who arrive for healthcare at a hospital (or other care location) with similar health problems, require the same kinds of intervention (diagnosis and treatment processes), and are likely to have similar kinds of outcome. A different CP is needed for each patient type, but the same CP form is used for all patients of the same type (Hindle & Yazbeck, 2005).

On reviewing the literature, there is evidence that around 60–70% of patients in hospitals can be allocated to patient types or groups, and so can be assigned to and follow a CP. Patient groups can be organised around case-types, specific disease categories, levels of dependence and access routes into care (e.g. elective or emergency), e.g. (Middleton & Roberts, 2000, p. 4):

- Monitoring: pregnancy, insulin-dependent diabetes, high blood pressure, terminal care;

- Elective: hip or knee replacement, cataract surgery, hysterectomy;
- Emergency: stroke, myocardial infarction, acute asthma.

An *episode of care* is the package of services to be provided by a clinical team for a particular health problem. In principle, the episode of care should be defined to cover an entire illness from onset to resolution; in practice, however, there may be reasons why one clinical team passes responsibility over to another. In other words, a CP might cover only part of an inpatient episode, or the entire episode from admission to discharge; it might even cover care that occurs in two or more settings (clinics, outpatient departments, nursing homes, community care, and/or primary healthcare facilities), or care provided in two or more different settings. For example, a single CP could be used to cover pre-admission outpatient care for a pregnant woman, confinement in hospital, and post-discharge care for mother and baby (Hindle & Yazbeck, 2005).

The *method of care* or usual care means the set of diagnostic and treatment activities that would normally apply to the patient type, and the sequence and timing of those activities. It represents an important element of the CP model of care, as do the patient group and the episode of care, and is about providing sequential and appropriate care (Hindle, Dowdeswell, & Yazbeck, 2004). It includes all kinds of care from the beginning to the end of the episode. For example, an episode of hospitalisation for transurethral resection of the prostate would routinely involve many well-established care activities, such as pre-operative antibiotics, review of X-rays, transfer to the operating theatre, periodic monitoring of the patient's vital signs by nursing staff, and post-operative removal of the catheters.

Usual care or method of care should be the most clinically effective and cost-effective process that the multidisciplinary team as a whole can devise. The process should combine optimal patient outcomes with the lowest significant risk within the given resources. Clinicians will always carry the responsibility of advocating the best possible care for their patients; however, the reality is that compromises will be needed (Hindle et al., 2004; Hindle & Yazbeck, 2005).

The CP approach works around the problem by setting out, in advance, what should happen when, and by authorising the nurse to make sure that it does happen – provided the agreed outcomes in terms of the patient's progress have been met (Walsh, 1997, p. 93). Resources that are used on one patient are no longer available for the treatment of another patient. A CP attempts to ensure that the patient receives the right care at the right time within an appropriate cost-quality balance. This is to be achieved by establishing desired patient outcomes within an agreed timeframe and by utilising known resources for each patient group identified.

Variances are deviations from the usual method of care. They can be deliberate or accidental, as when therapies are adjusted in response to an unexpected change in the patient's condition.

At the other extreme, variances might be accidental and undesirable, e.g. a patient's discharge is delayed because of a failure to initiate discharge planning.

An analysis of variances from the pathway conducted via a retrospective audit identifies trends in the delivery of care to the chosen patient group. The information can be used to change the pathway as appropriate (Middleton & Roberts, 2000, p. 6). A CP document usually contains a separate page at the back to record deviations or variances from the expected course of care.

A good pathway is rarely a representation of the 'best possible care' but, rather, the best affordable care (Hindle & Yazbeck, 2005). Some degree of variance analysis is required in order to check whether the system has drifted out of control. All systems run this risk, especially systems as complicated as healthcare (Middleton & Roberts, 2000). The only time more information is written on the pathway form is when there is a significant variance.

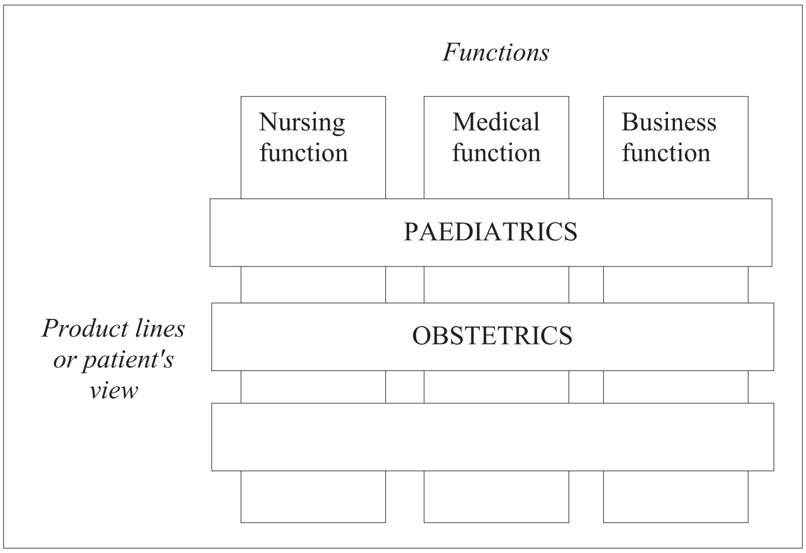
Experienced teams aim to contain variances to around 15% of cases during the first year of use of a new CP, and try to reduce this to 10% thereafter. If the rate is higher than 15%, the team will take corrective action; this usually means changing the CP itself, taking steps to encourage a greater degree of adherence to the CP by clinical staff, or both (Hindle et al., 2004; Middleton & Roberts, 2000).

Alongside the first four important aspects of the CP model as described above is the horizontal multidisciplinary teamapproach to care (inn contrast to the 'silo' approach). A *multidisciplinary (clinical) team* is a team or approach that utilises the skills and experience of individuals from different disciplines, with each discipline approaching the patient from its own perspective (Jessup, 2007).

This approach can be delivered by a range of professionals functioning as a team within the organisation, or by professionals from different organisations and brought together as a one-offteam. As a patient's condition changes over time, the composition of the team may change to reflect changes to his/her clinical and psychosocial needs (Mitchell, Tieman, & Shelby-James, 2008, p. 63). In other words, the pathway reflects all the roles of the professional disciplines in patient care, and reflects the patient's view rather than the partial view of one or two professional groups, e.g. nurses and doctors. Most pathways will include, at the very least, the care provided by medical and nursing professionals; this is because they are involved in nearly all types of care episode. They also have to specify the activities of other clinical professionals, if their services are always used or used on occasion. Such professionals may include pathologists, anaesthesiologists, radiologists, dieticians, physiotherapists, radiographers, social workers, etc.

The particular mix of professionals will depend on the type of patient covered by the pathway (Hindle & Yazbeck, 2005). Figure 3 provides a graphic illustration of a CP as viewed by the professionals and patients. The professionals are represented vertically in the departments of nursing care, medical care, anaesthetics and dietetics, while pneumonia, stroke and hip replacement represent the journey of the patient through the departments. For example, a patient in the pneumonia patient group or with pneumonia will be interacting with professionals in functions such as nursing care, medical care, anaesthetics and dietetics.

Figure 3: Two axes of managing services



Source: Adapted from S. M. Shortell & A. D. Kaluzny, Health Care Management Organisation, Design and Behaviour, 2006, p. 335

There are therefore two ways of managing healthcare services or complex interventions in hospitals (Shortell & Kaluzny, 2006). The first is called the 'functional approach' and is the most common approach in many hospitals. Management responsibilities are assigned by function or profession, such as nursing, medicine and administration or business. The second is called the 'product line' approach. This involves assigning management responsibilities according to the type of patient (paediatric, orthopaedic, obstetric, etc.). A mix of these two models is normally usedin healthcare service delivery units.

1.3 Structure of a CP

In the following I present the structure of a CP document by concentrating on the structure of a CP document.

According to Vanhaecht et al. (2007b), the lack of research on the auditing of CPs is astonishing. The Integrated CP Assessment Tool (ICPAT) is the only tool to have been validated by a study published in a peer-reviewed journal, and it appears to be the most appropriate clinical pathway audit tool. This tool ensures that CP development and implementation are both rigorous and systematic (Whittle et al., 2004). The tool evaluates the written CP (i.e. the document) and, to a lesser extent, the functioning clinical pathway.

There are two main types of CP documentation. Care can be plotted not only in terms of what should be done when (process), but also in terms of what the patient should achieve at set times (outcomes) (Walsh, 1997, pp. 82–83). There are two distinct types of CP documentation. The first is process-based documentation, preferred when the CP is required to act as a checklist or an *aide-mémoire* within those clinical areas with a high turnover of staff, where step-in staff are used or when there is a new junior staff intake. Process-based documentation ensures that, for instance, a wound is checked. That does not necessarily mean it has begun to heal, however; in this case, outcome-based documentation should be used, which is the second type of CP documentation.

In most cases a CP will include a mixture of process-based documentation (the task that needs to be performed) and outcome-based documentation (milestones the patient needs to reach to progress along the pathway). In practice, CP documents are intended to be flexible (changes are inevitable) and are to be encouraged in order to prevent current practice becoming the norm.

According to the literature on CPs (Walsh, 1997; De Luc, 2001; Devriese et al. 2005) no set rules as to how a CP should appear on paper. However, an international consensus has emerged that suggests that CP documentation should be: sequential, including a timeframe and indicators (e.g. to measure how effectively the patient moves along his/her journey), written in a language that has been agreed by the multidisciplinary team, and presented on A4 paper or an iPad.

As described above, a CP is a complex intervention, or the provision of a complex and integrated healthcare service whose aim is to track the patient's journey. It takes the form of a document as an outline or plan of anticipated clinical practice for a patient group with a particular diagnosis. It is the nature of the patient group involved and the skills and experience of the multidisciplinary team that will influence the methods of documentation, and how, by whom (responsibility) and when the intervention is to take place. A CP often takes the form of a matrix which places interventions (tasks) on one axis and time (hours, days, weeks) and milestones (specific stages of recovery) on the other. It describes the usual way of providing multidisciplinary clinical care for a particular patient, and serves as a place to record the care actually provided during an episode of care. Variances or deviations from the usual method can be recorded for the purpose of continuous evaluation and improvement of the methods of care (Middleton & Roberts, 2000; Hindle et al., 2004).

The content of CPs will differ according to clinical conditions or patient groups. Hospitals will normally consider developing a standard format for all CPs in use at a particular location. Familiarity with the documentation helps to ease difficult situations and protects patients when they are placed in a different specialisation from the one to which they were admitted; it also makes the rotation of staff between specialisations easier, and alleviates pressure when staff shortages occur, when there are a number of step-ins or when new staff members join the multidisciplinary team. The process of using CPs is straightforward in outline and involves real-time care documentation. Most clinical teams have a small number of CPs that cover their most common patient types; for example, an obstetrics team might have pathways for normal delivery, Caesarean section, pre-term labour, abortion and ectopic pregnancy that cover 55% of their patients (Middleton & Roberts, 2000), while other patient types do not have pathways because they are of lower volume.

There two typical types of CPs to found that prevail on the World Wide Web. These types of CPs are more or less presented in the form of diagrams and are known as Maps of Medicine or NICE pathways and are described below. On the basis of further online research, I came across different CP formats provided on hospital websites from different parts of the world (hospitals in Slovenia, UK, Australia, and so on; some typical examples are described below) , with most sharing more or less the same structure described below. Middleton and Roberts (2000) describe what a CP document should look like.

If possible, care should be recorded on the pathway form rather than on separate documents. A CP document would follow a *defined structure* consisting of the following (Middleton & Roberts, 2000):

1. Front page(s) (patient details);
2. Clinical assessment (including risk assessment);
3. Patient management plan (including review points where the patient's progress is assessed);
4. A section on variances from the expected care process.

Responsibility for each item is indicated at every step (e.g. with the initials of the doctor, nurse or therapist in charge). Documentation is added in sequence as each member of the team delivers care. It is usually only necessary to enter a tick (✓) to show that each activity has been handled properly and more or less in accordance with the pathway. In some cases, values (such as blood pressure or respiratory rate) and precise time need to be recorded. The main reason why hospitals might choose to indicate the approximate time at which an activity was completed is because they wish to undertake some kind of analysis or evaluation – for example, timings might be useful for updating the standard cost (the estimated cost of providing care according to the pathway). The pathway form can be used as the basis for writing a discharge letter, or for entering data into a computer system for payment purposes (Middleton & Roberts, 2000).

The *front page(s) of a CPdocument* provides patient details, admission details and a number of background details about the patient's condition and the intended management plan. It normally includes information appropriate to the condition and care setting, which might be a ward or department: patient details (name, address, home circumstances, past medical history, medication, allergies, etc.); admission details (date, time and reason for admission); admission observations (temperature, pulse, etc.); diagnosis (for medical or community-based care) or intervention (for surgical or community-based care); and, most often, an appropriate statement regarding clinical judgment, the desired objective of care, discharge criteria and the expected length of stay (Middleton & Roberts, 2000).

The *clinical assessment* of a patient normally includes risk assessment and takes place in three assessment stages: a medical assessment, a nursing and often therapy assessment, and an overall assessment carried out by the multidisciplinary team (Middleton & Roberts, 2000):

- With *medical assessments*, the details of an individual medical assessment are included in a CP and are entered into a structured form agreed by senior medical staff and containing information relevant to the chosen patient group. Time is saved by the use of a series of pre-defined questions, and there is also less likelihood that something important will be missed;
- *Nursing assessment*usually tends to monitor activities of daily living, such asbreathing and circulation, skin condition, nutrition and fluids, communication, mobility, sleep, cognition, etc. These activities are built into the CP to provide a basis for nursing assessment appropriate for the chosen patient group. Nursing assessment also incorporates risk assessment, using the following tools as required: nutritional assessment tool, falls risk assessment tool, pressure sore risk assessment tool, pain assessment tool, lifting and handling;
- *Therapy assessment*generally focuses on functional ability (physiotherapy) and cognitive ability (occupational therapy), and the setting of appropriate goals to be achieved. Therapists also usually keep their own, separately held notes, although they will often include information in the nursing notes if there is something specific they would like nurses to undertake or continue on their behalf. On some occasions, nothing is written and the care provided by therapists is undertaken in isolation from the rest of the multidisciplinary team. Including this information in CPs offers the opportunity to introduce multidisciplinary assessment that focuses on the symptoms presented by the patient and the potential investigations and/or medication required. Responsibility for each assessment item can be indicated in the CP, or a full assessment can be made by somebody trained to do so;
- *Multidisciplinary assessment* is about undertaking separate medical, nursing and therapy assessments, and often results in a duplication of information, with the patient answering the same question a number of times. The use of CPs offers the opportunity to introduce multidisciplinary assessment that focuses on the symptoms presented by the patient and the potential investigations and/or medication required. Responsibility for each assessment item can be indicated in the CP.

The *patient management plan* included in the CP places the tasks, interventions and outcomes defined at the outset against the expected timeframe for the pathway, i.e. sequential and appropriate care. There are a number of ways of presenting the management plan within the CP. Alternatively, another common method specifies the management plan by aspects of care.

In addition to recording tasks, interventions and outcomes, patient management plans should include space for each professional group to record additional comments (often called progress notes or communication) as appropriate. If the patient is progressing as planned, there is no need to write progress notes. This space is generally used to communicate information to other professionals or to highlight any issues raised by the patient or their family (Middleton & Roberts, 2000, p. 51).

It is essential to record *variances from the expected*, with a separate page usually being included to record variances at the back of the CP document. Those variances are most often coded according to a previously agreed set of variance codes.

1.4 Reported effects of the use of CPs

In this section I refer to a number of published evaluations of CPs and outline the most common findings. Some of the reported studies involve ensuring that there are experimental groups of patients whose care is supported by a pathway and a control group that is treated according to the usual method, i.e. not on a pathway. I will present the reported effects of the use of CPs.

As Middleton and Roberts (2000, p. 6) state, one of the benefits of a CP is that current practice is reviewed. It is the review of practice that highlights problem areas and/or areas of duplication, allowing changes in practice to be made as required. Pathways offer a means of incorporating available evidence and national and local guidelines into everyday clinical care. In other words, the CP specifies a carefully designed package of care.

Theseare interrelated for the most part and are described below: diagnostic services, length of stay, quality of care and patient outcome, legal risk, organisational development, and the organisation and planning of healthcare. For instance, there is evidence that the use of CPs can improve outcomes and thereby reduce the cost of healthcare (Holtzman, Bjerke, & Kane, 1998 in Gray, 2009, p. 26).

Table 1: Summary table of the benefits and adverse effects of the use of CPs

Benefits	Adverse effects or failures
- Reduced number of diagnostic services - Reduced length of stay - Current practice review - Improved health outcomes - Reduction of cost of care - Better coordination of care, improved communication between professional groups - Protection from malpractice claims - Organisation of facilities and assets in the healthcare system	- Lack of outcome indicators - Absence or lack of evidence - Organisational behaviour (especially barriers established by medical doctor professional group)

A. Number of diagnostic services

Several authors report that diagnostic tests are often repeated unnecessarily because of uncertainties regarding responsibilities and the ordering of tests in emergency departments, with a patient perhaps being moved to the ward or missing essential tests because of an assumption that someone else has ordered them. There is evidence that a pathway can lead to an overall reduction in waste and duplication, e.g. in the ordering and re-ordering of tests on a daily basis.

Some papers report reductions in costs through the avoidance of unnecessary therapies and diagnostic tests (Allen, Gillen, & Rixson, 2009; Govan, 2009; Hart & Musfeldt, 1992). Kwan-Gett, Lozano, Mullin, & Marcuse (1997) studied the effects of introducing a CP for the inpatient care of children with asthma in the USA. They found that there was a reduction of 33% in the costs of pathology tests and reduction of 42% in radiology costs. In the Prince of Wales Hospital in Australia, Board, Brennan, & Caplan (2000a) found similar results when studying surgical and urgent medical CPs: a fall of 70% in the number of pathology tests for scheduled surgical patients and a fall of 25% for urgent medical cases.

B. Length of stay

A CP indicates the optimal sequence of care activities – that is, the CP indicates an optimal sequence of activities and organises activities of care in an optimal sequence, thus optimising the sequencing of activities. In the provision of CP-based care, reports show that there is a reduction in the average length of stay.

Richter-Ehrenstein, Heymann, Schneider and Vargas Hein (2012) report that ‘the mean hospital stay decreased significantly from 4.5 days in 2006 to 3.7 days in 2007 and revealed 3.4 days in 2008. This is a decrease by 24.4% for the duration of hospital stay.’ Giuliano and Poirier (1991) demonstrated that a reduction in length of stay could be achieved without adverse effects on outcomes by deleting an intermediate phase of care in an intensive care unit for stroke patients admitted via the emergency department.

Flynn and Kilgallen (1993) studied the effects of a revised CP on patients admitted with total hip fracture: it was noted that patient education and discharge planning on the first and second days caused the length of stay to be prolonged. A change was therefore made, with discharge planning and physical rehabilitation being included in the pre-admission process. Delays in discharge were reduced when patients received instructions on post-operative physiotherapy at the pre-admission clinic.

A further illustration is provided by Seawright and Taylor’s (2011) report on kidney transplants, where they state that ‘the clinical pathway group had statistically significant decreases in postoperative length of stay, use of laboratory tests, and use of intravenous medications compared with the comparison group.’ Lodewijckx et al. (2011) and Pritts et al. (1999) also report positive effects on the length of stay. The latter report that with the implementation of a CP for bowel resection, the ‘mean postoperative length of stay was 9,98 +/- 0,62 days (pre-pathway), 9,68 +/- 0,88 days for (non-pathway), and 7,71 +/- 0,37 days (pathway) ($p < 0,05$ vs. other groups)’.

C. Patient outcome and quality of care

CPs enable clinicians to manage their work more efficiently and, at the same time, improve and promote the quality of care. The flow-process model, as Øvretveit (1992, p. 54) labels the CP,is a flow-process model that provides a framework for examining the service to understand patients’ perceptions and to identify opportunities for error and fail points where problems frequently occur. It is especially useful for helping staff to consider their service from the patients’ point of view and to understand their role in the overall process of care.

A CP is therefore a living document and one which is continually revised on the basis of experience, use, and technological and medical advances. In other words, a pathway is a journey rather than a final solution.

The relationship between pathway-based teamwork and continuous quality improvement is noted in the literature (Hart & Musfeldt, 1992; Horne, 1996). Cumbler, Zaemisch, Graves, Brega and Jones (2011) report that the CP for stroke inpatients, as an initiative to improve quality, decreased median inpatient alert-to-CT time by 57%, demonstrating that the speed of in-hospital stroke evaluation could be improved through the systematic application of quality improvement principles. Kitchiner et al. (1996) also report that CPs ‘provide a powerful audit tool, as all aspects of the process and outcome of clinical practice can be constantly monitored. Variances from set standards are minimized, and improvements are rapidly incorporated into routine practice and subsequently re-evaluated.'

A further reported effect is that clinicians are challenged to adapt to payment system changes: in their case study of a clinical pathway revision for cardiac catheterisation, Yan, Chen, Kung and Peng (2011) report that 'hospitals must implement necessary management control systems or measures to maintain both fiscal soundness and medical care quality'. Santoso, Iau, Lim, Koh and Pang (2002) reported experiences with a mastectomy clinical pathway in Singapore. They conducted a prospective study with experimental (pathway) and control (non-pathway) groups, and found that the length of stay (4.91 days to 4.1 days) and mean cost per case (USD 5,050 to USD 4,406) were lower in the pathway group; they concluded that the process of pathway design and continual monitoring through variance analysis made a direct contribution to identifying and discussing the problems of care methods within the team.

Finally, an increasing number of studies are also suggesting that clinical outcomes are improved by using pathways (Hoffman, 1997; Ogilvie-Harris, Botsford, & Hawker, 1993). These outcomes are also defined in advance, and agreed with the patient and carer. Milestones are used to measure the patient's progress along the pathway, and this information can also be used to measure actual against expected progress.

Indicators for care quality and outcomes are crucial. CPs normally include one or more measures of care quality. Many of these are identified by an analysis of variance reports. For instance, if a diagnostic test is missed or delayed, there should be a record of this variance and the causes. The preferred approach, however, is to ensure that there are checks on the quality of care which are independent of the reporting of variance.

Gallagher (1994) and Eccles and Mason (2001) provide examples of care quality indicators in CPs. As there is a need to manage the trade-offs between cost, care quality, outcome and equity, there is a growing interest in the measurement of outcomes within the CP context. Bergman (1993) states that the motivating factor for introducing outcome indicators in hospitals in the USA was the desire to establish more favourable contracts with insurers for the purpose of demonstrating their commitment to the well-being of patients.

Vrooman (1996) and Woodyard and Sheetz (1993) argue that if outcome measures are not included, CPs become focused on the task rather than the patient. The latter add that in the absence of outcome indicators, 'measures of clinical outcome [and]issues such as the quality of care cannot be measured or even recognized'. Nelson and Batalden (1993) note that if no indicators are included in the CP, this severely limits the usefulness of pathway information, and that performance will be measured by a provider's capacity to produce the desired health outcomes as a cost that represents value for money. However, it is worth noting that the international literature contains many examples of pathways that do not contain outcomes (Flynn & Kilgallen, 1993; Kimball, 1993; Metcalf, 1991; Tahan, 2002).

D. Legal risk

One added value of a CP lies in protection from malpractice claims, with the legal implications of pathways being addressed in a large number of papers. Griffith (2007), for example, considers the legal implications of CPs in response to the fact that many health professionals have expressed concern that 'comparing the actual care delivered with a CP makes them more susceptible to litigation should the patient suffer harm during the course of treatment'. Cheah (1998) discusses a wide range of medico-legal issues, while Ransom, Suddert, Dombrowski, Mello and Brennan (2003) analyse the relationship between adherence to pathways and malpractice claims in obstetrics in a large hospital system in the USA. The latter found that non-compliance with pathways was strongly associated with malpractice claims.

In 80% of malpractice claims, the main claim was directly related to a failure to follow the pathway. The authors conclude that adherence to CPs not only improves quality of care but 'might [also] protect clinicians and institutions against malpractice litigation.' Forkner (1996), who focuses on common negligence issues for nurses and vulnerability to malpractice, notes that pathways 'can be powerful mechanisms to prevent malpractice litigation or they can present liability issues.' All in all, the presence of a pathway reduces the risk of errors and, consequently, the risk of lawsuits; it also serves as a basis for judging whether care was inadequate (clinicians are able to validate the care they deliver).

E. Organisational development

CPs can contribute towards improving communication, the coordination of activities, organisational behaviour and the ability to accept innovations; however, the majority of the problems reported are related to organisational constraints. Evans-Lacko Jarrett, McCrone and Thornicroft (2010) state that 'in order to achieve adequate implementation, however, facilitators and barriers must be considered, planned for, and incorporated directly into the pathway with full engagement among clinical and management staff.' They report that 'barriers and/or facilitators may be present at each stage of development, and organisational barriers at any stage can impede successful implementation of CPs.' Another problem found with the process-focused CP was that there was a lack of clarity among staff about what counted as acceptable progress along the pathway, as there were no clear milestones against which to measure progress (Walsh, 1997, p. 89).

In a second typical illustration, Woodyard and Sheetz (1993) discuss the problem in relation to their own CPs and point out one danger of a CP is that it may become too task-focused. Hindle and Yazbeck (2005), in their study on the use of CPs across the EU, point out that 'one important constraint was reported to be a cultural aversion among doctors that arises at least in part from the implication that pathways require multidisciplinary teamwork which will prejudice medical autonomy. In other words, pathways challenge clinical professional sub-cultures.' The CP supports effective decision-making. If there is no evidence available for the chosen patient group, the clinical team needs to reach a consensus on what constitutes 'best practice'.

By defining what is expected to happen to a particular patient group, clinical problems can be identified earlier, allowing decisions to be made more quickly. Documenting practice in the pathway document coordinates the approach between the different healthcare professionals (and agencies) involved in delivering care, thus improving multidisciplinary teamwork and staff education. As Hindle & Yazbeck (2005) point out, it is often claimed that clinicians benefit directly because teamwork improves; it is in fact common for clinicians to report a high degree of frustration, and even stress, as a consequence of a lack of coordination between staff (e.g. when a diagnostic test is not performed as expected).

Frustration was a major factor in encouraging one large US hospital to adopt pathways for cerebrovascular accident (CVA) patients. The main reason for this frustration was that these patients were receiving care in 18 different units within the hospital, with delays, misunderstandings and duplications a common occurrence. Cooper, Jauch and Flaherty (2007) reported that the CVA pathway reduced length of stay by 1.6 days while maintaining a patient satisfaction rating of 94%. Frustration is also strongly related to conflicts between staff. There are many ways of managing conflict, but the introduction of clinical pathways is a relatively non-threatening approach.

Poole (1994) noted that professional groups became better able to identify and discuss the ways in which their faults and idiosyncrasies impinged on the work of other team members. The value of pathways as a communication tool has also been widely argued. Woodyard and Sheetz (1993), for example, highlight the contribution made by CPs to the efficiency of handover between nurses at the end of a shift. Zander (1992) calls the CP the 'verbal glue' which unites clinicians involved around the patient and ensures that there is attention to detail with direct benefit to the quality of care. She states that CPs perform the essential function of ensuring that the following questions are asked and answered: What interventions and outcomes should be happening in this shift? What is actually happening? What did not happen and why? What should be done about it? Who will rectify the problem and when?

Flynn and Kilgallen (1993) describe pathways as 'an inexpensive communication mechanism available to multi-disciplinary departments and … the program of care clearly states the various professional actions and goals'. Giles et al. (2011) report that 'a multipronged systematic team approach to identifying and capturing patients with a high risk of re-fracture and a dedicated nurse coordinator role has created efficiencies in the detection and management of osteoporosis'. In their study, Allen and Rixson (2008) claim that pathways ‘appear to be most successful in improving service coordination in the acute stroke context where patient care trajectories are predictable.’

CPs also report benefits in terms of staff training, such as the induction of new staff to the hospital, the orientation of medical and other clinical trainees, and support for clinicians temporarily working in a new and specialised area owing to the absence of regular staff. Hindle & Yazbeck (2005) conclude that the main reason why a pathway reduces costs and improves quality of care (or both) is that it is a tool that supports collective learning – that is, a learning process shared by the entire team. They also point out that, in practice, the act of writing down the pathway helps to identify ways of making immediate improvements. Škerlavaj, Dimovski and Desouza (2010, p. 190) state that learning is embedded within the organisation, and that the organisation has a critical role to play in fostering relationships between individuals to facilitate learning – a CP is one tool that facilitates this type of organisational learning, and organisational learning contributes to organisational performance (Škerlavaj, Dimovski, Mrvar, & Pahor, 2010). Organisational learning depends upon the evolution of structures, processes and shared mental models (Dimovski & Penger, 2004), which are preconditions for the development of CPs.

De Luc and Todd (2003) and Degeling et al. (2002) argue that in order to achieve successful CP development and implementation across a health organisation, information relating to clinical staff and how they integrate the latest clinical evidence, how they operate as a clinical team, their professional roles, and how they plan, deliver and record clinical care needs to be drawn on; there is also needs to be information from a management perspective in terms of managing change, leadership, and the strategic role of the organisation in supporting clinical staff to develop, implement and maintain their CPs. Information is also required from an IT and systems perspective in terms of service modelling, process redesign, decision support systems, computerised record-keeping and document control systems. A computerised CP requires detailed, structured definitions of its elements, and the roles, tasks, timing, sequences, data items and rules need to be clearly defined. This level of detail is best managed in the local clinical setting via software that is supported by the IT system, as noted by de Luc and Todd (2003).

F. Facilities and assets planning in hospitals

A basic principle of facilities planning is that it should be based on a plan for service delivery. There is a growing body of evidence demonstrating the improvements in outcomes, quality and cost-effectiveness that arise from the implementation of pathway-designed hospital care. This will have important implications for hospital planners, as new designs will need to reflect evidence-based plans for coordinated service delivery.

It will be clear by now that the CP can make an important contribution to the way care is organised. Schriefer, Englehard, DiCesare and Miller (2000) discuss the merger of two previously independent hospitals whose services partly overlapped, and an example is given by Willis (2000). The latter analysed experiences in the introduction of pathways at a large US hospital, and their study group comprised elective inguinal herniorrhaphies before and after the introduction of pathways. They found that the number of patients admitted to hospital without good reason fell by nearly 50%. They concluded that the main cause was an improved understanding among doctors and other clinicians regarding the process of care (as defined in the pathway); consequently, there was a better basis for judging whether admission to hospital was necessary.

The Report of a Survey of CPs and Strategic Asset Planning in 17 EU Countries (Hindle et al., 2004) discusses how a number of EU countries are looking at new ways of redesigning service delivery, and how these countries are exploring ways and means of reshaping health services to sustain a balance between affordability and the principles of equitable and universal access. There is clear evidence pointing to the benefits of integrated disease management, described as CPs.

Furthermore, the Report (Hindle et al., 2004) stresses that ‘the nature and structure of hospital capital assets play an important role in supporting better clinical outcomes and care standards but will only be effective if sufficiently well designed and flexible to adapt to the driving force of pathway shaped clinical care.’Health services managers should also recognise the need to manage assets from a strategic perspective across the entire hospital. CPs are, however, likely to have greatest impact in changing healthcare where and when they are applied across care settings.

In summary, the most common reported effects of CP use are that they allow organisational behaviour to be dealt with more transparently, reduce the length of stay, improve quality, enable assets and facilities to be planned more effectively, protect against legal risks, foster rationalisation, and reduce waste, overproduction and overprocessing. As we have seen, CPs and their influence on the business functions of hospitals, which is the focus of this dissertation, has not yet been tackled in the literature.

1.5 The pathway information system

De Luc and Todd (2003, pp. 3–12) identify the following limitations of the paper-based CP:

- The need for on-going clinical evidence management within care pathways;
- The development, implementation and maintenance of care pathways;
- The obstacles to moving away from paper-based care pathwaysand embedding them in clinical computer systems;
- Achieving a whole-community organisational change management approach for care pathways;

- The lack of clarity of the concept and definitions which are universally understood and accepted.

Taking the first point into consideration, one of the fundamental objectives of CPs is to support evidence-based practice or, if the evidence base is lacking, to support a structured clinical audit in monitoring outcomes and variances. In turn, this information helps to improve practice through the principle of continuous quality improvement (CQI) (Currie & Harvey, 2000). There is evidence that variance in clinical practice is present even when guidelines provide updated or new evidence; CPs, together with guidelines and protocols, are therefore an attempt to introduce greater standardisation and to reduce unnecessary variations in practice (Allen & Rixson, 2008; Morris, 2000; Poortmans, Aznar, & Bartelink, 2012; Scott, Grimshaw, Klassen, Nettle-Aguirre, & Johnson, 2011; Shiro et al., 2011).

A CP should always be up to date and be based on the latest evidence; furthermore, the information contained within it, and on which clinical staff decide treatment options for individual patients, should be readily accessible upon interaction with the patient (de Luc & Todd, 2003, p. 4). Morris (2000), Shaw et al. (2009), Showell et al. (2010), Staggers, Weir and Phansalkar (2008) and Waring, McDonald, & Harrison (2006) argue that excessive information in complex clinical environments increases the likelihood of clinical errors. According to Morris (2000), there are structured methods for assessing evidence, together with standards for representing bibliographical citations, but these are rarely incorporated into a CP.

These authors also emphasise that clinicians and managers who are trying to improve service quality need high-quality information, which must be relevant, reliable, timely and easily accessible. Organisations need to have in place a system for ensuring that the content of all their CPs is reviewed and updated regularly (i.e. at least annually) by reference to the latest clinical evidence; CPs can otherwise easily become obsolete and stagnant (de Luc & Todd, 2003, p. 5). De Luc and Todd (2003) state that organisations need to ensure that the skills and time are available to allow evidence to be searched and appraised and allow clinical staff to update their knowledge of the literature; they add that knowledge management requires improved ways of structuring and locating the relevant information.

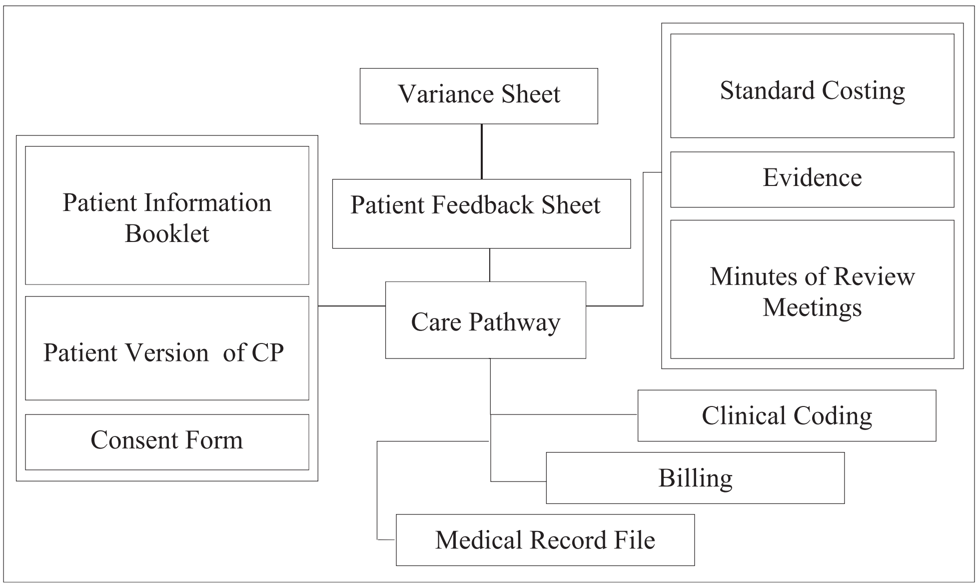
The point is that CP development, implementation and maintenance are very time-consuming. Furthermore, they require effort and commitment from the clinical teams developing them, and top-down support from the organisations. Huby and Rees (2005), Kent and Chalmers (2006) and March et al. (2000) point out that the development of CPs is expensive in terms of use of staff and, at the same time, represent a barrier to development.

As noted above, a CP is never finished, since it requires regular updates to take account of new evidence, changes in technology or treatment, and even resource reduction or augmentation. At the same time, there needs to be a structured approach to the dissemination of knowledge about CPs in order to support their development, along with easy access to other institutions' CPs for the purposes of review and comparison (de Luc & Todd, 2003, p. 7).

Another limitation relates to the move away from paper-based CPs and their embedding within the clinical IT system. As mentioned above, Barnes, Lawton and Briggs (1994), Campbell et al. (1998), Kwan-Gett et al. (1997), Lau, Cartmill and Leveaux (1996) and Sedman et al. (2004) have all argued that CPs provide benefits with regard to clinical documentation: they streamline clinical documentation, improve completeness, legibility and accuracy, improve communication between members of the team, aid clinical decision-making, and provide a structured audit tool for reviewing care standards and variances as illustrated in Figure 4.

Currie and Scrivener (2002) point out thatonly a few pathways have been embedded in proprietary work-flow systems, or have had their logic and form coupled to computer software in the UK's National Health Service. The literature provides scant evidence for the introduction of CPs in electronic form; a number of instances are, however, reported by Chu (2001) and Chu and Cesnik (1998). It would be true to say that not much has changed in the past ten years. Allen et al. (2009), Allen and Rixson (2008), Kwan (2007) and Wakamiya and Yamauchi (2009) all discuss moves towards an electronic version of pathways. E-pathways are in a developmental stage and there are few reports of their use within hospitals.

Figure 4: CP information system



Source: Adapted from D. Hindle & A. Yazbeck, Clinical pathways in 17 European Union countries: a purposive survey, 2005

According to de Luc and Todd (2003, p. 9), the biggest and most significant disadvantage of putting a CP into paper format is that this medium cannot show the structure, process steps and decision trees within the pathways, i.e. the pathway is essentially stored/presented as a list, with no means of zooming in and out of details, placing the pathway process flow within a broader organisational context (e.g. the reform of outpatient services), sharing common functions across different pathways, moving from paper-based to clinical computer system-based development, and cataloguing the pathway and its constituent parts. There are a number of other obstacles in terms of the use of paper-format CPs. De Luc and Todd (2003, pp. 8–9) list the most common ones:

- A CP contains a mass of information. The length and the amount of detail can become overwhelming, which can lead to the loss of prompt decision-making by members of the team;
- Paper documentation can only be at one location at any one time, and it is common for more than one member of the clinical team to need the patient record simultaneously, particularly when the CP crosses institutional boundaries;
- Once the CP is completed, the issue of ownership and storage of the documentation can cause tension, as the various organisations need to meet their operational requirements and legal obligations;
- The pathway collects a large amount of data which needs to be analysed and evaluated both for the provision of individual patient care (real-time analysis) and retrospectively, when reviewing the last 50–100 CP documents.

EPRs (Electronic Patient Records) are still a distant prospect for most healthcare systems. The health sector has fallen behind current thinking on electronic data handling. A CP, a clinical IT or computer system and EPRs are mutually supportive, which means that most healthcare systems still have a long way to go in this regard. De Luc and Todd (2003, p. 9) note that an appropriate IT system could make implementation of CPs easier in several ways:

- Improved data collection – management by exception and rapid data entry;
- Online access to guidelines/evidence/technical information;
- Grouped functions – test sets, drug regimens and packages of care can be ordered in one operation, thus saving time and reducing errors;
- Facilitation of clinical audit through patient-based data and clinical coding/terming;
- Improved data quality through elimination of duplication of information and handwritten notes;
- Flexibility – elements can be added to or deleted from a CP to create a care plan tailored to the patient, without loss of data quality for the individual patient episode;
- Multiple staff can view the clinical record from different locations simultaneously; and
- Individualisation of the ‘view’ of the clinical record for different staff or staff groups so that it becomes easier to find relevant information.

1.6 CPs as the basis for managing (financial) resources

CPs include important sets of information and, if properly used, provide the information required for evidence-based decision-making. CPs are much more comprehensive than the tools upon which hospitals have normally relied– for instance, aside from the evidence-based clinical guidelines, they also provide information on the way healthcare services are delivered, and describe the best practices that the clinical team can deliver given the available resources.

In turn, CPs can offer information about costs, optimal care settings and support services, and consequently offer insights that allow healthcare systems to (re-)define or reconfigure service delivery. They also provide tangible evidence to health purchasers that the provider is delivering quality care, together with the expected outcomes.

One of the core missions of any health system is to improve the state of health of its population; for this it has a finite budget. A health system will (should) consider four important items in relation to each disease intervention: what services must be in place to ensure optimal delivery, how and where the intervention is delivered, the efficacy of the intervention, and the cost of the intervention. The last two items, efficacy and cost, allow the healthcare system to determine which interventions have the highest value, i.e. those that provide the greatest benefit in terms of clinical outcome per unit of cost. The first two sets of information enable the system to determine how to deliver the prioritised interventions efficiently to the appropriate patients.

One way to control costs and hence healthcare expenditures is by capping the total healthcare budget; indeed, CPs can make it more difficult for funders to make arbitrary cuts because they make it more obvious to everyone what the consequences of reduced budgets will be. If a hospital (or a health service) wants to make best use of its budget, CPs will help to identify where more money would lead to improved health outcomes. Conversely, they will also indicate where money is being wasted – or at least, where it is not giving an equivalent degree of benefit to patients.

The study by Oates, Murray and Hindle (1998) is one of the very few to discussthe methods and results, measuring costs on a sample of public and private hospitals around Australia for the 1996/97 financial year.

A. Output-based payment

Most well-managed health systems around the world have moved from input- to output-based payment systems over the past two decades. Output-based payment involves the definition of categories of service (products or outputs), such as operations, drugs dispensed, days of stay in hospital or number of visits. The quantity to be purchased, together with the payment rates, is then defined for each category. The best-known example in healthcare is payment on the basis of case mix or diagnosis-related group (DRG). Around 650 categories of acute inpatient episodes are defined (Australian Institute of Health and Welfare, 2013); each has its own payment rate, which is usually a single amount covering all services from admission to discharge. It is generally considered less effective to define each day of stay as a separate product.

The two most common methods involve basing the payment rates on the estimated actual average cost in a recent period, or negotiation in the marketplace; a combination of these two methods is often used. A third method is becoming increasingly common, however: that of basing the payment rate on the estimated cost of providing care in a cost-effective way (which might be larger or smaller than the average cost in a recent period). This estimate of cost is known in most industries as the 'standard cost' and I will use this term here. In the context of healthcare, the standard cost is simply what ought to be incurred by a well-managed clinical team, and it makes allowances for all the realities, including insufficient resources, in order to deliver best-practice care (Drury, 1985; Hindle et al., 2004; Oates et al. 1998). Once the production method is designed, the expected resource use is translated into a production cost, as it is in all industries. By determining the intended resource use by type, one can define the expected cost. A CP presents an excellent basis for calculating the standard cost because it is designed by clinicians to represent a good method of care within the resources allocated.

B. Product-costing and actual average costs

Product-costing is an analytical process which determines the costs of manufacture of each type of product. It involves identifying the costs of inputs and tracing them through to the products. The methodology is well established and has become a routine activity in many parts of the Australian healthcare system (Oates et al., 1998, p. 241).

It applies equally to an estimation of actual average and standard costs, but it is much more common to compute actual average costs. The process is described as it relates to actual average costs, since some of the results may be helpful when calculating standard costs as described in the next section. There are variances, but the most common approach involves taking the total expenditure during a previous period, such as last year or last month, and fully distributing it between the products during that period. The total expenditure is first distributed between various types of input as recorded in the accounts (e.g. nurses' salaries, items such as drugs and medical equipment, and services such as buildings and electricity). The input costs are then distributed between cost centres by use of allocation statistics such as numbers of staff or items taken from central stores. Overhead costs, including administration and electricity, are then distributed between the cost centres that create the final products (e.g. intensive care, ward, nursing, operating theatres) by means of relevant allocation statistics. Finally, the costs of those cost centres are distributed to the final products (Oates et al., 1998).

C. Calculating standard costs on the basis of a CP

Much has been written about standard costing in manufacturing and relatively little in healthcare. On the basis of adherence to the pathway (by the multidisciplinary team), where the members of the teammust follow the steps of the pathway, it is crucial that the team is committed and is collectively responsible to budgeting so as to attain standard costs (Hindle et al., 2004). It is then possible to undertake several steps in calculating standard costs on the basis of a CP.

Once the basic foundation is laid, the first step is to estimate the cost per unit of input. This is normally provided by staff working in the hospital accounting department. The statistics required are normally generated by product-costing (as described above). Other internal (e.g. the cost of a specific diagnostic test) and external sources may need to be consulted. The next step involves estimating the costs of normal cases; this is a matter of taking the statistics from the earlier step and applying them to the quantities of resources listed in the pathway. The next step is to estimate the costs of variances.

The data may, at first, be inaccurate, but each pathway with a variance is examined and the differences in resource use estimated – another radiology procedure, for example, or an extra day of nursing care. To take another example, if it is estimated that there were 30 additional minutes of nursing time, then the additional cost is 30 multiplied by the average cost per minute of nursing (usually including overheads). The costs per unit of service can normally be easily calculated by anyone familiar with the hospital accounts. At this stage, one can estimate the average cost, including variances. The desired standard cost is the average of normal cases and variant cases. As a final step, the standard costs have to be validated.

D. Validating standard costs

There are several ways of validating standard costs on the basis of a CP. The idea is to use another estimate that was derived in a different way – and to use different sources of data where possible. An example of such a source is the *actual average cost*; another might be the estimate reported for the same case-type at another hospital. An example of the computations is given in Table 2. It shows the results of a special variance-costing study over a short period of time (one month). The data presented below is taken from an actual study in Australia, hence the reason for using Australian dollars (AUD), and is presented in a simplified manner (Hindle et al., 2004).

For each variance case, *Part A* of the table shows estimates of the additional cost by category (over the normal cost on the pathway). For example, *Patient 1* incurred additional costs of AUD 100 for accommodation on the ward, AUD 50 for additional nursing and AUD 50 for additional medical care. The additional costs for all seven variance cases were AUD 5,080, giving an average of AUD 726 per variance case. Note that variance cases might not result in any additional costs, an obvious example being a patient who dies shortly after admission, where the actual cost might be less than the standard cost.

Part B of the table shows the standard costs per cost category for patients who remain on the CP (and hence do not become variance cases). The standard cost is AUD 1,715 per case.

Part C shows the computation of an average expected cost for all patients of the type covered by the CP. For illustrative purposes, it is assumed that there are 100 patients per year, of which 20% are expected to become variance cases. The overall average cost is AUD 1,860 – higher than the standard cost for normal cases in order to take account of the fact that 20% of variance cases have significantly higher costs. In terms of the accuracy of the standard cost estimates, the estimate should be at least as accurate as the previous estimate.

Table 2: Illustration of computation of standard costs for a CP

Part A: Costs of patients reported as variances during study period (variance-cases)											
Patient	Accommodation			Labour			Services				Total
	Ward	ICU	OR	Nursing	Medical	AHP	Pathology	Imaging	Drugs	Other	
1	100			50	50						200
2		1.200		150	100				300	100	1.850
3				50	50					800	900
4				50	50	50	150		200		500
5	180			100		50					330
6	250			200	100						550
7	350			200	100					100	750
Total											5.080
Average additional costs of variances per case											726
Normal (on-pathway) cost per case											1.715
Total average cost per case											2.441

Part B: standard costs for patients on pathway											
Patient	Accommodation			Labour			Services				Total
	Ward	ICU	OR	Nurse	Medical	AHP	Pathology	Imaging	Drug	Other	
Normal	230		400	650	200	80	50		65	40	1.715

Part C: standard costs for all patients (including variances)			
	Number of cases per year	Estimated total cost per year	Average cost per case
Standard cases	80	137.200	1.715
Variance cases	20	48.814	2.441
All cases	100	186.014	1.860

Source: Adapted from Hindle et al., Report of a Survey of Clinical Pathways and Strategic Asset Planning in 17 EU, 2004, pp. 90-91

Hospitals routinely estimate the actual average costs. Over time, better data becomes available.In some countries, estimates are made by a team contracted by both the purchaser (health insurers or other payers) and the care providers working together. A high degree of collaboration between purchasers and care providers ensures a better estimate of the standard costs (if the data is accurate).

Standard costs are often used when there are new types of care, or where there is a lack of adequate data on actual average costs for another reason. For example, a payer can invite care providers to make bids for changes in payment rates, and accept the results if the standard costing method is clearly explained and if the pathway is available; finally, the purchaser has the right to ask for clarification of the pathway and its costs, and question particular aspects of both (Hindle et al., 2004).

2 COMMON CP MODELS

As we have seen above under 'Defining the Care Pathway', three pathway coordination mechanisms have been identified: chain, hub and web. In this section I present four commonly found CP models, which I then use as the basis of analysis when discussing business functions in a hospital.

Care pathway is a broad term used to describe sequences of healthcare intervention or provision. A CP can be viewed as the 'patient's journey' through the healthcare provider or system for particular groups of patients, cases or episodes. Typically, the pathway starts with the admission of the patient to the hospital or ward; he/she is then diagnosed and further assessments are carried out, followed by appropriate treatment. Upon stabilisation or improvement, the patient is discharged. As Crocker, Johnson and King (2008, p. 290) state, in practical terms a CP is a model of the anticipated activities for a set of related scenarios. This model is usually represented either as a diagram or a form containing activities and decisions.

Newell, Edelman, Scarbrough, Swan and Bresnen (2003) observe that most individuals do not understand the processes in which they are participating and are unwilling to change unless they explore it and discover its faults. In most cases and most naturally, doctors, nurses and allied healthcare staff hold their notes separately from each other and, as a rule, do not inspect each other's notes; this 'non-sharing of notes' has been the tradition for generations. Campbell et al. (1998) define a CP as a structured document in which all expected observations and interventions during an episode of care are listed and the results of activities recorded in one place.

Vanhaecht et al. (2007) also attempt to tackle the issue around the most frequent models of CP,devising four levels of aggregation of pathway products and three models of pathway coordination mechanisms. Crocker et al. (2007) take a step further and distinguish four distinct CP models. In the following, I present these four models on the basis of Crocker et al. (2007, 2008). However, at the time of writing, one of the models could no longer be retrieved from online resources.

For the purpose of finding and defining CP models, the search strategy with regard to the CPs in the section below is based on what was available online at the time of writing, i.e. from a search of websites judged as particularly relevant and limited to those in English. The examples and models of CPs provided below were freely available online. There are, however, CPs that are not freely available and are in the domain of healthcare staff. In terms of common CP models, I will use the findings produced by Crocker et al. (2007) as a basis, building around his established CP models and referring to them as the common models.

Crocker et al. (2007) state that pathways need to be accessible to clinicians, patients, managers, commissioners and information system developers. The format must therefore provide clarity and involve minimum effort on the part of the reader. Crocker et al. (2008, p. 289) point out that CPs are typically modelled in an *ad hoc* manner, with little reference to formal syntax or semantics. They examined and elaborated on the suitability of current CP modelling techniques for supporting business improvement and the development of information systems, and conducted a qualitative analysis of the variety in purpose, syntax and semantics in a selection of existing CPs.

The case study by Crocker et al. (2009) explored the extent to which formal techniques were evident in the creation of the current generation of CPs. Five CPs were selected from five different sources, and analysed in terms of scope, formality, presentation, intended audience, authority and use; the CPs were not selected randomly, but from the medical and health literatureas examples of good practice). These four CPs represent examples of the four most common CP models in the literature and online at the time of writing.

Some of the CPs chosen by Crocker et al. (2007, 2008) are no longer available online; in some cases they appear to have been substantially modified without any explanation provided, while others remain available as described in their papers. Therefore, for the purpose of this dissertation, I will use the updated and available CPs, following the suggested methodology to describe the four CP models. TheseCPs can be considered representative of the current state of CP development:

1. Breast cancer (suspected) treatment CP developed by Map of Medicine (published in July 2012 and valid until August 2013);
2. Spinal cord compression CP developed by Velindre NHS Trust (Pease, Harris and Finlay, 2004);
3. Type 2 diabetesCP developed by the National Institute for Health and Clinical Excellence (NICE) (updated in August 2012);
4. Laparoscopic cholecystectomy CP developed by NHS Lothian-University Hospitals Division, Royal Infirmary of Edinburgh (2004).

Crocker et al. (2007, 2008) looked at both the graphical representation of the pathways and the supporting advice notes, and examined the following four feature sets:

1. **Intended audience**: different audiences (clinicians, payers, policymakers, patients, users, carers, finance officers) are interested in different features and require different levels of detail, semantic and syntactic ability and quality;
2. **Medium of delivery**: this affects how information is disseminated, updated and used in practice;
3. **Degree of formalism**: Differing degrees of syntactic and semantic formalism offer contrasting virtues and disadvantages. Highly formal approaches result in explicit models, but may introduce great complexity. They can be used to create detailed models that cover all the exceptional circumstances that can be anticipated. The consistent use of a formal technique makes comparisons between models possible, while more relaxed approaches can offer flexibility. These approaches also allow for a greater degree of individual interpretation, which brings with it ambiguity. The influence on pragmatic quality is therefore dependent on the importance of these aspects to the intended use. The following indicators are used as indicators of formality: clear starting point, clear activity sequencing, a distinction between parallel and selective branches of activity, a clear presentation of decisions, and internal consistency;
4. **Capturing individual pathways**: provision of space for recording observations and interventions involved (and providing the reasoning behind the processes that are being considered); useful prompts regarding future actions required in order to deliver care.

I will add two more parameters to the Crocker et al. (2007, 2008) approach of distinguishing four types of model as illustrated in Table 3:

1. Under ‘intended audience’ I will add what is of greatest importance in terms of accountability: a **clear explanation of shared responsibility within the multidisciplinary team** – who does what and when;
2. As a separate line I will add whether there is evidence that the CP is integrated into other **organisational units/business functions**, i.e. financing, sales, purchasing, operations and organisation.

Table 3: CP features

Features		Breast cancer (suspected) treatment	Spinal cord compression	Diabetes type 2	Laparoscopic cholecystectomy
		CP model 1	CP model 2	CP model 3	CP model 4
1	Intended audience(s)	Clinicians	Clinicians	Clinicians	Clinicians
1a	Clear indication of who does what and when	NO	NO	NO	YES, partly
2	Medium of delivery	Electronic (but limited interactivity)	Paper-based	Electronic (but limited interactivity)	Paper-based – needs to be downloaded to insert values
	Electronic links provided for additional information/evidence	YES	NO	YES	NO
3 Degree of formalism	Clear starting points	YES	YES	YES	YES
	Clear activity sequencing	YES	YES	YES	YES
	Distinction between parallel and selective branches of activities	YES	YES	YES	NO
	Clear presentation of decisions	NO	YES	NO	YES
	Internally consistent	YES	YES	YES	YES
4	Space for recording observations/interventions and prompts for future actions	NO	NO	NO	YES
5	Integration in business functions	NO	NO	YES, partly	NO

Source: Partly adapted from Crocker et al., Towards a formalisation of CPs to embody good practice in healthcare, 2007; Crocker et al., The suitability of care pathways for integrating processes and information systems in healthcare, 2009, pp. 289–301.

2.1 CP Model 1

The Map of Medicine (2012) website is a collection of evidence-based, practice-informed care maps or pathways which connect all the knowledge and services around a clinical condition. The pathways are comprehensive and trustworthy, and provide electronic links to additional information and scientific resources, evidence-based information, expert knowledge and national (in this case, UK) policy.

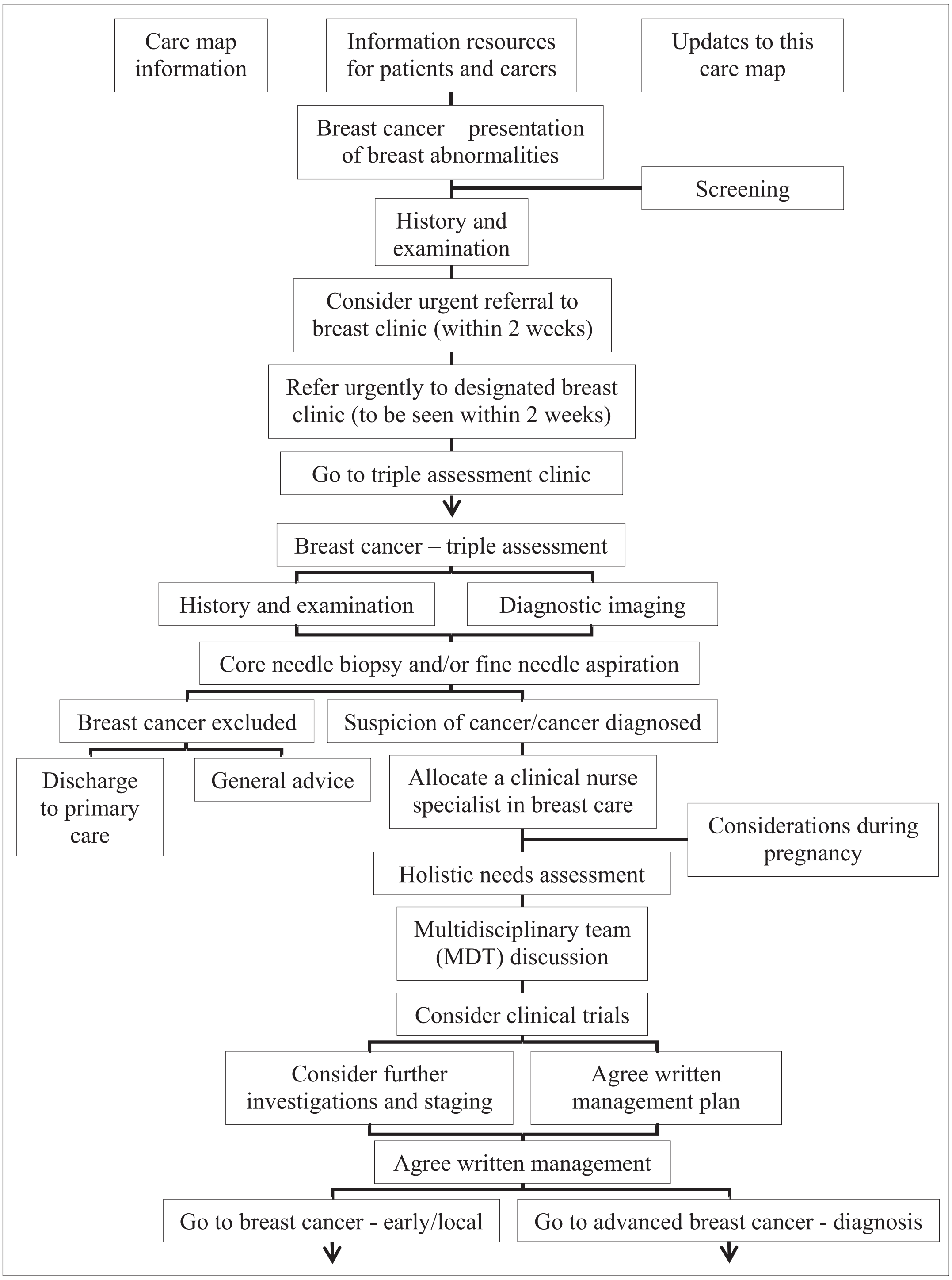
The CPs can be customised to reflect local needs and practices. Map of Medicine is a series of interconnected boxes containing concepts, events and activities with associated information, visualised by means of a flowchart as a sequence of activities with interwoven decision-making points. The connections and text within Map of Medicine are not built on any formal model – for example, they do not indicate the difference between decisions and parallel actions or when activities should happen. It is not clear at first which clinical professional group is responsible for which activity, but when following the links one can make assumptions about who is responsible for this within the multidisciplinary team.

The CP is designed to be used by health professionals and can be modified to suit local needs within the organisations. Despite being electronically accessible, Map of Medicine does not enable the details of a particular case to be recorded within it. This means that variance from the pathway cannot be recorded, and therefore they cannot verify that their pathway is best practice. It also means decision-support activities based on a statistical analysis of patient data (e.g. diagnostic support) must be handled outside Map of Medicine. This inability to handle case data and the lack of a formal model means that attempts to reformulate good practice based on localisations is not directly supported by the tool (Crocker et al., 2007).

This model comes close to the prospective model pathway, which is not organisation-specific at the highest of the levels of aggregation according to the categorisation proposed by Vanhaecht et al. (2007). It is based on guidelines, could serve as a model background and would need to be redesigned locally.

The Map of Medicine breast cancer CP (Figure 5) has additional electronically linked pages containing further references and explanations, such as: information on scope, definition, incidence, risk factors; information resources for patients and carers; updates to the CP; breast cancer presentation of breast abnormalities; screening; history and examination; when to consider urgent referral to breast clinics; and references that have passed critical appraisal. It constitutes a national pathway and Map of Medicine claims to be ‘keeping it up to date with emerging evidence, informed by practice-based knowledge, and where appropriate, cognizant of healthcare policy’ (Map of Medicine, 2012).

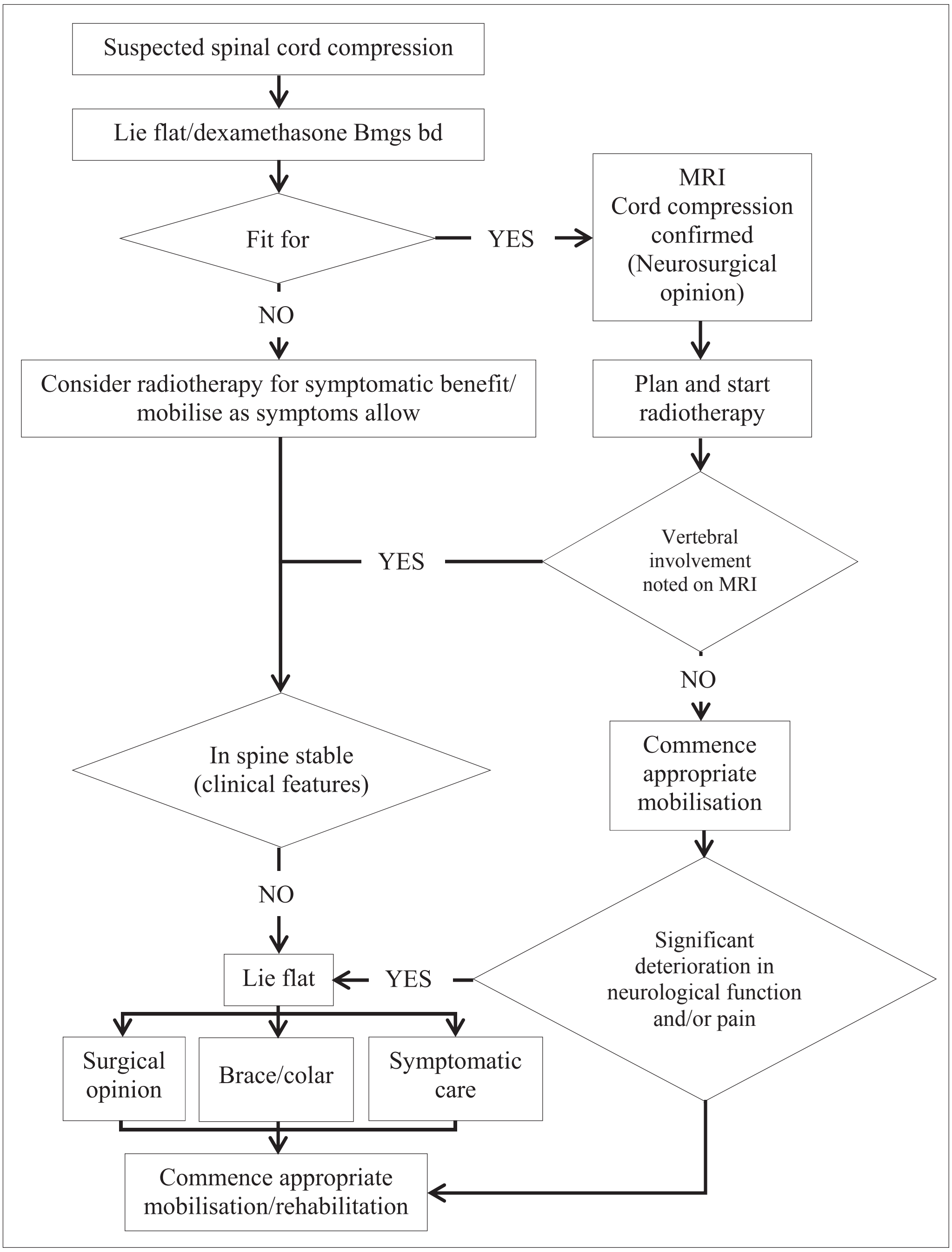
Figure 5: Breast cancer CP



Source: Map of Medicine, Breast cancersuspected, 2012 Map of Medicine, Secondary care – triple assessment clinic, 2012

2.2 CP Model 2

Figure 6: Spinal cord compression CP



Source: N. J. Pease, R. J. Harris & I. G. Finlay, Development and audit of a CP for the management of patients with suspected malignant spinal cord compression, 2004

Figure 6 is an example of a CP for cancer patients with suspected spinal cord compression developed by Velindre NHS Trust in 2004.

This pathway was developed and implemented by physiotherapists and medics at the Trust. The flowchart is attached to patient notes and actions are presented. However, no specific areas for the annotations are provided. There is a set of guidelines to support the flowchart and to explain and elaborate upon the diagram. Implementation of the CP has resulted in a significant reduction in complications and a significant increase in positive patient outcomes (Crocker et al., 2007).

The clinician is provided with decision-making points, but is not clear who is in charge of what and when within the multidisciplinary team. The arrows represent the processes and there is no space for recording variances. It is a presented as a flowchart containing a sequence of activities with interwoven decision-making points. Its physical format is a diagram/flowchart potentially serving as a basis for designing CPs at the local level and, similarly to the NICE breast cancer CP, at the prospective highest aggregation level. It does not provide any information on who does what and when, nor does it specify who is responsible for carrying out the activities.

It is considered to be the most aggregated pathway, as it is prospective and not organisation-specific, and is based on either international or national evidence.

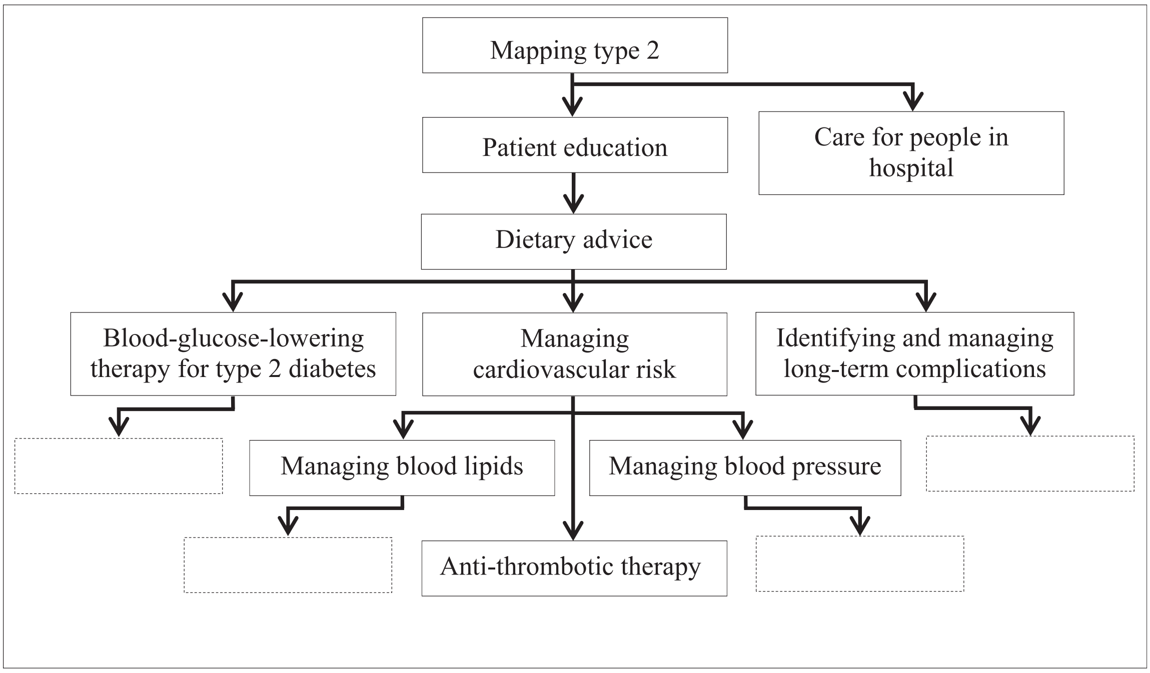
2.3 CP Model 3

NICEis a UK NHS body and has recently established NICE Pathways. It is an online tool for health and social care professionals that brings together all related NICE guidelines and associated products in a set of interactive topic-based diagrams. NICE Pathways include all relevant NICE guidelines, including clinical guidelines, public health guidelines, technology appraisals, intervention procedures, medical technology and diagnostics guidelines, and quality standards, along with the accompanying tools produced by NICE to support implementation. The pathways do not include information or guidelines from other sources(NICE, 2013).

As with the Map of Medicine concept, NICE CPs can be customised to reflect local needs and practices by users looking to introduce and implement new CPs. As noted by Crocker et al. (2007), the CP (Figure 7) is designed as a series of interconnected boxes containing concepts, events and activities with associated information. The connections and text within the pathway are not built on any formal model – for example, it does not indicate the difference between decisions and parallel actions, or when activities should take place. The CP is designed to be used by health professionals and can be adapted by the healthcare provider.

Despite being electronically accessible, NICE does not enable the details of a particular case to be recorded within it. This means that variance from the pathway cannot be recorded, and therefore that they cannot verify that their pathway is best practice. It also means decision-support activities based on a statistical analysis of patient data (e.g. diagnostic support) must be handled outside the CP. The pathway is unable to handle data and cannot be easily reformulated ona local basis.

Figure 7: Type 2 diabetes CP



Source: NICE, Type 2 diabetes CP, 2011

Unlike the other CP models, NICE provides costing support for many of the CPs, which includes national cost-impact reports that summarise national costs and savings and discuss the assumptions used, costing templates to assess the impact on local budgets, and costing statements for when the impact is not significant or is impossible to quantify at a national level.

NICE also provides links to costing support for many of its pathways (for the UK), with templates in Excel format. This costing tool is made up of several worksheets: selection of the local population for tailoring local cost-impact calculations; a costing template for estimates to reflect local circumstances; a costing summary which summarises the results; a worksheet with pharmacological treatments (which shows the available treatments); and a worksheet with a sensitivity analysis indicating the impact of uncertainty in estimates and predictions.

NICE pathways are interactive and designed to be used online. At first glance, NICE provides a single pathway diagram and uses links from the boxes in the diagram to the associated diagram – for instance, under 'Identifying and managing long-term complications', NICE provides additional information on the possible complications in the right-hand sidebar.

However, it does not say anything about who does what and when, and does not provide any further interwoven decision-making points. The electronic links provide descriptive recommendations, along with scientific evidence and information.

2.4 CP Model 4

Figure 8 is a sample page from a laparoscopic cholecystectomy CP. The 30-page pathway was developed at the hospital.

The patient and clinicians can assess the needs and agree on the treatment together. This form is quite typical of many documents in use at different hospitals and is, in fact, much more akin to a form than any of the other pathways illustrated. It is the only one to provide space for recording observations and interventions on an individual patient.

CP Model 4 contains a number of tools for assessing patients, and it provides space for recording treatments and variances. This model jumps directly into the 'what' or detailed activities in comparison to the other three models of CP and initially reflects a higher aggregation level. What comes across is the transparency regarding who is responsible for what within the clinical team, and when events should take place within the sequence of events or tasks. There are tick boxes and a space provided for inserting values and comments, initials, etc. However, it may not always be clear if certain activities happen in parallel.

This type of pathway could also be of extensive use for any clinical, operational and financial analysis. In this model it is clear who does what and when. In some sections it is process-driven, in others it is a checklist or a list of reminders. The model falls within the aggregation patient and local level advanced by Vanhaecht et al. (2007). It is organisation-specific, patient-type-specific and prospective, and ends up as a completed pathway. It remains in the hands of clinicians and is not patient-friendly (i.e. not adapted for use by the patient and his carer).

Figure 8: Sample page of the laparoscopic cholecystectomy CP

NHS Lothian - University Hospitals Division Royal Infirmary of Edinburgh Laparoscopic Cholecystectomy Integrated Care Pathway	Addressograph

PRE-ADMISSION CLINIC
CONSULTANT………………......…………………………………
PRE-ADMISSIONNURSETOCOMPLETE EXPECTEDLENGTHOFSTAY: DAYCASE/23 hour/inpatient

	DATE / /	**Initial**	**Var. code**
EDUCATION/ DISCHARGE PLANNING	Assessment questionnaire reviewed with patient Pathway discussed from preadmission to post-discharge period Patient understands reason for surgery Written information supplied. Laparoscopic Cholecystectomy □ General Anaesthesia □ Other: please specify:…………………….	……. ……. ……. ……. ……. …….	……. ……. ……. ……. ……. …….
MEDICATION	Patient advised to continue current medication □ N/A Patient advised to stop aspirin ……/days pre-operatively □ N/A	……. …….	……. …….
THROMBOEMBOL IC RISK	Standard prophylaxis discussed with patient –flowtron boots/minhep PMH of DVT/PE	…….	…….
VITAL SIGNS (chart)	Pulse……….BP……………Sats (if indicated)………… Weight……kg **Height**… cm **BMI……….Please chart on perioperative record**	…….	…….
TEST/ INVESTIGATION (Chart)	**Urinalysis: NAD** If abnormality detected: Protein □ glucose □ ketones □ blood □ **LFTs Yes** □ Yes **(if abnormal contact surgeon)** □ Yes □ N/A **BM** (as per protocol) □ Yes □ N/A **ECG** (if indicated/> 60yrs) □ Yes □ N/A FBC (if history of anaemia) □ Yes □ N/A U & E (if indicated) □ Yes □ N/A Others: Specify…………………… For results refer to Investigations section in case notes	…… …… …… …… …… …… …… ……	…… …… …… …… …… …… …… ……
SPECIALTY INFORMATION	Dentition details Crown: C Bridge: B Denture: D R 8 7 6 5 4 3 2 1 | 1 2 3 4 5 6 7 8 L R 8 7 6 5 4 3 2 1 | 1 2 3 4 5 6 7 8 L	…….	…….
FLUIDS/IV THERAPY(Chart)	**Patient advised that clear fluids are allowed up to 2 hours before admission to the ward and not to eat ANYTHING including chewing gum after………..on………………………**	…….	…….
DIET	Identify special diet and record. Advice given on pre and post-operative diet	…….	…….
ACTIVITIES OF DAILY LIVING	Identify special needs	…….	…….
ADMIN	Check patient details/addressograph labels. Ensure good supply of labels Advice given to leave valuables at home □ Yes □ No If ambulance required Order reference no.	…….	…….

NurseSignature/Printname:………………………………………………….. Date/Time……………

Source: NHS Lothian-University Hospitals Division Royal Infirmary of Edinburgh, Laparoscopic Cholecystectomy Integrated Care Pathway, 2004, p. 6

In summary, while it appears that all these CPs are used as part of a formulation process, these types of CP do not seem to reflect the entire process in any specific way (Crocker et al., 2007). A variety of styles is used for the presentation and dissemination of CPs. The Map of Medicine and NICE pathways have each developed their own standardised format, while the others depend on the team and the local organisational culture.

The laparoscopic cholecystectomy and spinal cord compression CPs are all designed to be used directly for patient care. Of these, only the laparoscopic cholecystectomy pathway provides specific space for recording details, but it is possible to annotate printed copies of the spinal cord compression pathway. The spinal cord compression pathway was not designed with widespread dissemination in mind; rather, it was to remain within the rehabilitation care team.

The breast cancer and Type 2 diabetes pathways cannot be annotated as they are electronic and do not provide for annotation. Furthermore, none of the pathways have links to an underlying computerised information system; otherwise there would be significant investment in the analysis, design, implementation and dissemination of good practice processes in healthcare (Crocker et al., 2007).

As noted in the literature, the design of services is best decided at a local level with local knowledge and resources; however, national guidance can often assist in this process. Many use the flowchart or diagram style, using different icons to make indications, which raises the question of syntax. None of the pathways examined have an explicit starting point, but assumptions can nevertheless be made. The laparoscopic cholecystectomy CP provides starting and end points, but it is still not clear what happens in parallel.

As noted by Crocker et al. (2007), standardisation of the representation of CPs around recommendations of good practice may assist in improving the quality of formulation and in improving dissemination and interpretation. The authors conclude that new techniques for representing pathways are being created *ad hoc*.

There are a number of established tools for process modelling widely used in business (King & Johnson, 2006) and potentially of use for modelling healthcare processes. Crocker et al. (2007, 2008) note that the formalism of the underlying models of CPs would present an opportunity for the models to be included within a computerised clinical information system (CIS).

Such models are available and in use within business to enable automated workflows and improve efficiency; moreover, they could increase the ease with which decision-support tools are used and linked to patient information, potentially improving patient care. The use of pathways in a CIS would also aid the collection and interpretation of data for secondary uses, such as clinical research and the improvement of good practice CPs. While formalism would help, it is important that any implementation allows for localisation and flexibility. Formalism would ideally assist in defining good practice processes, which could be redefined locally and then altered and opted out of as deemed necessary by the health professionals in charge of the patient's care.

NICE and Map of Medicine use their own standardised formats that can be easily transferred to any local level, even internationally with some modifications; the other three CP models use different styles (for instance, the laparoscopic cholecystectomy CP is not designed for widespread dissemination).

As a final note, Crocker et al. (2007) add thatit is difficult to achieve the required dramatic improvements in performance without formal or specified techniques (integration between new processes and the new technology will be unlikely). It is well recognised that aligning business processes with information technology is a key to good performance (Hammer & Champy, 1990). To my knowledge, there are very few hospitals that have taken up the development of electronic CPs and embedded them with the hospital information system.

3 CASE STUDY: GOLNIK HOSPITAL

The Golnik Hospital case study is significant as it can draw the attention of business managers, policy-makers and other professionals and stakeholders within the healthcare system. It provides a complete picture as to the pitfalls of the implementation and exploitation of CPs, namely, as it is observed, Golnik Hospital does not make full use of the CAP CP ver.2 and thus misses out on improving its efficiency and performance on the level of the organisation. Proper exploitation of the CP can bring importance to decision-making and policy formulation in the healthcare provision context. There is enough evidence in the case study that the CAP CP ver.2 is not properly regarded as a process tool that could be exploited or used by other business functions within the hospital. Put differently, processes have not been carefully studied or may be vaguely defined and would need to be reorganized so as to improve efficiency in the organisation of processes and thus increase the performance of Golnik Hospital. The obtained evidence and findings of the research can be applicable to other situations or hospitals (beyond the original environment in which the research was conducted) thus it can be said that it is reliable.

In my research work and on the basis of the Golnik Hospital cases study, I attempted to answer the who, why and how questions and thus also attempted to provide convincing arguments on the basis of multiple sources of evidence. It helps extend and expand the boundaries of existing knowledge of CPs. As is the case of many other case studies in business and management, it could be said that also Golnik Hospital case study "focuses on a contemporary phenomenon within some real-life context" (Remenyi et al., 2000, pg. 187).
In Slovenia, in terms of providing inpatient (hospital) care, we distinguish between general hospitals, which are organised at the secondary level, and specialist and university hospitals, which provide healthcare on two levels, secondary and tertiary, and normally include teaching

and research. In this dissertation I base my case study on Bolnišnica Golnik (Golnik Hospital) and its healthcare provision for community-acquired pneumonia (CAP). Golnik Hospital specialises in pulmonary diseases and is part of the Slovenian healthcare system. Although it is systematically moving towards becoming more of a matrix organisation, the hospital still has very strong roots in the most popular and traditional hospital structure. It has a pyramid (hierarchical) organisational structure, with personnel organised according to specialisation and the departments within the hospital organised according to a specific product line in healthcare, i.e.Golnik Hospital is organised around its pulmonary diseases services or products within formal departments (or wards).

As can be seen below, the hospital's organisational chart shows formal lines of reporting, but not informal lines of authority and reporting. The board occupies a position at the top of the chart; it is the board that hires and dismisses the director. Below the director is middle management (finance officer, human resource officer, professional bodies), followed by the departmental management level: teaching, research and development, and healthcare services. Several major types of function are carried out at the departmental level, including nursing and ancillary or professional services, support services and, most importantly, the medical staff departments.

Golnik Hospital was established under the Institutions Act *(*Slov*., Zakon o javnih zavodih*) and is presently regulated on the basis of the statute adopted in 2009 (Slov.,*Statut Bolnišnice Golnik – kliničnega oddelka za pljučne bolezni in alergijo*).

Golnik is one of six specialist public hospitals in Slovenia. It treats patients with pulmonary, allergic and other diseases. It has more than 200 beds across seven different clinical wards; it also includes three pulmonary and allergy satellite outpatient clinics (in the neighbouring towns of Golnik and Jesenice, and in the capital city Ljubljana), an outpatient unit for internal medicine, and an outpatient unit for diabetes in the town of Kranj. Between 7,000 and 8,000 inpatients and around 50,000 outpatients are treated at the hospital on annual basis. The average length of stay (ALOS) is seven days per admission. Patients are treated for the following high-volume diseases: asthma, chronic obstructive pulmonary disease (COPD), CAP, lung cancer, tuberculosis (TB), interstitial lung diseases, asbestosis and other rare pulmonary diseases.

Golnik Hospital has around 460 employees (see Table 4 below) and is managed by the hospital's administration. The administration organises and supports the medical care of patients, is responsible for integrating various business functions, and provides healthcare services. It comprises different professional groups, departments, units and services, efficient systems and controls, and services for supplying necessary and adequate supplies, equipment and facilities.

Table 4: Golnik Hospital fact sheet for 2009

	2010	2009
Number of beds	216	213
Number of admitted patients	7,937	7,403
Average length of stay (in days)	6.6	7.2
Number of outpatients	38,922	39,692
Total number of employees	444	459
Doctors	36	37
Nurses	61	58
Healthcare Technicians	124	136
Laboratory Staff	61	67
Others	162	161
Funds for training(in EUR)	340,858	322,829
Income (in EUR)	25,482,512	24,857,317
Expenses (in EUR)	25,362,742	24,661,908
Net income (in EUR)	119,770	195,409

Source: Adapted from Košnik et al., Annual Report Golnik Hospital – Clinical Department of Respiratory and Allergic Diseases Golnik 2010, 2011, p. 4

The Golnik Hospital Board (Slov., *Svet zavoda*) operates Golnik Hospital and has a duty to protect the assets of the hospital through efficient operation. The board's trustees are responsible for establishing strategic policies and overseeing the business. The trustees select the hospital director and entrust him/her with the day-to-day running and budgeting; he/she in turn reports to the Board and also represents the hospital within the community and the external environment. It is the director's duty to coordinate the collective efforts of staff at the hospital.

The main business of Golnik Hospital is medical care. This is then split into diagnostics and treatment on the one hand and nursing care on the other. The main activities under diagnostics and treatment are: inpatient care, outpatient care, diagnostics, palliative care, medical laboratories, clinical pharmaceutical activities, and respiratory physiotherapy and rehabilitation activities. Inpatient care, outpatient care, diagnostics and palliative care are shared with the nursing care function, which also encompasses social care, care as such, dietetics, nursing administration, coordination or information activities, and hospital hygiene. The activity of hospital hygiene is shared with the activities of the medical laboratories.

Inpatient care is provided on clinical wards (details are provided in Table 9) and run by medical staff. The doctor is formally the head of a clinical team. It is the responsibility of the doctor to diagnose the patient's condition and to prescribe the best and most cost-effective treatment plan. The main purpose is to provide patients with the highest quality medical care. Most of the work consists of diagnosing and treating patients with allergic and pulmonary diseases. The wards and other departments cooperate with each other to provide integrated care for all patients.

Patients are admitted to the hospital only for acute treatment reasons (ALOS in 2007 was seven days, down from nine days in 1997), with follow-up examinations being managed by the outpatient clinic; patients with pulmonary problems are most often otherwise treated in outpatient clinics. The satellite outpatient clinics located at the hospital and those located in the towns of Kranj, Jesenice and Ljubljana are an integral part of Golnik Hospital.

*Nursing care*is organised as a separate service but is still one of the main activities undertaken at Golnik Hospital. Its chief responsibility is to carry out the treatment plan developed by the doctor. Nursing staff provide round-the-clock healthcare and maintenance, patient support and treatment, and health education. Nursing care at the Intensive Care Unit (ICU) is slightly different. Many patients have co-morbidities, particularly cardiovascular diseases and diabetes. If there is a need for additional medical care or prolonged hospitalisation, these patients are then transferred to the Nursing and Palliative Care Ward.

Nursing care and activities, which also include technical support, take place in wards, diagnostic units, and outpatient clinics and laboratories. The hospital employs 190 nurses and healthcare technicians. Their activities encompass the nursing documentation that helps nurses to find, plan, implement and assess nursing care activities. Interdisciplinary nursing and healthcare standards ensure equal healthcare for all patients. Golnik Hospital set up the first nursing unit for non-acute care in Slovenia. TQM was introduced in 1997, and quality indicators are monitored and patient satisfaction surveys carried out on a regular basis.

Administrative tasks are organised in the same manner in all wards. Each ward has a *coordinator* who serves as a link between doctors and nurses, follows the transfers of patients to diagnostic units during their hospitalisation, enters information on diagnostic procedures and test results in the computer database, and sends patients' medical documents and dictates reports to administrators. The coordinator also ensures that doctors receive patient discharge papers on time, and prepares documents required for a diagnostic procedure within or outside the hospital. The centre of activity in each ward is the nurses' room, where all work is coordinated.

*Allied health services*or support functionssupport a number of departments in performing support functions that aid diagnosis and treatment. The support functions of Golnik Hospital are diagnostics and clinical laboratories, outpatient clinics, nursing care, the nursing unit for non-acute care, palliative care, and research and teaching.

The *diagnostics department*cooperates closely with clinicians on the clinical wards and with outpatient clinics, and carries out tests on the basis of set protocols and standards. There are six diagnostic departments at the hospital: the Respiratory Endoscopy Unit, the Abdominal Endoscopy Unit, the Radiology Unit, the Laboratory for Pulmonary Function Tests, the Laboratory for Cardiovascular Function Tests, and the Laboratory for Sleep-Related Breathing Disorders.

Clinical laboratories are anintegral part of hospital diagnostics. Although each laboratory constitutes an independent unit, their work is interconnected. There are five types of laboratory at the hospital: the Cytology and Pathology Laboratory, the Clinical Immunology and Molecular Genetics Laboratory, the Clinical Biochemistry and Haematology Laboratory, the Mycobacteria Laboratory and the Respiratory Microbiology Laboratory.

As mentioned above, the *outpatient clinics* are where staff decide whether or not to admit a patient. The reduction of inpatient length of stay (especially with CP implementation) creates more work for outpatient clinics. There are eight outpatient clinics: one is located in the Emergency Unit, there are three pulmonology clinics and one allergy outpatient clinic within Golnik Hospital, and one clinic each in Jesenice and Ljubljana (with two outpatient clinics for internal medicine), and one diabetes clinic in Kranj.

The *palliative care*team consists of the patient's personal doctor and home care service, as well as a palliative care specialist, a nurse and others (e.g. physiotherapist, social worker, psychologist, dietician, chaplain and volunteers).

Golnik Hospital is also a *research and teaching institution* for undergraduate and postgraduate medical students. It also organises various courses, workshops, seminars and other educational programmes for employees and external participants. *Scientific research work* is an integral part of the functioning of clinical institutions at tertiary level.

*Ancillary services, which include professional, advisory and administrative support services,*are provided in wards, clinical units and laboratories. They are strongly supported by a variety of professional services: the Pharmacy, the National TB register, Social Services, the Central Administration Unit, the Cleaning and Courier Service, the Hospital Hygiene Unit, and the Library. The Pharmacy is in charge of purchasing and dispensing all medications used to treat patients in the hospital, the National TB Register follows trends in TB, and Social

Table 5: The main tasks of the wards and the ICU at Golnik Hospital

	Number of			
Ward	Beds	Employees	Admissions in 2007	Main Tasks
100	31	27	1,656	Treats inflammatory lung diseases; works closely with Ward 300; cooperates with other specialists, particularly rheumatologists and paediatricians; authors of the guidelines for the treatment of patients with sarcoidosis; develops the national register of rare pulmonary diseases.
200	34	32	2,252	Specialises in diagnosing and treating patients with lung cancer, mesothelioma and occupational lung diseases; develops the Slovenian guidelines for the treatment of patients with lung cancer; provides integrated cancer treatment.
300	35	32	2,105	Treats immunological diseases of the pulmonary interstitium, asthma and other diseases of allergic origin; administers specific immunotherapy to allergies; authors of the guidelines for treating patients with anaphylactic shock and guidelines for the use of antibiotics in the treatment of respiratory infections, especially CAP.
Nursing and Palliative Care	19	12	369	Founded in 2003 and run by a registered nurse; nurses take care of patients, offer health education and rehabilitation, and prepare patients for independent life at home or in a nursing home.
600	37[3]	30	1,353	Treats patients with COPD as well as differential diagnostics of obstructive pulmonary diseases and chronic respiratory insufficiency; provides a rehabilitation programme for patients with COPD and an educational programme for long-term oxygen treatment at home.
700	18	n/a	377	Admits TB patients, provides comprehensive treatment, performs diagnosis and follows the patient's epidemiology; performs examination of those living in close contact with the patient and performs genetic analysis of micro epidemics; provides treatment and drug therapy.
Intensive Care Unit (ICU)	14	30	503	Treats the most severe conditions; admits emergency cases; performs the most difficult invasive and non-invasive procedures; weans patients off mechanical ventilation; isolation rooms available.

Source: Adapted from Košnik et al., Annual Report Golnik Hospital – Clinical Department of Respiratory and Allergic Diseases Golnik 2010, 2011; Golnik Hospital, Clinical activity, 2012

Services offer counselling and organisational help to resolve patients' social and family problems. New technology has allowed previously separated units to be combined into one Central Administration Unit. The advantage of this type of administration is its complete digitalisation and the collection of medical reports and test results in one place.

[3]Including six beds for rehabilitation.

The Cleaning and Courier Service is one organisational unit: the cleaning service keeps the hospital clean and hygienic, while the courier service transports patients between wards and diagnostic units, samples from wards to laboratories, and documents between wards and the archive. The Hospital Hygiene Unit cleans, disinfects and sterilises instruments and sanitary materials. The occupational hygienist is in charge of preventing and controlling hospital infections, hand disinfection with disinfectant solutions, employee vaccinations, and so on. The Hospital Library supports the clinical, educational, research and developmental orientations of the hospital.

The specialist staff working in *advisory services* and supporting the work of administration and management include:

- The Quality Management Coordinator, who is in charge of improvements and promotes good relations between staff and patients;
- The Communications and Public Relations Office, which is in charge of internal communications, communication with patients and their families, and communications with the media;
- The Legal Office, which provides legal solutions and expert advice on issues relating to civil law, labour law and internal management;
- The Nursing Care Adviser, who is in charge of the integrated, interdisciplinary and individual treatment of patients, is actively involved in the process of care, and whose work is closely connected with Nursing and Patient Care Services;
- The Head of Internal Control, who is in charge of making expert judgements on the procedures and processes carried out at the hospital in order to improve the quality of performance.

Non-medical administrative services are necessary for the management of the hospital’s business and facilities. The day-to-day running of the hospital is supported by a number of administrative units(administrative business functions):

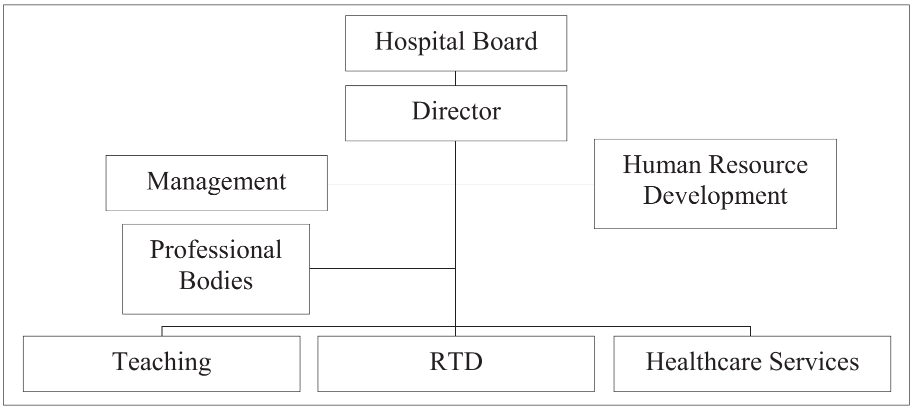
- The Unit for Medical and Business Informatics is in charge of computer-based activities throughout the Hospital;
- The Human Resources Unit is in charge of recruitment, staffing and human resources development;
- The Accounting and Financial Unit is responsible for financial issues relating to hospital partners, individual hospital units and hospital employees, and performs internal control tasks;
- The Purchasing and Public Procurement Unit prepares all public procurement documents and is in charge of selecting winning tenders;
- The Maintenance Unit is in charge of maintaining hospital equipment and premises.

These business services handle various functions such as registration services, admission and discharge services, record charges to a patient's account and handle accounts receivables with the payers (e.g. insurance companies). The finance department is in charge of establishing accounting function procedures, receives money, approves the payments of salaries and other expenditures, and advises the director on financial policy and on short- and long-term planning. The accounting department is in charge of maintaining organisational statistics for administrative decision-making and is in charge of the books of account. Information technology services are core functions of hospital management. The human resources department ensures that hospital staff are of the requisite quality and are sufficiently motivated, and is in charge of recruiting, preparing contracts and so on. Other business and administrative functions include plant and materials management, public relations, planning, marketing, fund-raising, housekeeping and security.

Executive Administrationis made up of the director,the director's administrative office assistants, and the business affairs assistant. The director represents the hospital to the external environment; internally, he coordinates the collective efforts of hospital staff. He reports to the hospital board, provides leadership in the implementation of the strategic goals, and delegates clinical care and administrative duties. The director is supported by the administrative office assistants and business affairs assistant. The Executive Administration is in charge of signing the General Agreement under which the hospital is provided with its main financial resources, i.e. the main source of funding of the hospital is governed by the General Agreement between the hospital and the national payer, the HIIS. This agreement specifies the number of planned DRG-based treatments, the number of 'weighted' cases for acute hospital care and the number of hospital days for non-acute care.

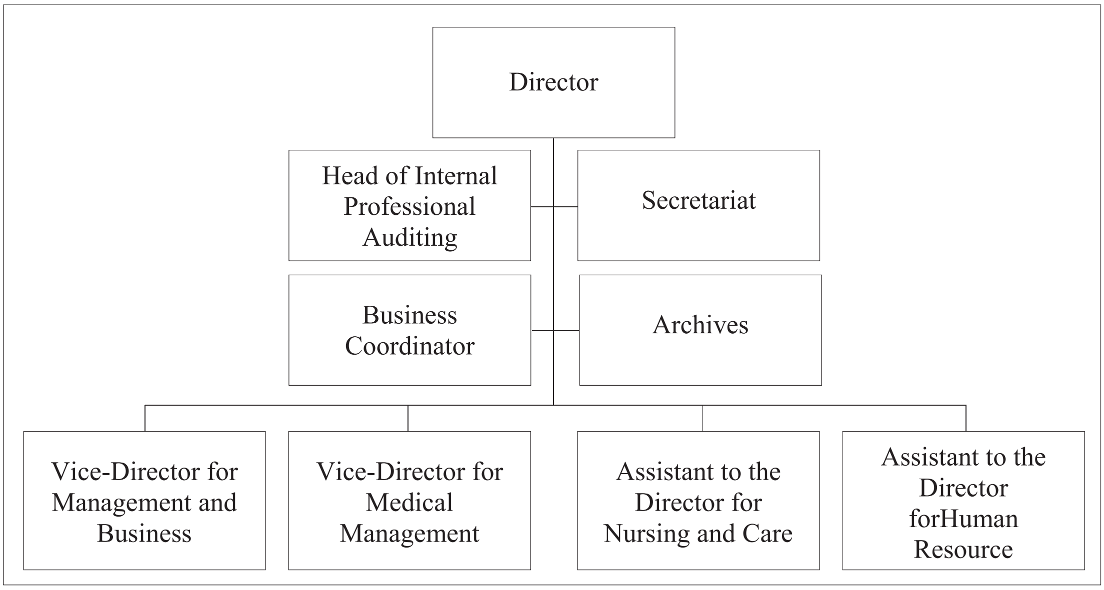
The hospital's organisational chart is presented below. Diagram 1presents an overall view of the institution, Diagram 2 presents a breakdown of hospital management department, Diagram 3 presents the departments within the hospital's healthcare service units, which are split into two main departments (diagnostics and treatment, and nursing and care), and Diagram 4outlines inpatient care at Golnik Hospital.

Diagram 1: Organisational chart of Golnik Hospital – overall view



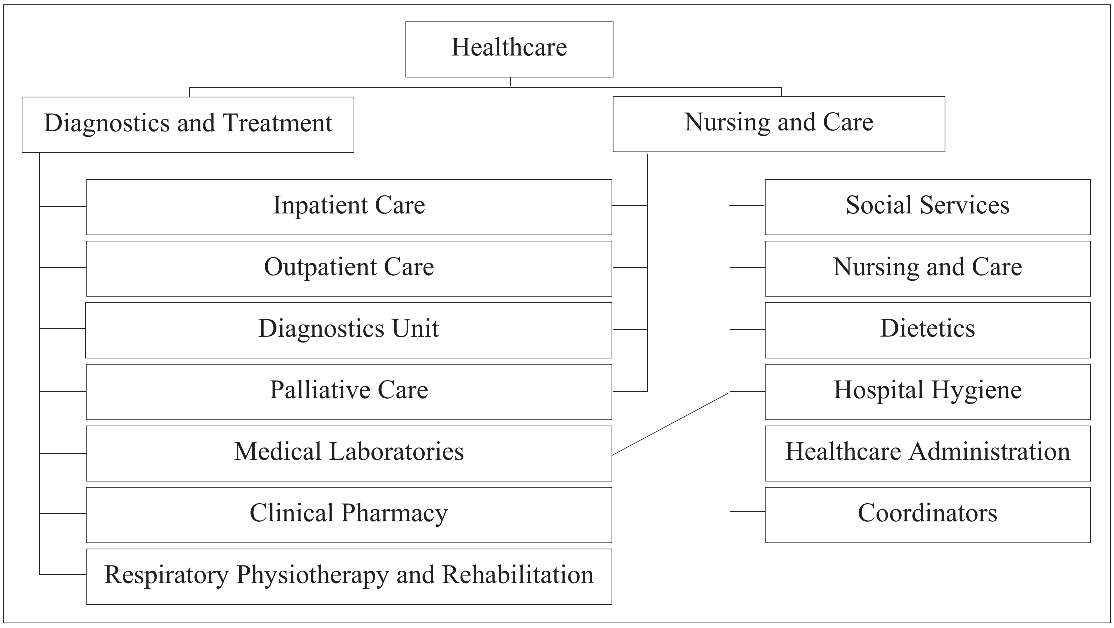
Source: Košnik et al., Annual Report Golnik Hospital – Clinical Department of Respiratory and Allergic Diseases Golnik, 2013, p. 7

Diagram 2: Golnik Hospital management



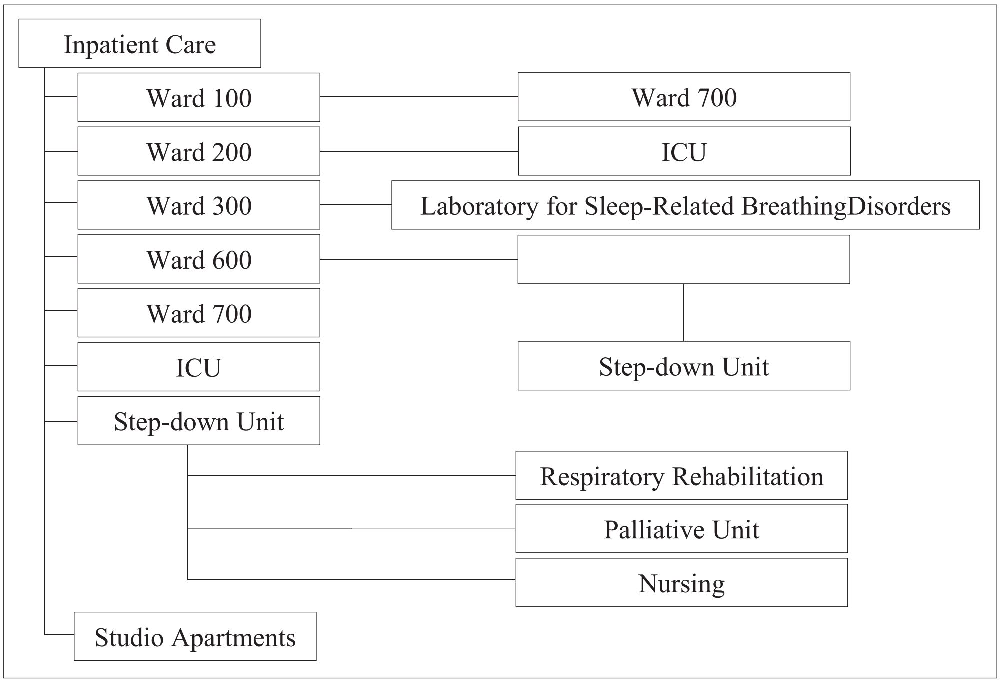
Source: Košnik et al., Annual Report Golnik Hospital – Clinical Department of Respiratory and Allergic Diseases Golnik, 2013, p. 7

Diagram 3: Golnik Hospital healthcare services



Source: Golnik Hospital internal documents, 2012

Diagram 4: Golnik Hospital inpatient care



Source: Golnik Hospital internal documents, 2012

As part of my research, I will go on to study and present the community-acquired pneumonia (CAP) product, the treatment of CAP on the basis of the Golnik Hospital medical chart and nursing care logbook and on the basis of the Golnik Hospital CAP CP ver.2 (hereinafter 'CAP

CP ver.2'). I then proceed to discuss the business processes of CAP CP ver.2 in light of my findings regarding business functions.

3.1 Golnik Hospital CP

The idea of CPs in Slovenia arose in the course of the World Bank Health Sector Management Project (2001–2002), which established the framework for introducing DRGs strongly promoted from top-down (from the level of the Ministry of Health to the provider's level) to improve hospital financing, alongside CPs which were proposed to hospital managers as a bottom-up approach to improving quality and coordinating healthcare.

According to a survey conducted by the Ministry of Health in 2005 (Ministry of Health, 2005), 14 hospitals had decided to use a CP (13 general and specialist hospitals and one psychiatric hospital). The process of introducing CPs is now at around the halfway point, with approximately half of all hospitals in Slovenia having decided to introduce at least parts of the process. Article 29 of the then 'Agreement with Hospitals' for 2006 stated that hospitals would have to introduce at least two new CPs per year (Zavod za zdravstveno zavarovanje Slovenije, 2006a). Since then, CPs have been subject to the 'General Agreement' between the payer and the provider. It is worth noting that CPs are not used as tools in negotiations or as tools for estimating the cost of care for a specific group of patients. Neither the payer nor Golnik Hospital (the provider) use the CP as a basis for evaluating the costs of programmes, nor would the provider be instructed to follow any specific kind of CP-based indicator (quality and/or process). The purchasing process, payment mechanisms and the dynamics between the outpatient and inpatient clinics do not have an impact on the use or promotion of CPs at Golnik Hospital. The only mechanism that has played a major role in terms of CP implementation is the clause in the annual 'General Agreement with the Hospital' (Slov., *Splošni dogovor*) between the payer and provider that states that CPs need to be in place for high-volume diseases (Zavod za zdravstveno zavarovanje Slovenije, 2010, 2011, 2012, 2013).

In terms of paying for health services, payments mechanisms and levels are regulated on the basis of contractual arrangements between the HIIS and Golnik Hospital. Each contract consists of the volume and price of the respective programme. A programme is, in this case, defined as set of services related to a certain type of care (outpatient specialist care, acute inpatient care, non-acute inpatient care, etc.). The capping of the annual budget for healthcare programmes at the national level results in payment amounts for Golnik Hospital being capped in its contracts with the HIIS.

Acute inpatient care at the hospital is prospectively determined(determined in advance) and is paid for on the basis of DRGs; non-acute inpatient care is also prospectively determined, but is paid for on the basis of bed day. As noted above, CPs have so far been designed solely for inpatient care and would not travel beyond the hospital framework or within different levels of the healthcare system; nor are they used in negotiation procedures or for any kind of regular efficiency or productivity analysis. There are no incentives to develop, implement or use CPs among healthcare staff. Healthcare staff at Golnik Hospital have ‘public servant’ status and are salaried through payments made by the Health Insurance Institute of Slovenia (HIIS) and voluntary health insurance (VHI) companies for the services provided.

3.2 CAP management and the clinical guideline

This section outlines how CAP is managed and how the treatment of a patient with CAP is recorded at Golnik Hospital, i.e. on the CAP CP and following the usual method of care for CAP. For the treatment of patients diagnosed with CAP, healthcare or medical professionals will usually follow evidence-based clinical guidelines for CAP.

Community-acquired pneumonia (CAP) has been defined as a set of symptoms and signs consistent with an acute lower respiratory tract infection associated with radiographic shadowing for which there is no other explanation; the illness is the primary reason for hospital admission and is managed as pneumonia. CAP is a common condition caused by a relatively small number of possible pathogens: pseudomonas, homophiles influenza and streptococcus pneumonia. CAP symptoms are the result of the invasion of these pathogens and the response of the lungs to the infection. In Slovenia, as in other countries, CAP is considered to be a high-volume acute infection or disease. In the UK, the common pathogen accounts for 30–40% of cases (British Thoracic Society, 2009), while 5.6 million cases of CAP occur annually in the USA (Lutfiyya, Henley, Chang, & Reyburn, 2006, p. 442). As in all developed countries, CAP is defined in Slovenia as pneumonia not acquired in a hospital or a long-term care facility. As noted by several authors, including the Slovenian researchers Mušič et al. (2006), the costs of treating CAP are extremely high. In the USA the estimated total annual cost of healthcare for CAP is USD 8.4 billion, with 600,000 patients, or 15% of those admitted, dying of the disease every year (Marrie et al., 2000; Lutfiyya et al., 2006). Reports from the UK suggest that CAP remains a significant cause of morbidity, mortality and economic burden (Nathwani et al., 2002, p. 31).

The latest report states that around 6,000 CAP patients a year are admitted to hospital, 60–70% over the age of 65; this age-group accounts for 15% of the total population of Slovenia, which was 2,032,362 in 2008. Between 1999 and 2008 the incidence rate of CAP among the over-15s at the primary level was approx. 10/1,000 inhabitants, with approx. 40% of CAP patients being over 65. In Slovenia, CAP episodes account for approx. 20% of all pneumonias – the same proportion as seen in many other countries. Pneumonia is an important cause of death: the mortality rate of patients treated as inpatients with pneumonia is approximately 10%, while the mortality rate among patients with CAP and other co-morbidities and/or the elderly is considerably higher (Mušič et al., 1999; Mušič et al., 2006; Mušič et al., 2010; Waterer et al., 2004; Ochoa-Gondar et al., 2008). Many cases are managed successfully without hospital treatment. However, on the basis of the CAP clinical guidelines, medical staff identify those patients who can safely be managed at home and those who will need hospital admission and critical care. As an illustration, in the USA the estimated average cost for inpatient CAP care is USD 7,500 per patient. Outpatient care can cost as little as USD 150–350 (Lutfiyya et al., 2006). In terms of economic consequences, the direct costs associated with CAP are high and mostly associated with inpatient care costs.[4]

The Pneumonia Severity Index (see Appendix A) was developed to assist doctors in identifying patients at a higher risk of complications and those more likely to benefit from hospitalisation (Mandell et al., 2003; Fine et al., 1997, 1997a). The same index is being used by Slovenian healthcare professionals (Mušič et al., 2006). For instance, where the patient has no co-morbidities, he/she is treated as an outpatient and is prescribed antibiotics; however, where co-morbidities are present, the healthcare professionals in charge will closely follow the Pneumonia Severity Index to decide upon the severity of the pneumonia and assign a risk class. If the total score of the risk class is below the threshold of 91 points, the patient's CAP falls in the low risk class on the Pneumonia Severity Index; he/she is then treated as an outpatient and is prescribed antibiotics. However, should the patient score 91 or more points (the maximum is 130), he/she falls within the moderate- or high-risk class and is then treated as an inpatient at a healthcare facility (Mušič et al., 1999; Mušič et al., 2006; Mušič et al., 2010). An illustration of the algorithm for CAP management is provided in Figure 9.

CAP treatment is based on pharmacotherapy, the primary goals of which include eradicating the causative pathogens, resolving the clinical signs and symptoms, minimising hospital stay, and preventing reinfection. The decision on medication should be based on the pharmacokinetic profile, adverse reactions, drug interactions and cost-effectiveness. Although data on the duration of CAP therapy is limited, current research recommends seven to 14 days depending on the type of bacteria.

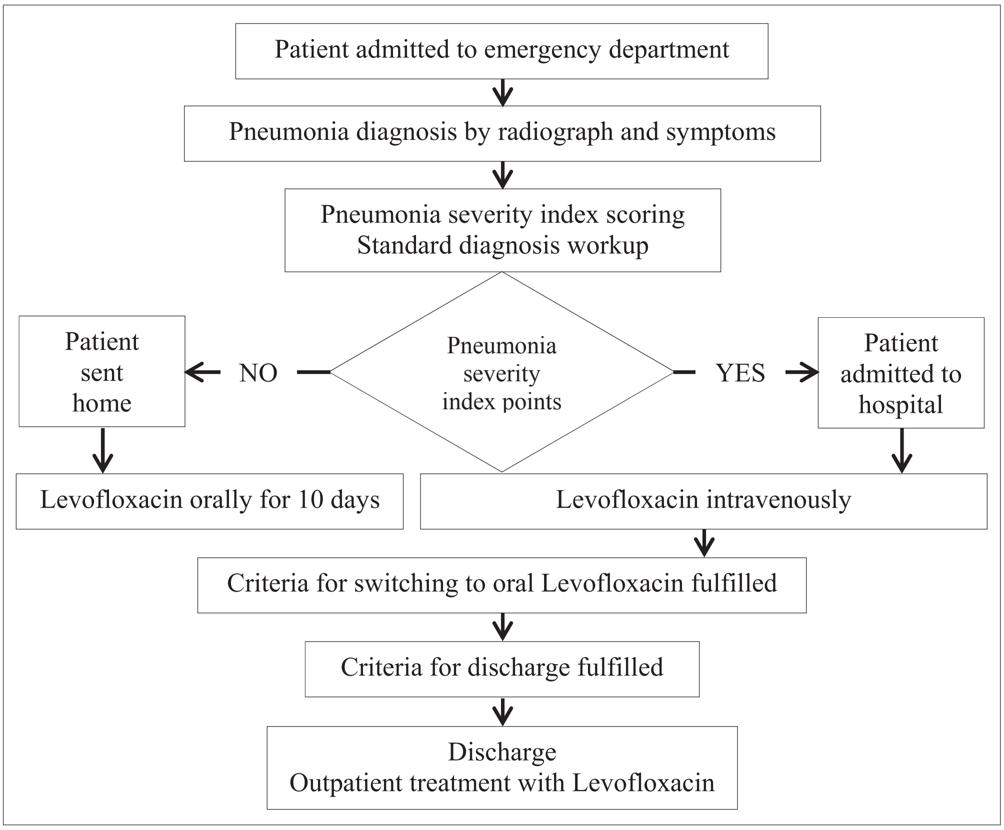
After the patient is clinically stable and able to tolerate oral intake, he/she may be treated with oral antibiotics for the remainder of the course. This can save money and allow earlier hospital discharge, which minimises the patient's risk of hospital-acquired infection. Recommendations have been proposed by Slovenian experts (Mušič et al., 1999; Mušič et al., 2006; Mušič et al., 2010) which suggest that patients referred to hospital with CAP should have a chest radiograph, preferably performed prior to arrival at the hospital, and oxygenation assessed by pulse oximetry. Temperature, respiratory rate, pulse, blood pressure, mental status and oxygen concentration should all be monitored and recorded initially at least twice daily, and more frequently for those with severe pneumonia or those requiring regular oxygen therapy (see the algorithm for CAP management in Figure 9).

In terms of arrangements for follow-up after hospital discharge, the Slovenian CAP recommendations rest on the presumption that clinical review should be arranged for all patients at around six weeks, either with their GP or at the outpatient clinic. Upon discharge

[4] In Slovenia, the DRG code for CAP is J12 – J18.9 ICD-10-AM v. 2.0.

or during follow-up, patients should be offered access to information about CAP, e.g. in the form of the patient information leaflet normally offered at Golnik Hospital.

Figure 9: Algorithm for CAP management



Source: Adapted from T. J. Marrie et al., Community-acquired pneumonia in the elderly, 2000, p. 1072

3.3 Recording CAP treatment at Golnik Hospital

At Golnik Hospital, CAP inpatient treatment is usually recorded on the basis of internal regulation in the medical chart (Slov., *terapevtski list*) and nursing care logbook (Slov., *dokumentacija zdravstvene nege*); the other method is to use the CP CAP, which is shared by nurses and doctors. I begin with a description of the medical chart.

3.3.1 Medical chart

A comprehensive discussion with medical staff involved in the treatment of CAP patients revealed to me how CAP is recorded. The team involved in CAP treatment keeps a record of the medical treatment and nursing care in three separate documents: one is the **medical chart**, the second is the nursing care logbook and the third is the CAP CP.

The medical chart appears on A3 paper which is then folded, resulting in a four-page document, and is added to the patient's file containing laboratory and other diagnostic tests results. The medical chart is available in its original format in Appendix B. The medical chart is used as the physical folder that exists for each patient admitted for pneumonia, as well as an information document. The maintenance of accurate medical charts is a legal requirement of Golnik Hospital.

It is the doctor who places orders or instruction plans in the medical chart for the nurses to carry out, i.e. it is used to record the systematic documentation of a single patient's care through time in one particular ward, and constitutes a detailed record of the patient's clinical status or achievements during the course of hospitalisation. Reassessment data is also recorded in these progress notes, which are simultaneously a form of master treatment plan. The progress notes cover details such as the clinical situation in terms of vital signs – blood pressure, pulse, body temperature, oxygen saturation, PEF (peak expiratory flow), fluid balance (infusion, by mouth, nasogastric tube, vomit, timed urinary collection) – which adds up to ten variables to be recorded, on the first page, at different times of the day.

The *first page* is intended for continuous measurement of various clinically important variables, especially where the patient has been admitted to the ICU. These observations of vital signs, marked in the table, can be made on an hourly basis depending on the severity and as ordered by the admitting doctor. A patient could come with an oxygen mask, could be subject to oxymetry (measurement of oxygen in the blood), may need a catheter or urinary pan, or may need to have their diaper weighed.

The *second and third page* allows healthcare professionals to insert progress notes that are entered over time (hours and days). There is also space for recording observations and the administration of drugs and therapies, instructions for the administration of drugs and therapies, laboratory test results and the results of vital signs, physiotherapy, infusions, and sensitivity to drugs,prescribed diet, drainage and other important notes. Progress notes are written by both nurses and doctors who document patient care at regular intervals during a patient's stay at Golnik Hospital.

Progress notes are, in essence, a record of events occurring during an episode and allow clinicians to compare past status with current status, communicate findings, and discuss and decide what care plan to follow; they also serve as an instruction or order plan. For example, if the doctor prescribes a specific drug therapy, it is then the nurse's responsibility to carry it out. Furthermore, these progress notes can also be used by any interested party in order to review an episode in detail (for example, as a communication tool between the patient and healthcare professional or as a tool for medical analysis or research). In addition, nurses generate their own progress notes on a more frequent basis, depending on the level of critical care. Finally, this type of documentation is then used for preparing the discharge letter, for administrative financial purposes, and for filing or archiving purposes. It may also be used medical research purposes.

The *second page* of the medical chart contains a number of set variables to be observed by the doctor in charge and by nursing staff; these observations are to take place every six hours. The doctor specifies what medication is to be taken by the patient, and in what amounts, and it is usually the nurse who prepares and dispenses the drugs. The medical chart also contains space for the nurse to indicate the amount of drugs dispensed to the patient, and space for the doctor in charge and the nursing staff to sign off (this is the only time when clinicians insert their initials or sign off on the medical chart). The doctor also indicates whether the patient is allergic to any drugs. This information would normally be obtained upon admission or on the ward. Taking the patient's medical condition into account, the doctor decides whether to order infusion, specifies the type of diet or orders physiotherapy (normally prescribed to those in a physically weak condition).

The doctor inserts his clinical decisions as he goes along; these are then carried out by the nurse. Depending on the course of treatment, the doctor may or may not order other laboratory investigations, insert observations to be respected by the nursing staff or, if need be, order drainage of the lungs (which is rarely done). Drainage is normally performed in a different department under local anaesthetic and by inserting a tube in the pleural cavity, but is ordered by a doctor in very rare cases when there is a strong suspicion of a lung abscess or a high level of fluid in the lungs.

The *third page* of the medical chart is a horizontal continuation of the content of the second page. The *last (fourth) page* contains space for the doctor in charge to insert any kind of instructions on infusions, as well as other observations and the date in the boxes provided. The bottom of the page contains instructions for prescribing and documenting the dispensing of medications or drugs, and instructions for ordering blood diagnostic tests. Drugs are ordered by the clinical pharmacist (at the doctor's request) through the hospital pharmacy.

3.3.2 Nursing care logbook

In addition to recording and inserting values and notes in the medical chart, thereby following the doctor's orders, nurses also keep their own nursing care logbook (see Appendix C), which is spread over a two-sided A3 sheet. The doctor seldom consults the nursing care logbook.

The nursing care logbook is a formal document completed by nurses in charge for monitoring purposes. There are informal and unwritten rules as to when a task should be carried out by any of the healthcare staff attending a CAP patient; they are mainly based on routine, clinical practice and experience. According to Golnik staff, some of the tasks would be carried out before the doctor's morning round, some throughout the day and in the evening, and some sporadically or intermittently depending on the patient's level of dependence. Some of the listed tasks might even be omitted (e.g. there is no need to clip nails every day).

The list of tasks is comprehensive and covers the main nursing categories of care. The following are recorded on the day, in the morning, afternoon and evening:

- Overall assessment of the patient (e.g. patient information, dependence on nursing care, degree of nursing care support required, assessment of risk according to the Waterloo scale, assessment of the risk of falling, rating of the level of need for non-acute care);
- Activities relating to the patient's breathing (e.g. cleaning of the oxygen mask, replacement of the nasal catheter, aspiration of upper airways, assistance with coughing, replacement of the nozzle for inhalation);
- Personal hygiene (e.g. providing a bed bath or a quick wash in bed, assistance with washing in the bathroom and in the sink, assistance with showering, preparation of items for washing and oral care, assistance with mouth-moistening, cleaning of dentures, genital care, hair-washing and nail-clipping);
- Feeding and drinking (e.g. assessment of or assistance with feeding, assistance with drinking, provision of positive reinforcement, monitoring of the nasogastric tube, replacement of the nasogastric tube or ensuring proper feeding through the nasogastric tube, replacement of the syringe and monitoring of the feeding system, monitoring of the nasogastric tube position and the provision of aspiration if needed);
- Excretion (e.g. monitoring of toilet visits or monitoring of the urinary container, monitoring of defecation and urination, escorting of the patient to the toilet, installation and replacement of the urinary incontinence treatment system, insertion of a urinary catheter, replacement of the urinary catheter, replacement of the urinary bag, provision of care after sweating or vomiting);
- Exercise (e.g. assessment of ability to engage in physical activity, assistance with sitting, standing and walking, assistance to find a comfortable body position, encouragement to change positions, monitoring of exposed areas for the emergence of pressure sores, installation of an active airbag);
- Safety (e.g. patient observation, installation of security bars, arm restraints or a segufix belt, discussions on safety); disease and healthy lifestyle information (e.g. provision of information about the disease, teaching of skills and inhalation therapy techniques, monitoring of inhalation therapy, participation in organised educational programmes, knowledge assessment, involvement of carers); and
- Communication assessment (e.g. setting-up of a conversation with an expert, noting of difficulties in speaking and communicating); medical-technical interventions (e.g. monitoring for suppuration sites, replacement of the infusion system, assessment of the injection site, provision of care for wounds, monitoring of changes to skin and mucosa, reporting of wounds, management of chronic wounds).

These tasks involve recording and assessing various parameters, monitoring, providing physical support, communicating with the patient and his/her carers, nursing, helping with the patient's daily activities, and recording the specifics concerning the various items used in the care of the patient. The sequencing of these activities is not straightforward; rather, the items on the sheet represent a comprehensive checklist of activities for the nurse to carry out throughout the day.

The second page of the nursing care logbook provides space (within two sets of tables) for reporting on nursing work, allowing nurses to enter the date, hour, any additional warnings and observations, and a nursing assessment, and to add their signature. At the bottom of this page, nurses enter nursing diagnoses, along with the objectives of nursing care; this allows them to evaluate their performance.

3.3.3 Golnik Hospital CAP CP ver.2

Golnik Hospital has decided to introduce, develop and implement CPs for its high-volume cases, and therefore also for CAP. One of the reasons for introducing the CAP CP at Golnik Hospital was to standardise the care of CAP patients in order ensure safer treatment and care, to make better, more cost-effective use of financial resources and better use of time, and to ensure that none of the steps in the care process were omitted. The CAP CP is also the document that contains the main source of data for analysing the quality of care; any kind of variance from the normal care process needs to be recorded, as it represents the information required to further improve the CP CAP. The first version of the CAP CP appeared in 2002, with the revised version, i.e. version 2, appearing in 2006. For the purpose of this dissertation, I have chosen to concentrate on this second version. The original CAP CP is presented in Appendix D.

Golnik Hospital CAP CP ver.2 is spread across three pages (A4 format, see Appendix D). The header is equipped with the hospital's logo, the name of the disease, the number of the form, the version number and the page number. These details are then followed by the admission information (date and hour of admission) and a space for the sticky label containing the patient's basic details: first name, surname, personal identification number and inpatient identification number. The footer carries information on the period of validity of the CP, the author, the reviewer and the approval of the director.

At first glance it looks like a tabulated checklist of accomplished tasks, or yes-no statements, with space for the staff member (doctor or nurse) in charge of a specific line item to insert his/her initials. Each item requires a tick in either the 'yes' or 'no' box and the initials of the staff member responsible. There are a total of 42 line items: in the first section, the first ten line items are intended as reminder points for the doctor in charge of admitting the patient to Ward 300, while the nurse in charge of admission addresses the second set of two line items (Table 6). The bottom of the first section contains a statement to the effect that if an answer is ‘no’, an explanation should be inserted in the table for recording variance found on the third page of the CP.

Table 6: First page of Golnik Hospital’s CP CAP ver.2, activities (1–12)

To be completed by the doctor in charge upon admission on the Ward			Initials
1. Criteria for CAP attained	Yes	No	
2. Investigation of chronic diseases comorbidities	Yes	No	
3. Measured blood pressure, pulse, temperature, saturation	Yes	No	
4. Completed X-ray and ECG (electro-cardiogram)	Yes	No	
5. Gas analysis of arterial blood	Yes	No	
6. Recorded blood count, differential white blood cell count, CRP (C-reactive protein), Na (Sodium), K (Potassium), blood urea and creatinine concentration, blood glucose	Yes	No	
7. Two blood cultures ordered	Yes	No	
8. Other biological sample analysis ordered	Yes	No	
9. Pneumonia Severity Index scored (Standard operating procedure 103-001)	Yes	No	
10. Prescribed antibiotics within 4 hours from the identified diagnosis	Yes	No	

To be completed by the nurse upon admission to the Ward			
11. Completed Nursing Care Logbook	Yes	No	
12. Estimate of the expected complications with regards to discharge	Yes	No	

Source: Golnik Hospital CAP CP, version 2, 2012

The second section covers items 13 to 34, where items 13 to 25 concern medical treatment and patient care conducted by the doctor, and items 26 to 34 concern the nurse. As on the first page, these items are set out in such a manner that the person in charge is required to tick ‘yes’ or ‘no’ and insert his/her initials in the box next to the answer on a daily basis. Where the answer ‘no’ is given, an explanation in the variance recording box at the end of the CP should be inserted, as it suggests that the treatment is deviating from that anticipated (Table 7).

Table 7: Activities 13-25 covered by the doctor

			Initials
13. Physical check-up completed	Yes	No	
14. Evaluated consciousness	Yes	No	
15. Measured blood pressure, pulse, breathing frequency, temperature, saturation	Yes	No	
16. Evaluated quantity and quality of sputum	Yes	No	
17. Prescribed antibiotic complies with the recommendations	Yes	No	
18. Oral antibiotic suffices	Yes	No	
19. Antibiotic dose adjusted to weight, functions of liver, kidneys	Yes	No	
20. Patient today needs oxygen	Yes	No	
21. Patient today needs infusion	Yes	No	
22. Assessed need for additional examinations for aetiology (infections, atypical inducer)	Yes	No	
23. Assessed need for control examinations (x-ray, blood count, differential white blood cell count, biochemistry)	Yes	No	
24. Patient still needs hospitalisation	Yes	No	
25. Clinical course of disease expected today	Yes	No	

Source: Golnik Hospital CAP CP, version 2 (2012)

Given its layout and form, the pathway is not process-driven but, rather, a checklist for everyone within the multidisciplinary team that allows them to follow the path of the patient and to get an overview of what has happened or what is anticipated. The tasks seem to be sequential, but it is not clear which items or activities take place concurrently (see Table 8).

Table 8: Activities 26–34 covered by the nurse

			Initials
26. Evaluation of threat for sores due to pressure	Yes	No	
27. Evaluation of the threat of falling	Yes	No	
28. Assessed level of nursing care	Yes	No	
29. Monitoring vital signs	Yes	No	
30. Doctor informed of the change of condition	Yes	No	
31. Required visit of the doctor on duty	Yes	No	
32. Expected complications at discharge	Yes	No	
33. Problems at discharge	Yes	No	
34. Social worker informed	Yes	No	

Source: Golnik Hospital CAP CP, version 2 (2012)

As already noted, these reminders or listed items do not represent any kind of sequential order of activities. Only when a certain activity is inserted on the medical chart is it considered to be an order issued by the doctor that needs to be carried out by the nurse. The last (third) page of the CAP CP is split into two sections. The first section deals with patient discharge (as noted in Table 9). After the space for inserting the date of discharge, the doctor needs to tick the 'yes' or 'no' boxes for five items (where a 'no' means that there is a variance concerning the expected discharge).

Table 9: Activities35-39 covered by the doctor

			Initials
35. Final discharge letter written	Yes	No	
36. If the patient needs antibiotic: has he received the prescription?	Yes	No	
37. Control check-up expected	Yes	No	
38. Provided recommendations for vaccination	Yes	No	
39. Information on the disease provided to the patient /carer	Yes	No	

Source: Golnik Hospital CAP CP, version 2 (2012)

The nurse handles three items (Table 10):

Table 10: Activities 40–42 covered by the nurse

			Initials
40. Patient received the discharge letter in his/her hands	Yes	No	
41. Notice to the nursing service sent	Yes	No	
42. Instructions	Yes	No	

Source: Golnik Hospital CAP CP, version 2 (2012)

The bottom part of the page is intended for recording variances from the usual process of care.

In the following section I provide a general overview of how care for CAP patients is provided by CAP CP ver.2 alongside the medical chart and nursing care logbook. In order to be admitted to the hospital, the patient needs to undergo triage in the emergency ambulatory department, where the patient is diagnosed with CAP and the urgency of the case is assessed using the Pneumonia Severity Index. During the triage phase, the doctor in charge decides, on the basis of clinical criteria, whether the patient should be admitted for CAP or not. If the patient does not bring along the results of the electro-cardiogram or chest radiograph, which is one of the requirements for admission to the ward, these two procedures are ordered: the electro-cardiogram (ECG) in the admissions office and the chest radiogram in a separate room next door. Once the patient is admitted for CAP, the care process begins at the Ambulatory Admission Office (or Outpatient Office) to the Ward, where two parallel horizontal care processes begin, one led by the doctor (who records care in the medical chart and the CAP CP ver.2 form) and the other led by the nurse in charge, who in tandem with his/her nursing team, carries out the doctor's orders and records care in the medical chart, the nursing care logbook and the CAP CP ver.2 form.

As senior staff informed me during our discussions, it is not necessary to carry out gas analysis of arterial blood for every patient. If the doctor does believe that it needs to be measured, a blood sample is sent to the biochemical laboratory, which is located one floor below the ward. The laboratory test results (as identified in step 6 of CAP CP ver.2) normally take up to 30 minutes to arrive, while analysis of blood cultures takes two days. Where sputum needs to be collected and sent for analysis, this might be sent to the microbiology laboratory, depending on the initial assessment of the clinicians on the ward. It can take up to one day for the results to return to the ward, with the doctor then prescribing antibiotics depending on the clinical (PORT system) and laboratory results. A decision on antibiotic therapy is taken with reference to the laboratory and clinical results; however, the initial choice of antibiotic therapy is normally based on professional experience, as it is crucial for the patient to receive the drug as soon as possible. This might change as the laboratory results come in. The nurse is usually in charge of preparing the antibiotics.

Every morning the nurse and doctor in charge, and occasionally the clinical pharmacist (to the author's knowledge there are no fixed rules or protocols as to when exactly the clinical pharmacist would join the doctor in the morning round), visit and assess the state of health of the CAP patient on the ward. The clinicians decide, on a daily basis and depending on the clinical assessment, whether blood pressure needs to be measured again and which other procedures need to be repeated (steps 13–25); the procedures are normally repeated during the first three to four days.

The most important step in these three to four days is the decision taken by the doctor in charge on when to switch from intravenous to oral antibiotics, as well as any adjustments to the antibiotic dose to take account of the patient's weight and his/her liver and kidney functions. It is not necessary to carry out every single step from 13 to 25 every day; the steps are left to the clinicians' professional judgement. The doctor would normally listen to the heart and lungs, and the patient would have his neck examined for changes in the shape of veins or oedema. Depending on his/her level of consciousness, as these are normally elderly patients, the nurse would do the assessmentson the basis of their nursing scale. Step 19 should also cover the need for a hepatogram (laboratory tests for kidneys and livers), but it is not indicated on the CP.

Depending on the specific patient outcomes, which are usually the measurements provided by the outputs on the CP, as these are clinically important decision-making points, the doctor in charge will decide when to omit a step. However, in most cases, as senior staff pointed out to me, patients are fairly homogeneous and so is the process of care, i.e. the frequency of measurements will depend on the patient's reaction. The frequency of measurements for monitoring purposes is left to the discretion of the doctor, who will also decide what medication the patient can continue to take or whether new drug therapy should be prescribed. Some steps will be repeated two or days after admission, depending on the initial laboratory results (this goes for steps 20, 21, 23, 24, and 25). However, under step 21 the type of infusion is normally noted on the medical chart. Values are not entered in this CP but are kept in the patient's medical folder on separate pages.

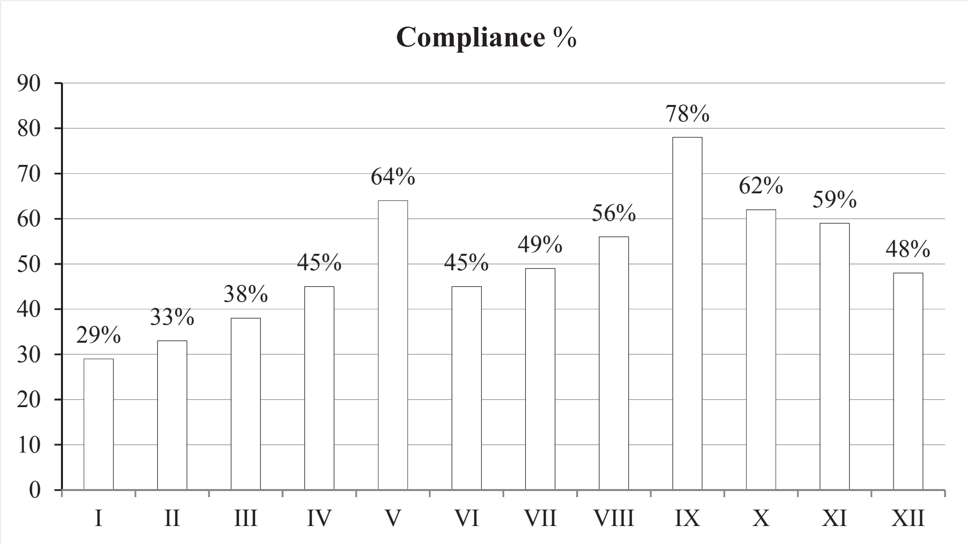
Steps 26 to 34 are addressed by nursing staff – and again, not every step is repeated on a daily basis (e.g. 'problems upon discharge' or 'social worker informed' would normally be recorded upon admission). However, all the other steps need to be undertaken on a daily basis in order to allow the patient's medical condition to be assessed. The nurse does not necessarily have to inform the doctor in charge of every change in the patient's condition within the episode of care. Step 31 is a step that would normally be undertaken at night or over the weekend.

Step 35 concerns the final discharge letter. If the patient still needs antibiotics, the doctor in charge makes a decision on prescription. It is also the task of the doctor in charge to decide whether a follow-up examination is needed, but they do not provide a date; they may also make recommendations on flu vaccination. The patient and his/her carers are also provided with information on the disease, but there is no indication of what form that information takes. As a final note, the nurse will make use of the last section of the CAP CP and indicate whether the patient has received the discharge letter, whether a note has been sent to the nursing service, and whether instructions have been provided to the patient and/or carer.

In conclusion, in terms of physical layout the CAP CP takes the form of a checklist and does not seem to be process-driven. I was informed by senior staff that the CP CAP is based on the Slovenian Clinical Guidelines for CAP published for the first time in 1999 and further revised in 2006 and 2010 (Mušič et al., 1999; Mušič et al., 2006; Mušič et al., 2010). In practical terms, CAP CP ver.2 is meant to be used on a daily basis; however, according to staff, the completed CAP CP ver. 2 are only sporadically used for analysis (one analysis was conducted in 2006). Team meetings to discuss the usefulness of the CP take place on an *ad hoc* basis about once a year; most frequently, the CAP CP remains in paper format in the archives alongside the medical chart. According to staff, in recent years the CAP CP has been used for junior staff and older senior staff.

However, in 2006, on the basis of the CAP CP, one analysis looked at the level of compliance with the CP for treating CAP. Compliance with the requirement to complete a CAP CP alongside the original hospital patient charts was initially 100%, but with time it began to fall. In 2006 staff decided to take a number of measures to improve the situation. Compliance was monitored and several CAP patient care quality indicators were tracked. Monthly analyses and reports were prepared and presented to clinical staff. Gradually, with the provision of monthly feedback to clinical staff, compliance rose from 29 to 45% in the first half of 2006, and to 48 and then 78% in the second half of the year, as noted in Figure 10.

Figure 10: Compliance with the requirement to use the CAP CP at Golnik Hospital (2006)



Source: R. Eržen, E. Mušič, & M. Košnik, Clinical pathway as a tool of improving quality for care in patients with CAP, 2006

The analysis was carried out on 866 patients hospitalised with CAP in 2006 (864 with severe forms of CAP and only two with the mild form). The average duration of intravenous antibiotic therapy was 4.5 days, down from 6.3 days in 2002. The ALOS in 2002 was 13 days, which had been reduced to 11.2 days by 2006; however, the mortality rate increased from 8% in 2002 to 8.5% in 2006, as Table 11 shows.

Table 11: Improvements in the quality of CAP treatment following CAP CP ver.2

Year	2002	2006
Less severe form of CAP	10 of 367 patients	2 of 866 patients
Average days of intravenous antibiotic	6.3 days	4.5 days
ALOS	13 days	11.2 days
Mortality	8%	8.5%

Source: R. Eržen, E. Mušič, & M. Košnik, Clinical pathway as a tool of improving quality of care in patients with CAP, 2006

4 THE IMPACT OF A CP ON THE BUSINESS FUNCTIONS OF A HOSPITAL

The organisation of a hospital, as with many institutions, involves a variety of business functions. A hospital is an institution devoted to delivering patient care, and the basic definition of a hospital typically involves the provision of services clustered around three key terms: observation, diagnosis and treatment (Samour, 2006). Observation involves analysing or studying patients and running tests and checks, all of which ultimately lead to a diagnosis; the diagnosis is the doctor's or medical provider's explanation of the cause or source of the problem or symptoms; and treatment is the course of action that the hospital will take to cure, lessen the symptoms of or otherwise care for the patient.

In economic terms, healthcare production capacities are about the conversion of supplies, labour and other resources into medical services performed by doctors, nurses, technicians, and other allied health professionals (Langabeer II, 2008, pp. 32–33).

Hospitals today are systems rather than facilities. They include buildings, offices or practices, outpatient clinics, treatment and rehabilitation centres, and other services (Langabeer II, 2008, pp. 32–33).

Roth (1993) describes the process model of a healthcare delivery system from the healthcare perspective, but does not present it from the business process model or CP perspective. I attempt to develop and present this in my dissertation.

CPs focus on clinical practice and outcomes, and omit the question of business functions within a hospital. To the best of my knowledge, no analysis has yet been undertaken of how the increased focus on CPs influences the business functions of a hospital as an organisation whose central function to provide patient care.

The key input in a hospital is patient demand for care; this in turn influences the whole organisation, along with the business functions the organisation requires in order to transform inputs into outputs.

In the introduction, I mention that the aim of my dissertation is twofold: (1) to explore how CPs influence the business functions of a hospital and (2) to examine which formal and standardised work processes within a hospital need to be reengineered in order to provide formal support to CP implementation. I focus in this section on how CPs influence the business functions of a hospital regardless of the healthcare system of which the hospital is a part.

A hospital is not a manufacturing organisation but a special kind of service organisation. It is a business to the extent that, in common with any large business, it has a formal structure and hierarchy of authority. It is people-oriented and provides patient care: the diagnosis and treatment of human illness and the 'restoration' of good health or an improvement in a patient's medical or clinical condition. As an organisation, it comprises departments, wards, staff, committees, boards, laboratories and many different kind of services whose common aim is to provide high-quality care for patients or users. A hospital requires efficient systems and controls, adequate and appropriate supplies and equipment and facilities and, most importantly, doctors and patients. Like any other business, a hospital comprises a set of business functions. I will first draw on a basic understanding of what business functions are, following this up with an analysis of CPs from the point of view of business functions.

4.1 Business functions in general

A **business function** is a series of logically related activities or tasks, such as planning, production, sales, purchasing and financing, performed together in order to obtain a defined set of results; it defines departments by the function each one performs, such as accounting or purchasing. The term 'functional departmentalisation' (or simply 'departments') is most often used (Daft & Marcic, 2009; DuBrin, 2012).

Gillespie (2011) offers another interpretation: that although organisations differ considerably in their activities, in their strategies and in the way in which they seek to add value, we can identify some of the functions that they usually have in common, and these are known as the functions of business. The most common functions of business are marketing and sales, operations, financing, purchasing and organisation. These functions may be undertaken by specialist departments, although in the case of smaller businesses it may be that many roles are combined (Gillespie, 2011).

In any business the various functions need to be integrated, and in an effective one they will complement each other fully. An organisation is a complex mechanism made up of interrelating parts. What the organisation is designed to do is its objective or corporate strategy; how it intends to do it is the strategy, with the activities themselves being carried out by the various functions (Gillespie, 2011). The relative importance of the functions and areas within them will vary from organisation to organisation (Gillespie, 2011).

There are many different types of organisation set up to serve a number of different purposes and to meet a variety of needs (Mullins, 2002, p. 96). Within organisations as a whole, there are a number of sub-systems interrelating and interacting with each other (Mullins, 2002, p. 120). There are three levels of organisation: the individual, position or job, the working group or department, and the organisation as a whole. All organisations have functions to perform, and they exist in order to achieve objectives and to provide satisfaction for their members; furthermore, they enable objectives to be achieved that could not be achieved by the efforts of individuals on their own (Daft & Marcic, 2009; Harmon, 2007; Ivanko in Možina, 1994, p. 375).

There are many approaches to analysing the organisational objective, goal or mission. The organisational goal can evolve from a single work process and/or be broken down into a single work process. A single process is mapped into a logical set of processes. This set of processes is then mapped into more specific and simpler sub-processes, so that we come down to a group of similar processes called ‘activities’. Activities are usually associated with several movements linked within a coherent entity that cannot be further broken down. Therefore, the simplest (and normally the most basic) processes are activities and tasks (Ivanko in Možina, 1994, pp. 376–77).

The types and number of activities within an organisation depend on the type of production, size, business conditions, the use of technology, the characteristics of the employees and various other circumstances, with related activities grouped into specific tasks. These tasks are assigned to jobs or positions, jobs being the smallest organisational unit in which the tasks are carried out (Ivanko in Možina, 1994, pp. 376–77) A job description would normally describe the requirements of the job: exactly what it entails, its purpose, duties, activities and responsibilities, and the position within the formal structure of the organisation (Mullins, 2002, p. 904).

Researchers who analyse or work on an understanding of the common goal divide common tasks into partial tasks at different basic horizontal and vertical dimensions. A proper definition and common goal of any organisation is a necessary prerequisite and the basis for the organisation of tasks within a job, a department or the organisation as a whole (Ivanko in Možina, 1994, pp. 376–437).

Organising work means continuously and systematically examining work, workflow, tasks and problems, and finding appropriate channels, means and methods of work in order to achieve the intended objectives within the context of an individual’s work, the work of a department or the work of the organisation as a whole (Ivanko in Možina, 1994, pp. 376–437).

When mapping tasks and activities, the organisational goals and objectives must be relied upon as the basic foundation. The set goals are pursued on the basis of the implementation of the tasks and activities, while the organisational goal defines all the activities and actions that enable its implementation. The implementation of the organisational goal is the common technical objective of the organisation, and the result of its implementation is the economic impact on the market. From the point of view of the market, the organisation goal must be met by means of a number of organisational procedures, with the optimal use of technology and cost-effectiveness. The ultimate objective of the organisation requires that certain tasks be performed. Performing these tasks provides an economic activity and enables the organisation to exist. However, the organisational goal is not solely determined by the implementation of technical goals (Ivanko in Možina, 1994, pp. 376–437).

Organisations perform a wide variety of tasks and activities. A fundamental principle is that work can be performed more efficiently if employees are allowed to specialise in a way that is coordinated with the overall business objective. Work specialisation or division of labour is the degree to which organisational tasks are subdivided into separate jobs or departments. Employees within each department perform only those tasks relevant to their specialised function. When work specialisation is extensive, employees specialise in a single task. Jobs tend to be small, but they can be performed efficiently (Daft & Marcic, 2009, p. 249) – for instance, work specialisation is readily visible on a car assembly line, where each employee performs the same task repeatedly.

Ivanko (in Možina, 1994, pp. 376–382) observes two approaches to breaking down an organisational goal: the horizontal and the vertical approach. In terms of the **horizontal approach**, the horizontal breakdown of the organisational goal seems to be most complete. Various work, technological and target-oriented processes are carried out within the organisation, which together form its business process.

Many authors suggest the breaking-down of the organisational goal into the components of business functions is composed of partial, interconnected and interdependent tasks. Business functions are further broken down into individual activities depending on the objective of the analysis. It seems that it is possible to combine this type of mapped organisational goal with the functional division of the organisational objective. The functional division of the organisational goal is the division of common tasks into business functions, business areas, basic elements of business and work processes. The organisational goal is then mapped into processes and sub-processes that occur concurrently in their horizontal and vertical integration (Ivanko in Možina, 1994, p. 382). The breaking-down of the organisational goal is presented below and illustrated in Figure 11:

1. **Business function** is the synthesis of specific related and interdependent processes and sub-processes to be performed by qualified operators or carriers of tasks in a partial closed-loop business process. For instance, a business function may be research, sales, accounting, HRM, etc., depending on the organisational goal;
2. **Area of business or work specialisation** is the synthesis of a part of a specific object of related and interdependent sub-processes and activities implemented by qualified operators that contextually defines the functional process of a specific business function. An example of an area of business would be market research, sales promotion or export;
3. **Primary elements of business** are the phases of work of an area of business based on the rank, level or purpose of the defined sub-process that is suitable for the design of organisational units, e.g. optimisation of stocks of end-products or the handling of products in stores, depending on the organisational goal;
4. **Work process** is a practical task in which a trained operator performs a specific job in order to carry out tasks related to the business element, e.g. analysing

storage by type of product or organising storage operations of stocks of end-products, depending on the organisational goal.

Ivanko (in Možina, 1994) also emphasises the importance of the **verticalapproach** to breaking down the organisational goal. He states that an organisation's organisational goal needs to be further broken down to a level of detail that enables those tasks capable of programming, planning, allocating and measuring the level of performance to be determined according to individual organisational units.

Figure 11: Decomposition of the organisational goal

Source: Adapted from Š. Ivanko in S. Možina, Management, 1994

As already noted, the goal of the organisation can also be broken down using the **horizontal approach**, thus providing more information on the object of the process and its rank, phase and purpose. The organisational goal is broken down into business functions, areas of business, primary elements of business and work processes, as described above.

With the breaking-down of the organisational goal into business functions, a medium-sized organisation most commonly comprises the following business functions (adapted from Ivanko in Možina, 1994):

- Research and development;
- Investments;

- Production and operations;
- Purchasing;
- Sales and marketing;
- Personnel function (HRM);
- Financing and accounting;
- Controlling;
- Organisation;
- Planning;
- Managerial function;
- Administrative function.

The functions listed above must be adapted to the specific needs of the organisation. Each organisation needs to choose the business functions most suitable and specific to it. For example, the sales business function encompasses the following business areas (adapted from Ivanko in Možina, 1994):

- Market research;
- Policy design and delivery;
- Design;
- Policy design and delivery of sales and distribution;
- Creation and direction of marketing strategy;
- Sales planning and promotion;
- Selection of sales channels and services;
- Endorsement and stocking of products;
- Sales and product distribution on the domestic market.

As a further illustration, we will analyse and break down the primary elements of business in the 'endorsement and stocking of products' business area. The basic elements of this business area are, as adapted from Ivanko (in Možina, 1994):

- Product delivery;
- Product storage;
- Maintenance of records on end-products stored;
- Optimisation of end-product stocks;
- Handling of products in shops.

To take it one step further, we will analyse and break down the primary element of business in the 'optimisation of end-product stocks' business area listed under point 4 above. The procedures of these elements are, as adapted from Ivanko (in Možina, 1994):

- Recording of the minimum, optimum and maximum stocks of end-products in the warehouse, by product type;

- Notification of deviation from the norm of end-product stock inventories;
- Analysis of storage by type of product;
- Design of the minimum, optimum and maximum stocks of end-products, by product type;
- Coordination of stocks by type of product, in accordance with the dynamics of production and sales;
- Organisation of storage operations for end-product stocks;
- Selection of the methods for evaluating end-product stocks.

In a medium-to-large organisation of heterogeneous production, the common tasks or overall mission can be broken down into approx. 22 business functions, 300 work areas, 3,000 basic elements and 100,000 work processes. The example provides an illustration of the horizontal breakdown of an organisational goal into business functions, with a single business function then being further broken down into area of business, the primary elements business and, finally, business work processes.

In the following paragraphs I will concentrate on describing the potential influence of CPs on the business functions of sales, operations, financing, purchasing and organisation, beginning with a description of the two most common healthcare system models.

4.2 Two healthcare system models

Several distinct healthcare system models exist: these include the out-of-pocket, national health insurance, Shemashko, Beveridge and Bismarck systems. I will concentrate on the Beveridge and Bismarck systems.

Many have argued that healthcare is different from other products in that patients do not respond to financial incentives. These views have been supported by arguments that state that demand is based on need, or that patients leave decisions entirely to their providers, who are concerned with their own interests and not with how much patients have to pay (Folland et al., 1997, p. 13). Patients do not necessarily know who is a good doctor or which hospital is a good hospital; they may also not know whether they are ill or what should be done if they are. This lack of (or asymmetric) information often makes the consumer or the principal dependent on the provider or the agent in a particular way (Folland et al., 1997, pp. 15–16; Penner, 2004, p. 35). In healthcare, an agency relationship tends to be formed when a party (principal) delegates decision-making to another party (agent). The task of the agent is to develop a contract or relationship to ensure that the agent is acting in his/her best interests.

As we will see in the section that follows, many services are fully or partly covered by insurance or the state in the Beveridge or Bismarck models. Therefore, while a patient may become less sensitive to price levels and price differentials in the choice of providers, third-party payers, such as insurers or the state, assume a monitoring function, negotiating with the hospital to establish reimbursement guidelines and acceptable pricing. Through selective contracting and other fee agreements, actual reimbursement are often lower that the provider's usual charges (Folland, 1997, p. 162). Health insurance is based on principles that affect the alignment of incentives around cost, quality and access. These principles are related to concepts such as information, predictability of risk and the ways in which demand for healthcare may be influenced. The primary reason for health insurance coverage is to protect against unpredictable risk, i.e. the costs of an unexpected illness, injury or disability (Penner, 2004, p. 34).

In most EU countries, hospital care is financed and provided within a single state-based system. Health insurance can be supplied by a third-party payer, which can be one of three types: private insurance companies, the state (Beveridge) or social insurance funds (Bismarck). For the purpose of this dissertation, I only concentrate on the most common healthcare system models: Bismarck and Beveridge.

In the Bismarck healthcare system model, also known also as the social health insurance system, the third-party payer is effectively a social insurance fund, which is usually independent of direct state control. There might be numerous individual funds or a single national fund with market powers equivalent to those of state authorities (Morris et al., 2010, pp. 166–167). Social insurance is based on solidarity (Bismarck), while taxation-based systems (Beveridge) usually cover the whole population (Morris et al., 2010, pp. 175–176). In the Beveridge system, finance for healthcare is mainly taken from taxes, which are collected by the state at the local, regional or national levels. They can be general (tax revenues are pooled together and allocated according to budgetary decisions made by the government or earmarked specifically to pay for healthcare; direct (levied on individuals or firms) or indirect (determined by the amount of consumption); compulsory or non-compulsory; and based or not based on ability to pay (Morris et al., 2010, pp. 175–176).

In the remainder of this section I examine the extent to which the influence of CPs on business functions can depend on the healthcare system model in which the hospital is set. I work from two main starting points: the business functions (as already described earlier) and the two models of healthcare systems, as backdrops to better comprehend the role of CPs at the macro level of a hospital.

4.2.1 The Bismarck healthcare system

This section comprises a description of the specifics of the two healthcare system models most commonly found in Europe: Beveridge and Bismarck. Against the backdrop of these two healthcare models I illustrate how a CP influences the business functions of a hospital: sales, operations, financing, purchasing and organisation.

The Bismarck healthcare system, which was introduced in Germany in 1883, is older than the Beveridge model and is the basis of Europe's social insurance systems. It is financed partly by contributions from employers and partly by premiums from employees. In Bismarckian social insurance, the role of the state is minimal, in contrast to the Beveridge model.

The state determines the conditions that govern the relations between healthcare funds, providers and patients, but does not directly integrate the funding and provision of healthcare. Healthcare funds, at arm's length from government, are responsible for implementing the healthcare plan. The relationship between healthcare providers and healthcare funds is governed by contract. The basic structure of the financial and governance relations within a social insurance-based system is given in Diagram 5 below.

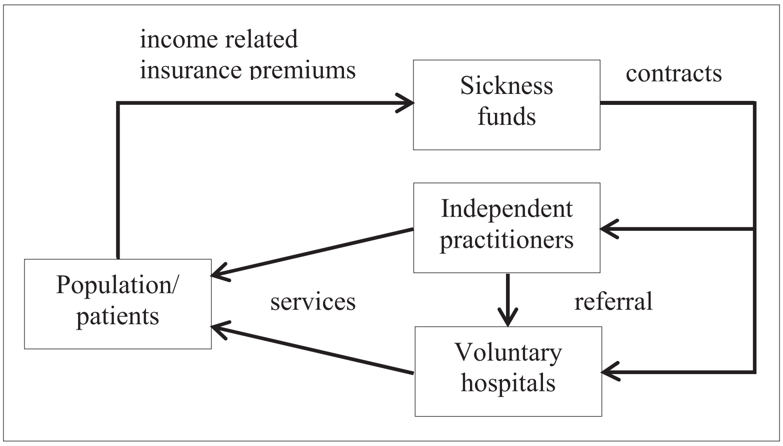
Around the turn of the 20th century, other Western European countries, such as Belgium and France, the Netherlands, Germany, Austria and Switzerland, adopted the Bismarck system. The basic approach is mandatory enrolment in health insurance funds financed by payroll taxes. All persons in work are required to have health insurance, with the costs divided between employer and employee. Contributions for pensioners, the unemployed and the disabled come from sickness or healthcare insurance funds, as well as from other social insurance funds. The employee's share is collected as a payroll tax at a rate proportional to his/her gross wages. The health fund or health insurance funds negotiate with hospitals for payment, and are required by law to provide a comprehensive set of benefits to citizens.

Under the Bismarck system, the state is also involved in the financing of healthcare via the provision of public health insurance, which is normally universal. There might be numerous individual funds or a single national fund with market powers equivalent to those of state authorities (Morris et al., 2010, pp. 166–167).

In many countries, payment mechanisms and levels are regulated on the basis of annual contractual arrangements between the health fund and healthcare providers. Each programme has an annual budget at the national level, which is then translated into caps on budgets for individual providers.

The purchasing process for healthcare services usually comprises two stages. The first consists of partnership negotiations with different groups of healthcare providers over the volume of services to be provided and reimbursed by the health insurance fund, while the second involves individual providers in negotiations on the type and volume of services that will be provided, the tariffs for these programmes and services, the methods of payment, the quality requirements, supervision of contract implementation, and the individual rights and responsibilities of the contracting parties. The reimbursements are capped, which means that the services provided in excess of the contracted amounts are not paid for. The same applies to those services which have been contracted but not actually provided.

Diagram 5: Basic structure of the Bismarck system



Source: J. Marrée & P. P. Groenewegen, Back to Bismarck: Eastern European Healthcare Systems in Transition, 1997, p. 7

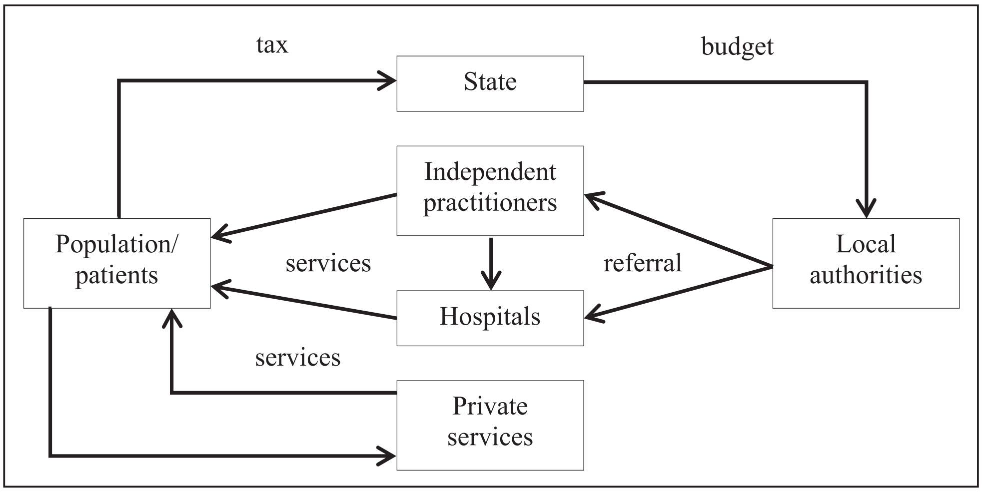
The role of the state under the Bismarck system is to pass legislation on policy and jurisdiction; it is also responsible for planning and managing public hospitals and public health programmes, and for supervising the health funds (Albreht et al., 2009; Marrée & Groenewegen, 1997; Morris et al., 2010).

4.2.2 The Beveridge healthcare system

The National Health Service (NHS) is the second family of European healthcare systems and originated in the UK in 1948. The NHS is largely financed through general revenues, with capital and current budget filtering from the national down to the regional level and then on to the district level (Diagram 6). It pays general practitioners on a capitation basis and hospital doctors largely on a salaried basis. Clinical budgeting and resource management have been introduced in the NHS, making doctors responsible for the financial consequence of clinical decisions (Lawton and Rose, 2009, p. 56). Under Beveridge, the state is involved directly in the financing of healthcare programmes (Morris et al., 2010, pp. 166–167).

The NHS has a centralised system and is funded by the state. Facilities are predominantly state-owned and budgeted. However, state regulation is less strong than it is in the Bismarck system, and there is more room for private services and private insurance (Albreht et al. 2009; Marrée & Groenewegen, 1997; Morris et al., 2010).

Diagram 6: Basic structure of the Beveridge system



Source: J. Marrée & P. P. Groenewegen, Back to Bismarck: Eastern European Healthcare Systems in Transition, 1997, p. 7

The Beveridge model became popular in other European countries in the 1970s and 1980s, including Denmark, Sweden, Norway, Italy, Ireland, Portugal, Greece and Spain.

The main differences between the two models are presented in Table 12. Under the Bismarckian system, coverage is basically employment-related, health insurance is compulsory, and the prices, types and volume of healthcare services are negotiated between payer and provider. Under the Beveridge system, the state provides healthcare through the collection of general revenues, with the state, as the sole payer, regulating the funding and provision of healthcare.

Hospitals (in the Beveridge system) were traditionally reimbursed by third parties on a retrospective cost basis – higher costs generally meant higher payments to hospitals. Unlike other industries, where sellers must compete on the basis of price for patients, retrospective reimbursement meant that hospitals were largely immune from the discipline exerted by the competitive process (Folland et al., 1997, p. 397). This situation has changed in recent years.

Hospitals and health funds must compete for their managed care business through price and quality. Hospitals are now reimbursed by many major third-party payers on a prospective basis at rates (usually based on DRGs) that are independent of their actual costs, e.g. the costed CP for elective care. Altogether, it can have an impact on the use of a CP.

Overall, one can say that while the Bismarck and Beveridge healthcare system models contain good information on the needs and demands of the population, the state (Beveridge) or insurer (Bismarck) need to know what they are negotiating for and what they are paying for.

Table 12: The Bismarck and Beveridge models summary table

Bismarck model	**Beveridge model**
- Healthcare is financed through payroll taxes	- Healthcare is financed through tax payments
- Based on the principles of compulsory health insurance	- No existence of insurance funds but local authorities manage healthcare funds or budget
- Prices, type and volume of healthcare services are a matter of negotiation between the payer(s) and the provider	- The government (as the sole payer) dominates funding and the provision of healthcare

Source: Adapted from J. Marrée & P. P. Groenewegen, Back to Bismarck: Eastern European Healthcare Systems in Transition, 1997

In the Beveridge system, the state also needs to think about investments and resources to ensure a healthy population; by contrast, under Bismarck, the insurer's (payer's) main concern is negotiating on price and volume with the providers and representing patients or potential patients.
It would be in the interests of any provider to provide a clear and detailed CP which ensures high-quality care. The state or the health fund might therefore become involved directly in the provision of healthcare in order to ensure greater access for certain population groups (Morris et al., 2010, pp. 166–167).

In the following, I base the exploration and understanding of the relationship between the CP and business functions on the observations made in the Golnik Hospital case study.

4.3 CPs and the sales business function of hospitals

Sales is the purchase of a good or a service by a buyer from a seller at a stated price or through an arrangement, and selling is the process of persuading potential buyers to purchase products (Pass, Lowes, Pendleton, & Chadwick, 1995, pp. 573–588). The business function of sales in classical terms deals with market research, promotion strategies, pricing strategies, sales strategies, the product itself, need, and supply and demand (Daft & Marcic, 2009; Gillespie, 2011; Kotler, Armstrong, Saunders,& Wong, 1999; Možina et al., 2004; Mullins, 2002).

In more precise terms, the marketing activities of a business begin with an identification of patients' needs. This may be through primary market research (which involves collecting new data, e.g. through surveys) or secondary market research (which uses data that already exists, such as government statistics or industry surveys). Having identified patients' requirements, marketing activities aim to satisfy those needs by ensuring that the firm provides the right products, at the right place and price, at the right time. Most of the time, marketing goes hand in hand with sales. A marketing strategy must therefore first be defined – for example, managers must decide on what markets to compete in and what range of products to offer. Second, the strategy is implemented via the marketing mix, which involves the 4Ps: price, product, promotion (what is communicated about the product and how it is communicated) and place (how it is distributed from the firm to the patient) (Gillespie, 2011).

As we will see in the section following, the sales business function of a hospital that is 'selling' or offering treatment or care on the basis of a CP can be 'translated' or interpreted as the sales of the CP, as a product or service that (a) defines what the provider can offer, (b) defines the product it offers, (c) prevents supply-induced demand (SID) and moral hazard, (d) reduces the risk of adverse events[5] and mistakes (in other words, reduces or increases the level of trust), (e) favours 'easy' or less complex patients, (f) favours difficult patients who are less 'risky', (g) establishes the grounds for pricing policies (it tells the payer what services it can receive or expect for the price paid), (h) promotes itself almost without any additional advertisement, and (i) enables the benchmarking of performance, patient outcomes, quality of care and so on.

4.3.1 Impact of CPs on the sales business function

In most European countries, the state typically intervenes in healthcare markets to a far greater degree than in most other markets: what providers can charge or what profits they may earn, regulating who may provide services, subsidising healthcare either partly or in full, funding healthcare via various types of tax and, in some cases, providing healthcare directly, e.g. in the form of public hospitals.

The sales activities of a public hospital begin with an identification of client or patient needs or wants. On the basis of the information given and of the CP, (a) **the provider or hospitaldefines what it can offer the patients and the payer**. The client of a public hospital is normally a patient who enters for an elective intervention as a healthy person or as an ill person needing diagnosis and treatment – in other words, patient groups can be organised around case-types, specific disease categories, levels of dependence and access routes into care (i.e. elective or emergency). In the case of the Bismarck model, the payer, normally the health insurance fund, and the patient can see what the provider offers in terms of healthcare services for specific patient groups. The same could be said of CPs in the Beveridge system: the patient and the state see what services are offered by the provider.

(b) **CPs define the product offered by the provider**. This involves market research, promotion and a sales strategy. In classical terms, a sales and marketing mix involves the 4Ps: deciding on the price, the product itself, promotion and place (Morris et al., 2010). Translating

[5] An adverse event describes a negative consequence of care that results in unintended injury or illness, which may or may not have been preventable (Henriksen, Battles, & Marks et al., 2005).

this into the business system of a public hospital, one would say that price is normally decided by the payer (often on the basis of DRGs or a similar system), but might eventually be decided on the basis of the costing of CPs, where their costing will influence the price of a particular treatment. As a product, a CP is a tangible asset and is already the single source of recorded care in several countries – for example, cataract surgery is considered a product in itself and is normally delivered at an ophthalmology clinic (i.e. the place of delivery).

However, some services can often develop in an *ad hoc* manner, which is a typical example of a CP requiring a web coordination mechanism. Patients may need to see many different professionals, on different days, in different departments or in different places. Promoting the CP is about communicating it as a product to the patient or user of healthcare services. Place, as the fourth dimension, pertains to how a product, in our case a CP, is distributed from the hospital to the patient. Since a CP is specific enough to understand, and enables us to see what activities and services are covered for a specific elective treatment, with a clearly defined product, both healthcare systems (Beveridge and Bismarck) could benefit.

Under Bismarck, the insurer (payer) would know exactly what to negotiate for in terms of volume and price, while under Beveridge the defined product also enables the proper allocation of healthcare funds on behalf of the state or local authorities – for instance, a hospital can subtly advertise hip replacement on the basis of a transparent and clearly presented CP. The payer will know exactly what to expect and how much to pay, and the better the hip replacement CP, the higher the likelihood is that the payer will decide to 'buy' the product, especially if the hospital of choice has a good reputation. Moreover, the insurer in this market may be interested in buying this product for its insurers if the price of this product – hip replacement – reflects the procedure as provided in the hip replacement CP. The hospital can then set a price for the product in accordance with the volume and the demand on the market as established through market research and health indicators; promotion can also be adapted and hip replacement teams set up, coordinated and managed in response to demand.

As we know, health is not tradable and improvements in health cannot be purchased directly. Instead, we focus on the production of health as the key means by which individuals express their demand for it, which may involve the purchase of products such as healthcare, which is thereby the indirect purchase of health improvements. Healthcare therefore has a 'derived demand' from the demand for health (Morris et al., 2010, p. 8).

A CP is a tool that (c) **prevents supply-induced demand (SID) and moral hazard.**With imperfect information and the ability to induce increases in demand, healthcare providers can often improve their profits by inducing patients to buy more output. This idea is similar to theories of more typical commodities, where sellers have an incentive to introduce advertising and product promotion in order to raise demand. Supplier-induced demand (SID) can be controversial, and refers to doctors deviating from their agency responsibilities to provide care in their own interests rather than those of their patients by using their discretionary advantage to achieve a target level of income (Folland et al., 1997, p. 181).

With a CP, SID can be better controlled by the payer. In both healthcare systems, SID can normally be controlled, where in many cases, especially under Bismarck, negotiation relies on historical data and perhaps even on forecasting exercises. Under the Beveridge model, the state keeps a close eye on outliers for SID and reacts if an unusual pattern arises in the hospital data. In the case of the NHS, the state dominates the funding and provision of healthcare and most healthcare is fully subsidised, meaning that nothing is charged at the point of consumption – effective demand is therefore higher than it would be if patients had to pay. Because there is no price system to reconcile supply and demand, demand exceeds supply (Morris et al., 2010, p. 11). A provider's self-interest may play a role in moral hazard, which is closely related to SID. Since an insured person is potentially using healthcare products or services at a higher utilisation rate, moral hazard can be containedwith (or restricted within) a CP because these costs are covered by insurance or because the insured person is primarily at higher risk of incurring healthcare costs (Penner, 2004, p. 37).

What is common to both systems is the fact that the consumer (potential patient), the hospital and the payer want to know what is expected in the provision of elective care. The client or patient's main concerns are clinical outcomes, along with mistakes and adverse events; they want to know that they will receive appropriate care in a timely fashion. CPs spell out the agreed standards that the healthcare provider and the clinicians are seeking to achieve – standards against which the actual care delivered can be measured. It can therefore be said, as discussed earlier in the dissertation, that a CP (d) **reduces or increases the risk of adverse events and mistakes, and can thus increase or reduce the level of trust between patient and healthcare staff.** This is welcome in both healthcare systems, as adverse events can incur high costs.

The success of a CP is often dependent on the choice of client group and on the reasons why a particular group is chosen (Middleton and Roberts, 2000, p. 4). As already discussed in Section 1, patient groups are groups of patients with similar clinical symptoms and requiring similar treatment, services and resources. In general, CPs will (e) **favour 'easy'** or **less complex patients, as well as more difficult patients with less risk**. In other words, in terms of the market research, supply, demand and sales strategy to be taken into account, CPs are generally developed for high-volume and/or low-risk patient groups whose diagnosis, interventions, timelines and outcomes can be predicted (Currie & Harvey, 1997), as well as for patients with more co-morbidities with less risk.

Common healthcare conditions normally cover a high percentage of patients (i.e. high-volume patients): the majority of the workload of most clinical teams and individual specialisations is made up of a small number of clinical conditions and interventions. By selecting these conditions, the focus will then be on the client groups that have the biggest impact on the organisation; one therefore assumes a high turnover, which would be important when the payer needs to ensure resources for unpredictable patients (under both healthcare system models). A CP allows (f) **the low-risk patients within these groups to be managed more efficiently** and more time to be allocated to more complex and unpredictable patients (usually less common cases). Negotiations on volume and price occur under the Bismarck model, and by negotiating on the volume of elective treatment and therefore price, the payer is able to lower the prices of high-volume patient groups or those complex patient groups with less risk, and to ensure that money is allocated for unpredictable complex healthcare interventions. Negotiations do not occur in the Beveridge model: the hospital is responsible for managing its clinical budget.

In practice, factors other than price determine who obtains health services; these factors might include waiting lists, which are often far too long in the NHS because the state is the sole payer and decides on the allocation of the funds for healthcare. However, since the CP has a defined scope (it has an agreed starting point and end-point, and the scope of a particular pathway will influence the type and number of staff in the delivery of appropriate care for the chosen patient group), it also provides equity of care. So in terms of setting price, (g) **CPs can play an important role in telling the payer what services it can expect to receive for the price paid, thus setting the pricing policy**. In the Bismarck system, for example, negotiations take place between the payer and the provider. It is in the interests of the payer to know what exactly it is paying for and for the provider to provide exact details of the services provided. It should be a hospital's main task to work out the costed pathway, i.e. the actual costs, and to set the price for a particular treatment. However, should the payer disagree with the price, the CP would be the perfect tool for deciding what to remove – following the clinical guidelines and without jeopardising the quality of care and expected healthcare outcomes for the patient, of course.

Hospitals should be interested in selling and marketing their products (CPs), regardless of the system of which they are part. CPs are tools that promote themselves, given their content, to users (healthcare staff), patients, carers and payers – indeed, it could be said a CP is (h) **a tool that markets itself**. As we have already seen, there is evidence that the higher the volumes of cases treated for specific patient types, the greater the quality of healthcare provision, leading to lower costs. However, given the restrictions in advertising for elective care, patients will respond to quality indicators when selecting a hospital; a quality indicator might be the use of CPs for certain patient groups, and patients may well seek hospitals that use CPs so that they know what they can expect on their journey through the hospital. One could say that many healthcare services are 'reputation products' (Folland et al., 1997, p. 165), and the same might be said of CPs.

Finally, (i) **a CP can enable benchmarking** – acomparison of CPs over time between hospitals for specific patient groups can be useful for payers, providers and users. A CP can, in this manner, allow the evaluation and analysis of CP data valuable to the payer, such as quality, patient outcome and patient satisfaction (which could be the case in both healthcare systems), while CP-based performance and process data would most likely be of interest to the owner of a public hospital using CPs. Furthermore, CPs can enable comparisons of costing and pricing data, thus highlighting how providers are delivering health services. This type of comparison can help in the negotiation phase between the payer and the provider. CPs can aid a comparison between the aspects of the performance of one provider against the other, e.g. mean costs per case (nursing, medical, allied health, operating theatre, pathology, imaging, overheads, etc.), outcomes, patient satisfaction, quality of care, staffing levels and so on. It may also help with a comparison of some of the elements of the CP of a specific patient group for different providers, such as the time needed to admit a patient before a procedure, whether the discharge plan has been reviewed at admission and how well it was delegated, the number of hours of post-operation stay in the intensive care unit, and so on.

4.3.2 Impact of different CP models on the sales business function

I will now describe how the three CP coordination mechanisms (or types) and four CP models, as outlined under Section 2 'Common CP Models'), can influence the sales business function of a hospital under the Bismarck and Beveridge healthcare system models.

The impact of the three overall CP coordination mechanisms or CP types described in Section 2 on the sales function can be described as follows.

The **chain coordination mechanism** or **chain CP** will have an impact on the sales function because it is a straightforward and predictable mechanism of healthcare provision – no *ad hoc* teams are needed, and this type of mechanism is most common for 'easy' and predictable procedures with very little or almost no foreseen complications (e.g. community-acquired pneumonia, COPD, cataract surgery, abortions, total hip replacement). The types of patient for this mechanism would be limited to groups of patients who are considered high volume, with predictable treatment and outcome and a defined average length of stay. The chain CP would, in many cases, be present in the day surgery department for minor operations in plastic surgery(removal of minor skin deformations), gynaecology (abortion), orthopaedics (knee/joint fluid aspiration), ENT (removal of sinus polyps), urology (phimosis), oral surgery (tonsillectomy and adenoidectomy), etc.

There is increasing demand for day surgery in both the Bismarck and Beveridge systems, as patient turnover is relatively high and the costs relatively low. There are, to my knowledge, financial incentives in both healthcare systems to transfer as many potential patients to day surgery – in accordance with clinical guidelines and decisions, of course. Another aspect is that the chain and hub coordination mechanism is mostly present in the care of high-volume diseases (as already discussed under Section 1, 60% of patients can follow a CP). In Bismarck healthcare systems, intense negotiations are expected to take place for day surgery or any kind of high-volume patient-type or elective care; a similar thing happens in the Beveridge system, where the state is mostly interested in keeping the working population as healthy as possible, treated at affordable cost and sent back to work. The state also needs to know how to build better healthcare workforce capacity, and how and when to invest in assets and facilities.

From the point of view of the sales business function of the hospital as established in the previous section, a CP with a chain coordination mechanism can:

a) Define what the provider is able to offer, present it transparently (so that the patient, provider and payer know what type of healthcare service to expect) and normally also present the sequence of delivery;
b) Define the product it offers – there is plenty of evidence attesting to those patient groups for which a CP with a chain coordination mechanism is most suitable (usually for elective surgery or chemotherapy processes, as they are often based on time-task matrixes, and the sequence can be day-by-day or often hour-by-hour);
c) Prevent SID and moral hazard, as the elements of the treatment are clearly defined in the CP;
d) Reduce the risk of adverse events and mistakes – in other words, reduce or increase the level of trust, since by defining the product and ensuring transparency of activities in the pathway, the risk of mistakes is minimal;
e) Favour 'easy' or less complex patients and predictable patients;
f) Favour difficult patients who are less 'risky' (this type of mechanism would not suit difficult and high-risk patients, who would normally be treated on a pathway that requires a hub coordination mechanism);
g) Establish the grounds for pricing policies (it tells the payer what services it can receive or expect for the price paid); as noted, this type of pathway covers high-volume patients and can establish the groups for pricing policies;
h) Promote itself almost without any additional advertisement (promotion has been discussed above and normally comes in a subtle way through quality of care and patient satisfaction). A hospital might also promote itself through the use of indicators and claim that a certain number of cataract patients were treated on a CP, with the outcome for this type of treatment being, for instance, 100%; the same might be attributed to a CP with a hub coordination mechanism; and
i) Easily enable a comparison of CPs over time between hospitals for specific patient groups, particularly in terms of costs and quality of care as illustrated in the two figures below.

The **hub coordination mechanism** or **hub CP** can have an impact on the sales function. This type of CP will be found in hospitals that provide elective care for almost any case-type and type of patient with a predictable treatment plan and potential but minor deviations, i.e. in most cases, processes that are a little less predictable than those for chain models, as in the fields of psychiatry or palliative care, for example, but more particularly in the field of internal medicine (acute exacerbations of bronchial asthma, radical prostatectomy, acute appendicitis, acute chest pain and low-risk myocardial ischemia, gastric bypass or laparoscopic adjustable gastric-banding).

From the point of view of the sales business function of the hospital as established in the previous section, a hub CP can, similarly to the chain CP:

a) Define what the provider is able to offer. The course of care is presented in a more transparent manner, and also shows where the service is provided outside the hospital, (perhaps in a different hospital or clinic that has certain equipment that the primary hospital does not have) or across organisational boundaries;
b) Define the product it offers specific patient groups following a hub CP. It many cases, some processes within the hub model contain elements of the chain model for highly predictable sub-processes; it therefore comes closer to the basic costing model of the chain model and the definition of which providers lie within the hospital and which lie beyond it;
c) Prevent SID and moral hazard, in a similar way to a chain CP, if transparently designed. A point of abuse of SID can arise when the patient is transferred from one hospital to another for a CT scan, for example, and some of the laboratory tests are duplicated, or when a patient may, through lack of trust, demandthat certain diagnostic tests be taken. This can be avoided if the CP clearly indicates when the laboratory tests were taken;
d) Reduce the risk of adverse events and mistakes, but to a lesser extent than in the chain model, where the sequence of care is very predictable – in other words, it can reduce or increase the level of trust, but will less likely achieve the level of trust offered by the chain model;
e) Favour ‘easy’ or less complex patients – although in most cases the chain mechanism model approach may better suit ‘easy’ and predictable patients, there are certain patient groups who would need to follow a CP requiring a hub coordination approach in order to ensure quality of care and the expected healthcare outcomes;
f) Favour difficult patients who are less ‘risky’;
g) Establish the grounds for pricing policies (it tells the payer what services it can receive or expect for the price paid);
h) Promote itself almost without any additional advertisement (promotion of any type of CP through quality of care and patient satisfaction). This model defines what the hospital is able to offer, what the consumer can receive and also what the other hospital, if involved, is able to provide in terms of healthcare services within this model; and
i) To a great extent enable a comparison of CPs between hospitals for specific patient groups over time, particularly in terms of costs, quality of care, etc.

The **web coordination mechanism** or **web CP** requires the formation of *ad hoc* teams. This type of care incurs high staff costs and a great many other resources. From the process point of view, a web CP looks quite different to the other two mechanisms in that it is more flexible. This type of CP requires a greater effort from all persons involved in the care of a patient with several co-morbidities of the high-volume disease kind. This mechanism is applicable to complex patients whose treatment is unpredictable and who need to be treated as the disease progresses, or who are admitted for complex diagnostic admissions. This type of mechanism covers, for instance, a combination of oncological and surgical procedures, e.g. a cancer patient undergoing bowel surgery, a patient with severe traumatic brain injury or requiring coronary artery bypass surgery, and major thoracic cases, including esophagectomies and lung resection, renal transplants, etc. This coordination mechanism would therefore most frequently be used for interdepartmental or even inter-organisational coordination of the treatment of a complex patient.

From the point of view of the sales business function, a web CP:

a) Cannot fully define what the provider is able to offer, since the patients are unpredictable or suffer from a variety of co-morbidities;
b) Can, to a certain extent, define the product it offers and combine several products;
c) Can, to a limited extent, prevent SID and moral hazard, as the patient may be too complex to be treated on a CP – in other words, the medical teams would have to meet daily to organise and structure the process of care for the complex patient;
d) Can perhaps reduce the risk of adverse events and mistakes if it clearly presents the combination of CPs to be used;
e) Is not meant for 'easy' or less complex patients;
f) Would best suit difficult patients who are 'risky' and would or could, in the best event, follow two or three pathways depending on their co-morbidities;
g) Cannot establish the grounds for pricing policies, instead providing rough estimates of the resources used (the price can only be established at the end of the episodes of care);
h) Cannot be as easily promoted as the other two types of CP, as there can be far too many products whose use occurs unexpectedly and across organisational and hospital boundaries, i.e. the web model is not necessarily attributed to one hospital or is not necessarily the product of one medical team, as it is in the chain model; and
i) Can, to a limited extent, enable a comparison of CPs over time between hospitals for patient groups with several important co-morbidities, e.g. the time required for discharge and readmission, or the transfer time between departments. The web CP is different from the chain and hub models, which rely more on the time-task matrix, since it relies more on the goals and tasks.

Moving a step further, I will now describe how the four CP models identified influence the sales business function of a hospital.

CP Model 1 is straightforward and presented in the form of a flowchart diagram (in the illustration of this model of a pathway for breast cancer[6] developed by the Maps of Medicine discussed under Section 2).

It takes the specific patient group through the expected steps of the treatment, starting in this case with breast cancer detection. It is a general pathway designed for healthcare staff at the regional/national level and has not been adapted to the local specifications of the providers or teams involved.

This type of model bears the characteristics of a CP with a chain coordination mechanism; it is also equipped with an interactive and support tool, provided one is on the Maps of Medicine website, which contains the basic but necessary information and is supported by evidence provided in the links. This CP could be used, to a limited extent, to attract potential patients/payers in any of the two healthcare system model settings.

It does not provide detailed information on who does what and when; moreover, the quantity and volume of resources needed is not clear, which means that it is not clear what treatment costs are incurred with every step. It does provide a general overview of the care of a breast cancer patient, but it is difficult to assess the resources required (financial, human, facilities, etc.).

From the point of view of the sales business function of the hospital as established in the previous section, the patients know what they can expect upon admission and on their journey – partly prior to admission and then throughout their journey (e.g. how soon certain events should take place, what the sequence of events will be, what the patient can expect, etc.). CP Model 1 crosses several organisational boundaries.

As a product, CP Model 1 is not differentiated and is rather generic. Similarly to the other CP models, it will prevent SID and moral hazard, reduce the risk of adverse events and mistakes in the coordination of care, and potentially increase the level of trust between provider and patient, thus possibly leading to better patient outcomes. This CP model does not give any clear indications as to whether it would favour ‘easy’ or less complex patients, or difficult patients who are less ‘risky’. In terms of costs, one can identify the key elements and estimate the costs.

CP Model 2[7]is an even simpler and more basic flowchart diagram for use by clinicians. It is informative in nature, but does not provide any information that could potentially attract the patients, the payer or the insurer. It represents the pre-mobilisation period, which could end in admitting the patient for elective surgery or commencing rehabilitation.

[6] Breast cancer is considered a high-volume disease.
[7] The example I use is the spinal cord compression CP as discussed under Section 2.

The cost of this CP model would be reflected in the DRG, with the provider risking being underpaid for its services on the basis of this type of CP model. It is more useful for clinicians than for patients. It is a model that could be of use at the regional or national level, but would then need to be further elaborated or broken down.

From the point of view of the sales business function, CP Model 2 carries the main characteristics of a CP, but in a more generic manner and with very little detail. It roughly defines what the provider is able to offer to the patient, and from the point of view of the user or payer, the CP product is only vaguely defined. CP Model 2 only suits less complex patients and is not as readily found on the internet in comparison with the other CP models, nor as patient-friendly; however, it is easy to use for clinicians.

CP Model 3[8] is a model that takes the flowchart diagram a step further in comparison with CP Model 1, in that it provides more information for patients and evidence-based information for clinicians.

CP Model 3 relies on the chain mechanism coordination approach, as care is more predictable and requires a high level of agreement between the members of the team. In comparison with the other three models, it provides financial costing templates for calculating the costs of various drugs used for the treatment of diabetes patients on the pathway.

As a chronic disease CP, CP Model 3 encompasses care at the primary level; this differs slightly from the other three CP models, which focus strictly on the acute setting. Unfortunately, the model does not say anything about the other resources required for successful and high-quality treatment. It is patient-friendly to the extent that it provides a general illustration of what can be expected, but there are no time boundaries or clear indications as to which professionals are involved in which step. From the point of view of the sales business function, CP Model 3 is fairly similar to CP Models 1 and 4; however, in comparison with the other models it has very good potential for establishing grounds for pricing policies, as it dictates what types of service a patient may receive or expect for the price paid.

CP Model 3 can provide a better estimate of care costs, e.g. the quantity of various medicines used for the treatment of a certain patient group following this type of model, as it provides financial templates with estimates and the costs of the drugs used to treat Type 2 diabetes at the national level. It also promotes itself on the internet, probably more satisfactorily than CP Models 2 and 5, as it falls within the realm of a well-established and trusted healthcare agency.

[8] An illustration of this model is the Type 2 diabetes CP developed by NICE, as discussed under Section 2.

CP Model 3 can be freely and easily viewed by patients, who can download all the information they require, as well as by healthcare providers; for the latter, it could represent a kind of guide for the treatment of a specific patient group. The model can be used for the purpose of benchmarking against the CPs of other providers for specific patient groups, particularly in terms of the costs of drugs used.

CP Model 4[9] is the only one of the four models observed that was locally developed within the given resources of its hospital. It presents the items and activities in a transparent manner, and is more comprehensive that the three other CP models.

The level of detail of this pathway allows one to define staff costs, laboratory costs, hotel costs, use of equipment costs, productivity costs, etc. It is the type of CP model that funds and insurers should be seeking in order to know what exactly they are paying. It could provide reassurance to patients and to their carers, as it clearly itemises every step in the treatment, i.e. it is clear which member of the multidisciplinary team does what and when.

CP Model 4 can also be used for high-volume patient groups and as the basis for calculating the costs of treatment; this allows a price to be extrapolated and then used in negotiations with health funds, and a pricing policy to be set. This type of model requires a chain mechanism coordination approach (to a great extent it uses a time-task matrix, and the sequencing of events is mostly day-by-day as well as hour-by-hour). Depending on the hospital setting and the available resources, it could potentially also call for a hub coordination approach to the treatment of the patient between departments, hospitals or standalone clinics.

In comparison with the other CP models and from point of view of the sales business function, CP Model 4 is in many aspects more precise than the other three CP models: it defines almost exactly what the provider is able to offer, can help prevent SID and moral hazard, and can reduce the risk of adverse events and mistakes in the coordination of care more reliably than the other four models (depending on the manner in which it is designed), which means that mistakes can be easily traced and marked as deviations to assist the team in discussing the case and ensuring a way of avoiding future mistakes.

Furthermore, it appears that CP Model 4 can easily increase the level of trust between provider and patient, possibly leading to better patient outcomes. In comparison with the other three CP models, it has the greatest potential to establish the grounds for pricing. Given the fact that it is published and freely available on the internet, it can easily promote itself, with the patient or carer in a better position to know what to expect; the only potential drawback is that patients and carers may find it too complex to understand, making a simplified version of the CP an option. This type of model can enable benchmarking for various elements (such as

[9] An illustration of this model is the laparoscopic cholecystectomy CP developed by the provider, as discussed under Section 2.

the quality of care, costs, level of staffing, level of materials and drugs used, waiting times, existence of a discharge plan, hours in the ICU).

4.4 CPs and the purchasing business function of hospitals

Purchasing is the business function involved in procuring raw materials and maintaining adequate materials, components, finished products and capital equipment, as well as ordering and acquiring supplies of these items at competitive prices. Purchasing is also charged with placing orders when necessary (Pass et al., 1995, pp. 535–536). In healthcare, the hospital (as the buyer) needs to keep up to date with the prices of materials and products, and be aware of new materials and new technology when they become available.

According to Feinstein and Stefanelli (2008, p. 114), there are five major objectives that must be achieved by the purchasing function: maintaining an adequate supply, minimising investment, maintaining quality, obtaining the lowest possible cost for the best value of the product or service, and maintaining the company's competitive position. Buyers usually perform a number of activities common to all organisations: they determine when to buy, control inventory levels, establish quality standards, determine specifications, obtain competitive bids, investigate vendors, arrange financial terms, oversee delivery, negotiate refunds, handle adjustments and arrange for storage. The following activities can be added: negotiating with suppliers, changing suppliers, invoicing payment and ordering placement with suppliers (Feinstein & Stefanelli, 2008, p. 105).

Put differently, the purchasing function is about selecting what needs to be purchased and when,a procurement plan, determining requirements, selecting suppliers, sourcing, maintaining a convenient and sufficient inventory, conducting negotiations, conducting research activities (value analyses, forecasting, what-if analyses, plant visits), maintaining supplier diplomacy, educating suppliers, purchasing, receiving, storing and issuing products, disposing of surplus and unsaleable items, recycling, developing record-keeping controls, and organising and administering the purchasing function (Feinstein & Stefanelli, 2008).

In terms of healthcare, care is not a commodity that can be stocked – a hospital is a resource-oriented service organisation without stocks of services (Bertrand & de Vries, 2005, pp. 26–27). The primary role of purchasing is threefold (Langabeer II, 2008, pp. 253–254):

- To find sources of supply for various types of products and services that the hospital requires;
- To manage the sourcing process for soliciting vendors and obtain competitive responses;
- To engage in purchase contracts that minimise total costs over the long term. Purchasing is also charged with continuously evaluating whether it is receiving these materials at the best possible price in order to maximise profitability. The

purchasing function represents a significant source of potential financial value for hospitals.

In many hospitals, purchasing is seen as an administrative function – for instance, the need for a new medical device is based on doctor preference or procedure, but the documenting of these specifications to allow purchasers to study the market, find vendors and solicit pricing information is a core function (Langabeer II, 2008, pp. 254).

Putting the above in the context of CPs, not all aspects of the purchasing function are relevant. **A CP does not play a major role in the purchasing function**, as it does not help to obtain the lowest possible cost for the best value of the product or service, nor can it maintain the quality of the purchased products or services, control inventory levels, obtain competitive bids or help investigate vendors and then arrange financial terms, oversee delivery, negotiate refunds, handle and arrange for storage.

A CP can, however, help manage the sourcing process in the sense that it (a) can help ensure adequate supplies for elective patients on the CP and (b) help determine when to buy an item. In addition, a CP can (c) help determine the specifications of the item needed,such as services, types of medicine and medical device and the type of equipment, but it does not identify the space needed or the labour that accompanies that; some of these items will be purchased as inputs and others as intermediate products, and some may be stocked.

4.4.1 Impact of CPs on the purchasing business function

As mentioned in the introduction to this section, the purchasing function is about acquiring products or services to accomplish the goals of the hospital. Hospital items or supplies are medical supplies, medical equipment used repeatedly for multiple patients, pharmaceuticals, and procedures. (Langabeer II, 2008) Items are issued or dispensed to patients; medicines are administered to patients.

Although there are several hospitals or even government agencies that attempt to set standards in the purchasing process, processes can vary between hospitals. Purchasing directs the healthcare supply chain by coordinating the flow of products from manufacturers, through distributors, through hospital reception points to the point of ultimate use or consumption; i.e. the ward, operating theatre, laboratory and so on. Most hospitals engage in centralised purchasing on the basis of a coordinated supply chain, where clinicians normally do not get involved in the procurement cycle except when specifying needs. Centralised coordination of the supply chain involves ordering products, negotiating and managing suppliers, and performing administrative and other tasks. Aggregating purchase volumes from multiple hospital departments, and standardising them around the same products and services, allows purchasing departments to source higher quantities and volumes, which helps drive efficiencies into operations (Griffin, 2012; Vissers & Beech, 2008). While a CP does not have a significant impact on a hospital's purchasing function, there are perhaps three areas in which it can contribute, as we will see below.

In terms of purchasing, a CP can (a) **help ensure adequate supplies for the care of patients**. This includes the following activities: (i) determining what, when and how much to purchase for hospital inventories; (ii) supporting centralised purchasing to ensure efficient operations and cost-containment in hospitals; (iii) supporting shared purchasing when two or more hospitals have decided to combine purchasing activities; (iv) helping to determine the leasing of capital equipment (e.g. highly technical equipment); (v) helping to ensure that the correct number and type of supplies and equipment are properly received; (vi) managing inventories; (vii) dealing with storage where the majority of a hospital's inventory is kept (Griffin, 2012, pp. 215–219).

None of the purchasing function activities or items are identified on the CP, with the exception of identifying what and how much to purchase, which would normally be based on historical data and forecasts. A CP cannot follow drops in inventory, but inventory can be managed on the basis of a CP. There is no relation between a CP and centralised purchasing, shared purchasing, the leasing of capital equipment, and storage activities – a CP can only help support these activities.

Inventory is a buffer against demand variability (Langabeer II, 2008, p. 276); for instance, when demand is less than certain or is variable, inventory helps protect against this variability. It is, in terms of operations, a buffer or safety stock against demand variability.

There are several reasons for keeping an inventory (Chase, Aquilano, & Jacobs, 2001; Langabeer II, 2008; Vissers & Beech, 2006):

- Variations in lead times in the supply chain requiring the maintenance of a certain amount of inventory for use in these lead times;
- To meet uncertainties in the supply, demand and movement of products, and to protect against lead times, disruptions and volatility, e.g. if 100 packs of plaster are used consistently in winter but a large ski accident creates demand for another 50, inventory would help provide some measure of protection or a safety stock to keep operations running when demand levels and lead times cannot be known for sure;
- Because of economies of scale, where in ideal conditions the hospital would meet 'one unit at a time at a place where a user needs it, when he needs it', which in principle would incur high logistics costs. Bulk purchase or batch ordering and storing brings in inventory, and therefore economies of scale;
- Because of most favourable price terms.

A CP has no influence on price or economies of scale. A CP can keep track of variations in lead times and take note of disruptions due, for instance, to a sudden decrease in demand and hence a lack of certain inputs. A CP does not indicate specifically what items or products are required in the treatment of a patient on a CP, but could be indirectly related to the cost of inventory.

A hospital that has more complicated cases and resource-intensive procedures is likely to spend more and order more supplies and inventory, thus putting pressure on the operating budget. Several CPs can together identify opportunities for item standardisation, i.e. it can identify items that are frequently ordered. Because its nature, it is very difficult for a CP to help identify or help predict shifts in volumes of items.

The purchasing function has a direct impact on patient treatment, but may not necessarily be influenced by the CP. For instance, if the purchasing function does not purchase syringes on time and have them delivered to the ward or diagnostic laboratory, this will make it difficult to carry out laboratory diagnoses such as blood tests.

Purchasing is carried out by the purchasing department, but an idea for the purchase of new equipment may start at ward level. A CP can help determine (b) **when to purchase a certain item or service**. A multidisciplinary team may become aware, on the basis of completed and analysed CPs and newly established clinical guidelines, that new equipment or a different medicine would be more effective or more appropriate for the treatment of a specific patient group. This would have an impact on only one step of the procurement cycle of the purchasing function.

A CP can trigger purchasing when the quantities of certain supplies such as medicines drop, especially if the CP is in electronic format and part of the hospital's information system. This drop could be related to just-in-time purchasing. However, most CPs are still paper-based and the hospital will rely on planning for the materials required. On the other hand, if it is a matter of medical equipment, the process of purchasing is different, but might still be triggered by the CP, e.g. if a deviation noted in the CP persists over a period of time due to a deficiency in X-ray medical equipment in the diagnostic laboratory, with the equipment ceasing to provide accurate images. The healthcare team can then decide to trigger the replacement of the equipment.

This is also an example of the link between the purchasing function and working capital. On the basis of the information provided by the CP, a conclusion is reached that a patient is waiting far longer for a computed tomography (CT) scan than is recommended in the newly published and approved clinical evidence. The imaging department may budget for a new CT scanner during the annual budget process; then, during the budget process, various CT models are discussed within the department and with the input radiologists who will use them directly, along with the anticipated prices. For highly sophisticated medical equipment required on the basis of an updated clinical guideline and/or the deviations noted in the CP, a

CP could help determine when to buy; otherwise, for perpetual inventory, the hospital staff can rely on the supply chain.

Purchasing aims to make intelligent purchasing decisions, i.e. to provide an uninterrupted flow of materials and services for hospital operations, find reliable alternative sources of supply and buy at the best value.A CP can help determine what to buy and specify the required quality of the material, equipment or service. In other words, a CP can, to a certain degree, (c) **help determine the specifications of the items** required on the CP for a specific patient type given the local resources and the specific clinical guideline; however, a CP cannot identify any of the intermediate products to be purchased.

The procurement plan of the purchasing function contains several steps (Feinstein & Stefanelli, 2008): (i) determination of needs; (ii) selection of suppliers; (iii) negotiation of purchase; (iv) the follow-up phase. As discussed above under (b) and (c), a CP can help to determine needs (what to buy and how much) and make a decision on quality; otherwise, a CP has no influence on the other three steps of the procurement cycle. A CP cannot influence the selection of suppliers so as to get the best value in terms of price, service and consistency of quality, nor does it influence purchase negotiations. A CP could potentially influence the follow-up phase (iv), where information on the quality of the purchased product or service is examined with regard to possible deviations in the CP, but the steps in the CP are independent of the items purchased.

In other words, a CP can provide quality control of a purchased product or service in the sense that it takes note of any kind of deviation from what is expected – for instance, where a generic drug is purchased instead of a brand name drug but does not take effect until later than expected, the healthcare team would note this deviation, discuss it at the team meeting, and decide whether to redesign the CP or go back to the more expensive original drug and thus remain on the same pathway.

It is not clear from the CP whether the quality of the purchased product, equipment or service influences the stages of the CP and thus the outcomes. To my knowledge, no studies have been conducted in this regard.

As noted, the purchasing function is the procurement of all materials required for the production or delivery of services – this might be the drugs, materials or equipment needed for the treatment of an inpatient by the clinicians. A CP does not explicitly indicate the inputs required for the treatment of a patient. There are certain products that need to be purchased as direct inputs in the treatment of a patient on the CP, while other products need to be purchased as intermediate products; both types of product can be purchased for inventory or stocking purposes, but intermediate services cannot be stocked. However, certain services can be purchased as inputs or intermediate products, but would not be identified on the CP; nor would the CP identify, for example, all the diagnostic equipment that needed to be purchased for testing blood or pathology samples (it would simply be assumed on the basis of clinical practice, guidelines or DRGs).

In a hospital, inventory is one of the key components driving increases in working capital (Langabeer II, 2008, p. 287). Inventory might include sufficient product on the shelves or stocks for the hospital. Inventory in healthcare is disaggregated throughout the rooms, departments, clinics and storage areas. Given the information system, it is very difficult to explore the utilisation of supplies and inventories on a per-procedure basis, especially in larger hospitals (Langabeer II, 2008, p. 281). The same can be said about CPs,which do not explicitly indicate the inputs needed for the treatment of a patient. It would then be possible, perhaps on the basis of an activity-based costing approach to service-line management, to track the actual quantities of the items utilised.

Purchasing oversees the vendors that supply it with the items it needs to operate properly, and stocks are an important issue. *Stocks* are part of a hospital's assets that are held in the form of *inventories*: *intermediate products* and *inputs*, where inputs can be identified as *work in progress*or *intermediate products* and *finished products.*

Most manufacturing organisations usually divide their inventory into: *raw materials* (materials and components scheduled for use in making a product), *work in progress*, which generates very low or zero inventory (materials and components that have begun their transformation to finished products, e.g.the preparation of medicine), and *intermediate products*, which are items that need further processing or transformation, e.g. intravenous injection, which might require additional processing with other injectable solutions. Hospital pharmacies that compound or mix their own drugs also manage intermediate products. Intermediate products are held in stock to prevent disruptions to production caused by a lack of materials or components such as medicines and disposable materials needed in the treatment of the patient. Similarly to manufacturing, hospital inventories are constantly being turned over as the production cycle repeats itself, with raw materials being purchased and converted first into work in progress (Langabeer II, 2008; Pass et al., 1995) and then into completed services or outputs.

The level of inventory for medicines and other intermediate materials will depend upon the hospital's forecasts about future demand, and the amount of stock the hospital needs to allow for delivery delays on raw materials and production delays in serving patients, with appropriate buffer stocks to cover unforeseen contingencies. *Finished products* (products such as syringes, bandages and stents ready for sale to customers, i.e.patients and clinicians)are an item in final form for consumption or utilisation; they will not be further processed, mixed, blended or transformed. Most of the products purchased in hospital supply chains are finished products, e.g. a syringe, bandage, disinfectant, etc. (Chase et al., 2001; Langabeer II, 2008; Pass et al., 1995; Vissers & Beech, 2008).

Hospitals would normally seek to minimise the costs of stocks by establishing optimum stocking levels. The level of stock to hold may not be entirely up to the healthcare team managing a specific CP. In addition to the two types of stocks (intermediate products and inputs), there are several other types of stocks that a hospital may integrate into its system(Langabeer II, 2008). *De-coupling stock*, for example, is buffer stock held between the machines in a single process, which serves as a buffer for the next process and allows work to flow smoothly instead of requiring a wait for the previous or the next machine in the same process. In a hospital, this is a point in the process at which operations before and after aredecoupled by a waiting list or a productive period of waiting (Langabeer II, 2008; Vissers & Beech, 2008).

Waiting list decoupling points are often used before a bottleneck resource to ensure maximum use of this resource, e.g. waiting for a general surgical outpatient appointment to ensure that the consultant's time is fully utilised (Visser & Beech, 2008, p. 46). *Anticipation stock* involves building up extra stock for periods of increased demand, e.g. plaster for the skiing or winter season, while pipeline stock comprises items still in transit or in the process of distribution on exchange carts or in distribution centres (e.g. implants).

A hospital distinguishes between two types of inventory: periodic and perpetual. *Periodic inventory* does not keep a running record of items that are sold or purchased, so a real-time balance of inventory on hand is never available. *Perpetual inventory*, on the other hand, keeps a running record of the inventory balance on hand at all times.

In hospitals, as in the retail and manufacturing industries, precision around the inventory is very important but is used less, although the trend is for more perpetual systems to be incorporated into hospitals(Langabeer II, 2008, pp. 286-287). The majority of a hospital's inventory is kept in the main hospital warehouse. The perpetual system provides valuable information about supply expenses and inventory values throughout the year, predicting demand and forecasts for the future (Langabeer II, 2008, pp. 286–287).

A CP can, to some degree, help with inventory calculations, which can then be used to monitor asset utilisation and so aid the purchasing function (Boyson, Harrington,& Corsi, 2004; Langabeer II, 2008; Vissers & Beech, 2005):

- Buffer or safety stock carries additional inventory to satisfy unexpected demand and is normally built on previous forecast errors and desired service levels. Some services can be ordered in a different setting and cannot be stored;
- Patient service levels are about achieving service levels, are a measure of the probability that a product will be available when the inpatient requires it, and allow for operational coordination;
- Patients are served indirectly, while clinicians are served directly by so-called 'materials management';

- Economic ordering quantity (EOQ) is used to help hospitals improve the balance between supply and demand;
- Inventory is used to manage the effects of lot sizes that cannot be matched precisely to actual demand.

A CP can, to a certain degree, help forecast demand (and thus influence the cycle inventory), safety stock levels, patient service levels and EOQ. However, the main challenge posed by a CP is that it is not explicit in terms of identifying intermediate products and/or services as inputs/or inputs.

To summarise, a CP has very little impact on the purchasing function. Purchasing can start on the ward and be triggered by the CP's multidisciplinary team, by variance-tracking and by updated clinical guidelines. It can help specify the products required and when to purchase them (e.g. when an equipment malfunction is identified or when there is a need to purchase a service in a different setting). Otherwise, a CP plays no role in price or in the labour required to install and learn how to use new equipment, nor does it influence inventory or stocks.

4.4.2 Impact of different CP models on the purchasing business function

I now move on to describe how the three CP coordination mechanisms and five CP models can influence a hospital's purchasing business function. Generally speaking, the purchasing function is influenced by the CP, but to a limited degree only. I highlight where a specific CP model has a more accentuated influence, or none at all, on the purchasing function of a hospital.

To begin, I will discuss the purchasing function in the light of the three CP coordination mechanisms identified at the beginning of this section – chain, hub and web – and their influence on (a) **ensuring adequate supplies for elective patients on the CP**.

A chain CP can help ensure adequate supplies. It is a fairly predictable CP in comparison with the web CP, for example, and is therefore able to specify the supplies required to ensure a smooth flow of work and smooth patient treatment. It is probably this type of CP model that makes it possible to determine when to buy a specific item (product or service) and determine the specifications.

With this type of CP, the hospital can obtain the lowest possible costs for the best value of the product or service. However, this is not as simple to do with a web CP, as it is less predictable. A certain service needs to be available or products delivered, either within one healthcare setting or a different healthcare setting, and it is also possible that co-morbidities may appear unexpectedly. A hub CP is more predictable than a web CP, and hence could provide more consistent information on what needs to be purchased.

Both chain and hub CPs will help determine what, when and how much to purchase for hospital inventories – something a web CP is unable to do. The purchasing function would then need to rely on historical data and forecasts, and to ensure that there are buffers or safety stocks, thus enabling patient service levels, EOQ and cycle inventory to be managed.

For the chain and hub CP, particularly in stable periods, the purchasing function can better plan and determine what, when and how much to purchase for hospital inventories, ensure efficient operations and cost-containment through centralised purchasing, exercise shared purchasing, know when to lease capital, take care of the receiving section, and manage inventories and storage. The CP provides information on the outputs only; since they are not identified on the CP in general, inputs would need to be discussed separately with the healthcare team of the CP of a patient type.

CP Model 1 is based on the flow of the patient along the pathway. The model does not make it possible to identify the supplies required to carry out the treatment of the specific patient group, but it does provide the outputs (services) and the use of certain types of equipment, e.g. ‘diagnostic imaging’, which means that the purchasing team can keep track of the use and characteristics of equipment and plan the use of new equipment in advance. One step in this CP is the ‘core needle biopsy’, where the purchasing team needs to ensure the adequate supplies of needles.

CP Model 2 provides a combination of information on the outputs and the supplies required – for instance, one of the steps is ‘collar/brace’, i.e. it indicates what type of supply is needed if the patient is to lie flat until the commencement of rehabilitation or mobilisation. This CP model also indicates the use of MRI and radiotherapy. It is not clear whether the MRI can take place within the same facility or whether the purchasing function would have to engage itself and purchase an MRI service in a different setting. On the basis of this information on the CP, the purchasing team can make some estimates but cannot, unless through discussion with the CP’s healthcare team, know exactly the extent of use of this MRI or the volume of radiotherapy needed. Interestingly, this CP also identifies the intake of a specific medicine, but says nothing of the quantity or frequency of the intake.

CP Model 3 (Type 2 diabetes) identifies the outputs provided in terms of services, e.g. ‘managing blood lipids’ or ‘managing blood pressure’. It says nothing about what type of management is involved, i.e. whether it is an orally administered drug and, if so, what type of drug and in what quantity, or whether it comes in the form of an injection. Again, it would be up to the purchasing team to investigate what the inputs are and, on this basis, ensure adequate supplies of drugs, which are the predominant item in diabetes care and incur high costs if not properly managed.

In comparison with CP Models 1, 2 and 3, CP Model 4 provides more information on the supplies required for the treatment of the patient group, and does specifically identify the volume of drugs required or the frequency of, for example, ‘urinalysis’.

A purchasing officer can identify from the CP the need for blood pressure measurement apparatus, a stethoscope, scales and laboratory diagnosis, and can therefore make some estimate of how and when to ensure specific supplies. Commonly shared products or services can be shared by different CPs; this is the case with laboratory services, for example. It is difficult to identify the inputs, intermediate products/services and inventories needed on the basis of any of these CP models, unless they are specified as in CP Model 4.

As discussed above, the purchasing function cannot ensure adequate supplies for patients on the basis of CPs. None of the CP models provide anything more than very limited information on what, how many and when supplies are actually needed. The purchasing department can estimate when to purchase braces or collars (CP Model 2) and the required stocks on the basis of historical data, thus ensuring economies of scale and favourable prices.

For more sophisticated equipment or services, (b) **when to purchase a certain item or service** and (c) **how to determine the specification of the items needed** are not always clear on any of the CPs, as they most often identify the outputs and, depending on the CP model, only occasionally some of the inputs.

If the stress is on purchasing highly technical equipment or services outside the boundaries of the department or clinic, e.g. in another nearby hospital, it is not always clear in any of the CP models whether the purchasing department has sufficient and adequate information (although an estimate can be made). The purchasing department might, for instance, have a good idea of the lifespan of an MRI or CT scanner and can then estimate when the old MRI or CT scanner would need to be replaced. If these highly technical pieces of equipment or sophisticated services are identified on the CP, the purchasing department can be prepared for any kind of new demand. Since none of the CP models (with the exception of CP Model 4) identify the settings, it is difficult to identify which services need to be purchased outside the boundaries of the clinic.

If a specific CP model’s healthcare team makes a decision based on clinical guidelines or on deviations in the CP resulting from equipment failure, or on the appearance of a new and better drug or better services outside the boundaries of the hospital, it can trigger a need to purchase. However, as we can see from the CP models, this would need to happen ‘outside’ or ‘off’ the CP; only then, on the basis of the determined needs, can the purchasing department proceed with its activities.

Unlike the rather unpredictable web CP, a chain CP is better placed to offer a more consistent and predictable determination of need; to some extent, this is true of a hub CP as well. On the basis of these two types, it could be possible for the purchasing department to follow more closely the supply needs of the healthcare teams charged with treating a specific patient group.

Overall, regardless of the models and given the fact that they mainly identify the outputs, CPs haveonly a limited influence on the purchasing function of a hospital. Were more information available on inputs and intermediate products, it would be easier for the hospital to identify and manage stocks and inventories efficiently and cost-effectively; and if inputs were better identified, centralised and shared, purchasing would help hospitals contain costs and ensure more efficient operations.

4.5 CPs and the operations business function of hospitals

The operations function is another common function of business that seeks to add value to the business as a whole. In hospitals, the operations function is the most important business function and the one that presents the biggest set of challenges.

Operations managers have multiple functions within a hospital, including reducing costs and variability, improving logistics flow, productivity and quality of patient service, and continuously improving business processes, while the operations function consists of all activities directly related to producing products or providing services. The function of operations incorporates capacity, location, the arrangement of departments, product and service planning, acquisition and the placement of equipment (California State University, 2013). Operations involve the actual production and delivery of the product or service. In the primary sector this may mean growing the product (e.g. farming) or extracting it (e.g. oil); in the secondary sector it involves activities such as assembly, manufacture and construction; and in the tertiary sectors it involves providing services such as tourism, education, insurance or healthcare.

Operational decisions include deciding where to produce, how to produce (e.g. what combination of resources to use and how much to produce yourself compared to how much to buy in), what volume and range of products to produce, and what quality and cost targets to achieve. They also involve research and development relating to new products and processes (Gillespie, 2011). Hackman and Wageman (1995) point out that the cost of poor quality (inspection, rework, etc.) is far greater than the cost of developing processes that produce high-quality products and services. Hospitals have, over the years, developed and established rules for managing patient flow and resources. Operational decisions play an important (if not the most important) role in planning the journey of a patient, as we will see in this section below.

The operations function of a hospital is set out by Langabeer II (2008, pp. 6–7), who states that the functions of operations encompass the workflow process, physical layout, capacity design and planning, physical network optimisation, staffing levels and productivity management, supply chain and logistics management, quality management, planning and process improvement (or engineering).

A CP identifies the relevant resources for the pathway that would most often cut across multiple departments, services and product lines for the more complex patient groups. Although hospitals are equipped with a number of standard operating procedures (SOPs) which are often reflected in the CP, they do not provide an overview of the journey of a patient through the acute setting the way CPs do. According to Praetorius (2012), a CP is in many ways similar to an SOP as it specifies in writing when, where and in what sequence individuals or teams should deliver care (Praetorius, 2012). For a simple patient group, a CP normally remains within one unit or department. In terms of processes and resources, a CP specifies what type of product is expected,as well as how and when a process is to be triggered or carried out. Ideally, CPs should be consistent with many of the processes within the organisation (Praetorius, 2012).

A CP cannot reorganise a whole hospital to achieve its objective and goals, as many CPs can draw on the same resources. However, in this context, a CP can help get operations and production under control, as described in the section to follow. I will tackle the main elements of the operations functions a CP perspective, and discuss how and if a CP can definethe (a) **outputs** in terms of capacity and resources and (b)the **inputs**; how a CP influences (c)the **efficiency** of operations and production; to what extent a CP provides support in (d)the **logistics** of the operations of a hospital; and finally, how a CP influences or enables identification of the type of (e)**healthcaretechnologies** used or needed in the production of care of a patient group.

4.5.1 Impact of CPs on the operations business function

The key elements of the operations function as described above can be transposed into healthcare and the hospital setting. Operations that are managed on the basis of a CP may provide better support to the overall system and processes of the hospital. The operations function of a hospital can be defined as the quantitative management of the supporting business systems and the process that transforms resources or inputs into healthcare services or outputs. Operations goals are productivity and quality, where the latter is a measure of a patient's perception or satisfaction (Langabeer II, 2008, p. 128).

Unlike manufacturing organisations, which focus on material flow, the core focus of a hospital is the patient and the flow of patients requiring treatment. The product specifications in the hospital are often subjective and vague, while production in a manufacturing organisation presupposes complete and explicit specification of the end-product and delivery requirements. In a hospital, the client is the patient and a product produced in a hospital may be the diagnosis and/or treatment of the client/patient (Vissers & Beech, 2008, p. 39). A CP can identify the products produced (diagnosis or patient treatment); hence, a CP (a) **defines the outputs.**

Outputs can include procedures, visits, units andactivities which are the result of the work conducted through processes and automation – i.e. they include the actual production and delivery of healthcare services (Langabeer II, 2008, p. 6). Another interpretation is that outputs refer to the complete course of treatment of a disease or condition that may require a bundle of activities (Schreyer, 2010). The number of outputs on a CP can be the number of procedures and visits a patient within a specific patient group would need to undergo or undertake, i.e. the units of drugs or the activities the patient will be subject to can also be defined. In some cases, for example abortion, the patient would undergo one procedure in a single visit. In other words, patients within a specific patient group following a specific CP are treated in the same manner and, depending on the requirements for treatment (i.e. the clinical guidelines and the CP as designed), have one or several services assigned to them.

As Rechel, Wright, Barlow and McKee (2010, p. 633) point out, CPs seem to provide a basis for using healthcare demand, derived from demographic and epidemiological data, to plan capital investment in the health sector. A CP is therefore a tool that 'demands' specific types of service or product, while the hospital is the supplier of these services or products. Giving an injection, for example, or taking a blood sample (an item that would appear on a CP) involves a certain kind of technical preparation that takes some time and cannot be identified or is not marked on the CP, such as putting gloves on, retrieving and measuring the quantity of prescribed medicine; moreover, the number of test tubes is not specified, nor does the CP say anything about any of the other steps taken in the laboratory to provide the results. The CP merely indicates that blood needs to be taken or an injection given.

A CP does (b) **not define all the required inputs**. Inputs are all the time, costs, labour, materials, capital and other resources utilised in the delivery of these services (Langabeer II, 2008, p. 6), the output on the CP.Inputs are defined as the resources and assets, such as labour and capital, and including cash, technology, personnel, space, equipment and information. Referring to the example provided under outputs, one will not be able to identify all the required inputs on the CP, e.g. for giving an injection as a service. The CP itself does not define the inputs, such as sterile gloves, needles, waste disposal box, vial of medicine or preparation in the pharmaceutical laboratory of the medicine to be injected, the disinfection substances, the cotton patch, the bandage, etc.

Inputs are needed or resources used to produce an output, but a CP says nothing about any of the inputs required to provide a service to a patient. A CP identifies what and which types of service are needed for the patient, but not how or what steps (as inputs) are involved to get to a specific service (output).

Hospital capacity is a complex mixture of assets that includes buildings, medical equipment for operating theatres and ICUs (Kuntz, Scholtes, & Vera, 2007, p. 214). To avoid overly complex models, it has become customary to measure capacity in terms of beds (Gaynor & Anderson, 1995; Keeler & Ying, 1996). According to Slack, Chambers and Johnston (2007), real capacity will depend on the precise mix of activities undertaken, as all types of demand are aggregated together. Therefore, once demand is known, one needs to understand how much capacity exists, and to plan for it accordingly. In healthcare, capacity can be measured in terms of various resources, including (Langabeer II, 2008, p. 107):

- The number of available beds, treatment or examination rooms, and clinics;
- The labour availability of doctors, nurses, and other providers;
- The availability of key medical technologies and equipment (e.g., diagnostic imaging, X-ray);
- Supplies and other resources;
- Lifts, hallways, and other facility space;
- Canteen, parking, and other support services.

For the purpose of this dissertation, I use capacity and resources as synonyms, and employ Langabeer's (2008, p. 398) definition of capacity as the amount of resources or assets that exist to serve demands. In order to analyse capacity, one requires a detailed understanding of the organisation's resources, including labour, equipment, technology and facilities. Documentation of this capacity would normally be done using time-series data, similar to how demand-series data was treated to track capacity change over time (Langabeer II, 2008, p. 107). Capacity is calculated as (number of machines or workers) × (number of shifts) × (utilisation) × (efficiency) (Russell & Taylor, 2005, p. 244).

Chase, Aquilano and Jacobs (2001, pp. 354–355) argue that capacity must also be stated relative to some period in time. Capacity-planning is therefore viewed in three time durations: *long-range* (greater than one year), where productive resources, such as buildings, equipment or facilities, take a long time to acquire or dispose of; *intermediate-range* (monthly or quarterly plans for the next six to 18 months), where capacity may be varied by alternatives such as hiring, new tools, minor equipment purchases and subcontracting; and *short-range* (less than one month), where capacity is tied into the daily or weekly scheduling process and involves making adjustments to eliminate the variance between planned and actual output, where possible alternatives include overtime, personnel transfers and alternative production routings.

In light of the above, the historical data provided by CPs can aid the forecasting and planning of capacity over a specific period of time; in short-range capacity-building, for example, a CP can help schedule the operating hours of a surgeon who needs to share his time with other surgeons'clinic hours. On the basis of historical data provided by a CP, it is easier to plan capacities, whether long-, intermediate- or short-range, and hence provide a better overview of capacity management. However, in capturing historical data for forecasting purposes, it is important to take into account changes in technology, population health status and healthcare practice (i.e. updated or new clinical guidelines or other types of evidence-based practice in the treatment of a specific patient group) (Leggat, 2008, p. 13).

A CP is a tool that could be **useful for patient forecasting**. A hospital needs to be involved in tracking patient volumes and traffic levels so as to be able to project volumes for individual departments and services throughout the day. Forecasting patient demand is the first step in being able to thoroughly understand changes in activity levels over time. It is a collaborative process that estimates the volume of patients that will be served by a specific type of service, at a certain location and over a specific time period (Langabeer II, 2008, p. 97–99). This service can take place within the ward or go beyond the organisational boundaries of a hospital; it can even take place in a different clinic or hospital at different times (within the same day, the following day, week or month, etc.).

In addition, a CP can help the incorporation of new technologies and practices, but will not be able to identify when a new technology or practice is needed. As for the health status of the population, a CP may not have an important role here as there are other tools for observing it; that said, a CP can help identify the incidence rates of a certain patient type.

Capacity is normally planned in advance and can be assisted by CP implementation for high-volume diseases. As mentioned in the introduction to this dissertation, between 60 and 80% of patient types can follow a CP; therefore, a CP can help identify the capacities required and ensure logistics (which will be discussed below) so as to provide optimum throughputs and thereby optimise patient flow.

A CP can potentially identify the requirements for interventions, services, locations, facilities (e.g. examination room or clinic), labour (e.g. doctor, nurse and other healthcare providers' time), medical technology, and materials or units of supplies and other resources, as well as transport or other facilities.

Capital and labour in hospitals play a major role in production: labour, for instance, is an input with many dependencies (skills, education, motivation, etc.), while capital, such as locations and facilities, is a more important element in healthcare service delivery. Capital is another factor of production and constitutes investments in assets to offset labour, or assets used to produce even more assets. It is normally the management that decides on the trade-off between capital and labour.

According to a study by Hindle et al. (2004) on the correlation between CPs and strategic asset planning, they observe that the planning of assets (buildings, equipment, etc.) is not handled in an entirely satisfactory way. They conclude that asset planning requires effective long-term service planning and that CPs are valuable tools in the planning of services, since pathways often need to be cross-setting and problem-focused in order to be most use for asset-planning purposes.

The second point is that labour is normally tied to patient volumes and workload; as for medical technologies, some may be defined as outputs (e.g. surgery, diagnosis) and some may be as part of intermediate inputs. Outputs might be defined, for instance, as 5 ml of antibiotic; however, in terms of input, we do not know how much was diluted with water to make up the antibiotic required for intravenous provision to a patient. Volume may not always be indicated and may be taken for granted (for instance, the volumes may be a matter of long-term experience or defined in the clinical guidelines, and thus self-explanatory). Labour and materials of the same groups (as inputs) are often shared – for example, a hospital may share a specialist who is a surgeon in the operating theatre and at the clinic, and resources too may be shared (e.g. an MRI or ultrasound device that is shared by different specialists or units or even different hospitals or clinics). Depending on the nature of the treatment or care provided, it can be the sum of several inputs.

Similarly to labour, units of supplies and other resources are closely tied to patient volumes and workload. A hospital has a variety of means of transport (vans, lifts, cars, etc.) and a CP can help to trigger arrangements for all these means, e.g. a vehicle that transports the patient to a different facility for an MRI and transports them back to the hospital of admission. Transport occasionally also encompasses the transport of biological or pathological tissue samples to a specialised laboratory facility at a different location – in this case, this would be seen as an intermediate input not mentioned by the CP.

A CP does not always identify the facilities at which the production of care takes place. One can assume that care takes place between the ward, diagnostic laboratory, operating theatre (if the elective care is a matter of surgery), and therefore the pre-operating and post-operating room, intensive care unit and rehabilitation facility, all depending on the course of the treatment of a specific patient group. As for labour, the CP will not explicitly indicate the labour needed in the pathology laboratory, for example, or the use of the equipment in the laboratory.

One of the main tasks of the operations function is to plan for capacity. *Capacity-planning* and *capacity-planning strategies* are important dimensions of the operations function in hospitals. Capacities may be linked and available in the same location or in a different location to the one the patient is currently being treated in. In the latter case, it means that the patient would need to be transferred. Depending on the course of treatment, and hence the design of the CP, the patient would travel through these capacities and be subject to throughputs[10] (discussed under (e) logistics below) and waiting times. Bed occupancy and the number of beds per population at large remain the predominant metrics in hospital capacity-

[10] Throughput is the velocity or rate at which services are performed or products are delivered (Langabeer II, 2008, p. 9).

planning (Green, 2003; Kuntz et al., 2007; Toussaint, Herengt, Gillois, & Kohler, 2001), although they do not provide a good measure of the services provided inside the hospital; they are basically a core piece of capital stock in the hospital that constrains the performance of the other assets around it (Rechel et al., 2010, p. 632). Instead of the utilisation of capacities, i.e. beds, Kuntz et al. (2007, p. 221) argue that hospital capacity should focus on the hospital services required, e.g. DRGs. DRGs are based on hospital output (cases).

Capacity-planning and control is an issue faced by every operation, and one that can profoundly affect the efficiency and effectiveness of the operation. It is concerned with making sure there is some kind of balance between the demand placed on an operation and its ability to satisfy that demand (Slack et al., 2007), e.g. if an operation has too much capacity at any point in time, it will be under-utilising its resources, and if demand is lower than capacity, its costs are spread over too few patients, meaning that its costs per patient are high. If an operation has too little capacity, its costs will be low (because its facilities will be fully utilised), but its patient service will be poor because it is, for instance, making them wait for their services. This potentially undermines the success of the hospital and keeps the patient satisfaction level low. The consequences of getting the balance between demand and capacity wrong can be very serious.

While capacity-planning in hospitals, especially services, is similar to capacity-planning in manufacturing, there are a number of important differences in terms of time, location and volatility of demand. Service capacity depends more on time and location. As mentioned earlier, health is stochastic. Unlike products, services cannot be stored for later use, but they can be estimated on the basis of historical data. To reiterate, capacity must be available to produce a service when it is needed.

Service capacity must be located or provided near the patient. However, a hospital may occasionally not have the capacity to provide a certain service, and would then need to transport the patient to a healthcare facility that has the specific capacity to ensure continuous treatment. The capacity to deliver the service must first be distributed to the user or patient, which allows the service to be produced.

Another major difference is that service capacity is subject to volatile demand fluctuation (although it can be contained on the basis of historical data, and waiting lists can contribute to better planning), while utilisation has a direct impact on service quality for three reasons (Chase et al., 2001, pp. 365–366):

- Since services cannot be stored in hospitals, inventory cannot smooth demand as it can in manufacturing;
- The customer interacts directly with the production system; however, hospital patients have different needs, and therefore different levels of experience with the process, and may require a different number of steps or ‘transactions’;

- For greater volatility in service, service capacity in hospitals is often planned on a daily or weekly basis, and sometimes in increments as small as five to 30 minutes, e.g. emergency rooms or trauma units during the skiing season, when the likelihood of fracture cases increases.

Planning capacity levels for services must consider the day-to-day relationship between service utilisation, as the measure of how close a firm is to its best operating level, and service quality (Chase et al., 2001, p. 366). Haywood-Farmer and Nollet (1991, p. 59) note that the optimal utilisation rate is very context-specific – low rates are appropriate when both the degree of uncertainty and the stakes are high, e.g. in hospital emergency rooms. However, due to the degree of uncertainty involved, it is rare to come across an emergency care CP. As we have noted on a number of occasions, CPs are most useful for elective care, where the day-to-day relationship between service utilisation and operation is more certain.

CPscan help to align capacity with demand, and to plan and manage capacity and hence capacity constraints. Slack and Lewis (2002, pp. 152–153) distinguish between *three capacity-planning strategy classes*: capacity-leading, capacity-lagging and capacity-smoothing. Since my dissertation addresses elective care CPs, meaning that demand is fairly constant (as in the case of chain and hub CPs covering 60–80% of inpatients), capacity-leading and capacity-lagging would be the most appropriate strategies for a hospital to consider. *Capacity-leading* is the adding of capacity in anticipation of an increase in demand; a possible drawback of this strategy is that it often results in excess inventory, which is costly and often wasteful. *Capacity-lagging* is the adding of capacity only after the organisation is running at full capacity or beyond as a result of an increase in demand. It reduces the risk of waste (e.g. there may be a sudden increase in pneumonia patients due to a severe winter, the demand for care increases and this leads to the adding of more capacity for the care of pneumonia patients). A CP can identify waste (and therefore costs) by better controlling the potential sources of waste. Bush (2007, pp. 871–873; Ohno, 1988) identifies seven critical waste areas in hospitals: waste of overproduction, waiting and transport (i.e. the moving of unnecessary items), unnecessary processing, inventory and movement (e.g. a doctor or nurse goes to another room to fetch a drug), and the making of defective products (e.g. patients' complaints, misfiling of documents). The third strategy is *capacity-smoothing*, where capacity is added in small amounts in response to changing demand. This would normally happen in the network CP model, where demand may fluctuate in response to the patient's co-morbidities or complexities, and where the hospital has to provide care using inventory or stocks and find additional capacities.

A CP, particularly one in electronic format, can help analyse whether resource constraints (e.g. labour shortages, such as a nurse's or doctor's time) or surpluses (e.g. duplication, waste, under-treatment) exist at all points in time. A hospital may deal with these constraints by increasing capacity (where capital allows it, e.g. the purchase of new equipment or the subcontracting of additional capacity for certain services, such as an MRI at a different hospital, thus requiring the patient to be transported), de-bottlenecking (by using process-engineering tools and targeted improvement methods to free capacity), reducing demand (e.g. by redirecting patients to other facilities), and transferring capacity from other areas (e.g. if capacity in one area or department is not needed, it can be used in another area) (Langabeer II, 2008, pp. 108–109). On the basis of the identified constraints of a CP, the multidisciplinary team would then redesign the pathway and work towards eliminating the constraints identified.

As we have seen, CPs are used for patient groups in which the degree of uncertainty in treatment is rather low. CPs are more likely to be developed for elective care. The level of capacity-planning is kept *constant* (known as *level capacity*)(Slack et al., 2007). This type of capacity-planning approach would be found in a chain CP. Unlike a level capacity plan, *chase demand capacity-planning* is frequently adjusted in an attempt to match it to demand at any point in time. This can be done a number of ways, e.g. by using overtime, varying the size of the workforce, using part-time staff or subcontracting (Slack et al., 2007). This type of capacity-planning would be partly applicable to the hub CP model, where the CP requires the use of a capacity that is not found within the same facility and the patient needs to be sent to a different location, and even more applicable to a web CP. Similarly to chase demand-planning, the third approach is about *managing demand*when demand is influenced or changed in order to bring it closer to capacity at any point in time. Hospitals normally need to cope with fluctuating demand and therefore use a combination of the three strategies outlined above (Slack et al., 2007).

CPs will merge at bottlenecks (where they share resources, e.g. an operating theatre) before going their separate ways. Capacity-planning needs to ensure that each patient travels along the shortest and least costly path. A CP reveals which of the types of planning outlined above is most appropriate, and points out the exceptions. A CP also provides information about capacities from the point of view of outputs – with an increase or decrease in demand, the CP would remain the same, and would change only on the basis of variances detected or changes in the clinical guidelines upon which it was originally based by the healthcare team. CPs seem to be a way of conceptualising capacity and capacity-planning in hospitals (Rechel et al., 2010).

Langabeer II (2008, pp. 95–97) states that without understanding patient demand in hospitals, it is nearly impossible to align resources and capacity (as discussed below) with demand. A resource has a capacity, which refers to the ability of a resource to generate production, measured as the amount of products per unit of time, and is the amount of resource allocated for production (Vissers, 2008, pp. 51–52).

As mentioned above, I use capacity and resources as synonyms, as the literature often uses these two terms interchangeably. **Resources can be defined as objects on the CP that are used in the production process** but not transformed or consumed by production (e.g.);

examples of resources are personnel, buildings, materials and equipment. However, as we will see below, a CP cannot specify how a specialist's time will be shared between surgery and clinic hours.

According to Vissers (2008, pp. 52–54), there are different ways of classifying resources: dedicated resources, shared resources, leading resources, following resources, bottleneck resources, continuous or intermittently available resources, and specialist time as a shared resource. The use of resources needs to be considered when allocating resources for production in order to achieve high occupancy and high productivity (Vissers, 2008, p. 52).

More specifically, *dedicated resources* are those resources that might be dedicated to only one single patient group or specialisation (Vissers, 2008, pp. 52–54), e.g. where a diabetes nurse is normally allocated to general medicine, but focuses only on the care of diabetes patients. Only on the basis of a clinical guideline and/or the knowledge of the multidisciplinary team can one identify the nature of a resource. A CP may not always make a clear distinction between a dedicated resource and a shared resource. Within units, most resources are normally shared and may be used by different product lines, e.g. X-ray machines. Reasons for sharing include costs, quality and control of resource use.

The *sharing of resources* at hospital level can facilitate the goals of high occupancy and productivity; sharing resources might also be seen as a means of improving the quality of healthcare processes (Vissers, 2008, pp. 52–54). There are two types of shared resource: time-shared resources and other shared resources. *Time-shared* resources are resources, such as operating theatres and outpatient facilities, allocated to a user, e.g. a specialist, for a specified period (Vissers, 2008, pp. 52–54). *Other shared resources* are resources which are generally available for all specialisations but which do not have special allocation arrangements, and therefore arrangements for reserving capacity at service departments (Vissers, 2008, pp. 52–54), e.g. a diagnostic department or ICU, because an average number of patients can be expected from outpatient clinics. This would be an example of decoupling the patient flows between units or even organisations.

A CP indirectly identifies what and when resources are used, by whom and for how long, but says nothing about sharing; neither the inputs nor the resources required (and their volume) are made explicit, which means that no information is provided as to how or when to split or share resources. The resources are assumed, or could be based on the clinical guidelines for a specific disease.

Leading resources are those resources that trigger the generation of production of other resources (Vissers, 2008, pp. 52–54). For example, for surgical specialisations, the allocation of operating theatre time acts as a trigger for bed capacity and nursing staff requirements, which would normally be identified on a CP. Within a medical assessment unit, resources for admission trigger the need for resources for investigation and diagnosis, while the allocation of operating theatre time to a specialist at a specific period during the week will lead to the admission of patients the day before or on the same day and the occupation of beds and nursing workload during the patients' stay. Operating theatres are therefore leading resources, and beds and nursing staff are *following resources* (Vissers, 2008, pp. 53–54).

Bottleneck resources are those resources which are most scarce and which therefore determine the overall volume of production; they represent constraints. Bed capacity or nursing staff capacity might be seen as a bottleneck for the overall volume of inpatient production, as might access to surgical beds; however, operating theatre capacity is leading in terms of generating production and bed capacity requirements. Controlling access to leading and following resources is a key way of ensuring that bottleneck resources are used efficiently.

A CP can help identify bottlenecks. A bottleneck is a choke point or a point in a process at which demand exceeds available capacity. It can occur at any point where capacity is insufficient to meet demand due to physical or logical constraints; it can also be a person, a role or any other barrier to cooperation between and performance within departments. The removal of bottlenecks is the key to increasing throughput or capacity. A bottleneck at the end of a process typically results in long waiting times and inefficiency (Langabeer II, 2008). One cause of bottlenecks in hospitals is semi-autonomous departments seeking to optimise their own operations without considering how this affects the performance of other departments (Tzortzopoulos, Codinhoto, Kagioglou, & Koskela, 2008). Common settings for bottlenecks are diagnostic facilities (e.g. imaging) and operating theatres (Elkhuisen, van Sambeek, Hans, Krabbendam, & Bakker, 2007), but they may occur at any point in the process: registration, during equipment transition and upon discharge (Langabeer II, 2008). Many CPs that merge or share a specific resource can help identify the steps that cause bottlenecks, long waiting times and other constraints, and thus help eliminate them or find ways to parallelise some activities.

One of the most significant bottlenecks in healthcare is long waiting times, which is reflected in poor patient satisfaction and process inefficiency, and can occur anywhere in the hospital. **Wait** (or waiting) **times can be identified on the CP**.Wait or waiting times are defined as the time interval during which there is a temporary cessation of service; they are the most controllable and significant variables driving waste and inefficiency(Langabeer II, 2008, p. 100). The traditional layout and workflow of hospitals to some extent resembles a batch-and-queue organisation, with equipment and activities arranged by type rather than according to the sequence required to deliver a final outcome, i.e. patients are processed in batches before being moved on, often to wait in line for the next stage (Rechel et al., 2010, p. 633).

Queues or waiting lines form because users are seeking to be provided with a service more quickly than that service can be provided. Queues can be minimised using quantitative tools, and can be modelled to improve service, align staffing with projected volumes, and control the service levels or the minutes spent in a queue. The components of queue simulation models are arrival rate, service rate and queue structure (Langabeer II, 2008, pp. 110–111).

Vissers and Beech (2008, p. 80) distinguish different types of waiting time according to source. The most common type of waiting time is the time spent in a queue before one is served. This is called access time or waiting time (on the waiting list). The term ‘access time’ refers to the time one has to wait before getting access to a service. Once access to a service has been obtained, the next time waiting period is called ‘waiting time’. The term ‘in-process waiting time’, e.g. waiting in the room before an X-ray examination, is often used to refer to the time in the process at a more detailed level of an operation. Another type of waiting time is ‘batch waiting time’. As illustrated above, this refers to the time a patient has to wait before there are enough patients available to fill a clinic or operating theatre session. The third type of waiting time is the ‘frequency-of-service waiting time’ and refers to the time the patient has to wait until the next session is organised. The overall waiting time of a patient often comprises a combination of the above.

Wait or waiting times can be identified on a CP – for instance, one can identify the time required to wait between the final preparations of the pre-operating stage to actual surgery (in-process waiting time), or the time between the recovery stage and next service, e.g. X-ray. A CP will therefore help identify waiting times on the pathway as part of the treatment. However, a CP plays no role in relation to waiting lists and normally concludes with the episode of care; if a patient who has just undergone left knee replacement is put on a waiting list for right knee treatment, the knee replacement CP would not start until admission. In simple terms, a CP does not record the time spent on a waiting list.

There are two more resources to consider alongside dedicated, shared, leading, following and bottleneck resources: these are continuous or intermittently available resources and specialist time resources. Beds and emergency departments, for example, are available on a continuous basis, while clinics, operating theatres and opening hours at diagnostic departments are available only during specified hours and are therefore intermittent resources (Vissers & Beech, 2008, pp. 51–54). A CP may be able to ‘reserve’, or trigger the process of reserving, an operating theatre, for example. *Specialist time resources*are regarded as a resource shared between the patient groups served by the specialisation. This is due to the multi-functional character of the specialist as a resource who participates in different phases of the production process (e.g. surgery or outpatient sessions).

CPs are unable to solve all problems relating to capacity and resources. They do not show how a specialist’s time is shared with other activities, and only partly show when a specialist is to dedicate time to a specific activity. However, once a specialist’s time is defined in the operating theatre for instance, they can help to identify how much time can be allocated to clinical hours. In all, a CP provides a summary of the types of resources used for the production of care, i.e. it provides information on the level of utilisation of predetermined items on the CP (e.g. the expected outputs) and is reasonably fixed. Some of these resources are concurrent and shared, while at other times they may run consecutively. Resources are often used for other product groups, but the CP identifies the resources in an isolated manner. Given the nature of hospital care, the dominant position of specialists makes them the leading resources in the resource-allocation process.

The third main element of the operations function is (c) **efficiency**. A CP defines the products or services to be provided by healthcare staff, but says nothing about maximising production or about how to minimise which resources required for production. A CP for a specific patient group does not say how well overall resources are used to achieve the desired outcome.

The literature distinguishes between several types of efficiency, but we will focus on technical and allocative efficiency. Technical efficiency is the amount of output produced with the minimum amount of input, while allocative efficiency is the given relative price of the inputs. Achieving efficiency is about comparing the costs (resources spent) and benefits (well-being produced) of competing healthcare interventions, and ensuring that resources are allocated in such a way as to maximise gains to society. Efficiency is sought at two levels: allocative efficiency determines whether programmes are worthwhile, and technical efficiency determines the best ways of producing worthwhile programmes (Donaldson & Gerard, 2005, p. 88). In other words, efficiency is a state in which the costs of producing any given output are minimised and the utility of individuals' preferences is maximised.

For the purpose of this dissertation I will use the following definition of technical efficiency: technical efficiency is a particular allocation of inputs into the production process, if the output of one good cannot be increased without decreasing the output of another good (Pindyck & Rubinfeld, 1998, pp. 584–598; Tajnikar, 2000, pp. 50–57, 80–107). **Technical efficiency** asks the following question: 'Given that some activity is worthwhile doing, what is the best way of providing it?' This perspective brings costs and involves choosing between alternative means of achieving the same ends; it may therefore be interpreted as the pursuit of maximum output from a given level of resources or minimum cost for a given level of output. Technical efficiency would come into play, for example, if there were a choice between an effective drug therapy and a surgical operation to treat a given condition. Assessment of the costs and effectiveness of each option determines which is more operationally efficient. If drug therapy is both less costly and more effective, it is clearly to be preferred (Donaldson & Gerard, 2005, pp. 74–75). In other words, technical efficiency is where the costs of producing a given output are minimised, or where output is maximised for a given cost (McGuire et al., 1988, p. 76).

Allocative efficiency is about the adequate combination of inputs, given the relative price of inputs, used to produce a given amount of output. It judges whether an activity is worthwhile. If something is deemed worthwhile, then it must be carried out in a way that ensures the optimum use of scarce resources (Donaldson & Gerard, 2005, p. 75). In other words, allocative efficiency exists where it is not possible to make any individual better off without making another individual worse off, or when no consumer can be made better off without making someone else worse off (McGuire et al., 1997, p. 76; Pindyck & Rubinfeld, 1998, p. 613; Tajnikar, 2003, pp. 50–57, 80–107). Translating this into hospital care, products or services produced in combination need to match the expected healthcare outcome. Efficiency requires that productsbe produced in combinations and at costs that match people's willingness to pay for them (Pindyck & Rubinfeld, 1998, p. 611).

In economic theory, efficiency is evaluated in terms of the production of an outcome product; by contrast, in healthcare it has come to mean the production of units of services, such as a surgical procedure or hospital stay. Purchasers want appropriate care provided in a technically efficient manner, with the lowest possible use of resources and at the lowest possible cost (Academy Health, 2006, p. 12). Similarly, a consumer or patient wants a service that is efficient, with no unnecessary delays in treatment, along with effective, evidence-based care.

To maintain efficient operations, healthcare organisations need to optimise patient and other process flows, which also entails using de-bottlenecking approaches to improve throughput. A CP can help track patient volumes and traffic levels to help improve throughputs. However, throughput based on one CP for a specific type of patient would require a closer analysis of the resources shared with other common activities on a different CP and with other hospital activities. The use of quantitative tools, such as models to minimise waiting times and forecasting algorithms, helps support improvements in flows and throughput.

One important element of operations and efficiency is production, which is about turning inputs into outputs. The **production function** represents the maximum output a firm can produce for each specified combination of inputs, thus allowing inputs to be combined in varying proportions to produce varied output (Pindyck & Rubinfeld, 1998, p. 176–201). Production functions describe what is technically feasible when a firm operates efficiently, i.e. when it uses each combination of inputs as effectively as possible. Because production functions describe the maximum outputs feasible for a given set of inputs in a technically efficient manner, it follows that inputs will not be used if they decrease output (Pindyck & Rubinfeld, 1998, p. 177).

Productiondetermines the overall volume of inpatient production, e.g. bed occupancy as a measure of efficiency. Bed capacity is a bottleneck resource that the hospital tries to maximise. Analysing a number of CPs for a patient group can provide information on inpatient production, whereas a stand-alone single pathway say nothing about throughput. Analogous to the definition of the elements of production and operation in an industrial setting, Vissers (1994) defines the elements of production in health service organisations as the design, planning, implementation and control of coordination mechanisms between patient flow, diagnostics and therapeutic activities in order to maximise output/throughput with the available resources, taking into account different requirements for delivery flexibility (elective/appointment, semi-urgent, urgent), acceptable standards for delivery reliability (waiting list, waiting times) and acceptable medical outcomes (Bertrand & de Vries, p. 27 in Vissers & Beech, 2008). As in manufacturing, the means of production are staff and equipment (Bertrand & de Vries, pp. 26–27 in Vissers & Beech, 2008).

CPs may enable a better understanding of productivity and, as they better align various components and elements of the production of care, may affect productivity. Increased production can be achieved by removing technical inefficiencies, taking advantage of economies of scale and making improvements in technology. This can be attained by maximising outputs with the given inputs (output-oriented) or by minimising inputs for the production of an output (input-oriented) (Pindyck & Rubinfeld, 1998, p. 187).

Productivity is defined as the ratio of outputs to inputs, where outputs are the level of production or yield of products and services resulting from operations management (Langabeer II, 2008, pp. 128–129). In many industries there is a standard measure of productivity that is used to monitor changes over time; however, this is less common in hospitals. Labour productivity comparisons between healthcare organisations are not widely conducted, for two main reasons: first, there is a lack of publications and research on the subject; second, healthcare is perceived differently according to region or specialisation, and does not lend itself to productivity monitoring (Langabeer II, 2008, pp. 128–129).Since the inputs are not defined on the CP, it is difficult to work out productivity.

Many hospitals measure productivity and see improvements over time. Operational scorecards that track productivity and performance for key business processes are needed to track performance internally over time (Langabeer II, 2008, pp. 128–129). It is not always possible to identify on a CP where key decisions from the point of view of the patient affect productivity, as this will depend on how elaborate or detailed the CP is. For example, if a nurse is able to visit three patients in a 30-minute timeframe, then three visits would be the output and the input would be 30 minutes of labour, with the associated cost equal to that time multiplied by the nurse's average hourly wage. If any supplies or other materials are given to the patients during this timeframe, they are also added to the inputs.

We can express productivity using the following equation:

$$\mathrm{P} = \frac{\mathrm{O}}{\mathrm{I}} = \frac{\sum(\text{procedures,visits,units,activity})}{\sum(\text{time,cost,labour,materials,capital})}(1)$$

where P = productivity, O = output and I = input. Productivity is calculated as the sum of all outputs divided by the sum of all inputs, where inputs can include time, cost, labour, materials, supplies and capital, and outputs can include procedures, visits, units and activities. Productivity can be measured in a very basic way by using only one variable of output relative to the inputs, and in a more complex way by using a variety of factors, where the ratio of total outputs is applied relative to the resource inputs. To analyse hospital productivity, one can examine the activity indicators, such as the number of nurses or doctors per bed, hospital man-hours per discharge or visit, capital cost per discharge, or total general service cost per discharge (Langabeer II, 2008, p. 132).

With two inputs that can be varied, a manager will want to consider substituting one input for another (Pindyck & Rubinfeld, 1998, p. 192–201). Similarly, when more capital is added in place of labour, capital production falls. Production needs a balanced mix of both (Pindyck & Rubinfeld, 1998, p. 192–201). Additional output cannot be obtained unless more capital and labour are added in specific proportions (Pindyck & Rubinfeld, 1998, p. 194). Given the fact that inputs are not identified on a CP, it is difficult to discuss the substitution of one input for another. However, when there is a deviation on a CP, the CP team would most likely decide to investigate the roots of the deviation and identify anomalies in the inputs, e.g. the laboratory diagnostic equipment was malfunctioning, rendering the laboratory results inaccurate (output on the CP) and leading to an inadequate dose of drugs being dispensed to the patient.

A hospital is normally interested in continuously improving the ratios of outputs to inputs, and its productivity can be improved in four ways: (i) output expands with no change in inputs; (ii) output increases with a decrease in inputs; (iii) inputs are reduced, downsized or streamlined with no change in outputs; (iv) technology or process breakthrough eliminates inputs with no change in outputs (Langabeer II, 2008, p. 133). Based on one or more specific clinical guidelines and other factors, a CP could potentially identify the labour and time needed to carry out a healthcare service, as well as the units of material and capital used for the treatment of a patient type. However, it is not possible to use a CP to identify the use of intermediate products or inputs; this can only be assumed on the basis of clinical practice and evidence-based guidelines.

Since capacity deals with resources and assets, it is quite understandable that logistics is a core function of operations, alongside hospital capacity. According to Vissers & Beech (2008, p. 101), a CP tries to visualise the medical decision-making process, in contrast to the logistics approach, which uses a process description with a clear linkage between the resources used for the process. A CP can help with (d) **the logistics of the patient's journey through the various capacities and resources**. Logistics is defined as the efficient coordination and control of the flow of all operations – including patients, personnel and other resources (Langabeer II, 2008, p. 10). By improving throughputs and streamlining processes, logistics can search for cost savings in key resources and supplies in the supply chain (Langabeer II, 2008, p. 41).

As illustrated in Figure 12, Vissers and Beech (2008, pp. 47–49) distinguish three approaches to logistics in a hospital: unit, chain and network logistics. **Unit logistics** concentrates on the logistics of a single unit. The unit perspective is normally represented by the following units:

outpatient department, diagnostics department, wards, operating theatres (OT) and intensive care units (ICU), where managers are responsible for the running of these units, for the level of service and for the efficient use of the resources available.

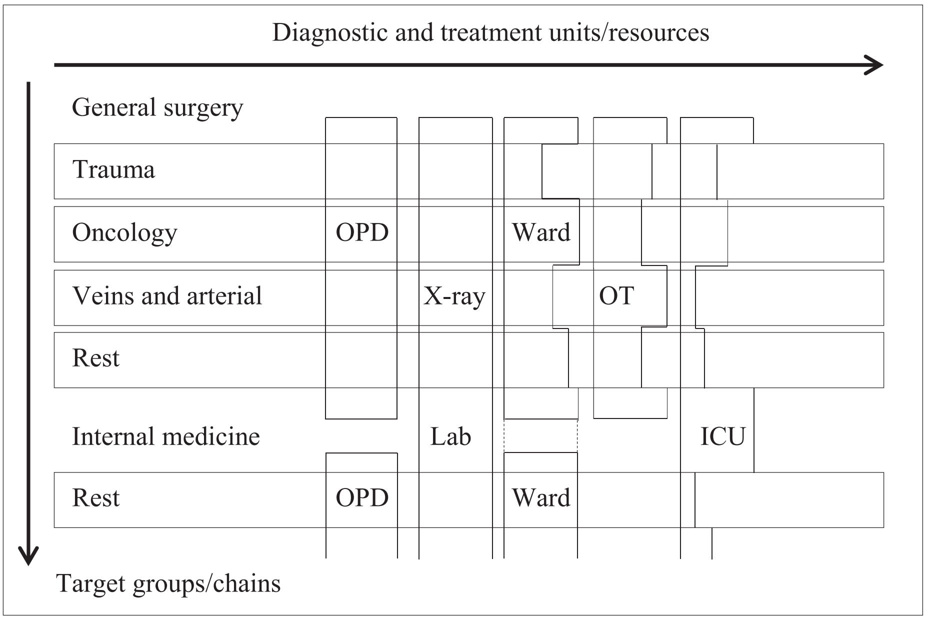
The focus of unit logistics is on the total flow of the patients using the unit, and on the effect of this flow on the use of resources and staff workload. This type of unit logistics approach is suitable for making an efficient analysis of OTs and outpatient departments. Its weak point is that is it not process-oriented; its strong point is that it can easily manage capacities by being focused on resource-utilisation and by controlling workload. A CP could potentially cover one single unit (e.g. abortion and cataract surgery are carried out in a single unit, most commonly an outpatient department), although most CPs expand across several units depending on the patient type, as illustrated by chain logistics.

Chain logistics considers the logistics of a single chain – that is, the chain perspective is represented by patient groups (gynaecology patients, orthopaedic patients, etc.). The focus is on the total process of the patient visiting different units on their journey through the hospital. The chain perspective strives to optimise this process in line with targets such as short access time, short throughput time and short in-process waiting times. The objective is to maximise the service level for one specific patient group, which does make it difficult to look at the efficiency of the chain in terms of resource use. Resources are normally allocated to specialisations and not patient groups, so efficiency can only be considered at the level of the flows from all patient groups belonging to a specialisation – and this is where a CP would play a major role. In other words, the chain perspective focuses on the service level, and its strong point is the management of processes. It is not related to the use of resources, but could still be suitable for redesigning processes in hospitals.

Finally, **network logistics** combines both perspectives and is a trade-off between service level and resource utilisation. It does, however, require more effort from the whole hospital. As stated above, while the unit approach is suitable for analysing the efficiencies of OTs, outpatient departments and so on, and the chain logistics approach suitable for redesigning processes, network logistics is most suitable for both. For instance, a desire to improve patient access to diagnostic services by making these services available 24 hours a day might have a negative impact on the performance of diagnostic departments; or improvements in the process of care for stroke patients might result in a reduced level of services for other patient groups that require physiotherapy if there is a limited supply of physiotherapy services. This adverse consequence would go unnoticed if a chain logistics approach were adopted on its own. A network logistics approach therefore helps to avoid a situation where an improvement in one process at the expense of other processes goes unnoticed. In terms of logistics, CPs for high-volume diseases that encompass 60–80% of elective patients can provide the background for setting up logistics of the flow of all operations in the hospital.

Figure 12 below illustrates how diagnostics and treatment units and resources are used by various patient groups. A CP for a specific patient group will link and run across the diagnostic and treatment units and resources, i.e. using unit and chain logistics, and be most helpful in supporting the network logistics approach of a hospital.

Figure 12: The unit, chain and network perspectives



Key: ODP = outpatient department; Lab = laboratory; OT = operating theatre; ICU = intensive care

Source: J. Vissers & R. Beech, Health Operations Management: Patient Flow Logistics in Health Care, 2008, p. 47

In terms of operations functions, the technology element should be considered whenever quality and efficiency is low. The method of combining the inputs of production in the process of making an output is called technology – in other words, technology is a given state of knowledge about the various methods that might be used to transform inputs into outputs; and as technology becomes more advanced and the production function changes, a firm can obtain more output for a given set of inputs (Pindyck & Rubinfeld, 1998, p. 176).

Healthcare literature contains several definitions of health technology. A CP would normally (e) **identify the technology used to provide care in the treatment of a patient**, i.e. technology is a set of techniques and is part of every relation between inputs and outputs. Health technology can be any type of intervention (the diagnosis, monitoring and treatment of a disease or condition, where, at the high-tech end of the scale, the medical technology includes total body scanners, implantable devices such as heart valves and pacemakers, and replacement joints for knees and hips) that improves the quality of care and the efficacy and sustainability of healthcare systems.

According to the European Commission's Medical Devices Directive (2007), 'a medical device or technology is any instrument, apparatus, appliance, software, material or other article, whether used alone or in combination, including the software intended by its manufacturer to be used specifically for diagnostic and/or therapeutic purposes and necessary for its proper application, intended by the manufacturer to be used for human beings.Devices are to be used for the purpose of diagnosis, prevention, monitoring, treatment or alleviation of disease; compensation for an injury or handicap; investigation, replacement or modification of the anatomy or of a physiological process; or control of conception.'

Similarly, the definition of health technology provided by the International Network of Agencies for Health Technology Assessment's (2013) is: 'the ways of treatment of a specific healthcare condition is any kind of intervention that may be used to promote health, to prevent, diagnose or treat disease or for rehabilitation or long-term care. This includes the pharmaceuticals, devices, procedures and organisational systems used in healthcare.'

Another similar interpretation is provided by the World Health Organisation (2013), which defines health technology as 'the application of organised knowledge and skills in the form of devices, medicines, vaccines, procedures and systems developed to solve a health problem and improve quality of lives.'

On the other hand, Ball, Simborg, Albright and Douglas (1995) point out that when hospital executives talk about technology, they are most commonly referring to clinical decision support, medical informatics or electronic records. It can be the technology used as a support system in the hospital, or the interventions used and applied in the treatment of a patient.

While a CP does not influence technology, technology does have an influence on the design and content of a CP. For example, for a specific cancer patient type, their condition might be treated with chemotherapy; however, since the market now provides an alternative, the clinical guidelines have been adapted accordingly to reflect the switch of the technology of treatment from chemotherapy to drugs in the form of pills to be used for this specific cancer patient type. The CP would then have to be redesigned and adapted to the newly introduced technology. In doing so, many inputs, resources and capacities are dropped as chemotherapy is abandoned and replaced by the new method of treatment or technology.

In other words, a CP can help identify new technologies and/or services, where to place them and what to replace old technologies and/or services with, depending on clinical practice and the latest evidence-based clinical guidelines. A CP would therefore need to be updated accordingly. These technologies or services can be supported by scientific findings or operational tools. The implementation of new technologies and services can have an impact on the use of resources, capacity-planning, logistics, etc., i.e. on the operations function within the hospital. Another example might be a new ultrasound machine with the same key functions as the old ultrasound machine, which will not have such an impact on the CP; however, a new, more sophisticated ultrasound machine that is even more precise in the definition of organs and anomalies could speed up diagnostic processes or change the type of treatment, e.g. instead of open heart surgery, an intravenous intervention would be enough to achieve the same or better healthcare outcomes for the cardiac patient group.

In terms of operations, Langabeer II (2008, p. 134) observes that technology in healthcare can influence productivity, helping to automate processes and remove entire tasks and activities by means of new software and a new system. It can eliminate a number of tasks and employees, and might increase the volume of outputs. In this case, the result is a change in the total productivity ratio through automation, which changes the cost structure of the inputs relative to the output.
A CP can use one type or a combination of several types of technology. Depending on the technology, one can identify the technology which, in turn, is linked to a range of activities. Surgery is a type of treatment technology and encompasses a number of connected interventions or activities, e.g. diagnostics, anaesthesia, surgical procedures, intensive care and rehabilitation. These interventions would normally be identified on the CP.

The types of output that change in response to technology would have an impact on the design and content of a CP. A totally new type of output – for example, laser surgery instead of classic surgery (such as kidney stone removal) – shows how output on a CP must be changed. Given improvements in technology which are introduced as a new method, one can expect a drop in input, such as labour in the operating theatre, or where hospitals go from treating cataract surgery as an inpatient episode totreating it as an outpatient episode or in day surgery. This is a vivid illustration of how advances in technology as an input can affect the outputs on a CP. Improved know-how as an input/technology can also change the output. A CP may not always be able to capture these inputs (e.g. a new surgery technique will not be reflected on the CP); if it does, this could then be reflected in the output or the service or products provided to the patient (e.g. instead of treating a patient with chemotherapy, a biological drug is introduced and this is output is reflected in the redesigned CP).

4.5.2 Impact of different CP models on the operations business function

I now move on to describe how the three CP coordination mechanisms and four CP models identified can influence the operations function in a hospital. The pre-planning of service delivery on any of the CPs identified can have an impact on the operations function to varying degrees.

In terms of defining the **outputs**, a CP with a chain coordination mechanism will most specifically identify the services/outputs (diagnostics, treatment, etc.). Similarly, a hub CP will also identify all the outputs, especially in those sub-processes that use the chain approach for highly predictable segments on the hub CP. This type of CP may need to be more flexible than the chain CP and enable services that were not envisaged as having to take place, such as a requirement to send a patient to a different healthcare setting for a very specific type of diagnostics test that only that particular setting offers. It can therefore be said that the hub model allows for more deviations from the normal or predicted type of care.

However, a chain CP may be limited in explicitly defining all the outputs in advance, as is the case with a chain CP and, to a great extent, a hub CP; this is because the outputs are general and not specific (the patient types are unpredictable and complex), and may simply be trigger points for a number of other outputs that need to be provided *ad hoc*. Of the four CP models discussed, CP Model 4 most comprehensively identifies outputs in such a way as to allow the inputs to be inferred. While CP Models 1 and 3 do identify the outputs, some may not sound as clinically specific as is the case with CP Models 4 and 2, and they do not provide outputs in as concise a manner as CP Model 4.

Concerning **inputs**, none of the CP models provide information on all the time, costs, labour, materials (final and intermediate) and other resources utilised in the delivery of services. A chain CP would normally be based on a time matrix, from which it would then be possible to make estimates of time and labour; similarly, a hub CP can also provide some insight in terms of time and labour. With a web CP model, which is normally based on a goal-task matrix, the notion of time and labour is easily lost – in other words, it is difficult to track.

Given that time is not specifically defined, nor is the input of labour and capital and the use of other resources such as buildings and equipment, CP Models 1, 2 and 3 do not provide a clear picture of the inputs needed. For CP Models 1 and 3, the inputs can be roughly estimated on the basis of assumptions, clinical practice and, perhaps, in-depth discussions with the clinical team. CP Model 2, for instance, identifies the use of a brace/collar and the requirement for an MRI and radiotherapy (although volume is not identified); from this it might be possible to extrapolate some information of forecasting purposes. CP Model 4 is the model that makes it easiest to estimate the inputs; this is because it is more comprehensive and more specifically identifies the outputs upon which it is possible to work out the workload inputs. This is also the model in which capacities can be planned to a certain extent only, since it is not clear, for example, which equipment or diagnostic lab is to be shared with other CPs, or how.

Assumptions and estimates can be drawn for planning resources, in light of the historical data, clinical guidelines and clinical practice, so as to better plan resources for the patient group of this specific CP. In addition, CP Model 4 identifies leading resources, such as surgery, that then call for following resources that are not identified on the CP; it will also call for a continuous availability of resources that are identified as outputs, e.g. intravenous therapy, but says nothing about the volume needed. In comparison with the other three models, this model provides more information on the possible bottlenecks that can arise for the specific patient group. Any kind of identification of inputs in its pure sense would need further investigation.

The key turning point within the operations business function in terms of using a CP is the question of **efficiency** and **productivity**. As far as productivity is concerned, it is difficult to say which CP model is more productive, as the inputs are not identified. It would be easy to identify labour productivity if these CP models provided more information on who does what, when and for how long. The CP model that comes closest in this respect is CP Model 4; once again, however, we have to say that it is rather limited in terms of measuring productivity, as it identifies the outputs but not the inputs.

As for **logistics**, the CP turns out to provide a clearer understanding of the capacities or resources through which a specific patient group is 'travelling'. By maintaining an overview of all outputs, a CP ensures that specific outputs do not work to the detriment of other outputs and that, if they do, this does not go unnoticed. These models are good at pointing out when some outputs are working to the detriment of others – this is most pronounced in a chain CP, in a hub CP to a great extent, and in CP Models 1, 2, 3 and 4 (where CP Models 2 and 4 are representatives of the chain coordination mechanism CP, while CP Models 1 and 3 contain some elements of the hub coordination mechanism). By applying the concept of logistics, the chain and hub CP types, as well as all four CP models, can ensure there is no duplication of outputs and ensure implementation at the right time (e.g. to avoid under-treatment), i.e. at the clinically significant right moment, hence ensuring a trade-off between service level and resource utilisation. A web CP is normally formed in an *ad hoc* manner, is normally complex and is more prone to follow a combination of unit logistics and chain logistics, depending on the co-morbidities and complexities of the patient group. It would be rather difficult to apply the network logistics approach, as it is likely that, in some situations, some processes may go unnoticed or be duplicated at the expense of others.

As described above, a CP does not influence the technology; rather, technology influences the design of the CP, which may or may not be evident in terms of output. For instance, if a new ultrasound machine is introduced for the treatment of a specific patient group, it is difficult to notice this on the CP, while if a treatment for a cancer patient group is changed, e.g. a drug is introduced to replace chemotherapy, the new output is identified on the CP. This will be most pronounced in a chain CP (CP Model 4), where the outputs are comprehensively identified, as well as in those components of a hub CP where the sub-processes are based on the chain coordination mechanism. If they are clinically significant, the web CP would also acknowledge them; otherwise, any new technology could go unnoticed on this type of CP, which serves more as a guide than the chain and hub CPs. CP Models 1, 2 and 3 may not be so sensitive to the use of new technology and may not take notice ofit since, again, they are not developed specifically for a particular setting and are therefore less organisation-specific.

To start with, a chain CP can most readily or directly influence the operations function. This type of model is most common and is used for highly predictable processes with a high level of agreement between the team members for 'easy' patients for whom almost no complications are foreseen (e.g. elective or planned surgery, chemotherapy). For these care processes, the CP can be used as time-task matrixes, where the sequence of timing will mostly be day-to-day. However, similarly to the other three CP models, it does not specify what quality, performance and process indicators are to be observed. These indicators may be vital for the operations function of a hospital, potentially 'setting off alarms', helping detect which activities or processes in the CP need to be revisited and/or setting targets for healthcare staff to aim at – particularly since this model is a little more complex than the chain model.

Performance and process indicators are an asset for any hospital aiming to perform better, be more efficient and effective in the provision of care, and deliver quality care that satisfies healthcare staff, patients and the purchaser of healthcare services. Where it would have a greater impact is in ensuring high-quality care and reducing duplications and variances in the provision of care. If a hospital has a good overview of what is happening to 60% of its patients (high-volume and predictable), it will then be able to improve logistics and business processes. The logistics of this type of CP are simpler than those of a web CP, where the logistics can get fairly complex, as we will see below. In addition, resources (human, financial, material) can be most easily tracked and transparently defined.

In other words, this CP model is such that it allows one to understand the production of care as one would the production process in a factory. It normally brings high levels of satisfaction to patient groups and good healthcare outcomes, there is normally less variety in the treatment processes, there are common requirements in services and quality, and it is normally quite homogeneous in terms of the resources required. In comparison to the hub and web models, it does not require a high degree of flexibility, as decoupling points are normally well defined. Volume and range are normally predictable and defined in the CP, which means that the costs may be easier to follow.

Similarly to the chain model, the hub CP can also influence the operations function of a hospital. This type of CP requires a closer understanding of how to combine the 'where to produce' and 'how to produce' in order to meet the quality targets. The timing of specific activities and the place of production or delivery of healthcare services can run across different settings within the hospital with different teams – on the ward, in the diagnostics laboratory, and in the pre-operating, operating and recovery rooms – but not across different departments or units. It can also specify the volume and range of services to deliver, especially for highly predictable sub-processes that use the chain model, and help reduce the duplication of services and other waste by better aligning production.

There are many anecdotal reports of patients being sent several times within their episode of care for the same type of test by different doctors involved in the pathway. This can mean two things: either the doctors or specialists do not trust the results produced by a certain diagnostics laboratory, or they simply do not look for the laboratory test results on the patient record; it may even be the case that the specialist forgets to initiate another diagnostic test at the same time as the initial one, thus ordering the nurse or technician to take more blood from the patient for another reason, when this could have been done at the first blood test.

Similarly to the chain CP, the hub CP can also reduce variability and deviations. A hub CP involves at least two healthcare teams for two or three diagnoses. Furthermore, a hub model can help improve logistics by improving throughputs and streamlining processes, since it integrates additional healthcare teams in the treatment of the patient. Hip replacement surgery, for example, would require several teams: the anaesthesiology team in the pre-operation phase, the surgeon and his/her team during the operation in the operating theatre, and another healthcare team in the post-operation and recovery phases, where the major role would be played by the physiotherapist.

A CP also influences productivity by analysing the use of technology, assessing the need to introduce new technology, and searching for higher outputs from all employees and other assets; this, in turn, can have an impact on the volume and price of treatment. The hub CP type can pinpoint where the waiting timesare, and so help eliminate the duplication of services and reduce mistakes in the delivery of care. The hub CP can contribute towards better coordination of all processes and activities of careof a specific CP, for example, that most likely crosses the boundaries of a single department at least once by taking into account other CPs and processes in the hospital. This type of CP can help define where certain processes are common to many CPs.

The web CP, given its low frequency of occurrence in comparison with the chain and web CP types, can have an extensive influence on the operations function. Since this type of mechanism– the web type – is not so common given the multiple comorbidities patients may have. These types of patients are normally less predictable than those patient groups on CPs with a chain or hub coordination mechanism types. The web CP requires greater flexibility of production in terms of where to produce and how or when to deliver care; the volume and range of products to produce, and therefore the quality of care, may vary from case to case. The delivery or production of healthcare services can take place in different settings within the hospital. This type of CP is able to eliminate variability and the duplication of services only with difficulty. The organisation and structure of care processes are a matter of daily staff meetings, which places the quality of care that the CP is aiming at in jeopardy.

Based on historical data for complex patients, a web CP can improve productivity by analysing the use of technology, assessing the need to introduce new technology, and searching for higher outputs from all employees and other assets, as already suggested for the above two CP types. Since multiple teams are involved, the coordination of care may become too complex, requiring a designated case manager to oversee patients on this type of CP and ensure a continuous process of care, both in terms of the delivery of care and a 'smooth' journey for the patient.

On the whole, this type of CP model presents a challenge to the operations function. In treating complex patients with various serious co-morbidities, the operations functions have to adjust continually to the changing state of health or diagnoses of a complex patient, as demand could be prone to disruption in the care of patients on the chain or hub CP models. One way in which a hospital tries to minimise these types of disruption is by buffering or insulating the operations functions.

It can do this in two ways. The first is physical buffering, where it designs inventory, stock or resources either on the input side of the transformation process or on the output side; this involves tolerating large stocks of input or output resources, which can be expensive, can prevent the operation from improving and can also mean that it makes the patient wait (waiting times, queues and waiting lists) for services, potentially leading to dissatisfaction (Langabeer II, 2008; Griffin, 2012). The second is organisational buffering, where it allocates responsibilities of the various functions within the organisation so that the operations function is protected by other functions. The costs of delivery of care on the basis of such a CP will be known only upon discharge, as it can combine many different and unpredictable products.

With the exception of CP Model 4, none of the four explicit CP models define the volume and range of products. Only CP Models 1, 3 and 4 provide information as to where a certain product will be delivered, while the time matrix of CP Model 4 contains an indication of when a product will be delivered. However, there are no indicators or targets provided that allow a better understanding of the quality of care or the outcomes expected. CP Model 4 can have some influence on the operations function, as it indicates the range and volume of services to be delivered to the patient on the pathway more explicitly than any of the other CPs, and places the products in different hospital settings (e.g. admissions office, ward, pre-operating room, post-operating room). CP Models 1, 3 and 4 define the products and services of delivery required in the delivery of care for a certain patient group. CP Model 2 does not influence any of the elements of the operations function.

4.6 CPs and the financing function of hospitals

The finance function supports the pursuit of business objectives by providing information for management in terms of performance measurement, decision-making and control, by providing information for shareholders and other external parties in the form of published financial accounts, and by ensuring that finances are available for business activities such as short-term liquidity and cashflow, and long-term financing and solvency (Kaplan, 2012, p. 115). The financing function is one of the main elements of business, and organisations need to set financial targets and allocate money within the business (Gillespie, 2011). Funds are invested in the financing function, which is expected to make a positive contribution to the economic well-being of the business and to generate a ‘return’ in excess of the cost of funding the business.

The financing function needs to plan (human resources, information system requirements, targets, objectives), to control (assessing how effective the function has been in meeting its goals), and to ensure good management and leadership (Kaplan, 2012, p. 117). It has an internal and external function within the business. The four main functions are: recording financial transactions (internal – books of prime entry, ledgers and asset control); treasury management (internal/external – cash, working capital and foreign exchange management, financial risk management, short-, medium- and long-term finance); financial reporting (external reporting – financial statements, tax and regulatory information); and management accounts (internal reporting – costing records, budgets, pricing, decision-making information, e.g. for investment decisions) (Gillespie, 2011; Kaplan, 2012, p. 115).

In terms of reimbursement, the common hospital payment methods are as follows (Albreht et al., 2009; Langenbrunner and Wiley in McKee & Healy, 2002, pp. 154–157; Morris et al., 2010, pp. 167–171):

- *Fee-for-service*is payment based on procedure or service,where financing is tied to the provision of a specified procedure or service, and the number of procedures or services provided within the specifications agreed between the payer and the service providers determines the level of resources available to the hospital; similarly, **per-point** payment is where the volume of services is measured by the number of points (in Slovenia, known as the 'Green Book' classification for payment);
- *Payment per day*(or per-day payment) is where the financing of services or procedures is based on a specified payment per bed-day; it is also sometimes referred to as hospital bed-day payment;
- *Payment per case*(or per-case payment) has two basic types of model: per-case (e.g. DRG) and per-discharge regardless of the type of case; it is also referred to as output-based payment;
- *Global budgets*for hospitals are aggregate one-line payments fixed in advance to cover expenditures for specified services over a fixed period of time (e.g. one year). Global budgets constrain growth in the price and quantity of services, while allowing flexibility in the use of resources within budget limits;
- *Per-capita payments* can be used to determine regional budgets or budgets for intermediary fund-holders within a region, or to distribute funds from the payer to a specific health institution or group of institutions. For instance, capitation is used to provide a specified package of healthcare services for a specified population for a fixed fee per person and for a fixed period of time (e.g. one year).

The financial goal of a public hospital is not to make a profit but to control costs. Finance is a key element in the efficient functioning of all aspects of the hospital system, from strategic planning to daily operations. Therefore, transposing the above to a hospital setting and applying this in the context of CPs, this section concentrates on the financial functions of a hospital, including (a) **billing and collection**, (b) **financial management** and (c) **budgeting** (Wang in Griffin, 2012, p. 292), which can potentially be influenced to varying degrees by a CP.

4.6.1 Impact of CPs on the financing business function

Billing and collection is the function responsible for billing the payer for services rendered in the hospital (Wang in Griffin, 2012, pp. 292–297). These services could be those noted as outputs, albeit taking into account all the inputs, overheads, etc. (Section 2 contains more on costed pathways), and seen on the CP. It is probably better to build payment or bill the payer (insurer) on the basis of costed CPs. By capturing different items of the services rendered on the CP, the hospital can then use this information in the negotiation phase when discussing the policy basis for reimbursement of the hospitals.A CP can play various roles in billing, collection, financial management and budgeting. To begin with, there are a number of common methods of hospital payment and reimbursement.

Billing and collection will depend on the hospital payment methods used. If costing and billing are carried out on the basis of a CP, the method of payment of a CP may come closest to the fee-for-service payment method. A CP is, in simple terms, a compilation of outputs or services that take place in a sequential manner, with the outputs or services providing the basis for fee-for-service payment. In other words, one sees on the CP all the services (outputs) provided to the patient, but not the costs of these services; therefore, these services (as outputs) only partly display the costs (through the number of these services). A CP can be combined with the DRG, as both methods deal with case-types or patient groups.

The method of reimbursement (Morris et al., 2010, pp. 167–171) relates to the way in which healthcare providers are paid for the services they provide, as it can affect the quantity and quality of healthcare. There are two methods for reimbursing hospitals: retrospective and prospective reimbursement.

Retrospective reimbursement at full cost means that hospitals receive payment in full for all healthcare expenditures incurred in some pre-specified period of time. Reimbursement is retrospective not only in the sense that hospitals are paid after they have provided treatment, but also in that the size of the payment is determined after treatment is provided (Morris et al., 2010, pp. 167–171). A CP retrospectively provides information on the number and types of services that need to be paid for.

Prospective reimbursementimplies that payments are agreed in advance and are not directly related to the actual costs incurred. Incentives to reduce costs are greater, but payers may need to monitor the quality of care provided and access to services.

If a hospital receives the same income regardless of quality, there is a financial incentive to provide low-quality care for the minimum effort and at minimum cost. However, quality monitoring is easier and faster if a hospital places most of its high-volume elective patients on CPs. A CP also helps the clinical team and/or the hospital to plan ahead and to forecast, and sets the price for an episode of care for a specific patient group.

Prospective reimbursement can take two forms: global budgeting and cost per case. Withglobal budgeting, the size of the budget paid to the hospital is set prospectively across the whole range of treatments provided, which is unrelated to the actual costs incurred and to workload. This provides a financial incentive to constrain total expenditure (Morris et al., 2010, pp. 167–171).

Setting cost per caseprospectively means that the amount paid per case is determined before treatment is provided, and reimbursement is separated from the costs incurred or the services provided per case, which generates incentives for containing costs. A CP is a tool that can help contain costs. Prospectively set cost per case is the DRG pricing scheme. DRG payments are based on the average cost per case in each diagnostic group derived from a sample of hospitals (Morris et al., 2010, pp. 167–171).

As many healthcare systems worldwide are moving to per-case payment (e.g. DRGs), pressure exists to use CPs not only as an organisational response to external requirements and expectations, but also as a tool for setting and negotiating contracts between purchasers and providers.

The precise effect of this type of reimbursement will depend on the actual costs incurred by the hospital. The predicted effects of the DRG pricing scheme are cost-shifting, patient-shifting[11]and DRG creep.[12]A CP can contain cost-shifting, ensure patients are not shifted for reasons of financial gain, and ensure transparency of treatment, thus aligning the appropriate DRG to the CP used and providing protection against DRG creep.

There are, as we have seen, a number of possible relations between CPs and DRGs. In the US, CPs were introduced in response to the introduction of DRGs, since cost and quality are easier to manage if a CP is employed. A reference length of stay (LOS) and a budget are assigned to each DRG. CPs, as a method for monitoring processes and processing time, were introduced in order to reduce LOS and manage costs while maintaining quality of care (Zander, 1988a, 1988b). The goal of CPs is to provide appropriate and effective healthcare, and to reduce variations in practice (Institute of Medicine, 1990; Campbell et al., 1998), which normally incur costs. Reducing variation is considered to be an effective means of reducing healthcare costs (Goldberg, Chan, Haley, Harmata-Booth, & Bass, 1998; Hanna al., 1999).

In terms of adherence, it is possible to match the case-type of one DRG with a CP of that same case-type – for example, a total knee replacement CP can comply with a DRG for total

[11] Cost-shifting and patient-shifting are ways of circumventing the cost-minimising effects of DRG pricing by shifting patients (or some of the services provided to patients) out of the DRG pricing scheme and into other parts of the system not covered by DRG pricing. For example, instead of being provided on an inpatient basis, treatment might be provided on an outpatient basis, where it is reimbursed retrospectively (Morris, Devlin & Parkin, 2010, pp. 167–171).

[12] DRG creep arises when hospitals deliberately or inadvertently classify cases into DRGs that carry a higher payment, indicating that they are more complicated than they really are (e.g. when cases have multiple diagnoses) (Morris, Devlin & Parkin, 2010, pp. 167–171).

knee replacement such as the All Patient Refined DRG classification (or APR-DRG 302), or a cardiac valve surgery CP might adhere to two DRGs (e.g. APR-DRG 162 and APR-DRG 163). On occasion, for slightly more complicated cases, two DRGs might comply with two different but closely related CPs; however, if the case is too complicated, the patient is not treated on the basis of a CP. Financially speaking, a DRG reflects a weighted average cost and can provide estimates of the costs of the CP.

Devriese et al. (2005, pp. 37–38) explored the relationship between CPs and DRGs. Their study found that in Belgium, as in the US, the top ten elective care conditions organised by CPs are normal delivery, stroke, total hip replacement, total knee replacement, breast carcinoma, Caesarean section, transurethral prostatectomy, diabetes, herniated disk and inguinal hernia. CPs are most frequently developed for the major diagnostic category of the musculoskeletal system and connective tissue, and so are developed for APR-DRG 302. A recent study by Westerdijk, Zuurbier, Ludwig and Prins (2012, p. 214) found that the highest number of CPs were in medical specialisations such as head and neck surgery, cardiology, gastroenterology, gynaecology, anaesthesiology, pulmonology, orthopaedic surgery and general surgery.

For a hospital, the main products are outpatient attendance (in an ambulatory or outpatient clinic) and completed inpatient episodes. For inpatient episodes, intermediate products comprise all services that require a combination of inputs and are used to create a complete episode, e.g. pathology tests, surgery and imaging.

Costing intermediate products on a CP can be a useful step in costing the final product of a completed CP. A CP may not identify all the intermediate products – in other words, depending on the CP model, it may not always identify all the inputs or intermediate products used to create and complete a patient episode. A CP may be considered to be a product that is 'sold' to the patient or payer, while the outputs on the CP may be considered to be the final products. Thus, in terms of billing and collecting, a CP can help define the product or services within each individual patient care journey.

The second main function of financing is **financial management**. A hospital's financial department is responsible for managing the overall accounting, treasury, financial reporting and financial services operations of the hospital. This includes ensuring that the official accounting records of the hospital are up-to-date and accurate, creating and presenting financial reports to internal and external parties, providing financial supports to hospital management and development personnel, and safeguarding and preserving the assets of the hospital (Wang in Griffin, 2012, pp. 298–299).

A question that often arises when dealing with CPs is how much money or resources are wasted in a hospital by *not* using a CP. A CP can help manage hospital finances and provide financial and budgetary information, e.g. in the planning of ward-staffing levels or materials.

It does not have a direct impact on the overall accounting and financial reports of the hospital, but can support the financial services operations of the hospital.

There is not a great deal of literature on the contribution to funding or contracting made by CPs. This is possibly due to the fact that contracting information between purchasers and providers is placed only infrequently in the public domain or in the scientific literature. A CP does not always lead to an improvement in patient care. Although CPs are intended to increase the quality of the multidisciplinary teamwork and the quality of care, a vast amount of pathway projects are only evaluated in terms of economic parameters, e.g. LOS (Devriese et al., 2005, p. 30).

A CP supports negotiations and contractingas part of finance management; it may also help finance department staff to understand what services are provided to the patients and, on the basis of that, to discuss the inputs with the clinical team. A CP is considered to be easier to follow for finance officers than a general handwritten medical record in which outputs (services) are not clearly defined.

On the basis of the CP, a finance officer is able to understand where costs are incurred and how high those costs are; theycan also therefore estimate when the payment will be processed. In some countries, finance officers are involved in designing the CP, as they can provide information on the costs of inputs and therefore outputs.

In addition to providing financial support to clinical teams and managing finances, the financing function deals with preserving hospital assets. A CP can help with fixed capital investment, identifying when to replace capital items (such as MRI) or invest in the latest technology.

Fixed capital assets, such as property, plant, machinery and equipment, are held over the long term, while working capital assets – stocks, inventory and the like – are normally held over the short term.

Fixed capital investment is undertaken by a firm in order to replace worn-out and obsolete capital items (thus enabling it to produce a greater volume of products) and to remain competitive by investing in the latest technology (Pass et al., 1995, p. 337; Penner, 2004, p. 192). CPs can help enhance assessments of the financial performance of a unit or of a hospital as a whole, and allow a ratio analysis (profitability, performance, liquidity, debt and asset management ratios) to be conducted. For instance, the more productive an ultrasound imaging machine shared by a number of CPs, the higher the return on total assets.

The third main financing function of a hospital is **budgeting**. A hospital's resources (e.g. capital, office space, material, human resources) are limited, which means that it must create a plan to maximise utilisation of those resources. A hospital's resources are allocated in the budgetary process. A CP can help to keep a hospital running as closely as possible to the financial plan, and therefore help with the allocation of resources (Wang in Griffin, 2012, pp. 307–331).

A CP can be the main tool for finance officers when planning costs. By providing an overview of the outputs, they can ensure cost-effectiveness, which in turn provides the basis for working out the inputs.

A CP cannot directly trigger payment for a certain service provided outside the hospital; except in clinical terms, a CP as such carries no direct financial responsibilities towards external providers. An item on the CP can, for example, prompt the team when it starts to arrange an appointment for an MRI scan in a different facility than the one to which the patient was admitted; if the CP is part of the hospital-wide information system,it can also therefore notify the financing department or the clinical department (if it is the budget-holder) that this service has been carried out. This is left to the financial management functions, which would then need to manage billing, collection and budgeting.

In conclusion, a CP can help in four ways: it can serve as a basis for negotiating prices with the payer, define the basis for setting internal prices and allocating revenues among departments, and be used as the basis for updating payment classes (diagnosis, e.g. DRG, or utilisation, e.g. at least ten home healthcare service visits). A CP therefore provides the basis for budgeting, and can assist in the management of cost and quality, especially in the case of high-cost and/or high-volume case-types (Hindle & Yazbeck, 2005).

The term budget is a broad concept that includes the operating budget, capital budget and cash budget. The hospital establishes its *operating budget* by planning for the revenues it expects to receive for providing services to patients, as well as the expenses it will incur in doing so. There are also two types of operating budget, the *flexible budget*and the *fixed budget*, with the former being more useful to healthcare due to the uncertainties inherent within it,sinceone can determine which numbers are likely to change and which to remain the same. According to Dunn (2006, p. 557), with flexible budgeting the actual results are compared against the appropriate activity level. Because the flexible budget covers a range of activities, a manager can construct a new budget if the actual costs are different from what was originally planned. A flexible budget is therefore one that adjusts to changes in the volume of workload, given the fact that variances can occur and are noted on the CPs. Variances in the CP can affect the budget, leading to calls for the use of flexible budgeting.

A *capital budget* is anything the hospital acquires to provide services for more than one fiscal year (capital assets typically include buildings, vehicles, information systems, major diagnostic and treatment equipment, and the development of new systems and products) and is closely linked to financial management. The *cash budget* is the cash that hospitals keep in bank accounts for daily transactions, such as meeting payroll, paying suppliers and covering ongoing operating expenses (Wang in Griffin, 2012, pp. 307–331; Penner, 2008, pp. 71–72). Different CP models reflect different types of budget, as discussed below.

In terms of the budgeting function, a CP can play a role in allocating financial resources within the organisation, i.e. the budget, for a given period, and then comparing those financial resources with the actual outcomes in order to examine why the differences occurred. The operating budget can be influenced by the CP, as it defines what services are provided to the inpatient and thus what expenses are incurred. As for the capital budget, the CP can help with what the hospital needs to acquire in order to provide services (the assets, facilities, equipment, etc. required). Links between the perceived cash budget and the CP can be observed, since a CP identifies when a cost is incurred for a specific service and when this service is or needs to be paid for.

A hospital can prepare several different types of budget, the most popular types being the line-item, department and programme budget, which may be based on forecasting fixed or flexible budgeting techniques. A **line-item** expense is a specific class or category of resource used by a hospital, e.g. salaries and overheads. By contrast, a **department or clinical budget** divides the budget into units for which individual managers or clinical teams are held accountable in hospitals under the Beveridge healthcare system, and clinical teams are entrusted with a budget, e.g. for administration, therapeutic services, diagnostic services, etc.

A **programme budget** is a budget for a programme, e.g. neurosurgery, orthopaedic surgery, internal medicine or ophthalmology. Budgets can be prepared that will show the expected revenues and costs of each programme, which makes it easier to evaluate each programme's profitability (Griffin, 2012). Hospitals normally plan for the future and use forecasting methods. Nevertheless, payment will depend on the methods used in contracting with the payer (insurer).

Within a hospital, CPs can assist in the costing process, particularly when clinicians (within their department and especially if they are budget-holders) believe that clinical decisions control costs, as they benefit from the avoidance of waste. Clinicians therefore manage costs by using CPs, and measure only what is needed to control costs by taking into account variances that can potentially incur costs. Labour, material (inputs, intermediate products) or service intensity, or demand for a specific CP for a specific patient, can all help tailor the budget, as discussed below. A CP is obviously a good basis for calculating the standard cost, since it has been deliberately designed to represent high-quality care under circumstances of a continual scarcity of resources (Devriese et al., 2005, p. 29).

The cost of normal cases under a CP is complemented by the cost of the variances noted, e.g. an extra day of stay, another radiology procedure or an additional consultation. A CP takes into account variances according to patient needs, choices and expectations, appropriate changes in treatment, unavoidable risks and complications, etc. These standard costs need to be validated. Literature exists that addresses how CPs can help reduce costs and maintain or improve the quality of care, as mentioned in Section 1. CPs can also be used as protection against funding decisions from health insurers, e.g. an arbitrary reduction in the prospectively determined price of the accepted LOS for a given DRG (Maxwell, 1998).

4.6.2 Impact of different CP models on the financing business function

A CP is a document that can be shared by anyone involved in the treatment of a specific patient group, either on the front line or in a functional department such as the finance department. Alongside this, it provides support for communication within and between various members of professional groups (doctors, nurses, heads of medical departments, head nurses, management) (Degeling et al., 2003; Hindle et al., 2004; Hindle & Yazbeck, 2005; Yazbeck, 2004).

In this section I examine the impact of different CP models on the three elements of a hospital's financing business function as identified above. In terms of **billing and collection**,all CP models (CPs with chain, hub and web coordination mechanisms and CP Models 1, 2, 3 and 4) have this in common: they can provide a good basis for calculating the standard costs, as they explicitly represent the services to be provided within the limits of the resources allocated. One option would be to pay every single step on the CP on the basis of fee-for-service, as all the CP models considered in this dissertation identify the outputs rather than the inputs. Given this, in a system based on retrospective payment, any CP model would only be able to identify in part the costs of every service (output) provided for a specific patient group. Similarly, if the CP models are inserted within a healthcare system that reimburses prospectively, it would help the hospital to partly plan, and thus set the price for the treatment of a specific patient group on a CP. Again, I stress the term 'partly' in this context because, as mentioned several times already, a CP does not provide specific and in-depth information on the use of inputs, intermediate products, work in progress, etc. Any of the CP models will, to some extent, be able to contain costs incurred in services (outputs).

A CP model based on the chain coordination mechanism will provide most transparency in setting out all the services (outputs) on the CP. Given the predictability involved in this type of CP model, it is possible to prepare financial forecasts on the basis of historical data and to estimate the costs incurred; similarly, a hub CP, given its predictability and the level of agreement between members of the multidisciplinary healthcare team, will provide information on the services provided within and also possibly beyond the boundaries of the department, unit or clinic, i.e. in a different healthcare setting. Unlike the chain and hub models, which are far more common, the web model of a CP makes it difficult to identify the incurred costs prospectively, as the teams need to adapt to the health status of those patients with several important co-morbidities that cannot be predicted in advance; the cost of this treatment would therefore most likely rely on the attributed DRGs. Since DRGs are financial mechanisms and can go hand-in-hand with a number of CPs, a hospital can initially prepare costing on the basis of a CP and benchmark it with the adherent DRG, and then see to what extent the costed CP and the adherent DRG conform with each other. A DRG is considered to be a fixed amount for each inpatient. There has been a worldwide debate on the adherence of a CP to a DRG and vice versa; and although there are many ongoing debates around the world as to whether a DRG value should or must match the costed CP, the value of a DRG may not always reflect the costed pathway. However, the fact is that many hospital reimbursement systems have moved toa per-case payment system that is set prospectively, i.e. DRGs which already define the product price. Patients with similar clinical conditions are allocated within categories and are expected to use the level of hospital resources; in basic terms, a DRG identifies the services and products that a patient within a specific DRG receives.

With regard to the other four hands-on CP models, Model 1 does not provide any information on workload and labour, who is involved in each of the steps and how much time is used for each of the steps; neither is it possible to identify any of the inputs and intermediate products. Similarly, CP Model 2 is fairly limited, as there is no indication of who is involved in which step and for how long; however, it does provide an indication of some of the materials to be used (brace/collar equipment, MRI, drugs). One can assume that one brace would be needed per patient, but neither the volume of MRI required nor the quantity of drugs to be taken by or injected into the patient intravenously are indicated. CP Model 3 is the CP model that provides, not directly on the CP itself but alongside it, a financial template that enables the team to contain the costs of the drugs used or dispensed to a patient with Type 2 diabetes. In comparison with the other three CP models, Model 4 provides by far the most information, not only in terms of outputs but also, to varying degrees, of inputs. It is on the basis of this CP model that costing exercises can be carried out. What is common to all is that it is not possible to directly identify the input of labour on a profile-by-profile basis, nor where care takes place (operating theatre, admissions room, in a different healthcare setting, etc.).

A CP can provide finance officers with an insight into the management of the finances of the hospital. It is not only a tool to be used by the healthcare team around the patient but also, in contrast to classic ‘medical records’, a document that can help finance officers understand what outputs and inputs are used in the treatment of an elective patient on a CP. Although the CP may not, strictly speaking, identify all the fixed capital assets, a finance officer can make a number of assumptions. Again, these assumptions are most easily made in the chain model, while the hub model would need to take into consideration the fact that a certain service may be provided at a different location, e.g. the finance department would have to deduct the cost of capital assets if an MRI is to be purchased in a different healthcare setting to the one in which the patient is treated.

Again, the web model would present a challenge here, as it is difficult in advance to predict how, when, where and by whom a patient with multiple severe co-morbidities will be treated. Using the first two models, the financing department can pool information on the basis of all the existing CPs that share fixed assets (e.g. ultrasound machine, operating theatre, intensive care room) and working capital assets (e.g. needles, medicines, other consumables), and so manage a portion of the finances of the hospital and run a ratio analysis. Of all the four CP models, Model 4 provides the most elaborate information for the finance officer, since it provides information on the assets, items or goods to be financed, and on staffing levels (no time inputs are indicated, however).

A CP can be an important tool for finance officers when the hospital is designing its budget and allocating its financial resources. In some hospitals, **budgeting** is left to clinical departments; the clinical department or clinical team is expected to work within this budget (administration, diagnostic services, therapeutic services, etc.), or else the budget is allocated to a programme, e.g. internal medicine, paediatrics, cardiology, neurosurgery.By contrast, in a line-item budget the individual financial items are grouped into cost centres (e.g. for salaries, overheads, heating, cleaning, etc.), where comparisons can be made between years and estimates provided for the current or a future period. Different CP models will call for different types of budget.

Almost any CP model indicates clinically specific decisions, and hence clinically specific costs. A line-item budget would not be greatly influenced by the chain, hub or web CP models, as it keeps the category or class of resources at a higher aggregated level (e.g. salaries for full- and part-time employees, services such as rental, equipment and utilities, supplies such as office supplies) than the hospital's clinical and the programmes budgets. The chain and hub CP models would play a major role in a department or clinical budget. It is the team within a specific department that will know best how to allocate financial resources – resources for which the teams themselves are held accountable. To give an example, a knee replacement team will know best how to budget on the basis of their own development of the CP: how much to allocate for administration, therapeutic services, diagnostic services, surgery, etc. on the basis of the CP, which defines the outputs, clinical practice and activities (these may be unknown to anyone outside the team).

Whether using a chain, hub or web CP model, the clinical team may find that indicating every single item represents a potential distraction from the purpose of developing the CP; it would therefore be almost impossible to find a CP that identifies all the ward consumables. It is possible to count the resources (e.g.how many nursing and/or doctors' minutes, how many diagnostic tests by type, imaging, pathology, etc.) on the basis of the outputs and activities, and therefore to estimate the costs per unit of service (e.g. cost per nursing minute, including overheads) and finally add the costs together.

The possible cost components to include when costing a chain or hub CP model are the costs of ward, medical and non-medical consumables, equipment depreciation and salaries; however, these items are normally not identified on any of the three CP models. Most costs based on specific treatment are usually clinically identifiable, via historical clinical practice and clinical guidelines, by the team or finance department. This is where the financing function can help – for instance, medicine prescribed for a specific treatment, and thus clinically easily identifiable, normally passes through the pharmacy prescription system and is likely to be captured and documented. This is where a finance office can then identify the cost of a specific treatment for a specific CP, whether based on a chain, hub or web coordination mechanism.

The costs of other pharmacy items that are common to all ward treatments, such as simple pain relief, antibiotics and general placebos, can be treated as 'pharmacy overheads', which means that a standard 'other pharmacy items per day' can be used in the costing of a chain or hub CP model; this may not be as easily applied to the web CP because of its unpredictable nature and the uncertainties involved in treatment of the patient.

Two types of clinical ward consumables can be identified: specific and generic. These are treated similarly to pharmacy items. For example, urinary catheters are common to urology wards, but would also fit a specific pathway on a neurology ward. This is where the CP's clinicians would need to decide what is specific to the pathway. The financial function can then conduct a rough cost-modelling procedure to reveal the consumables component, and treat it as a standard cost similar to the pharmacy consumables described above.

Non-medical consumables can be calculated by the hospital's financing and accounting department in order to provide a standard cost per day based on cost-modelling. The CP can help identify the machine or equipment time; the accounting staff can then complete the calculation on a current replacement cost basis. As with other components, a generic daily depreciation can be factored in for 'normal' monitors, beds, oxygen pumps and so on, and only include specific items of depreciation at an item level where it is clinically significant to this pathway.

For nursing and medical components, it may be useful to split their time into three sub-components with regard to salaries, e.g. nursing minutes on the ward, nursing minutes in the operating theatre, etc.; the same could be done for the medical components and for other related healthcare staff on the CP.

In the operating theatre, the financing or accounting department can incorporate set-up and clean-up time for the chain and hub CP models, alongside anaesthesia, prostheses, other pharmacy items, operating theatre consumables, the sterile supply unit and equipment depreciation. Depending on the importance of the laboratory processes to the CP, laboratory services can be treated as intermediate products and brought into standard costing as a single item per laboratory test or image. The proportions of overheads can also be applied in the appropriate proportion to the chain and hub CP models.

Although, as discussed above, the hub model has a greater impact on the clinical budget in conjunction with a chain model, it could also have an influence on the programme budget, where the programme would keep track of the revenues and expenses and thus work out losses or profits have been made. A programme budget would be more practical for the web CP model, and it would be left to the programme team to allocate that budget according to the requirements applying to the highly unpredictable health status of the patient, e.g. a neurology inpatient who suffers a heart attack. In terms of the hospital's operating budget, it would be almost imperative to deploy a flexible budget in order to ensure that all the variances that occur on any of the CPs are captured and incorporated. This is due to the fact that every patient is unique – some patients may need more anaesthesia than others, or a patient may react much faster to a drug or reach the expected healthcare outcome with less speed than a patient in the same patient group, with the costs of an extra day at the hospital thereby being incurred.

The chain and hub CP models can have an intrinsic impact on the capital budget; however, it would be up to the team managing the finances to investigate what lies'behind' every CP. With chain and hub CPs, finance officers may be able to identify where a certain treatment takes place or which specific equipment is being used for diagnostics, but they may need to obtain additional information from the clinical team; as for a web CP, they are able to obtain information on the services provided only retrospectively. As noted already, any CP model can help the finance department identify when a cost incurs and when it needs to be paid.

It would be difficult to apply any type of budget for CP Models 1, 2 and 3, as they are mainly lists of the steps to be undertaken by the patient and a list of reminders for healthcare staff – for instance, one of the outputs on CP Model 1 is 'consider clinical trials' or 'agree written management plan' and 'core needle biopsy'. This type of design could provide the basis for the clinical budget, but a lot of the information is missing: who does what, when costs are really incurred, what constitutes a service as opposed to simply a note for the patient or healthcare staff, how much time is needed for each step, what the time-span of fixed capital is, the units of drugs prescribed, etc.This is information that would allow one to put the costs together in clinical budget cost centres such as the therapeutic service, diagnostics service, support services and administration. CP Model 2 is less fragmented and provides a little more information on the type of drug to be provided to the patient (without specifying the volume) and whethera brace or radiotherapy are required. This type of CP model could well suit a clinical and programme budget if more information were readily available from the CP itself. Similarly, CP Model 3 provides very little information that would allow any kind of budget to be constructed.

By contrast, CP Model 4 provides far more information than the other three models. It identifies which member of the healthcare team is responsible for carrying out the activities, identifies the variances from normal practice, provides a timeline, and carries information on the medication provided to the patient, as well as many of the other details necessary for working out a budget. This type of CP model could well be managed by an abdominal surgery programme or internal medicine department, but would have almost no impact on the line-item budget.

Because CPs do not specify inputs or intermediate products, it is difficult for the financing function to allocate financial resources across the programmes or to clinical teams. Hospitals would still have to rely heavily on DRGs and line-item budgets, while some hospitals would allocate the necessary financial resources for the programme or clinical team to manage. CPs can be easily costed if all the inputs are provided or transparently available, and provided the CPs take variances into consideration and see the patient as unique.

It is worth noting that there are ongoing debates in countries where CPs have a high level of penetration in the healthcare system, such the UK and Australia, on whether to use CPs as the basis for payment or not, and whether it is the task of the clinical team to contain costs of the CP. A costed CP cannot be fully considered to be a payment unit, for two reasons. The first is that because every patient is unique, there must be room for variancein practice within and between CPs in cases where more applicable ways of caring for them are obvious and effective, e.g. levels of analgesia must be variable and choices between surgical approaches must vary according to individual patients.

At its extreme, tying costing and payment to a CP would have the perverse effect that a hospital that provided a particular CP (and did so well) would get paid even if the patient, in reality, needed something completely different; the second reason is that innovation needs to be encouraged by payment systems and not disallowed by the payment conditions. Alternative CPs must therefore be capable of being applied to the same types of patient (DRG) for the same payment, even if their costs differ. To make payment contingent on particular protocols inhibits this. In general, two fundamental principles need to be balanced. The first is that the hospital should get paid for resolving the patient's healthcare issues and not for the particular CP they use to do that, i.e. DRG and payment should be based on the characteristics of the patient's condition and characteristics and on not the care provided. The second is that, to get the best practice, the most cost-effective care principles of quality and safety of care should also be a condition of payment, which means that attention must also be given to whether appropriate and best practice care are provided, i.e. the use of an evidence-based CP.

Lying across both principles is the bridging issue of the third principle: the appropriateness of care, which is a huge issue in cost-effectiveness. If we set payment purely on the second principle, the balance crosses the line. It becomes an even more complex issue (one which goes beyond the scope of this dissertation) when payment and definition for a particular DRG that is closely related to a particular CP is being used as the basis for the care. Given the above, a specific CP should not then form the basis for the costing of whole patient groups and, subsequently, for payment itself *(personal communication with Professor Richard Marshall from University of New South Wales, Australia)*.

Table 13: CP models and types of budgets

CP models	Line-item budget	Clinical or departmental budget	Programme budget
Chain	Useful prospectively	Useful	Useful
Hub	Useful prospectively	Useful	Useful
Web	Useful only retrospectively	Difficult to budget due to high level of uncertainty	Useful but with high level of uncertainty
CP Model 1	– Difficult to use –Need to rely on the DRG value	A finance officer would rely on the value of the DRG	A finance officer would rely on the value of the DRG
CP Model 2	Cannot be influence	Could potentially have influence through DRG	Could potentially have influence through DRG
CP Model 3	– Difficult to use – Need to rely on the DRG value	A finance officer would rely on the value of the DRG	A finance officer would rely on the value of the DRG
CP Model 4	Useful / can be used	Favourable /Useful	Favourable /Useful

4.7 CPs and the organising business function of hospitals

In this section I begin by describing the organising and then the staffing business function. These two functions are interrelated and are therefore often presented together. In the section to follow, as with the previous four business functions discussed, I attempt to illustrate how a CP can influence the functions of organising and staffing in a hospital.

Several views on or approaches to defining the organising and staffing function can be found in the literature. According to DuBrin (2009), **organising** is the process of making sure the necessary human and physical resources are available to carry out a plan and achieve the organisational goals. Organising also involves assigning activities, dividing work into specific jobs and tasks, and specifying who has the authority to conduct certain tasks. Another major aspect of organising is the grouping of activities into departments or by means of another logical subdivision. The staffing function, from which human resource management (HRM) stems, ensures the availability of the human resources required to achieve the organisational goals. Hiring people for jobs is a typical staffing activity. Staffing is such a major activity that it is sometimes classified as a function separate from organising (DuBrin, 2009, p. 9).

Similarly, Barnard (in Williamson, 1995) states that organising is a managerial function by which an organisation is able to define the positions, the related jobs, and the coordination of authority and responsibility. A manager therefore always has to organise in order to get results. The managerial function of staffing involves manning the organisational structure through proper and effective selection, appraisal and development of staff to fill the roles assigned to them. According to Langabeer II (2008, p. 16), the organisation function also includes the staffing function and a variety of tools, such as an organisational chart to manage people's roles and report relationships, process flowcharts for improving activities, and Gantt charts for managing projects.

In other words, organising is a dynamic process and the process of deciding how best to group and relate organisational activities and resources (Dunn, 2006, p. 189, 191). Organising is an impersonal function, which means that the organisation is designed with the activities in mind and not around the individual personalities in place to perform them. It rests on formal organisation theory, with several major principles (Dunn, 2006, p. 190):

- Authority and the delegation or distributing of authority makes the organisation come alive. Authority may be line or staff in nature;
- The span of management sets outside limits on the number of subordinates a manager can effectively supervise;
- The division of work is essential for efficiency. It may require the design of jobs (job or work specialisation);
- The formal structure is the main network for organising and managing the various activities of the enterprise, and is often done through departmentalisation;
- Unity of command must prevail; that is, each person should take orders from and report to only one superior;
- Coordinating activities and resources is a primary responsibility of management and is fulfilled through the proper performance of managerial functions.

To clarify the terminology, an **organisation** is a consciously coordinated social entity with a relatively identifiable boundary that functions on a relatively continuous basis to achieve a common goal or set of goals. An organisation recognises the need to formally coordinate the interaction patterns of the members of the organisation (Robbins, 1990, 2009, p. 4). The five basic elements of an organisation are strategic management, the technological elements of the techno-structure, middle management or line, support elements or staff, and the operating core (Mintzberg, 1983). To understand an organisation, one needs to understand what organisational structures and design are. An **organisational structure** defines how tasks are to be allocated, who reports to whom, and the formal coordinating mechanisms and interaction patterns that will be followed.

An organisation's structure has three components (Robbins, 1990, 2009, pp. 4–8, 83–113): complexity, formalisation and centralisation. *Complexity* considers the extent of differentiation within the organisation. This includes the degree of horizontal differentiation, i.e. specialisation or the division of labour (or departmentalisation), and vertical differentiation, i.e. the number of levels in the organisation's hierarchy, the span of control and the extent to which the organisation's units are dispersed geographically. *Formalisation* is the degree to which an organisation relies on rules and procedures to direct the behaviour of its employees. This includes job descriptions and standardisations, the degree of freedom permitted, and the procedures and rules. Organisations have various kinds of regulation that instruct employees as to what they can and cannot do. *Centralisation* considers where the locus of decision-making authority lies. In some organisations, decision-making is highly centralised; in others it is decentralised. Authority is dispersed downwards through the hierarchy, i.e. who collects information, who decides, and what the roles of senior, middle and low management are. Constructing and changing an organisation's structure to achieve the goals of that organisation is what *organisational design* is concerned with (Robbins, 1990, pp. 4–8, 2009, pp. 83–113).*Organisation theory*is the discipline that studies organisational design and structure, and it takes a *macro perspective*. Its unit of analysis is the organisation itself or its primary sub-units. It is concerned not only with employee performance and attitudes, but with the organisation's overall ability to adapt and achieve its goals (Robbins, 1990; Dunn, 2006).

In contrast to organisation theory, *organisational behaviour* takes a *micro view*by emphasising individuals and small groups. It focuses on behaviour in organisations and on a narrow set of employee performance and attitude variables: employee productivity, absenteeism, turnover and job satisfaction. Individual behavioural topics in the organisational behaviour field include perception, values, learning and personality, i.e. *motivation*. Group topics include roles, status, leadership, power and communication, i.e. *conflict*.

This micro-macro distinction creates some overlap – for instance, structural factors have an impact on employee behaviour. In terms of overlap, the topic of conflict in the organisational behaviour field tends to focus on interpersonal and intragroup conflicts that derive from differences in personality and poor communication. Conflict, when studied by organisational theorists, emphasises the problems of coordination between units; and while organisational behaviour is likely to see all conflicts as 'people problems', organisational theory tends to see the same conflict as resulting from flaws in the organisation's design (Robbins, 1990, pp. 4–8, 2009). In other words, the characteristics of the *micro-organisation* are conflict and motivation, while the *macro-organisation* is characterised by complexity, formalisation and centralisation.

Working from the framework provided by organisational theory, the determinants of organisational structure (the strategy and size of the organisation, technology, the environment and the power-control perspective) will influence the organisational structure, which can be in the form of a simple structure, machine bureaucracy, professional bureaucracy, divisional structure and/or adhocracy. This will, in turn, determine the design of the organisation (Robbins, 1990, p. 26).

The implementation and use of a CP has a significant impact on the organising and staffing functions of the hospital. In terms of organising and the organisational structure (i.e. the macro perspective), **a CP can help manage complexity**, given the fact that healthcare is highly fragmented due to its various specialisations. In addition, **a CP can help manage formalisation**, which is the degree to which jobs within the hospital are standardised. In terms of clarifying who is responsible for collecting information and the role of senior, middle and lower management, **a CP can help identify how authority is dispersed downwards through the hierarchy** and to what extent and how authority is decentralised. A CPempowers its caregivers or clinical staff at any level of the hierarchy, gives them decision-making powers where appropriate, and ensures transparency in patient care, accountability and responsibility. From the micro perspective, **a CP can have an impact on conflict and motivation within the healthcare team**.

4.7.1 Impact of CPs on the organising business function

Organising is the deployment of organisational resources to achieve strategic goals. The deployment or resources is reflected in the organisation's (e.g. hospital's) division of labour into specific departments and jobs, formal lines or authority, and mechanisms for coordinating diverse organisational and clinical tasks (Daft & Marcic, 2011, p. 212). Continuous advances in medical sciences and technology have resulted in greater specialisation on the part of professionals, facilities and equipment and in increased fragmentation of the delivery of care. The proliferation of specialities provides advantages for patients; however, it does create problems in administering healthcare institutions such as hospitals because of the need for various organisational structures to coordinate the specialities. It also causes problems for the patients who can no longer go to a single doctor (Dunn, 2006, p. 208–209). The recent trend is for a hospital to find the means to best group the activities and resources and provide patient-centred care.

Given the fact that healthcare has, due to its highly specialised fields and the continuous advances in medical science and technology, become extremely fragmented and thus complex, a **CP can help manage organisational complexity**, i.e. it can help integrate and synchronise departments and specialist jobs (and so aid vertical differentiation), identify authority within the hierarchy and the span of control, and help coordinate the work of dispersed units (within the hospital or in separate units outside it).

A CP would normally identify the degree to which a **job specialisation** or the **division of labour** is broken down and divided into smaller parts. It can also identify which departments are involved in the CP.Hospitals normally comprise several clinical departments, and departmentalisation is a fundamental characteristic of organisational structure – it is the process of grouping many activities into distinct units according to logical arrangements. Departmentalisation creates the building blocks for the formal structure, and relies on specialisation. Organisation subdivides the work into departments or other units in order to prevent confusion. This is the point at which a CP can provide support by helping to align departments according to the needs of the patient group. There are many different ways of departmentalising, including organising by function, product, geography, patient, process, equipment and time. A department can be a distinct unit, division, service, etc. over which a manager has been given authority and for which he/she has accepted responsibility (DuBrin, 2009; Dunn, 2006, p. 207–217).

Job specialisation or division of labour is the degree to which organisational tasks are subdivided into separate or individual jobs. With too much specialisation, employees are isolated and perform a single job only. Too many specialisations create separation and hinder the coordination that is essential for organisations to be effective (Daft & Marcic, 2011, p. 213–214). Taylor (1913), one of the original management researchers and the father of scientific management, laid the groundwork for the concept of **specialisation**, suggesting that if a person performed a single task repeatedly, theywould be able to perform that task faster and to a higher level of quality than other jobs because theywould be exposed repeatedly to the process and have learned from their experiences. Continued **specialisation in healthcare** helps to produce well-defined roles and tasks, concentrated work effort and greater efficiency. A CP can help integrate new specialisations and aid division of labour. In many regards, specialisation is what leads hospitals to structure their organisation around units such as nursing or material management (Langabeer II, 2008, p. 18), which is another way in which a CP can help negotiate complexity. Employees within each department perform only those tasks relevant to their specialised function. The jobs tend to be small, but they can be performed efficiently. Many hospitals have already created healthcare teams around patient groups in order to formulate and implement CPs.

A CP can also help manage formalisation in the sense that it clarifies the procedures, tasks, activities and rules to be followed and adhered to by the CP healthcare team, as well as identifying the degree to which an individual within the healthcare team is independent. In terms of clarifying who collects information and the role of senior, middle and lower management, formalisation refers to the degree to which jobs within the organisation are standardised (Robbins, 1990, p. 93). Hospitals normally rely on standard operating procedures (SOP), which are often reflected in the CP (as already mentioned under Section 4.5), but they do not provide an overview of a patient's treatment. A CP can call for the standardisation of any of the procedures, or can itself become a standard. Given the fact that a CP is a living tool, it may change design over time; it is up to the clinical team to decide whether the CP is a standard or not. A CP can occasionally be supported by a number of standardised clinical protocols, but officially it would be up to the clinical team or senior hospital management to decide whether or not to standardise the CP. Formalisation goes hand-in-hand with any kind of CP model. A CP model will determine the degree of formalisation of the patient type's journey, as discussed below.

Jobs in a hospital are normally considered to be highly formalised, with the incumbent having a minimum amount of discretion over what is to be done, and over when and how it should be done. Employees can be expected to always handle the same input in exactly the same way, resulting in a consistent and uniform output. There are explicit job descriptions and a great number of organisational rules and clearly defined procedures covering work processes. On the other hand, where formalisation is low, employees' behaviour is relatively 'non-programmed'; such jobs offer employees a great deal of freedom to exercise discretion in their work. Standardisation not only eliminates the extent to which employees engage in alternative behaviours, but also removes the need for employees to consider alternatives (Robbins, 1990, p. 93). That said, a CP, although not always a standardised or formal tool in the hospital, can help employees to perceive an alternative that allows them to tackle urgent patient-centred care, and helps to align staff and to coordinate all the fragmented and highly specialised jobs so as to provide the expected healthcare outcomes. Not all hospitals have defined rules, procedures and instructions for the use of CPs, which can be very much left as unwritten regulations – although formalisation can apply to both written and unwritten regulations (Robbins, 1990, p. 94). Given the nature of CPs and their recent penetration into hospitals, a high degree of formalisation may not yet have been reached. Needless to say, jobs within a hospital are highly formalised; nevertheless, it may be the case that the coordination of these jobs is not formalised, resting in many cases on informal relations, which is where CPs can make a contribution. It is worth adding that, in terms of micro organisation, CPs can alleviate conflicts and have a positive effect on the levels of motivation of healthcare staff.

Members of the various professional groups on the CP undertake the assigned duties in cooperation with each other, hence providing patient-centred care. When several people work together to achieve the organisational goals, social ties tend to build; this informal organisation helps to secure the cooperation by which the goals can be achieved in a smooth manner (Mullins, 2002). CP development still relies strongly on informal relations within the hospital (Hindle et al., 2004; Hindle & Yazbeck, 2005). A hospital is considered to have a **formal organisation**with a structure of well-defined jobs, each bearing a measure of authority and responsibility. It is a conscious determination by which people accomplish goals by adhering to the norms laid down by the structure. **Informal organisation**, by contrast, refers to a network of personal and social relationships which originates spontaneously within the formal set-up; through informal organisation, relationships are developed which are built on likes, dislikes, feelings and emotions. Informal organisation is not the result of conscious effort; instead, it emerges from formal organisation and is not based on any rules and regulations. Both formal and informal organisation are required if an organisation is to run efficiently. Formal organisation can work independently, but informal organisation depends fully on formal organisation. Formal and informal organisation help to create an efficient and smooth working organisation (Dunn, 2006; Robbins, 1990).

In terms of clarifying who collects information and the role of senior, middle and lower management, **a CP can help identify how authority is dispersed downwards through the hierarchy** and the extent to which authority is decentralised and how it is decentralised. Centralisation/decentralisation is the most problematic of the three components, the other two being complexity and formalisation, as discussed above. It is defined as the degree to which the formal authority to make discretionary choices is concentrated in an individual, unit or level, thus permitting employees minimum input into their work (Robbins, 1990, p. 114).

The degree or span of control that an individual holds over the full decision-making process can be used as a measure of centralisation (Robbins, 1990, p. 114). The principle of the span of control is the number of employees reporting to a supervisor. A tall organisational structure would normally have a narrow span of control and more hierarchical levels, as is the case with hospitals, while a flat organisational structure would have a wide span of control and few hierarchical levels (Daft & Marcic, 2011, p. 218). The five steps of the full decision-making process are (i) collecting information to pass on to the decision-maker about what can be done; (ii) processing and interpreting that information to present advice to the decision-maker about what should be done; (iii) making the choice as to what is to be done; (iv) authorising elsewhere what is to be done; and (v) executing. Decision-making is most centralised when the decision-maker controls all these steps (Robbins, 1990, p. 114). With a CP, every single member of the healthcare team has an overview of the patients' documents, being a tool that 'merges' doctors', nurses' and everyone else's documentation into a single coherent document. Information is therefore open and available to all team members, interpretations and advice are shared by everyone on the team, choices are taken with the team, and it is clear what needs to be done and by whom. In other words, a CPempowers the CP's caregivers or clinical staff at any level of the hierarchy,gives them decision-making powers where appropriate, and ensures transparency in patient care, accountability and responsibility.

Authority is the right to direct others and to act and give orders, and is one of the ways in which the manager gets the job done (Dunn, 2006, p. 191). Authority can be categorised into various types of organisational authority depending on the attributes: positional (based on position and the legitimacy of the manager's position – impersonal), functional (based on expertise and knowledge – highly personal) and personal (based on an individual's characteristics, with authority coming from the subordinates' needs being consistent with the leader's goals) (Dunn, 2006, pp. 195–196, 204).

It is important here to distinguish between **line** and **staff authority**. Line authority means that people in management positions have formal authority to direct and control immediate subordinates, while staff departments include all those that provide specialist skills in support of line departments, e.g. marketing, research or accounting; staff authority is therefore narrower and includes the right to advise in the staff specialists' area of expertise (Daft & Marcic, 2011, pp. 216–217). In other words, staff have advisory capacities whereas line staff have a direct responsibility to ensure the goals are achieved through their subordinates (Dunn, 2006, p. 258). Staff authority, on the other hand, is based on expertise, not managerial authority (Dunn, 2006, p. 268). For example, the finance department of a hospital would have staff authority to coordinate within line departments regarding the accounting forms to be used to facilitate equipment purchases.

A CP calls for a less hierarchical structure – staff on the team of a particular CP will know when and how to make decisions independently, and when to wait for the superior to call for action. A CP clarifies the line of vertical authority relationships within the hospital from superior to subordinate, which is the **scalar chain** or **chain of command**.**A chain of command** is the unbroken line of authority that links all individuals within the organisation and specifies who reports to whom, and is associated with unity of command and the scalar principle (Dunn, 2006, p. 235; Daft & Marcic, 2011, p. 214).

A CP can also have a significant impact on **unity of command**, which is the delegation of authority flow from a single superior to a single subordinate (Dunn, 2006, pp. 236–237). Unity of command is a critical organisational concept: it enables administration to coordinate activities, pinpoint responsibility and accountability, and define and clarify superior-subordinate relationships. Whenever the principle of unity of command is violated, management must expect complications. Some complications appear as employee frustration because of conflicting directives, and others in staff turnover and poor employee morale (Dunn, 2006, pp. 234–237). A CP can help alleviate conflict situations, as it can clearly identify responsibility and accountability, as well as resolve conflicting directives.

Where a CP is used, authority is to some degree dispersed, and the authority positions at different levels within the healthcare team of the CP are clarified. One can say that both unity of command and the scalar principle enable better communication, combination of resources and coordination within the CP team. This does not mean that authority, as the formal and legitimate right of a manager to make decisions, issue orders and allocate resources to achieve organisationally desired outcomes, is jeopardised; rather, it concerns the transfer of authority and responsibility to positions below the manager in the hierarchy, thus empowering other members of the CP healthcare team.

A centralisation-decentralisation authority continuum exists in all organisations (Dunn, 2006, p. 254). Centralisation and decentralisation pertain to the hierarchical level at which decisions are made. Centralisation means that decision-making authority is located near the top of the organisation, while decentralisation means that that authority is pushed downwards to lower levels of the organisation (Daft & Marcic, 2011, p. 218). With a CP, authority is delegated to the lowest level of supervision, which means that the organisation around a patient group is highly decentralised. A CP calls for a decentralised approach to authority, facilitating rapid responses to new information, providing more detailed input into a decision, instilling motivation, and representing a potential vehicle for training staff to develop good judgement (Robbins, 1990, p. 114). However, subordinates may occasionally be reluctant to shoulder authority and responsibility.

I have discussed the impact of a CP from the macro perspective above. When it comes to the micro perspective, a CP can play a major role in **conflict and motivation**. Conflict is a process in which an effort is purposely made by one person or unit to block another, which frustrates the attainment of the other's goals or the furthering of his/her interests (Robbins, 1990, p. 434). Given its nature, a CP ensures that task dependency is aligned in advance in terms of who does what and when; it can also ensure that there is still some kind of formalisation in a patient's treatment path, that resources are properly allocated, that decision-making is participative, and that the various members of the healthcare team (different healthcare professional groups, i.e.doctors, nurses, pharmacists, physiotherapists, etc.) are aligned with each other. A CP also can provide the basis for discussing dissatisfaction with roles and sorting out communication problems, help achieve the common goal of the particular patient group's healthcare team, reduce the interdependence of the units and clinics involved (in the sense that one does not need to repeatedly explain where treatment of the patient stands and why a certain diagnostic test is needed), increase interaction between all players, and help reduce any kind of manipulation in communication ('power games').

In terms of **motivation**, decentralising decision-making can provide employees with the necessary motivation. Professionals and skilled employees, such as doctors, nurses, physiotherapists, etc., are particularly sensitive to having a say in those decisions that affect how they do their jobs. A CP can help anyone on the team share their views in the decision-making process. In traditional hospitals, it is mainly senior doctors who have the power to make decisions (Degeling et al., 2002; Hindle & Yazbeck, 2005; Hindle et al., 2004; Yazbeck, 2004); a CP can therefore provide the basis for ensuring that every member of the team is part of the decision-making process and hence is motivated to provide the highest quality of care within the resources allocated. A CP identifies the steps for achieving the expected outcomes of patient treatment; it also identifies the dependence that exists between the members of the healthcare team.

The **organisational structure** will provide the basis for **organisational design**. Several organisational designs exist: machine bureaucracy, professional bureaucracy, divisional structure and adhocracy (see Table 14 below). Mechanistic structures are characterised by high complexity, formalisation and centralisation (routine tasks, programmed behaviour, slow response to the unfamiliar), whereas organic structures are relatively flexible and adaptable, with an emphasis on lateral rather than vertical communication, influence based on expertise and knowledge rather than authority of position, loosely defined responsibilities rather than rigid job definitions, and exchange of information rather than on giving directions (Robbins, 1990, p. 211).

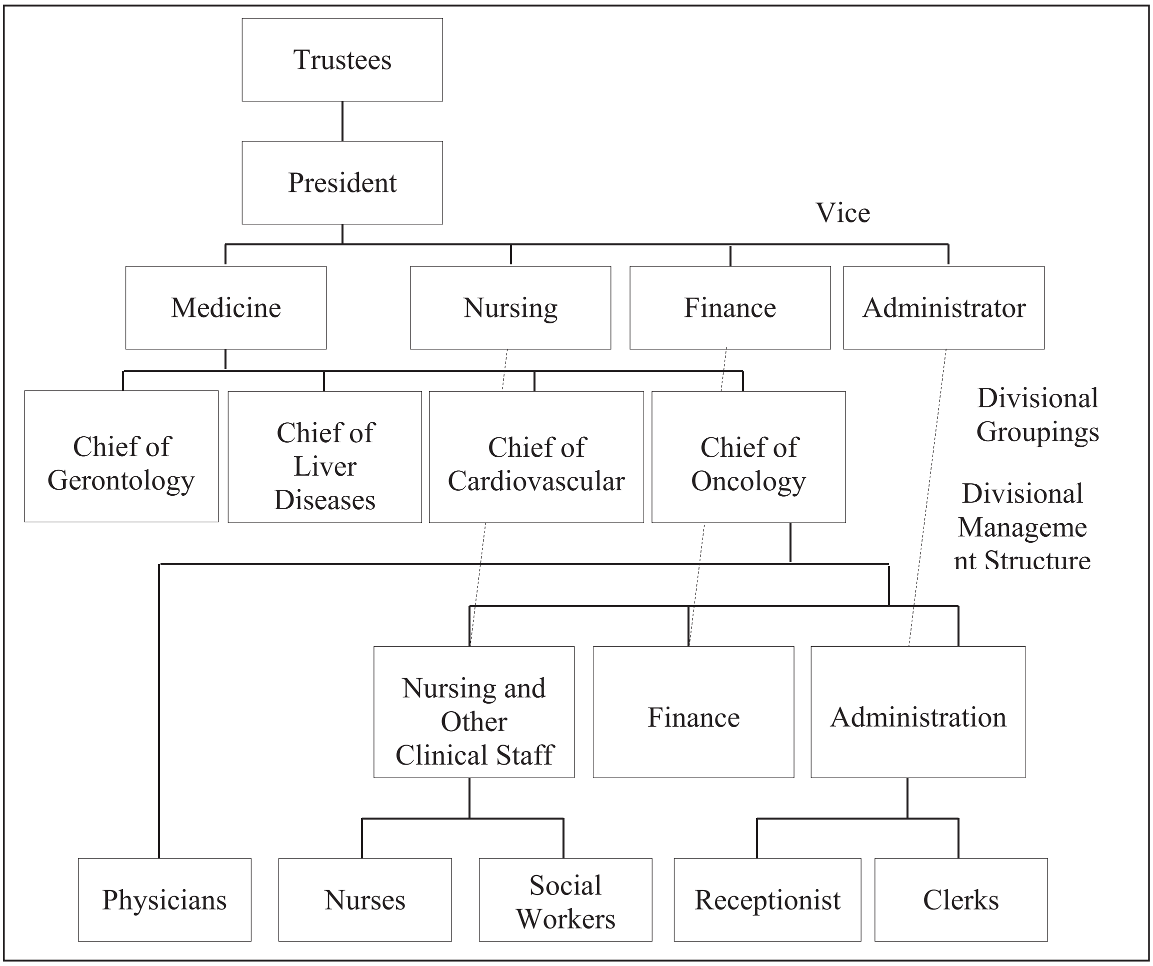
While a **divisional structure** looks a lot like a machine bureaucracy, it has been designed to respond to a strategy that emphasises market or product diversityin cases where the organisation is large, technologies are divisible, and the environment is simple and stable (Figure 11). By contrast, an **adhocracy (matrix)** is looser and more adaptable. Its structure is more horizontal, with decision-making authority being decentralised. People at the lower levels have more responsibility and authority for solving problems (Burns & Stalker, 1961; Courtright, Fairhurst, & Rogers, 1989; Daft & Marcic, 2011; Robbins, 1990, p. 304).

A traditional hospital is considered to have the elements of a **professional bureaucracy** (Figure 12);this is because it rests on routine technology and because the members of an organisation of this type are highly specialised, confronting a complex environment comprising healthcare and patients, where a decentralised bureaucracy is necessary but not present. Hierarchy is very strong and authority highly centralised; we can therefore say that a traditional hospital has elements of a **machine bureaucracy**, which has a rigid, vertical and centralised structure, with decisions taken at the top. The organisation is highly specialised and is characterised by rules, procedures and a clear hierarchy of authority. It is designed to handle large size, a simple and stable environment, and technologies comprising routine and standardised work (Burns & Stalker, 1961; Courtright, Fairhurst, & Rogers, 1989; Daft & Marcic, 2011; Robbins, 1990, p. 304).

Nevertheless, more and more hospitals are moving towards the **adhocracy (matrix)** type of organisation in response to advances in healthcare and to the fact that highly specialised jobs call for the formation of professional teams; it is also due to the fact that CPs are on the rise and gaining a great deal of attention, and that implementation of the team concept has become so important. The matrix approach has dual lines of authority – in other words, it combines aspects of functional and divisional chains of command simultaneously in the same part of the organisation (Daft & Marcic, 2011, p. 224). The matrix structure evolved as a way of improving horizontal coordination and information-sharing (Burns, 1989). The vertical chain of command is a powerful means of control: passing all decisions up the hierarchy takes too long and keeps responsibility at the top.

The **team approach** gives the medical manager (or head of department or case manager) a way of delegating authority, pushing responsibility to lower levels, and acting more flexibly and responsively (Daft & Marcic, 2011, p. 225). In recent decades, medical specialisations have evolved to a high level and staff become more specialised, leading to the fragmentation of care; that care therefore needs to be integrated. Hospitals and other healthcare providers are faced with the imperative to coordinate.

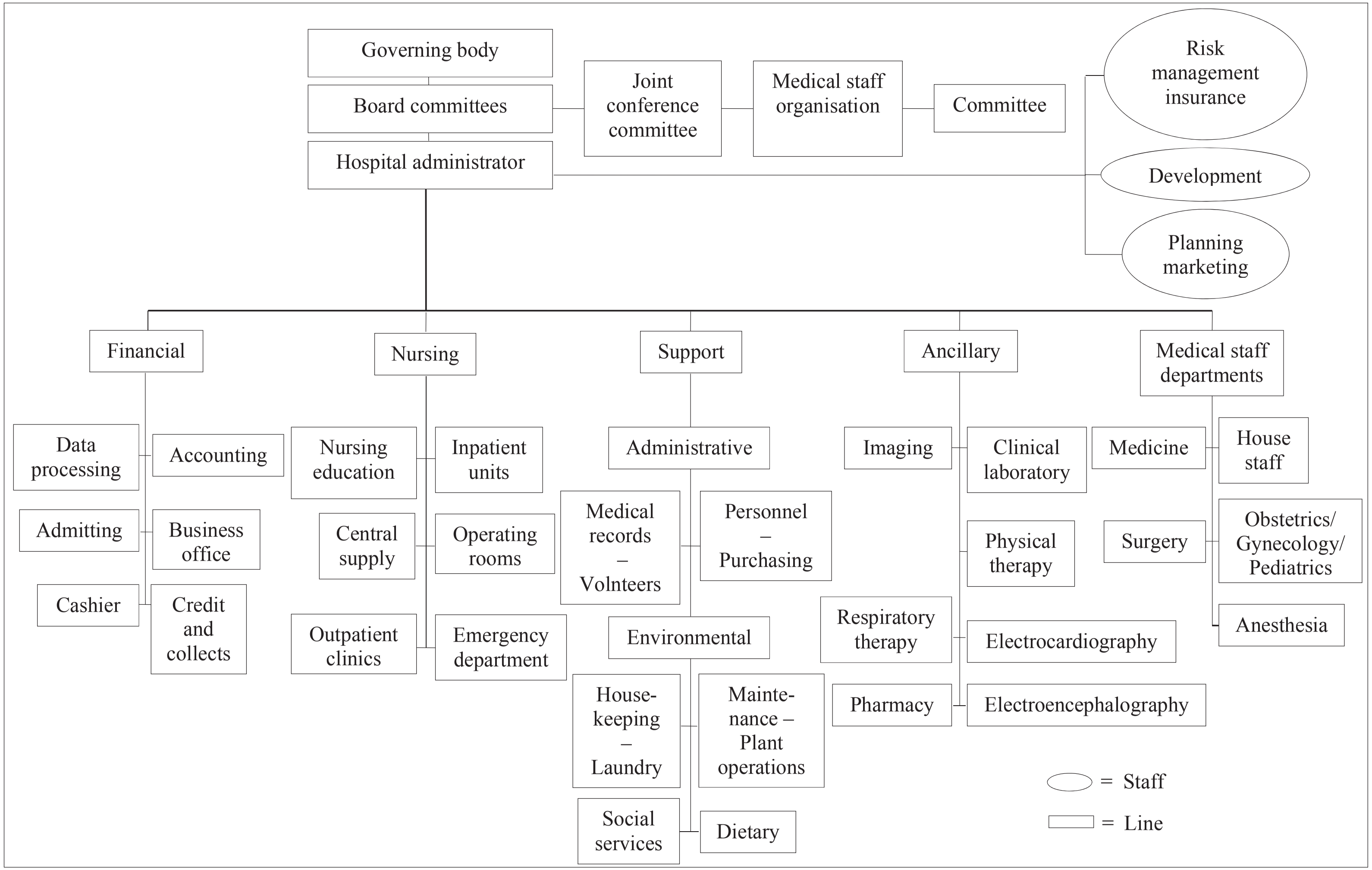
Figure 13: Example of a divisional design



Source: Shortell & Kaluzny, Health care management: organisation, design, and behaviour, 2006, p. 331.

A **cross-functional team** is a type of team consisting of employees from various functional departments who are responsible for meeting as a team and resolving common problems. Team members typically still report to their functional departments, but they also report to the team, one member of which may be designated as the leader. Cross-functional teams are used to provide the required horizontal coordination to complement an existing divisional or functional structure (Daft & Marcic, 2011, p. 226).

Figure 14: Typical hospital organisation chart



Source: Griffin, Hospitals: What They Are and How They Work, 2012, p. 3.

Table 14: Summary of four configurations of organisations

Characteristic	**Machine bureaucracy**	**Professional bureaucracy**	**Divisional structure**	**Adhocracy**
Specialisation	High functional	High social	High functional	High social
Formalisation	High	Low	High within divisions	Low
Centralisation	High	Low	Limited decentralisation	Low
Environment	Simple and stable	Complex and stable	Simple and stable	Complex and dynamic
General structure classification	Mechanistic	Mechanistic	Mechanistic	Organic

Source: Adapted from Robbins, Organisation Theory: Structures, Designs, and Applications, 1990, p. 305

A CP enables cross-functional teams to work fluently and coherently and to go beyond clinical or unit boundaries. A CP can also help with the formation of permanent teams for specific patient groups. The permanent team is a group of employees who are organised in a similar way to a formal department. Coming from several functions, the members of this type of team are permanently assigned to solving ongoing problems of common interest. Authority is pushed down to lower levels, with frontline employees often being given the freedom to make decisions and take actions at their own initiative (Daft & Marcic, 2011, p. 227).

A CP can help with the setting-up of the organisational design or the formal arrangement of jobs within the hospital, but it calls for a matrix structure type of organisation. It can helpdefine the set of formal tasks assigned to individuals and departments within the healthcare team, define the formal reporting relationships, including lines of authority, responsibility for decisions, the number of hierarchical levels, and the span of managers' control, and set up the effective coordination of individuals within the CP healthcare team within or across departments.

In summary, in terms of the organisation functions, a CP helps identify many activities, particularly the outputs. Given the existence of departmentalisation within hospitals, a CP can help link the activities of the departments required within the CP and, by doing so, clarify the line of command and authority; it can also assist in aligning staff to ensure efficiency in the treatment of a patient group (avoiding waste of time, money and effort, and the duplication or omission of any necessary activities) and bring smoothness to the workflow, providing as it does a means of coordination between authority and responsibility. A CP aids interaction between formal and informal organisation, makes it clear to whom an individual within the CP team is accountable and to whom this individual has to report, helps define the job the individual needs to undertake, according to his/her skills and expertise, and hence clarifies the role of every person involved in the treatment of a patient on a CP so that there is no misuse of power and responsibilities are clear.

Specialisation is achieved through division of labour and leads to efficient and effective administration. As we have seen, a CP helps coordinate activities between different departments of the organisation, creates clear-cut relationships between positions, and ensures mutual cooperation between staff. Since a CP helps clarify the powers that each member holds, it automatically helps to increase their level of satisfaction and thereby their sense of security, which is important in terms of overall job satisfaction. A CP is therefore instrumental in allowing staff to play their respective roles and undertake the activities to which they have been assigned, thereby allowing them to achieve independence in their work. It could be said that a CP has two components: decentralisation and routine. In other words, decision-making goes to the appropriate level, empowering healthcare staff or caregivers and providing them with an acceptable range of variances. A CP is about routine in the sense that activities and processes are undertaken by different professionals at a specific time, because these activities and processes are identified as most efficient relative to the alternatives.

4.7.2 Impact of different CP models on the organising business function

Any CP model will have an impact, to varying degrees, on the organisation function of a hospital in relation to complexity, formalisation, authority, conflict and motivation. If we look through the lens of the organisation function, a chain CP (the most common model) helps manage the complexity of fragmented and complex services, integrates and synchronises departments and specialised jobs, identifies authority and the scope of control, and assists in the coordination of different professional groups or members of the team for a specific patient group within the department. It appears that the outputs (services) identified on the CP can, to great extent, satisfy the organisation function; this is indeed interesting when we consider that this is not the case for the financing, operations and purchasing functions.

The clinical teams who design the CPs normally concentrate on identifying clinically specific decisions for the care of a specific patient group; hence, unlike the operating function, the organisation function is interested in organising these clinically specific decisions, which are normally identified as inputs on the CP, as well as the time needed to provide a service. A CP can help **manage complexand fragmented services**.A chain CP model is able to coordinate its activities in a smooth manner, as the care of the specific patient group is highly predictable and the sequence of timing is mostly based on days. Similarly, a hub model would also play an important role, helping to integrate and synchronisethe need for service, not only within a specific department but also beyond its boundaries, perhaps in a different hospital, as some of the sub-processes may be less predictable and would be subject to management by a key person; as for the team charged with operating a web CP, *ad hoc* synchronisation and coordination would normally be needed on a more frequent basis, according to the complexity of the patient, and would depend less on the time and more on the goals of care provision. This is where a CP model of this type may have to overcome hurdles, with team members being required to put more effort into achieving coordination between departments or even external units. In the chain and hub CP models, authority and scope of control are transparent; this may not be the case with the web CP model, potentially leading to frustration on the part of the members of the team(s), as we will see below.

Of the four CP models examined, CP Model 4 is the one that most precisely provides information on how to coordinate highly specialised professional groups and activities, as they are presented in a sequential manner and within a specific timeframe. What is interesting with this CP model is that it transparently identifies all the steps or rather outputs (and sometimes even a number of inputs); moreover, it 'flattens' the hierarchical approach to providing care to the patient. Because of the layout of the CP and the number of inputs, every single member of the team knows what their role is and when they are supposed to take over. Since these activities, which include many small and highly specialised jobs, are explicitly 'spelled out', it is clear who does what and when, and who is responsible and accountable for each activity. CP Models 1 and 3 do not specify to whom a task is designated (whether doctor, nurse or someone else), and presents a combination of consultations and very specific activities; however, it does use a flowchart to link the many specialised tasks or outputs required for the treatment of a specific patient group in order to provide comprehensive, clinically meaningful and sequential steps in patient care.

By contrast, while CP Model 2 relies on a flowchart, it does not identify in depth all the highly specialised tasks that need to be coordinated and synchronised. Similarly to CP Models 1 and 3, the design of Model 2 could be considered as providing only a general method of synchronising and coordinating the activities of various departments, which may or may not be identified on the CP and which may be regarded as self-evident by healthcare staff who have been employed in the hospital for some time (but perhaps less evident for a replacement or a new member of the team).

In terms of **formalisation**, a chain CP model may be straightforward in clarifying the procedures, tasks and rules to follow, and in expanding independent decision-making. A chain CP helps standardise jobs within the department in which the CP takes place in order to provide a consistent and uniform output – albeit one that leaves space for variation and professional judgement. On a CP of this type, the formalisation of jobs and activities can help communication and alleviate confusion and conflict. Formalisation would be most pronounced in a chain CP, where the care processes are highly predictable and there is a high level of agreement between the members of the CP team. In a hub CP, chain models may be used for highly predictable sub-processes (these are indeed those that can be easily formalised), whereas the degree of formalisation is rather low in a web model. As with the hub model, chain models can be used for predictable sub-processes. We can conclude that the higher the level of agreement between all members of the CP team and the higher the level of predictability, the greater the likelihood of the CP being formalised.

Unlike CP Model 4, where members of the team are expected to handle activities in the same manner in order to provide consistent and expected outcomes, the other three CP models are not as formalised in this sense, providing a rather more flexible basis for the members of the CP teams; consequently, their jobs may be less programmed and they may exercise a good deal of discretion in their work. This may motivate staff to look for alternatives. By contrast, given its design and structure, CP Model 4 calls for standardisation in the provision of care to a specific patient group, whereby it formalises care provision in writing. This is to say, the other three CP models may also have a number of unwritten rules and procedures for the provision of care to a specific patient group, and may also rest on informal relations within the organisation.

We can conclude that although standard operating procedures, protocols, etc. exist in a hospital, there is no formal way of linking all these activities in the structured manner of a CP; in other words, the CP is the only way of formally linking all these activities. A CP, especially CP Model 4 and the chain model, call for formalisation of the integration, coordination and synchronisation of all the fragmented activities provided at different times by highly specialised healthcare staff members on the care journey taken by a specific patient group; this is also because these two types of model may also be able to transform informal into formal organisation of care provision, with transparency in terms of responsibilities and authority.

Authority on a CP is dispersed downwards through the hierarchy, and is most decentralised in the chain CP and, more specifically, in CP Model 4. The members of the team will already have thoroughly discussedwhat information is to be passed on in terms of what can be done, what should be done, what is intended to be done, and where to turn for authorisation in case a problem (deviation) occurs; this discussion is most likely to have occurred during the design stage of these two types of CP model. Instead of having authority centralised, as is the case with hub CPs (and to an even greater extent with web CPs), it is spread among the members of the CP healthcare team. There is no need to give orders, as the activities have been consolidated and identified within the team and are transparent on the CP. Authority is then shifted from being positional (the doctor’s only) to functional, i.e. based on the expertise and knowledge of every professional involved, be it nurse, technician or doctor, as every single member of the CP team, being a highly specialised professional, is an equal and important partner. Authority is also shifted to the personal, i.e. the individual’s goals and characteristics matches the leader's goal (the goal of the hospital), which is to achieve the expected healthcare outcomes for patients on that specific CP.

Line authority is diminished and staff authority increases on the CP because of the expertise of the highly specialised staff involved. As there is no need to report directly to the line authority, the chain of command on a CP becomes rather weak; however, this saves time and ensures that the unity of command is not jeopardised. Within a CP healthcare team for a specific patient group, the superior can be a case manager, case coordinator, head of department or doctor, depending on the laws and procedures of specific countries; this is the healthcare professional responsible, in the final analysis, for the patient (the doctor in charge is most commonly the leader of the clinical team).

CP Model 4 requires that those in charge of each activity enter their initials in the CP; the CP also clearly indicates which member of the professional group is in charge of what. In these two types of model, responses and decisions are rapid; staff may therefore be far more motivated by being directly involved in decision-making and be empowered to do so. Unlike the treatment of patients off the CP, which may be the case with patients on a web CP, the nursing staff would be responsible for carrying out the treatment plan developed by the doctor in charge, who in turn would be responsible for diagnosing the patient accurately and prescribing the most cost-effective treatment plan within the scope of the latest clinical guidelines.

The hub CP model also calls for a less hierarchical composition, especially in those segments where the CP is based on the chain model, i.e. where the level of agreement and level of predictability are high enough. However, when things become less predictable – within an internal medicine department, for example, where a patient may not respond to a certain treatment but might need to be transferred to another facility and to the care of another CP team – the line of authority may not be as straightforward as it is in the chain model. This is a model that typically calls for a case manager or key person to be in charge, ensure that the care is properly coordinated and lead the care processes. The chain of command may become questionable and the unity of command may no longer flow from one single superior, potentially causing complications. This type of CP model calls for a great amount of personal effort on the part of those involved in the care of a specific patient group, thus relying more heavily on informal than formal relations. Authority is decentralised in those processes based on the chain model, but may become centralised when the care needs to be conducted in a different healthcare setting.

The web CP model presents a number of problems with regard to authority. It can be centralised and decentralised, and this most likely depends on the level of informal organisation. Authority is therefore subject to alternation between line and staff, unlike authority in the chain model where it rests mainly on staff. The unity of command within the web CP can easily be broken or very weak, depending on the complexity of the patient, while the chain of command and centralisation of authority may be very hierarchical and dependent on informal organisation. The likelihood of conflicting directives may be high because of the complexity and unpredictability of the patient.

In comparison with CP Model 4, Models 1, 2 and 3 are designed in such a way that they say little about authority, chain of command, unity of command, centralisation and decentralisation; this is because they do not provide enough detail on who is responsible or accountable for what. CP Models 1 and 3 are represented on a flowchart diagram that is a little more sophisticated than that provided for CP Model 2, which employs a simple diagram. These three models are rather general in their design and do not provide precise information on the delegation of authority. This is an issue that would have to be addressed by any CP team that planned to adopt the CP and adapt it to its local environment.

As noted above, **conflicts and lack of motivation** will arise when the alignment of tasks is not clearly defined, as in the chain CP model or CP Model 4, for example. It is likely that the members of a chain CP (CP Model 4) team will be highly motivated and subject to almost no conflict in the provision of care; a higher level of conflict would be expected in the web CP model and perhaps a little less conflict in the hub CP model. As we have seen, the web CP model may be very difficult to formalise, and would therefore rely heavily on informal organisation. That said, any kind of CP model could help (retrospectively) to identify key conflicts and provide bases for communication and for solutions to improve the coordination and integration of highly specialised staff members. However, in this type of CP model, motivation may remain low, due to the fact that it is particularly difficult, when patients come in with severe co-morbidities, to decentralise decision-making down to lower levels of the hierarchy within the department, the hospital or in a different healthcare setting.

Analysing CP Models 1, 2 and 3 through the lenses of conflict and motivation, it is difficult to say to what degree conflict is present, or to define the level of motivation. The models do not provide sufficient detail to allow us to see how decision-making is decentralised, or how and for what reason a certain effort is purposely made by one person or department to block another, given the vagueness or general nature of these CPs.

Finally, in terms of **organisational design**, and as illustrated in Table 15, some CP models are preferable to others under certain conditions. A chain CP calls for a divisional structure of organisation, a hub CP for a combination of a divisional structure and adhocracy, and a web CP for adhocracy.

Table 15: CP models and organisational design

	CP Models						
Characteristics	**Chain**	**Hub**	**Web**	**1**	**2**	**3**	**4**
Influence on specialisation	High	High	High	High	Not clear	High	High
Influence on formalisation	High	Medium	Low	Not clear	Not clear	Not clear	High
Influence on centralisation	Low	Medium	High	Not clear	Not clear	Not clear	Low
Environment where CP is placed	Stable, less complex	Stable, medium complexity	Highly unstable, very complex	Stable, medium complexity	Stable, less complex	Stable, medium complexity	Stable, less complex
General structure classification	Mechanistic	Combination of mechanistic and organic structures	Organic	Combination of mechanistic and organic structures	Mechanistic	Combination of mechanistic and organic structures	Mechanistic

5 CP IMPACT ON BUSINESS PROCESSES IN ORGANISATIONS

The aim of this section is to present the theoretical foundations that will allow a further exploration of CPs and their implementation, use and impact on business processes within hospitals. I start by describing the development of the concept of business processes in general, continue with a definition of the concept of business processes, describe the process types and business process modelling, and finally discuss the business processes of healthcare service providers.

The last few years have seen the arrival, from the private sector, of new management thinking in healthcare: total quality management (TQM) in the 1980s, the business process reengineering (BPR) introduced by Hammer and Champy in 1993 and by McNulty and Ferlie in 2004, 'soft systems methodology plus' from a team in Australia (Braithwaite, Hindle, Iedema, & Westbrook) in 2002, and 'lean thinking' in 2008 by Papadopolous and Merali, who were probably the first to introduce the concept of lean thinking in Europe. In the United States, Berwick et al. (1989, 1996) have generated literature on evidence-based system improvements. Another concept to take into consideration is the concept of business process orientation (BPO) developed by McCormack and Johnson (2001).

All stress the lateral redesign of work processes to minimise delays for the patient by focusing on continuous improvement in order to generate incremental improvements.

5.1 Development of the concept of business processes in organisations

In the modern literature of the management and organisational sciences, as well as other closely related sciences, there is a belief that businesses and other organisations can exploit their core competencies and create competitive advantages by actively modifying, adapting and implementing appropriate improvements in their processes. In modern times, organisations are usually described as a set of business processes that can be analysed and improved in order to achieve higher performance (Melão and Pidd, 2000).

An important role in achieving greater efficiency and effectiveness of improvements in the implementation process has been attributed to Frederick W. Taylor, considered the father of operations research, who published the *Principles of Scientific Management* in 1911. This book contributed to the development of systems theory and other scientific contributions by contemporary scholars. It became clear that maximising the effectiveness of the departments and functions within an organisation can occur at the expense of the efficiency and effectiveness of the organisation as a whole. These are also the concepts that are advanced by systems theory, which deals with the organisation as a complex system and has been defined as an approach to problem-solving by viewing problems as parts of an overall system rather than by reacting to specific parts, outcomes or events. In other words, the components of the system or organisation can best be understood as having supporting relationships with each other and with other systems rather than existing in isolation. Put simply, leading organisations have come to realise in recent years that they cannot achieve the results they want by modifying specific processes in isolation from one another. Contemporary management theorists, who have formalised the idea of the value chain that cuts across the departmental or functional boundaries of an enterprise or organisation, have made significant contributions to the development of the process concept and to an understanding of the organisation (Harmon, 2007).

In his arguments regarding competitive advantage and the concept of the value chain, Porter (1985) establishes the baseline for an integrated or comprehensive approach in terms of identifying, analysing and managing business processes. He defines the value chain as a sequence of activities undertaken by the company or organisation when carrying out manufacturing activities and delivering products or services to end-customers or users. The key to a successful organisation is that it carries out only those activities that contribute to the creation of value.

The value chain of each company, which can also be called the internal value chain, is based on the creation of greater value for final products or services and increased customer satisfaction. What is therefore important to Porter's concept is that every function involved in the production of the product, and all the support services, from information technology to accounting, should be included in a single value chain. It is only by including all the activities involved in producing the product that a company is in a position to determine exactly what the product is costing and what margin the firm achieves when it sells the product.

The internal value chain presents the potentials of the organisation for achieving a competitive advantage. The key to understanding Porter's concept of the value chain is that there are different business functions involved in the process of creating value for end-users, and the appropriate support business functions or activities are interdependent components of a particular value chain. This definition of the value chain, as advanced by Harmon (2007), is also called the large-scale process, thus cutting across the boundaries between the individual business functions, departments or units of an organisation.

Similarly, Rummler and Brache (1990) point out that many problems in implementing processes occur at the transition between different departments of the organisation, as these departments focus on their own activities (with their own standards and procedures) in their own way without paying much regard to the overall process. This is often referred to as 'silo thinking'. They argue that the only way to overcome these interdepartmental problems is to conceptualise and manage processes as a whole. The Rummler-Brache methodology for the establishment of business process organisation, classification analysis andthe improvement of management processes has had a significant impact on the development of different approaches, methods and techniques under the heading 'improving performance', which aims at achieving improvements in business processes and providing higher quality (e.g. Six Sigma and TQM) (Harmon, 2007).

Despite the important contributions made by these authors, the major turnaround began with the study of business process reengineering (BPR). With the contributions of authors such as Davenport and Short (1990) and Hammer (1990), new concepts and methodologies were established and expanded by theorists such as Porter, Rummler and Brache (Harmon, 2007). Davenport and Short (1990), Hammer (1990), Davenport (1993) and Hammer and Champy (1993) have advocated a departure from the classic functional and hierarchical or excessively departmentalistic organisation and development of process-oriented organisations as a means of achieving significant increases in efficiency and effectiveness.

BPR was more than an emphasis on redesigning large-scale business process, and the driving force behind the BPR movement was Davenport (1993). He argued that information technology had made large strides in the 1980s and was now capable of creating major improvements in business processes (Harmon, 2007, p. 10). Hammer (1990) advocates a similar view and argues that it is necessary to replace existing processes with newones. He adds that while an organisation needs to take maximum advantage of information technology when redesigning processes, it also needs to ensure that these processes are properly integrated. This is due to the fact that the specialisation of work and the approach of earlier theories on the science of management led to greater efficiency on the part of individual departments and functions in the organisation, where the maximum efficiency of individual departments was also achieved at the expense of the efficiency and effectiveness of the organisation as a whole.

More recent literature claims that practical experiences with BPR no longer acknowledge the key role of achieving greater efficiency of the organisation on the basis of radical changes in the operations of the organisation and its business processes. It could be argued that the authors who supported this movement have acknowledged there has been a revision of the BPR concept; for example, instead of using radical changes as the key words for BPR, Hammer (1996) highlights the term 'process' and the concept of process orientation as the key elements of BPR, and failures in the radical redesign of business processes in practice have led to the concept becoming unpopular. In line with the belief that major changes as well as gradual improvements in processes are important for achieving greater efficiency in organisation, the terms 'business process reengineering', 'process improvement', 'process innovation' and 'business process redesign' are frequently used interchangeably to refer to the phenomenon of 'business process change' (Kettinger and Grover, 1995; p. 11).

By reviewing the contributions of contemporary theorists engaged in the study of business processes, we find that they originate from different fields of science, and thus also differ in their purposes and key messages. Harmon (2007, pp. 17–18) traces three groups or traditions through the literature and practice:

- Contributions of authors who deal with operations research and quality control, with a focus on process improvement (e.g. TQM, Six Sigma and Lean Six Sigma);
- Contributions in the field of management, with a focus on organisation performance;
- Contributions in the field of information technology, with a focus on process automation (e.g. systems of operations management and comprehensive software solutions).

The approaches, methods and techniques for achieving operation processes are presented in the first group; in the second group, the emphasis is on the coordination of key business processes with the strategic goals, with the purpose of achieving a competitive advantage and greater performance on the part of the organisation; in the third group, the emphasis is on process automation and support in implementation.

Smith and Fingar (2003) state that since these fields are interrelated and other experts from different fields take part in change management processes, a number of advantages arise from the integration of different approaches, methodologies and technologies. Today, we use the term 'business process management', which links existing and new methods in this field and presents a comprehensive approach to process change. Consequently, as Harmon (2007, p. 17) puts it, the term 'business process management' was coined to suggest the emergence of a more synthetic, comprehensive approach to process change that combined the best of process management, redesign, process improvement and process automation.

5.2 Defining the concept of the business process

The scientific and technical literature in the field of business processes often cites two definitions of a business process. Davenport (1993, p. 5) defines the process as a structured, measurable set of activities whose ultimate goal is the production output of a particular customer or particular market. In a similar manner, Hammer and Champy (1993, p. 45) define the process as a set of activities based on one or more types of input to create an output of a specific value for the customer. Lindsay et al. (2003) present and build on the definition of a business process as it results from the primary definitions of business processes, while Smith et al. (2002, p. 4) define the business process as a comprehensive and coordinated relationship between all periodic and parallel activities that are necessary for the company to provide a certain value to its customers. Smith et al. (2002, p. 4) highlight that business processes are large and complex, and contain a flow of information and materials; they are dynamic and respond to customer needs and to changing market conditions, exceed the limits of the divisions within the company, are ongoing, are at least partly automated, depend on the skill and judgement of people, and are hard to see, since they often run without documentation and are embedded in the subconscious and the history of the organisation.

Havey (2005) provides a simpler definition and states that business processes are a set of rules for resolving a certain business problem. A more formal entity, the Workflow Management Coalition (1999), defines the business process as a process or activity (or rather, a set of procedures or activities) which, within an organisation with a specific organisational structure in which functional roles and relationships are defined, makes a joint contribution to the achievement of business and other objectives. Kovačič, Jaklič, Indihar Štemberger and Groznik (2004) define the business process as a component of logically interrelated activities that create value by transforming a set of inputs into a specific network of outputs – products, services, documents or arrangements – in combination with people, methods and tools.

Despite the fact that it is possible to find many definitions of the concept of the business process in the literature, Lindsay et al. (2003) warn that the existing definitions are too detailed, highlighting the business component only to a limited extent, and that business processes do not sufficiently separate and characterise the production process. Similarly, Melão and Pidd (2000) emphasise the fact that different authors have different views on business processes. They demonstrate that business processes can be understood as:

- Deterministic machines;
- Complex dynamic systems;
- Interacting feedback loops; or
- Social constructs.

Most of the definitions of processes described above are consistent with the first view of processes as deterministic processes. A **deterministic process** is appropriate for the structured processes characteristic of a manufacturing organisation operating in a stable environment, or for administrative and bureaucratic processes related to the flow of documents within specific services. *Deterministic* or *mechanistic* views treat business processes as a static set of clearly defined activities or tasks in which inputs are transformed into outputs in order to achieve clearly defined objectives. The deterministic view implies, in a similar way to scientific management, that people within the process are involved in the same way as machines (Melão and Pidd, 2000, p. 114).

What is fundamental to the deterministic or mechanistic view is the structure of processes, while processes such as **complex dynamic systems** mainly highlight the connections and interactions between sub-systems of processes (internal processes), interactions between processes and the environment (external relations), and the dynamic behaviour of processes. In contrast to the deterministic or mechanistic view, this view is consistent with the view taken by systems theory, which emphasises the importance of cooperation with the external environment and presents a holistic approach towards addressing business processes. The deterministic view presupposes the observation of the behaviour of the whole process rather than the behaviour of individuals isolated from the components of the whole process (Melão and Pidd, 2000, p. 116).

The definition of business processes as an **interacting feedback loop** is comparable to the definition of processes as complex dynamic systems. In this case as well, it is understood as a process of flows of certain resources from outside its boundaries, through a sequence of stocks (levels) representing accumulations (e.g. materials) or transformations (e.g. raw material to finished product). The key difference between these two views is that the former is treated as a complex dynamic open loop system, while the latter, business processes, as interacting feedback loops are treated as closed-loop systems (Melão and Pidd, 2000, p. 118). Flows of resources depend on certain rules, decisions or policies regarding the actions to be undertaken to achieve the goal or desired outcome. However, since these policies depend on information, the system also responds in accordance with the feedback received. This means that the system is not independent of the historical conditions of the system (Pidd, 1996).

The last of the four views on business processes above presents business processes as social constructs. In turn, understanding business processes as social constructs highlights the fact that business processes involve people with different values and expectations, and hence different individual goals and motivations. This view highlights the subjective and human aspect of processes. The existence of different views on the actual and necessary course of processes that are often contradictory emphasises the importance of negotiation and consensus-building when modifying processes.

Understanding business processes as social constructs is particularly suitable for less tangible processes in which implementation activities are strongly linked to the involvement of human activity processes, e.g. in health, social and education services. In such cases, the process modelling tool allows different opinions to be interpreted, and encourages debate on the current and desired course of processes; the disadvantage of this approach is that the goal of achieving consensus often disables the need for major changes to processes (Melão and Pidd, 2000, pp. 120–121).

5.3 Process types

There is no clear distinction in the terminology and definitions used by different authors between the terms 'business process' and 'process'; for this reason, a range of different terms, idioms and expressions – 'value chain', 'core process', 'large-scale business process', 'work process', 'workflow', 'key process', 'supporting process' and 'process management' – can be found. It is important to note that different authors make different distinctions between process types. Processes are categorised as certain types depending on whether they deal with internal business processes (processes that run within a particular organisation) or the business processes that connect the organisation; in turn, they can be classified according to the type of structure and decomposition, or to their contribution towards creating additional value.

Regarding internal business processes, Kettinger and Grover (1995) distinguish between *intra-functional business processes*, which occur within a particular business function or department, and business processes that run beyond a particular business function or unit (*cross-functional business processes*); they then further distinguish between internal business processes and inter-organisational business processes. This distinction accords with Porter's (1985) definition of the internal value chain and value system, or the external value chain that connects a particular organisation with suppliers and customers.

When defining types of process from the point of view of the structure and decomposition of processes, one can proceed from the distinction between the processes presented by zur Mühlen (2004) and Harmon (2007). Zur Mühlen (2004, p. 38) more discreetly defines the process as a comprehensive and logical time sequence of those activities that need to be carried out when dealing with a specific object in the process (e.g. material or information). The same author defines the workflow as a special way of illustrating the process that is structured in a manner that enables a more formal coordination between activities, software solutions and actors within the process, with the help of an information system known as the workflow management system. He adds that the business function is a special type of process – business processes are defined at the strategic level, are therefore called high-level processes and are defined alongside the strategic goals of the organisation. Business processes build those activities that connect the organisation with the environment and partners on the market (customers, purchasers, suppliers and other stakeholders).

Similarly, Harmon (2007) broadly defines the process as a set of activities that begins with a certain specific event in the organisation and with which the information, materials and other inputs are transformed into a specific output or final product. Large-scale business processes are those processes from which the output is designated to the customer or end-users, whereas the results of the remaining processes are inputs for the other processes within the enterprise. Harmon (2007) uses Porter's concept of the value chain for processes at the highest level in the enterprise, for which he also uses the term 'large-scale process'. Harmon (2007, p. 81) breaks this value chain or large-scale process down into individual business processes (hierarchical decomposition) representing the major operational processes in an enterprise; the business processes are then further split into the processes comprising a specific set of sub-processes. Finally, according to Harmon (2007), the process that can be observed at the lowest level is called an *activity*.

At all the levels of decomposed processes, be it the level of business processes or the level of processes, sub-processes and activities, one can observe the role of processes in creating value. If we proceed from the role in creating value played by an individual business process and that of an individual step (or task or procedure, terms which are loosely used to describe the sub-elements of an activity) of a business process (e.g. processes, sub-processes and activities), we can distinguish between processes and activities which directly add or create value, hence the term 'value-adding activities', and those that facilitate the adding of value, which are often called 'value-enabling activities' (Harmon, 2007). Porter (1985) differentiates between *primary processes* or *activities*, and *support processes* or *activities*. These, in turn, comprise the internal value chain of a particular organisation, and are derived from the role of activities when creating value, where the core activities directly contribute toward the creation of value (the creation of the product or service for the end-user), with the support activities complementing the core activities.

Harmon (2007) further breaks down support activities into support processes or enabling processes that directly support the implementation of the core processes, and the more generic support processes such as planning, organisation, communication, monitoring and control activities within an organisation. The first group comprises the process of ordering and purchasing materials, and the second group comprises support processes which Harmon (2007) calls the *managerial process*. Ould (1995) also uses the same terms to describe the support processes and the set of supporting processes as the managerial process. In terms of creating value in the core, support and managerial processes, Ould (1995) and Harmon (2007) share the same view of processes at all levels, i.e. businesses processes, processes, sub-processes and activities.

5.4 Business process modelling

To model business processes is to provide an illustration of business processes and the course they take. It is necessary, therefore, to highlight those aspects of business processes that we would like to illustrate in a clear and comprehensible way to the participants, and any possible problems for which appropriate solutions need to be found (Vergidis Turner, & Tiwari , 2008). There are other similar explanations provided in the literature. Lindsay et al. (2003), for instance, define business process modelling as a snapshot of real business processes at a given point in time. Völkner and Wernes (2000) state that the modelling of business processes is key to analysing, evaluating and improving business processes; the business modelling process is used to structure business processes in such a way that the existing and possible alternative sequence of activities can be comprehensively and systematically analysed. Guha et al. (1993) argue that business process modelling is a tool with which we can capture, structure and formalise knowledge of business processes.

There are a great many business process modelling techniques available; the most common examples include flowcharts, information flow diagrams, IDEF (integration definition) diagrams, extended Event Driven Process Chain diagrams, Petri nets, role activity diagrams, UML (Unified Modelling Language), systemic dynamics and simulations of discreet events (Kovačič in Bosilj Vukšić, 2005, pp. 186–207; Eatock et al., 2000; Vergidis et al., 2008). In 2004, with the aim of standardising or unifying business modelling techniques, the Business Process Management Initiative (BPMI) brought together the producers of business process modelling tools. This is how the graphical representation of business processes, called Business Process Modelling Notation (BPMN), began to take shape. The BPMI developed the BPMN, which has been maintained by the Object Management group since the merger of the two organisations in 2005.

As far as business process modelling is concerned, the view of a business process as a deterministic machine corresponds to the body of work underlying much of the hard and static approaches to business processes. In this, the stress is on mapping and documenting the flow of items, the activities, their logical dependence and the resources needed. Many techniques from operations management, operational research and information systems have been repackaged into a business process modelling context in recent years. Frequently used techniques include process flow-charting and its extensions, DEF diagrams and role activity diagrams (Melão and Pidd, 2000, pp. 113–114).

It is useful to use Petri nets or discrete event business process simulation for the modelling of processes that are complex dynamic systems. With discrete event simulation we can observe changes (or rather, the responses of the system in which the activities take place within a specific chronological order) to specific discrete events (Melão and Pidd, 2000, p. 116). However, specific discrete events are not appropriate when defining the business process as an interacting feedback loop of a discrete event simulation, where the state of the system changes the events that take place at a particular point in time. The system dynamics methodology was put into effect to model this type of process– that is to say, within the field of business process modelling, the view of a business process as interacting feedback loops is supported by system dynamics theorists.

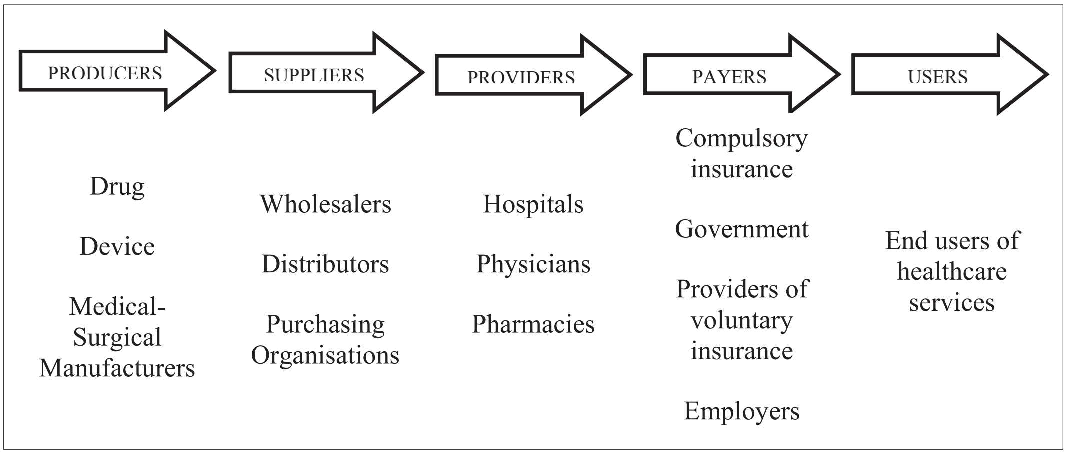
While a discrete event simulation is concerned with the modelling of discrete state changes and individual entities, a system dynamics model of a business process operates at a more aggregated level of abstraction, with flow rates being modelled as continuous variables (Melão and Pidd, 2000, p. 118). The modelling of business processes as social constructs allows for the interpretation of different views, and encourages discussions on the existing and desired course of processes. This view of business processes as social constructs is closely linked to a soft strand of thinking about business process modelling. Unlike the previous viewpoints, soft models are sense-making interpretive devices developed to generate debate on and knowledge of how the process is being and should be carried out. The technical view is not entirely ignored, and the application of soft systems methodology (SSM) is therefore suggested. SSM is used to represent a business process as a would-be purposeful human activity system consisting of a set of logically interconnected activities through which actors convert inputs into some outputs for customers (Melão and Pidd, 2000, p. 120–121). In their paper, Braithwaite et al. (2002) state that wherever one looks in the healthcare system, one finds complex and unresolved issues, most of them deep-seated and systemic; they argue that SSM is a staged approach for healthcare by which sustainable solutions to difficult problems may be developed and enacted.

5.5 Business processes of healthcare service providers

Business processes in healthcare can be defined and observed at different levels by taking into account Kettinger and Grover's (1995) description of internal and inter-organisational business processes, along with Porter's (1985) distinction between internal value chains and external value chains (or value systems). In terms of business processes, if we take into account the relations between a healthcare service provider and its suppliers, payers and end-users, we can then also use Porter's logic of the value system or external value system in healthcare (Porter, 1985).

In this dissertation, this type of value chain is called the 'value chain of the healthcare system' and represents the entire process of transformation of inputs into output intended for consumption by the end-user. The intention or purpose of each of the steps in this chain is to increase value – or rather, to create value additional to the value of the origin of the inputs. The steps in the value chain of the healthcare system are illustrated in Figure 13, which figure adapts Burns's (2002, p. 4) Health Care Value Chain so as to bring it as close as possible to the elements of the Slovenian healthcare system. Some of the steps have been changed: the chain begins with the producers of medicinal products and equipment and the manufacturers of medical-surgical devices and materials (step one). Step two is covered by the purchasers, who are represented by the group purchasing organisation, the wholesalers and dealers, and step three is covered by the providers of primary, secondary and tertiary healthcare services, and by pharmacies. The fourth step encompasses the payers, who include the state, employers, individuals, insurers, etc., and the final step is covered by the users of healthcare services.

Figure 15: Value chain of the healthcare system



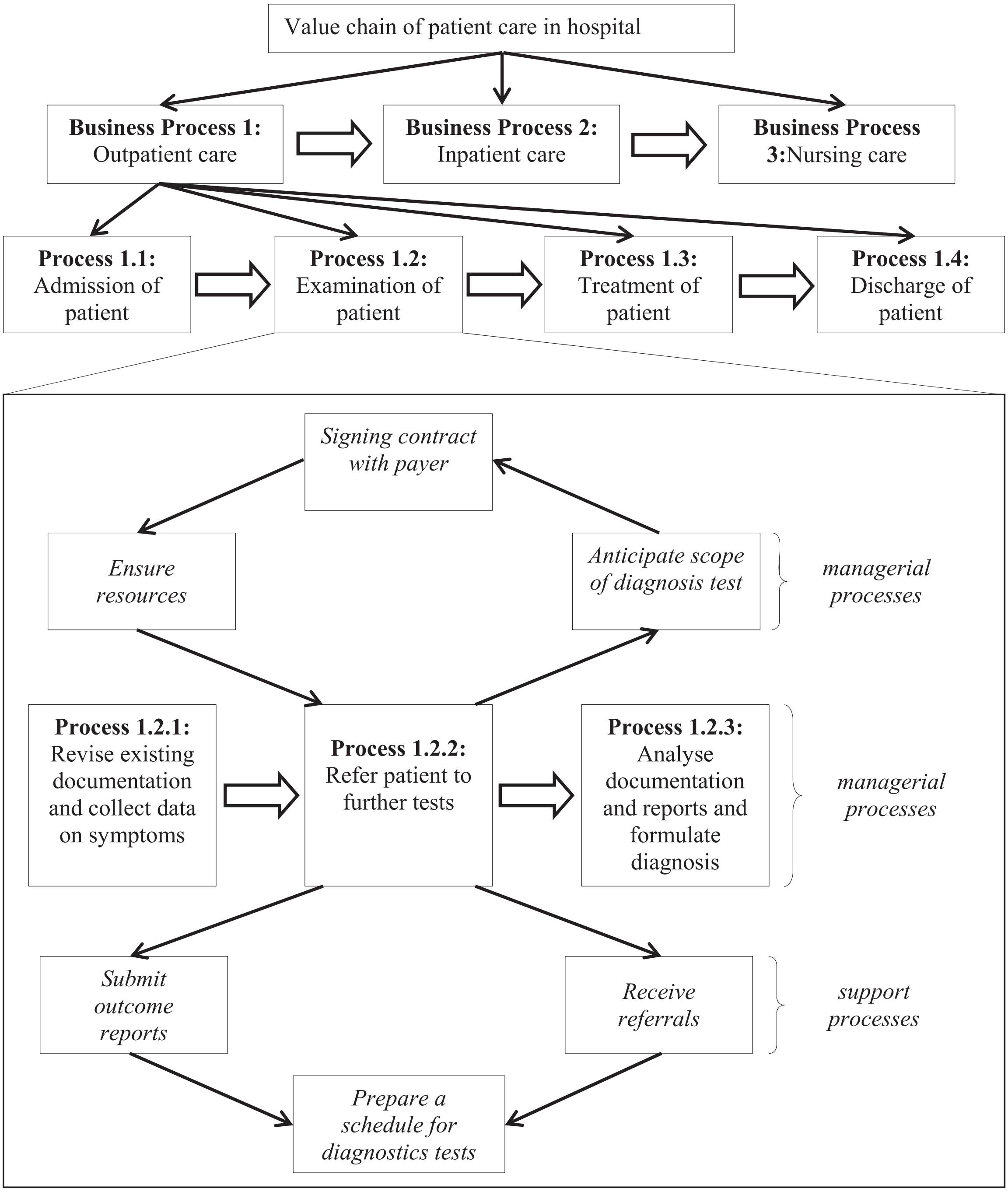
Source: Burns et al., The Wharton School Study of the Health Care Value Chain, 2002, p. 4

The purpose of analysing the entire value chain of the healthcare system is to examine the individual steps of this chain or its efficiency and effectiveness, to identify the key strategic issues, such as the source of inefficiencies in the relationship between the individual steps (e.g. between suppliers and providers of healthcare services), and to understand the baseline for cooperation and competitiveness along the entire value chain. Burns (2002, pp. 3–10) points out that a value chain of this type represents a collaborative partnership between specific steps with the aim of creating a product or service at minimal cost that will satisfy the needs of customers or users.

There are a number of reasons that make coordination, cooperation and strategic partnership between the steps of the value chain irrelevant in the healthcare system. These include(Burns, 2002, pp. 3–10):

- State ownership;
- Non-profit orientation;
- Supplier-induced demand;
- Inadequate incentives created by certain mechanisms for paying for healthcare providers;
- Soft budgetary constraints;
- Underdeveloped integrated healthcare;
- Low investment in the development of information systems;
- Inadequate monitoring of costs and other factors; and
- Lack of development of a mutually competitive value chain.

Figure 16: Breakdown of processes at a hospital



Source: Došenović Bonča, Inovacije kot dejavnik učinkovitosti in uspešnosti bolnišnic v Sloveniji [Innovations as Determinants of Hospital Efficiency and Performance: the Case of Slovenia], 2010, p. 21

For the reasons listed above, there is no adequate information on the costs and added value generated by each step in the value chain of the healthcare system. By closely analysing healthcare service providers in terms of their business processes, i.e. one step in the value chain of the healthcare system, we are able to distinguish the internal business processes, i.e. processes that are typical only for an individual provider of healthcare services, such as inter-organisational processes. The increasing trend towards providing comprehensive and integrated care makes it necessary to account for the fact that providers of different levels of the healthcare system are involved in patient care (e.g. the cooperation and interrelation of the provider at the primary and secondary levels of the healthcare system).

The internal and inter-organisational processes of healthcare providers as modelled by Harmon (2007) are comprised of key processes that we will call 'business processes'. Individual business processes can be broken down into processes, and then further into sub-processes and appropriate activities. Each level of process within healthcare service providers can be defined as core, support and managerial processes or activities. In Figure 14, Došenović Bonča (2010, p. 21) provides an example of the decomposition of processes for a selected healthcare provider, which in this case is a general hospital. We have defined one single value chain, i.e. the value chain of patient care in a hospital, in light of the fact that the goal of all healthcare services in general hospitals is to improve a patient's health outcome. This value chain can be divided into core processes and business processes in general hospitals, where business processes are defined according to the core activities of general hospitals. If we classify specialist outpatient activities among the core businesses of a general hospital, medical activities and nursing care, we can then include the 'outpatient care', 'acute patient care' and 'patient nursing care' business processes within it.

5.6 The concept of business process orientation

Another concept worth pointing out especially in relation to CPs and their call for a more horizontal organisation and ownership of processes in the hospital is the concept of business process orientation (BPO). The concept of BPO defines an organisation that, in all its thinking, emphasizes a process as opposed to hieirarchies with a special emphasis on the outcome and customer satisfaction (McCormack & Johnson, 2001 in Dimovski, Škerlevaj, Škrinjar, Jaklič & Šemberger, 2006). As suggested by the authors, structural changes must be implemented in order to support process change initiatives must be coupled with the corresponding cultural changes. Cultural changes are brought even more intensively with CPs (Hindle & Yazbeck, 2004). Organzational learning culture (OLC) is a set of norms, values and underlying assumptions about the functioning of the organisation that support more systematic generative organisational learning; this in turn may be the missing link between process orientation and organisational performance (Dimovski, Škerlevaj, Škrinjar, Jaklič & Štemberger, 2006). A CP can help align the

process orientation and contribute towards a more hospital performance improvement. The CP calls for an adoption of the process view and will, if used in its essence, deploy corresponding organisational elements to support it. McCormack and Johnson (2001) studied five key dimensions of organisations: the process view, structures, jobs, management and measurement and customer-focused, empowerment and continuous-improvement oriented values and beliefs (culture). Values and beliefs of healthcare staff (or organisational culture) are crucial in the understanding and adoption of CPs (Yazbeck, 2004).

6 CPs, BUSINESS FUNCTIONS AND PROCESSES IN HOSPITALS: DISCUSSION

Interaction effects constitute a very difficult and complex area. A CP flowchart shows different pathways, and some 'problematic' patients may enter different pathways during their episode at the hospital. In any case, the consequences or interaction effects on services and systems may be extremely complex and hard to predict; for example, an acute coronary syndrome patient may interact in different ways with accident and emergency services (A&E), general X-ray, the catheterisation lab, the laboratory, doctors, general nurses, nurse specialists, physiotherapists, social workers, psychologists, dieticians, other hospital departments, cardiac surgery and other hospitals. Each of these interactions may have cascade effects that are hard to predict. These types of patient would normally not follow a CP, or would be taken off the pathway. In most cases, however, a patient will follow a more or less settled pathway of care.

CPs were conceived as a means of improving patient outcomes by describing the optimal way of managing a patient's care for high-volume cases. A CP aims to provide the best clinical care based on clinical evidence and within the confines of the resources allocated; it also carries added value in terms of administrative and management efficiencies and cost-containment. The core tenet of this dissertation is that a CP that achieves this will, among other things, promote changes to processes that result in administrative and financial efficiencies. In this dissertation I focus on the CP at Golnik Hospital.

6.1 The CP as a process

A CP is a formal expression and description of the journey undertaken by each patient within a specific patient group in the course of his/her treatment in a hospital. The objective is to achieve optimal care, combined with effective management and financial efficiency. This observation is fundamental to effective research on the impact of the implementation of CPs on the core business functions and processes, and to the identification of any likely requirements to reengineer both of these aspects.

If a **hospital does not have a defined CP** for a high volume of a specific patient group, the process of care itself is based on experimental steps or professional experience, where each step is defined in order to identify the patient's health condition at each stage of his/her treatment. It is an incremental approach to the planning of the treatment of a patient or patient group, as the clinicians establish the initial condition for which the patient has been admitted and the final condition of the patient, which should be the 'elimination' of the medical condition for which he/she was admitted to the hospital in the first place – or, in basic terms, the recovery or improved health outcome of the patient. If a CP is not used, treatment normally takes place in incremental stages.

At the end of each incremental stage, clinicians make an intermediate assessment of the patient's medical condition. In turn, on the basis of this assessment, the clinicians develop the next stage of treatment. The identification of intermediate health outcomes and the consequent adaptation of therapies should result in the 'elimination of the initial condition', or the patient's recovery, and therefore achievement of the ultimate goal of medical treatment. Individual stages and therapies provided by the hospital to the patient depend on the ability to objectively assess the patient's condition, and on the skills, knowledge and experience of doctors, nurses and other healthcare staff. Depending on this skill and experience, as well as on the hospital's capacities, the hospital designs treatment for an individual patient, which can vary greatly according to the patient or patient group.

The **difference between care provided on the basis of a CP and usual (i.e. non-CP-based)care** lies in the higher level at which CP-based care is formalised – that is, it constitutes one of the forms of formal organisation within the hospital. A CP starts as an initial input in the form of a patient with a medical condition, and ends as an output in the form of the elimination of the medical condition or the patient's recovery. The special feature introduced by the CP is the formal record of all stages of the treatment process within the defined input-output relationships on the CP. The individual stages within the process of patient care are identified on an evidence-based scientific understanding of the disease in question and on experience, which is medical practice obtained at different levels in the treatment of a particular diagnosis.

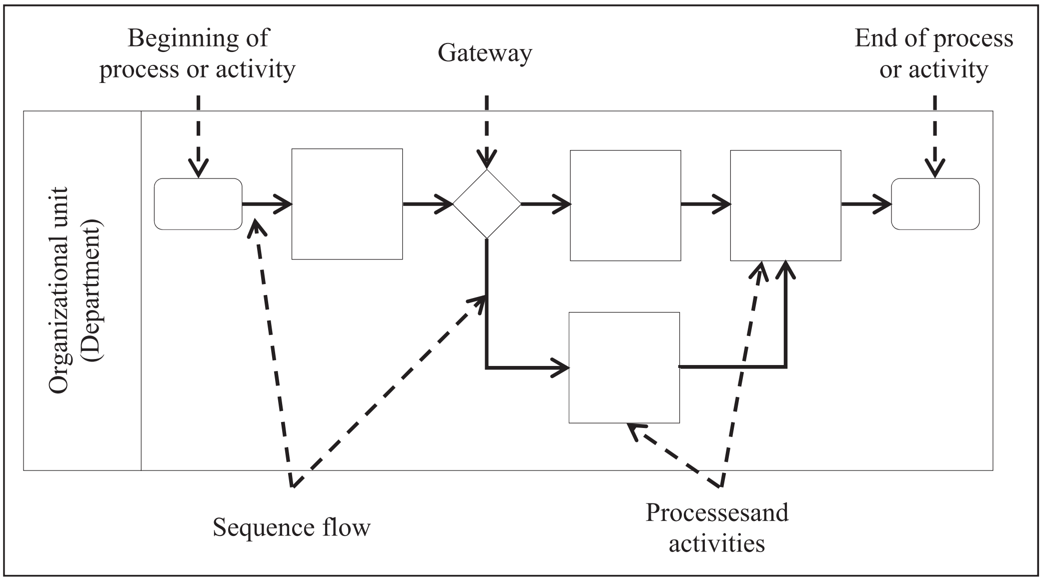
A CP is therefore a formal record of the treatment or careprocess and thus, in essence, basically possesses all the features of one of the business processes within the hospital. This means that the CP, like all other processes, is composed of three basic elements: inputs, outputs, and activities that transform inputs into outputs (Figure 15). Hence the process in its entirety covers the path of a patient in a hospital at the time of his treatment, meaning that the patient is the carrier of an input (his/her medical condition) and an output (improvement of his/her health condition).

As discussed in the analysis of the four CP models (Section 2), a CP refers to a specific type or group of patients. A specific CP model reflects the type of patient group with a specific clinical condition; it also features the input activities that comprise the process model of the CP. This may relate to an identification of the activities within the context of the initiation of treatment or care, parallel and dependent activities undertaken in the treatment process, checkpoints at which decisions have to be taken, and the setting-up of a sequence of specific evidence-based and consistent activities. CPs can also define the profile of staff charged with carrying out certain activities, what these activities are and when they should be implemented, the method of recording information in the course of treatment and the patient's health condition or status, and the planning of future activities at each stage of treatment. The business and management activities that have to be performed within the framework of the activities of a specific CP should also be clearly defined (but usually are not).

Figure 17: Transforming inputs into outputs

It will be clear from the above that a CP has to accommodate a considerable variety of items and activities. Experience has shown that, in general, it is possible for a CP to include all these elements. This finding is particularly important because, as developed further below, many other processes within the hospital are related to CP process models. The more the elements of activities are covered by a CP, the more opportunities there are for a CP to relate to and integrate with other aspects of the process model. These are the elements of a particular activity (Figure 16), the elements of decision-making and the creation of feedback loops, the elements that define the execution time of each activity, and the elements that encompass data-handling. These are elements that depict each of the processes and enable processes to be modelled. CPs have elements that define the beginning and end of a process.

Figure 18: Basic symbols for modelling business processes using the process flowcharts technique



Source: Adapted from P. Došenović Bonča, Inovacije kot dejavnik učinkovitosti in uspešnosti bolnišnic v Sloveniji [Innovations as Determinants of Hospital Efficiency and Performance: the Case of Slovenia], 2010, p. 47

Business process modelling notation (BPMN) is a standard for business process modelling and uses a notation that is similar to that used in unified modelling language activity diagrams. Most documentation of the use of BPMN describes complex repetitive activities. Benson (2008, p. 24) notes that no evidence or examples have been published to suggest that BPMN may be suitable for the sort of non-procedural process used in clinical decision-making. The following BPMN are normally used (Activiti, 2013, Benson, 2008, BPMN 2.0, 2011, BPMN, 2013):

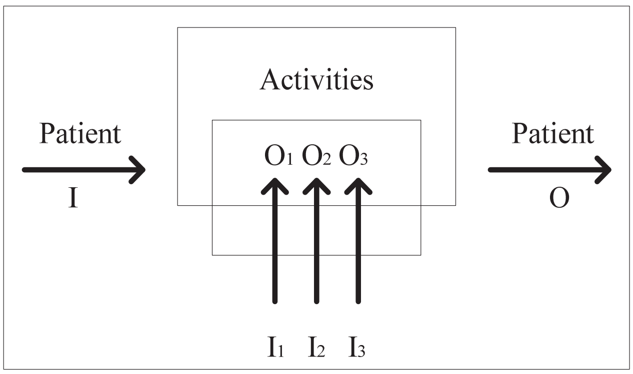
- Activity is the generic term for a business process, process, sub-process or task. They have a hierarchical relationship. A business process is at the top of the activity hierarchy in BPMN and is defined as a set of activities performed within an organisation or across organisations, as shown on a business process diagram;
- Process is limited to the activities undertaken by one participant (organisation or role). Each business process may contain one or more processes. A process is an activity performed within an organisation and is depicted as a set of activities (sub-processes and tasks) contained within a single pool;
- Each sub-process may be expanded as a separate, linked diagram showing its component sub-processes or tasks;
- A task is an atomic activity showing that the work is not broken down to a finer level of detail – it is a unit of work or the job to be performed. Sub-processes and tasks are shown as rounded rectangles and can be refined. Sub-processes, which can be expanded, are shown using a plus sign in the icon;
- Participants are each represented by a pool, which may contain lanes. Each pool contains a single process;
- A pool may be subdivided into lanes, and lanes may represent different roles within an organisation. A pool is a container separating processes from each other and showing the sequential flow between activities. Shown as a small circular icon, an event is something that happens during the course of a business process that affects the flow. In other words, pools and lanes represent responsibilities for activities within a process;
- Events may represent triggers for activities to begin or the outcomes of those activities. Start, intermediate or end events are indicated by the thickness of the circle perimeter. The information inside the circle refers to the type of trigger or result;
- A gateway, shown as a square diamond, is used to control the branching, forking, merging and joining of paths. An icon inside the diamond shows the type of control (exclusive XOR, inclusive OR, parallel AND or complex);
- Connectors link the flow objects (activity, event and gateway). There are three types of connector: sequential flow (a solid line with an arrowhead) shows the order in which activities are performed within a process; message flow (a dotted line with an arrowhead) shows the connections between processes; and association (a dotted line with no arrowhead) is used to associate information and annotations with flow.

6.1.1 The hospital as a place of intertwined horizontal and vertical processes

In order to provide the care indicated by the CP to a particular patient or patient group, a hospital needs adequate and appropriate health services and products (e.g. drugs and medical devices); in some cases the hospital also requires CP implementation to relate to non-medical services. A fundamental characteristic of a hospital is that it produces these services itself: it converts certain inputs into outputs, which are services and products required for the care of an individual patient. In this dissertation and for the purpose of better visualising CPs and their processes, I use the term horizontal and vertical processes which could be translated as core and support processes respectively. The reason I use horizontal instead of core is that not all processes are core and not all vertical are support. In the care of the patient, a support processes in literary term can be crucial and core through the treatement and optimal health outcomes.

The services and products required for the implementation of a CP emerge, to a greater or lesser degree, from the relevant processes that run within the hospital. It is typical for a CP to contain processes *that are defined with respect to the course of care of a certain patient type, whereas the process of obtaining the services and products necessary for the implementation of a CP are defined with regards to products or services*. As represented in Figure 19, we can visualise the CP as a horizontal process associated with the patient's view – the services and products required for the vertical processes emerge from the relevant inputs, terminating as outputs in the form of the services and products necessary for implementation of the CP.

Figure 19: Horizontal and vertical processes associated with CPs from the point of view of the patient



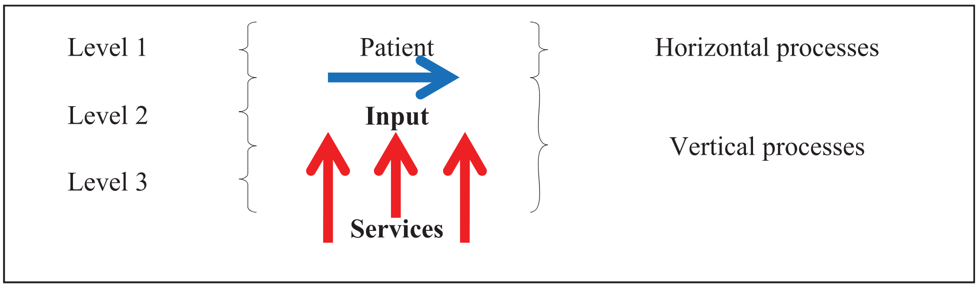
Key: I = input; O = output

This schematic view of the processes taking place within a hospital reveals that, in essence, a hospital comprises two types of process: the first, encompassed by the CP, relates to the care of patients, while the second reveals the production processes that provide services and products necessary for the implementation of the CP. An effective CP will facilitate the integration and coordination of horizontal and vertical processes that might otherwise relate to each in haphazard and potentially wasteful ways and result in sub-optimal clinical care.

One of the characteristics of services is the fact that, within a hospital, vertical production processes exist to provide those services and products that make patient care possible. **This means that the hospital as a whole is an organisation in which horizontal and vertical processes are intertwined**. The patient is always an integral part of the horizontal process, while vertical processes are concerned with the patient directly or indirectly, but only to the point where the outputs of these vertical processes are generated.

It follows that there are three levels of efficiency in a hospital that are crucial for identifying the effects of CP implementation on the organisational structure of and the processes within a hospital as presented in Figure 18 (the blue arrow illustrates patient flow, the red arrows illustrate the inputs). The**first level** – the level for which a hospital exists in the first place – is patient care, which is captured as a horizontal process. The **second level** is the creation of the products and services required for patient care; it is represented at the end of the vertical processes within the hospital. The **third level** is the level of input the hospital requires within the production processes, which are the processes that run vertically within the hospital in order to produce the services and products required for patient care. It is therefore a question of the intertwining and integration of vertical and horizontal processes, which should be reflected, as we shall see later, in the processes inside the hospital and its organisational structure, as well as in the role of its individual business functions.

Figure 20: Three levels of hospital efficiency



6.1.2 Processes and business functions of a hospital

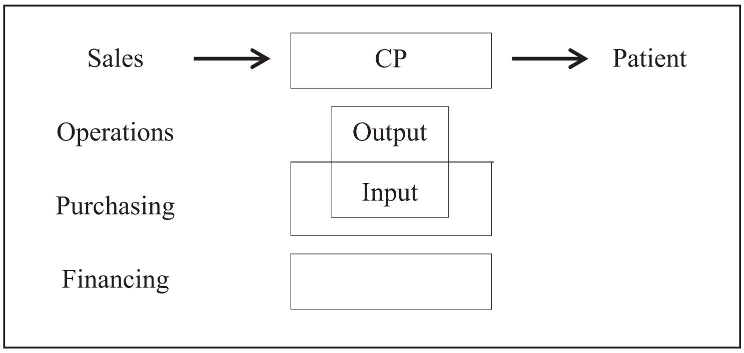
The look at the processes within a hospital as outlined above reveals not only the relationship between the implementation of the CP as a horizontal process of hospital operations and other vertical processes, but also allows one to establish the relationship between CP implementation and the role of business functions. Taken as a whole, this forms the basis for analysing the impact of CP implementation on core business functions within a hospital, as illustrated in Figure 21.

If we are aware that the patient enters the hospital from the outside environment and is discharged back into that environment, and that activities in the form of vertical processes are entirely focused on the patient, we can conclude that the **business function of the sale of products and services** produced by the hospital is basically tied to the patient's journey as designed by the CP. The patient's characteristics, and particularly the characteristics of his/her condition, define what services and products are expected to be offered in this regard by the hospital.

The supply of these products is organised within the context of vertical processes crucial for understanding the production process within the hospital; these, in turn, convert inputs into appropriate outputs. Vertical processes are therefore key elements of the production processes and operations functions within the hospital.

Since it is important to obtain all the appropriate inputs for the organisation of the transformation process within the vertical processes, purchasing and its function are closely related to these vertical processes. **Purchasing is a business function** that is directly related to the **financing of the activities of a hospital**. Because of the interrelations via the quasi-sales function of the hospital, CP implementation will and must affect the main operations function of the hospital, and through this its purchasing and financing function as well. CP implementation defines the organisation of hospital activities. A well-structured CP will take cognisance of this and should be integrated in such a way as to facilitate business efficiencies and economies.

Figure 21: CPs and the core business functions of a hospital



6.1.3 Operations function of a hospital

The systematisation of processes within a hospital into horizontal (encompassed by the CP) and vertical processes, which represent the core of the operations process, allows a precise definition of a hospital's operations function.

As we have explained, healthcare deploys a **three-level production function**. The first level indicates the conversion of inputs to appropriate outputs, such as the services and products required for the treatment of patients; the second level represents the impact of health outputs on a patient's health; and the third level is the impact of health on an individual in terms of his/her utility function.

We have explained that, in healthcare, the first level is generally linked to **efficiency**, where efficiency is observed as the volume of input the healthcare provider requires per unit of output. The health condition or cure that a healthcare provider achieves by providing health services is defined as the **effectiveness** of the health production function; this is considered the second level.

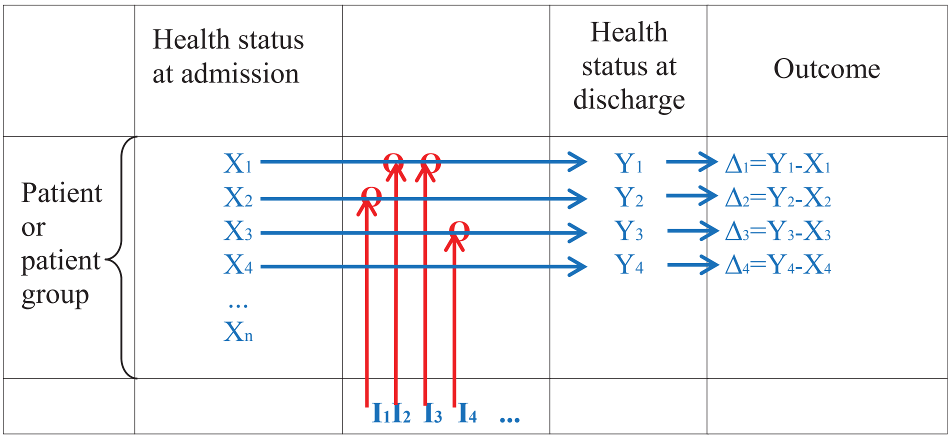
The first and second levels are therefore also manifested at hospital level, if we define the hospital as a system of vertical and horizontal processes. Vertical processes are typical efficiency processes because they are about transforming inputs into the appropriate health services and products required by the hospital in order to treat patients. In this case we can speak of technical efficiency when taking the price of inputs into account, and also of allocation efficiency or cost efficiency of the production process within the hospital. When we talk about hospital efficiency, we can only measure the relationship between inputs and outputs, and the generation of costs on the basis of the use of inputs. The horizontal processes of a CP start their journey with the use of health services and products with the aim of achieving favourable health outcomes or curing the patient; therefore, a CP connects health services and products, among other things, to the health condition of the patient at the end of the CP (i.e. upon discharge).

The health condition at the end of CP is obviously the difference between the patient's state of health at the beginning of the CP and his/her state of health at the end of the CP (Figure 22). If the medical condition at the beginning of CP is eliminated, we achieve the maximum improvement in the patient's health that can be achieved within the hospital.

It should be noted, however, that a positive health outcome can be attained by a hospital with the use of a wide range of health services and products. The relationship between health services and products on the one hand and the patient's condition at the end of CP or his/her final health outcome on the other hand is a way of expressing the effectiveness of the health production function. Therefore, when a CP is tied to the effectiveness of a hospital, the production processes plotted as vertical processes are linked to the efficiency of the hospital.

That said, effectiveness is not merely about how the transformation of an individual patient's state of health is achieved, but also about the volume and scope of health products a hospital needs in order to bring about a change in his/her state of health. The objective, when admitting the patient, is obviously to provide a cure for his/her condition, or at least to provide the maximum possible improvement in his/her state of health. Hospital effectiveness is thus also associated with the amount of health services and products required to achieve the defined maximum improvement in health or the expected health outcome.

Figure 22: Difference in patient's condition



Key: X= patient or patient group, Y= changed state of health, Δ= expected outcome (recovery or improved state of health), I= input, O= output

If we consider the efficiency as well as the effectiveness of the health production function, an efficient hospital is one that manages to produce health services and products with minimal amounts of inputs and, at the same time, to achieve the maximum improvement in the health of the patient with minimal amounts of health services and products. Since CPs relate to the effectiveness of care in the form of a change in the patient's condition, as well as to the quantity of medical services and products used and to achievement of maximum health or the expected health outcomes, one of the other objectives of a CP is to identify those activities that are important for achieving maximum health, and to omit those activities not necessary for the achievement of the expected health outcomes (or maximum health). It could be said that the mission of CPs in hospitals is to ensure effectiveness where vertical production processes represent CPs' efficiency. This means that a specific CP can be realised or implemented with the same level of effectiveness, but at differing levels of efficiency.

Therefore, from the business perspective, hospital efficiency is partly related to the use of CPs, but is mostly dependent on the method of production and the operations of healthcare services within the hospital. Alternatively, efficiency of vertical production processes is lost in a CP if a certain degree of improvement or progression in the patient's condition is not met by the hospital (given the minimum possible use of healthcare services and products).

It is therefore considered that a CP can be realised at differing levels of efficiency within hospitals, with part of this efficiency being defined within the CP. The method used to design a CP affects the services and products that a hospital is required to provide in order to implement the CP.

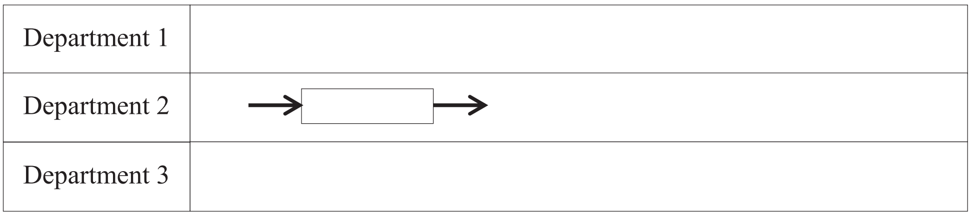
6.1.4 Different types of CP model

To analyse the influence of a CP on a hospital's organisational structure and business functions, it is important to understand the different types of CP available. It is not the technology of producing health services and products that enter the CP – typically, CPs are defined in accordance with the required healthcare technology. It can be argued that every activity within a CP comprises selected techniques used in the care of a particular patient group on the whole – in other words, a specific CP represents a specific spectrum of treatments. This applies even where particular techniques may to some extent be substituted. In turn, this means that health outcomes can be achieved in several ways. All techniques that are useful from the point of view of efficiency in the treatment of a case-type. If there are alternatives in technologies, these can be substituted within the framework of that specific CP.

From this point of view, it makes sense to classify CPs into three groups: chain CPs, hub CPs and web CPs, as already outlined in Section 2.

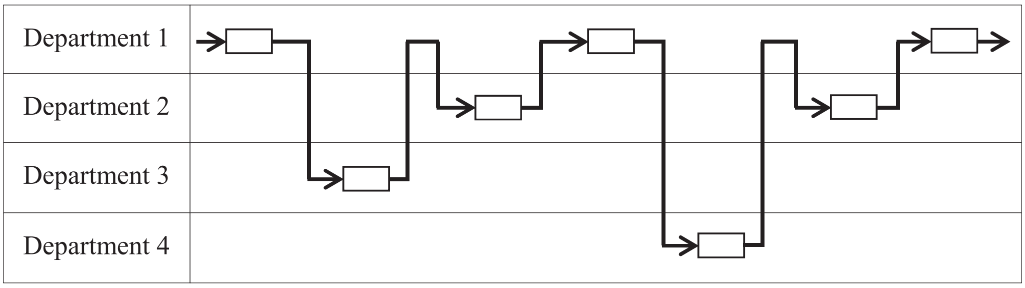
In a **chain CP** (Figure 21), an individual patient usually receives care within the context of a single department, where the staff and material capacities of that department enable the expected health outcome to be achieved and can provide the services and products required for patient care. In this case, the vertical processes of production of health services and products enter this department, while the production of these services and products can be generated within the department, within other departments or even outside the hospital. In this case the patent is not transferred from department to department. A chain CP is the simplest form and is an integral part of other forms of CP.

Figure 23: Chain CP



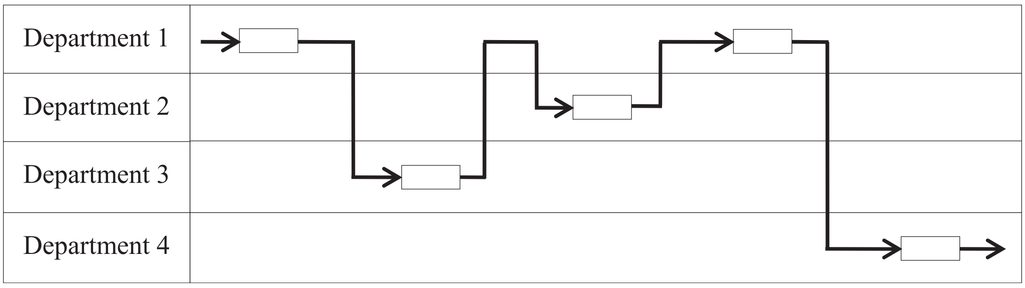
A **hub CP** (Figure 23) is a CP in which the patient enters a specific department, which then becomes his/her primary or base department. Upon entering the department, the patient is assigned to a doctor responsible for treatment and to other medical staff. Treatment under a hub CP may take place in other, different departments, meaning that the patient may migrate to other departments, where the provision of care continues in accordance the principles of a chain CP. After completing the course of treatment in a certain department, the patient then returns to the base department at which his/her treatment began. However, if patient care requires the transfer to another department, the patient moves to a web-type CP model. Patient discharge from the hospital is linked to this department. Although in this case the patent is included in the activities of various departments, these activities are always supervised by the doctor in charge of his/her care at the base department.

Figure 24: Hub CP



A **web CP** (Figure 24) is also designed in such a way that the patient enters or is admitted to a specific hospital department; depending on his/her co-morbidities, complexities and the treatments required, the patient is transferred from one department to another and does not return to the base department of initial admission. In this case, the patient is generally followed not by a single doctor but by a group of doctors charged with carrying out the treatment across different departments. The patient's may be discharged from a different department to the department of admission.

Figure 25: Web CP



These three different CP models affect both the vertical production processes and the organisational structure of the hospital; the type of CP is therefore defined by the healthcare provision required. Generally speaking, all three CP types will be required in one hospital; this fact in turn affects the processes running within and the business functions of the hospital, and dictates the hospital's organisational structure.

6.1.5 Impact of CP implementation on hospitals

Although CPs are merely the formalisation or refinement of existing processes of patient care, their implementation has a significant impact on the functioning of the hospital as a whole. This impact can be observed at different levels and from different perspectives. An analysis of the impact of CP implementation shows that it is possible to observe the effects of vertical processes on the business functions and organisational structure of the hospital. As far as vertical processes are concerned, these effects can be observed in two ways and are related to our findings on the role of horizontal and vertical processes in Section 4 on the efficiency and effectiveness of hospitals, where the CP determines the activities involved in treating patients and the decisions that have to be taken. **The CP first directly identifies those vertical processes that are necessary for its implementation** – this is the first impact of CP implementation on vertical processes within a hospital – while the second impact occurs **within the vertical processes themselves**. To some extent these processes change because information on patient care can be tracked on the CP.

6.1.6 Impact of CPs on vertical processes

Activities, decisions and waiting times within a CP determine the aspects of the health services and the products required for CP implementation; they thereby also define the types of vertical process required for CP implementation. We can say that, in order to achieve its goal of implementation and effective treatment, a CP is determined by the activities and decisions relating to waiting times.

The different CP types must clearly take into account those activities that are essential for patient care and that cannot be avoided. This in turn underlines the importance of integrating activities into vertical processes, which requires the hospital to provide appropriate services and products for CP implementation.

A CP also defines those essential and necessary diagnostic and control activities related to decision-making, since decision-making points relating to CP implementation are of crucial importance. A CP must provide the hospital with adequate vertical processes to support such decision-making points; in so doing, it is necessary to be aware of the decision-making points of monitoring features classified **according to importance** in the course of treatment; in some cases it is possible to omit the diagnostics decision-making point as a checkpoint, and hence the corresponding vertical process.

A CP also defines **optional activities** that are not needed in all cases. Their implementation is typically linked to the results of diagnostics and checkpoints. Hospitals may not always be required to provide the vertical processes that support optional activities at every point in time, or the hospital itself does not provide them at all on its own.

A CP is therefore the **basis for identifying vertical processes**, which provide health services and products as output, while at the same time allowing the vertical processes to be grouped according to the urgency or necessity of their provision within the hospital. The vertical processes that support the necessary activities, diagnostics and checkpoints must always be available within the hospital, whereas other services may be more open to professional discretion.

This is how the CP defines vertical processes and calls for hospital production, and where the hospital must ensure regular forms of activities within their departments. Some vertical processes occur occasionally and therefore do not require permanent organisational production lines within the hospital. The CP therefore defines the vertical processes that are vital for care, as well as less critical processes that may not require permanent organisational structures.

It is particularly important for a CP and its elements to define the processes which the hospital is able to provide but which may not necessarily be important from the point of view of the CP. With this, the CP does not allow the creation of induced demand of health services and products within the hospital, and therefore also **induced vertical processes**, which are not needed for the treatment of a specific patient group. Such processes create unnecessary costs and place an unnecessary burden on hospital capacity.

From this perspective, in light of a CP's aim to reduce costs and relieve the burden on capacities, a hospital may not offer certain patient services and/or products (deeming them **too expensive**, for example). A CP requires proper, high-quality execution – in other words, an effective CP will, generally speaking, result in reduced costs and improved efficiencies, but there may occasionally be conflicts if the CP demands services and/or products that the hospital cannot afford.

A special aspect of the impact of a CP on vertical production processes in hospitals occurs when the CP also defines **when each activity has to take place** (i.e. the time of manifestation of each activity), as well as the time and place of occurrence of the need for specific outputs from the vertical production processes. This aspect facilitates the planning of production processes within the hospital, and is accentuated when it comes to the **sharing of vertical processes** between different CPs. When a specific vertical process creates an output to be used in a different CP or in the implementation of a CP for different patient groups, what is of crucial importance is the information on the timely occurrence of the outputs from such vertical processes. In this case there is a need for the management and reciprocal (harmonised) coordination of CP implementation. This is only possible if the CP expresses a degree of flexibility in the timing of each activity. CP implementation therefore allows the hospital to coordinate the time dimension of a vertical process with the time dimension of the emergence of a particular activity that requires the output of this vertical process for different patient groups and different CPs. Such coordination is particularly possible in cases where the CP follows the chain and hub CP models.

It is only by chance that a web CP, which retains the capacity for the incremental planning of patient treatment, allows the coordination of the emergence of vertical processes as appropriate CP activities develop. The development of a web CP therefore needs to ensure the ongoing emergence of appropriate vertical production processes, which may have the potential to lead to the materialisation of excess capacity and increase the supply costs of health services and products from vertical processes.

If the purchasing of inputs for vertical production processes is associated with the financing of purchases and the definition of costs for the implementation of a specific vertical process, the support processes in the hospital enable the identification of those activities within the CP which are associated with higher costs. If the activities within the CP are divided into

necessary (or mandatory) **and optional**, we can, in the case of appropriate support processes related to vertical production processes, divide the necessary activities into **more expensive and less expensive ones**. This influences the management of CP implementation and coordination between the CP and vertical processes. Moreover, since it is also necessary to carry out the required activities within the CP in the most cost-effective manner, and although it might be professionally highly demanding, it makes sense to **reduce the risks attendant upon CP implementation** by means of the greater inclusion of those activities that are optional and less costly.

A CP therefore has an impact on the vertical range of production processes in several ways, improving patient care and minimising risks inherent in patient care, eliminating the unnecessary vertical range of production processes and ensuring that those vertical production processes are properly chosen and that production processes are selected from the point of view of the costs essential for the smooth running of the hospital. It can be expected that these effects will apply to a reasonable extent when the CP is organised as a chain or hub CP.

6.1.7 Impact of CPs on production

CP implementation also affects the form and content of vertical production processes. Again, since key activities take place in the vertical production process in hospitals (i.e. the production of health services and products so that the hospital can provide care to patients), the impact of CP implementation on vertical production processes has a simultaneous impact on the operations business function.

It should be noted that some types of health service and product provided by the hospital to treat patients on a CP evolve from the production processes of other healthcare providers, i.e. that a portion of health services and products used by the hospital stems from the healthcare market of inputs and is produced by other healthcare providers. This applies in particular to drugs and technical medical devices (and their adoption requires a critical appraisal of both the evidence base for and the cost-effectiveness of their use). All other health services and products used by the hospital are part of the production process within the hospital.

The impact of a CP on production processes can vary, and is precisely defined in the health services and products required for CP implementation. The **CP enables the precise definition of outputs** to be provided by the hospital in its production processes. Since the CP in some way represents the core business of a hospital and the stability of its activity, the stability of different forms of care carried out on the CP by the hospital is also manifest in the vertical stability of the production processes.

These processes are repeated and carried out on a large scale and routinely, or may have effects in the economic sphere. In some cases, some of the activities within the vertical production processes also take place within the horizontal process of patient care; the vertical production process therefore does not need them. The more precisely the CP is defined, the more precisely defined are those healthcare resources that must emerge from the vertical production processes. This also enables an appropriate increase in the efficiency of these processes and potential cost savings.

Since a CP defines the activities that are necessary for high-quality health outcomes, and because a hospital must provide appropriate healthcare resources for CP implementation, accessible evidence of the development of the CP at the hospital is also the path through which the patient **acquires information** on what the hospital actually offers and what it will require to look elsewhere – for instance, a different hospital or clinic.

It is worth noting that CP type does not have a major impact on the implementation of vertical production processes *per se*. A CP defines the time and frequency of the emergence of certain health services and products and, given this, the vertical production processes in terms of services and products that result as outputs on the horizontal process of the CP. Because health services and products of the same vertical production process are normally shared among different patients and different CPs, the CP also influences the **volume and scope of the necessary capacities and other inputs**, and the time or timeliness of their emergence. A CP does not say anything about sharing capacities and other inputs, but defines the scope and time of emergence of demand and of the capacity requirement of inputs.

Depending on the technology used in the vertical production processes, a CP also affects the **types ofcapacity and input**that must be managed within the hospital production process. While a CP determines the time of occurrence of a specific health service or product within the CP, it also **defines the time**at which the hospital must have adequate capacities and inputs.

Similarly, a CP defines the extent of the necessary capacities and inputs, and it is necessary to begin from the number of patients following a specific CP and the features of the CP. The ability to plan the necessary capacities and other inputs into the production process at a hospital is enhanced if the CP is designed or planning in the most rational manner.

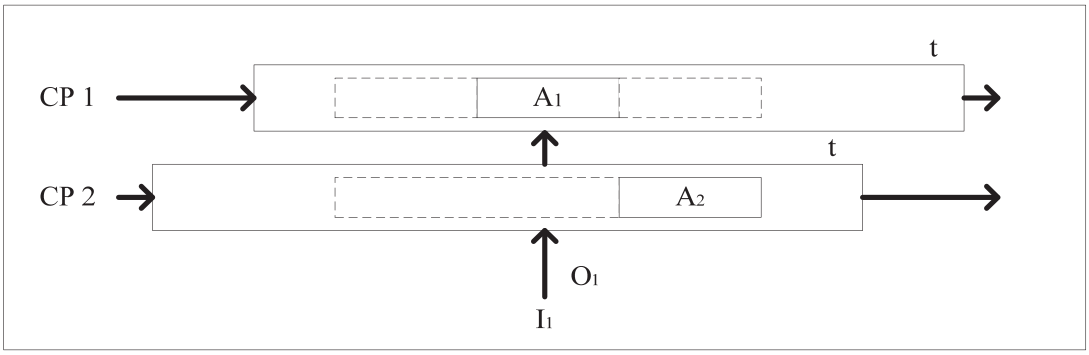
Significantly less precision is possible in **planning** for capacity and other inputs in relation to key activities that occur within the CP. The fact that a CP defines critical activities and decision-making points means that they also define those inputs and capacities that the hospital needs to have for adequate production.

Similarly, when we consider CP-based patient care to be the core hospital activity, we can then also identify the management of those capacities and inputs that are tied as core activities to the production of the health services and products required by the hospital in necessary and standard activities or at decision-making points. Not only does this have an impact on capacities and other inputs at the hospital, but it also has an impact on the **proper management of demand for health services and products** offered by the vertical production processes that enter the CP.

From this perspective, it is important for a CP to also define a specific **time tolerance** in the implementation of activities; this enables demand to be managed, as illustrated in Figure 26, in order to align the requirement for health services and products with the available capacities and the scope or volume of inputs at the hospital.

The possibility of the occurrence of certain substitutable outputs exists within the vertical production processes. It is therefore of key importance that the demand or need for health services and products within the CP be determined from the point of view of outputs of vertical production processes, which is key to determining demand for health services and products within the CP. The CP defines the activities and decision-making points necessary for determining whether there is a **possibility of substituting** the health services and products to be used in patient care. This possibility of substitution enables adequate organisation flexibility on the part of vertical production processes; this is because it is particularly important for achieving greater technical and allocative efficiency in these processes.

Figure 26: CP and time tolerance



The central element of the vertical production process is the **technology** employed, and concerns the reciprocal relationship between the CP and the technology deployed. Changes in technology within vertical production processes will enable the CP to change; as a new or modified technology emerges, new health services and products that require different activities and decisions within the CP may also emerge. It is therefore important to update the CP continuously, as it can provide grounds for the introduction of new technology by the hospital. The CP therefore enables flexibility in terms of the use of health services and products in a way that allows minor changes in technology and, in particular, allows changes to be implemented in technology in the production of health services and products, which can ultimately improve the effectiveness of CPs.

In some cases care may require a variety of techniques, so the CP must be designed in such a way as to allow flexibility. In this way, a CP with the appropriate degree of flexibility in its activities and decision-making points will enable the hospital to use those techniques in an appropriate manner.

6.1.8 Impact of CPs on the purchasing function

As already mentioned, the impact of CP implementation on the vertical production processes, and hence the operations function within a hospital, leads to CP implementation having an impact on the purchasing business function. The purchasing function is defined more broadly than is usual for a typical production organisation, which is partly due to the characteristics of hospital activities as well as the impact of CPs.

We can say that there are two areas of purchasing activities. The first is associated with those health services and products which the hospital does not produce within its vertical production process but which it **purchases on the open market**. In these cases, the timing of the coordination and implementation of the CP is crucial in terms of procuring specific services or supplies and minimising stocks of purchased medical products. The greater the coordination of CP implementation and patient care in relation to activities that are similar to each other and that require the same products, the lower the hospital stocks. Stocks are, of course, also dependent on the possibility of purchases of such products being made at the right time.

The second purchasing function area relates to the **provision of inputs** for the execution of vertical production processes within a hospital; this includes the provision of space, appropriate equipment, medications and technical medical devices, as well as the relevant personnel. The implementation of these production processes must also ensure the relevant fixed capacities and purchasing, as well as the occasional expansion of the scope of investment. In simple terms, the purchasing function is responsible for ensuring adequate capacities and other inputs into the vertical production processes of the hospital.

The purchasing function must also evaluate the optimal scope of capacity and stocks, which is mostly achieved by coordinating its activities through the regulation and coordination of CP implementation. With CP implementation, the greater the coordination of timely activities and the possibility of managing the necessary, critical (and optional) activities of the CP and its decision-making points, the greater the possibility of reducing the available capacities and the volume of stocks required as inputs. In this case, the type of capacity and the purchasing of other inputs are determined by the scope of the capacities and stocks, so that it is possible to achieve maximum savings in this area with the appropriate management of CP implementation and appropriate patient treatment. With the proper and reciprocal coordination and collection of appropriate information on the flexibility of the application of activities and decision-making points, the CP can also ensure that the necessary capacities and supplies of other inputs are minimised.

Minimising stocks and utilising capacities appropriately can therefore be largely achieved through proper CP management. From this perspective, it is also important for the hospital, in terms of both capacity and other inputs, to set certain **standards** and integrate inputs into standardised groups, within which it can then help to identify the required substitution of inputs. This allows managers to retain vertical production processes for attaining the proper standardisation of outputs, which enter in the form of health services and products. For this reason, appropriate flexibility in selecting the types of health product and service entering the CP which are crucial for the implementation of the purchasing function is subject to the vertical organisation of production processes.

With such standardisation it is possible to make additional improvements to the **quality** of healthcare services and the products that enter the CP. At the same time, a flexible definition of the activities and decision-making points within the CP is also a precondition for exercising those changes in the techniques of the production of healthcare services and products in the hospital that are related to the emergence of new inputs and performance, without the need to entirely modify the CP.

6.1.9 Impact of CPs on the financing function

In terms of the financing function, CP implementation is observed through its impact on vertical production processes and the purchasing function. Likewise, CPs are important in terms of financing hospital operations and activities.

The definition of the financing function commonly arises from the fact that so-called capital and current expenditures are incurred within hospitals – **capital expenditure** is related to the financing of investments and the use of fixed assets. Similarly, as we have found when analysing the purchasing function, minimising capacities largely depends on the appropriate coordination of CP implementation and care of the patient group (and, of course, on the number of patients being treated in a hospital). We can also then conclude that the scope and volume of capital expenditures are primarily related to CP management and the number of patients treated. It is by no means irrelevant how well vertical production processes are organised within the hospital; on the contrary, their effectiveness determines the scope of inputs per unit of output, and hence the scope of capital expenditures necessary to implement a specific CP.

Since fixed capacity gives rise to fixed costs, and proper coordination of CP implementation affects the required capacity and hence also the fixed costs, harmonised CP coordination is a key element for reducing fixed costs. Where a CP is based on rational planning, particularly chain and hub CPs, it is possible to plan the exploitation of fixed capacity carefully, and therefore also the costs that are allocated to individual activities and decision-making points within the CP from the point of view of capital expenditure, using relevant information on the number of patients that enter the CP. In this way the CP provides a basis for enabling capacity to be managed and for the utilisation of that capacity to be planned; this also minimises capital expenditure per unit of activity within the CP.

Current expenditure is related to inputs that are variable in character. It is typical for hospital operations to be planned within the framework of **hospital business budgeting**. If we ignore the time dimension of CP implementation, which can actually give rise to running costs in hospital operations, it is in this respect very important to be able to carry out a consistent budgeting process at the CP level, especially for chain and hub CPs. In this case, care (or rather, the implementation of specific activities within the CP) is agreed in advance so that it is possible to derive calculations for the whole process without major errors. In fact, in these cases, the budget is also defined at the level of the CP in order to help determine the required, optional and non-standard activities and decisions of the CP. All required and standard activities and decision-making points may be captured in advance by budgeting the CP. However, in the case of a web CP, where it is possible to define the budget but at the level of the intervention or involvement of a separate department, the entire budget of the CP is not known in advance. In this way, a web CP consists of a large number of budgets, which are independent of each other and cannot be pre-determined in advance as the total budget. These are, in fact, running costs for the implementation of the web CP and can only be calculated at the end of care or at the end of the CP.

A CP that provides accessible information regarding the processes of horizontal features within the hospital can also provide the basis for identifying the payment system and the **forms of payment** to the hospital. The current most common methods of hospital payment, as we have identified, are associated with DRGs. The CP may be used as one of the bases for calculating the cost of the DRG; of course, it is not only up to the hospital to make this calculation, but also the payer. Based on the activities and choices, as well as the waiting times within the CP, it is possible to derive the calculations of the CP alongside the relevant norms of capacity use and inputs, including personnel, and through that to prepare calculations for each DRG. As we have identified, per-case payment is linked to horizontal processes, while per-service payment is payment which is related to the output of vertical production processes within the hospital. Where we use the per-case payment method, it is therefore possible to introduce the calculation of each DRG in accordance with the standards and norms established by the CP.

In its own way, CP implementation strengthens the payer's negotiating position with the hospital (as the provider). The payer will require precise control of the costs that arise with the provider in CP implementation in order to avoid activity costs that are higher than the expected payment (normally ensured by the payer). In such cases, the CP determines the price of the case on the one hand and the cost of its implementation on the other. From this perspective, it is crucial for the CP to be regularly updated and modified or continuously developed, with the results being taken into consideration by both payer and provider. In a different case, a situation may arise in which a certain form of CP may be taken into account by the payer but a different one by the provider. Such cases are, as a rule, detrimental to the hospital and can also cause damage the payer, who did not take into account improved efficiency and effectiveness in both vertical and horizontal processes in the hospital and adjusted its payment only on the basis of increased efficiency and effectiveness. On the other hand, the hospital can then negotiate which activities to drop if the payment is foreseen to be less than the incurred costs.

6.1.10 Impact of CPs on processes and the organisation function

Implementing a CP by taking into account the impact on the vertical production processes within and the purchasing and financing of the hospital requires the adjustment of the organisational structure and processes within the hospital, where the type of CP employed will have an impact on this adjustment.

A **chain CP** represents the current organisation of departments in the form of a **professionalbureaucracy** and is adjusted for relatively small units. In this case, it is about the horizontal division of labour with a low depth of specialised work within the department and a head of department as the organiser of the production process.

A **hub CP** requires a high level of centralisation of the doctor's role. The doctor is, in turn, responsible for every patient in terms of both the CP and the management of care or the patient; for instance, it can be argued that for hub CP implementation, some form of web CP organisation is suitable, where project leaders or case managers are doctors who are responsible for the care of the patient. This care may be facilitated by **multi-disciplinary meetings** to coordinate the activities of all members of the care team.

A **web C**P involves different departments that are in charge of conducting patient treatment autonomously and that may be organised in different ways. Different departments and different staff within these departments are responsible for patient care. It is important for there to be an obligatory network of responsible peers in different departments who relate to a single patient with various co-morbidities. Therefore, in this case, it is most appropriate to set up ***ad hoc* forms of organisation** based primarily on the relationship between peers or responsible committees in the provision of treatment to an individual unpredictable patient with high complexities and co-morbidities.

In light of the above considerations, CP implementation requires two special authorities or bodies. The first body is responsible for allocating patients to the appropriate CP or identifying the CP appropriate to the patient type, i.e. it matches the CP to the patient's diagnosis or medical condition. This is a '**triage body**' that establishes a bridge between the earlier forms of treatment or diagnosis from outside the hospital and a patient's entrance to one of the CPs at the hospital. The second body is associated with **the coordination of operations of the specific CP**. As we have seen, in terms of hospital effectiveness and efficiency it is vital for there to be a possibility for flexibility in CP implementation in relation to time, space, the health services and products required by the patient, as well as the required and optional choices of individual activities and decisions within the CP. This requires the coordination of operational forms of planning for a very short period of time and the appropriate authority for the coordination of activities within the CP.

CP implementation requires the separation of horizontal processes from vertical production processes, where the first relate to the CP and the second are, in their essence, support processes, even though they comprise the hospital's core activity. Vertical production processes can be easily organised into very simple structures. It is important, however, to have links with the **development department**, as the efficiency of these processes depends to a great extent on the use of technology and on innovations entering these processes by means of different capacities and inputs. A hospital that implements a CP therefore requires a strong development department. One of the tasks of a development department is to increase efficiency within vertical production processes.

We have seen that proper CP management and proper patient care and cure also ensure that operations and purchasing functions are conducted to the necessary level of concentration, which in turn allows economies of scale and activities to be exploited. We have also established that, with respect to this, the standardisation of fixed capacities, as well as of variable inputs in vertical production processes within a hospital, is of crucial importance; this can be achieved by centralising the purchasing function. CP implementation requires the organisation of **centralised or shared/group purchasing** of production capacities and other inputs. This is particularly the case if we utilise all the possibilities for proper coordination in CP implementation. It makes no sense to decentralise the purchasing function in relation to the CP or vertical production processes; on the contrary, it makes sense to centralise purchasing, which can, with the relevant division of inputs, create greater efficiency in the operations or performance of the hospital.

Similar consideration applies to the **financing function**, which requires a number of specialised services. One of the important services relates to the planning of CP implementation and of vertical production processes, and is charged with determining the costing aspect of CP implementation and providing information on the resources required to carry out specific activities or the CP itself. On the other hand, the financing department needs to ensure appropriate financial resources for CP implementation; the financing department therefore needs to ensure that an adequate service is in place to deal with the generation of hospital revenues. To some extent, such a service should, via hospital management, be organised and integrated with certain **quasi-sales services** – that is to say, CPs precisely define the types of care offered by the hospital to patients. From the point of view of revenue generation, the hospital can take advantage of this a kind of 'offer' in situations where 'the money follows the patient'. At the same time, it is crucial to understand the meaning of the price the payer pays – which must accord with the costs of CP implementation, as we have already explained in detail.

Some CPs require a greater emphasis and some a lesser emphasis on internal logistics. As with all types of CP, with the exception of the chain CP, it is about moving the patient's location within the hospital (to different departments) and possibly beyond. It would therefore make sense to organise a special logistics service for hub and web CPs.

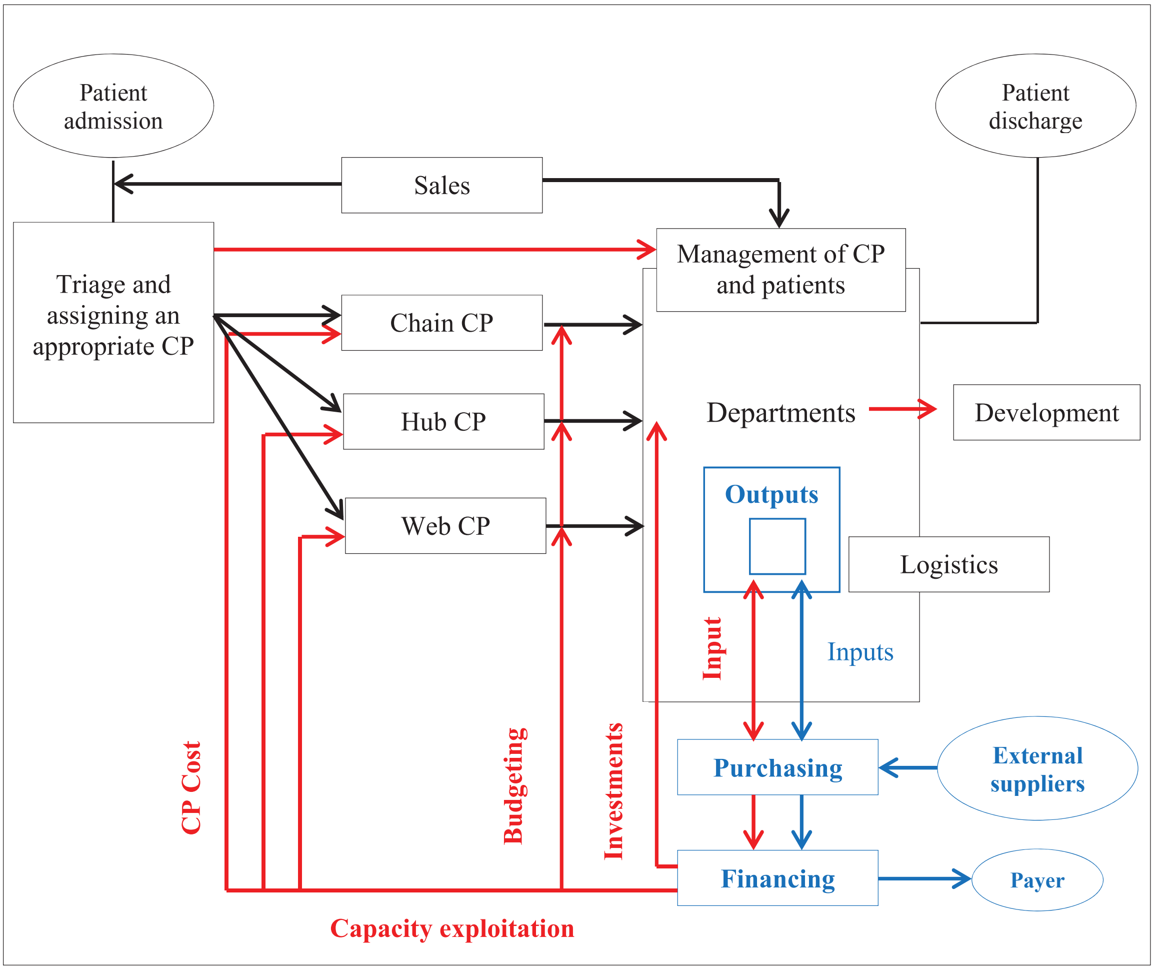
6.1.11 Basic scheme of processes following CP implementation

If we consider the impacts of CP implementation on the organisational structure of a hospital and, in particular, on the processes within it, we can design a basic scheme of processes. When doing so, it is assumed that the scheme captures three types of flow: **flow of patients, flow of services and health products, and flow of information**, as illustrated in Figure 27.

In Figure 27 there are several processes going on. I used different colors for better visualisation but have no particular meaning. The patient is admitted in the admission's office who would be informed by the sales' department on what he or she can expect on his journey of recovery / treatment in terms of healthcare services and/or products he or she would be subject to. The patient is then according to his healthcare condition assigned to an appropriate CP. Triage would also determine the model type the patient would follow (chain, hub or web mechanism). Depending on the CP model type, the financing business function would then be able to determine the CP cost, the budgets and needed investments (basically, it would deal with the exploitation of capacities) in the departments (or wards). For the department to run properly, the logistics unit would take care of the inputs and outputs needed for the management of the patient on the basis of the CP. It will also run the needed activities with the purchasing business function that will in turn deal with the external suppliers all in collaboration with the financing business function, which will then need to deal with the external payer). The information collected in the departments would then be supplied to the development department who would then deal with the overall analysis of the impact of the CP on all the functions of the hospital. This department would also provide the patient upon discharge with the information of his/her treatment process.

All processes start with patient admission. Since we find that CP implementation also defines the products offered to patients by the hospital, patient admission can be influenced by the management of this admission in the sales department; this may also be associated with the payer. After admission, CP implementation requires the proper triage of patients and the matching of the case-type to the appropriate CP. The beginning of implementation, as described earlier in detail, thus includes vertical processes that ensure an adequate supply of health services and products required for CP implementation. Harmonised coordination, which is crucial in this case, requires the appropriate management of the CP and the patients. We also find that patient flow as defined by the CP requires appropriate logistics. Vertical production processes are associated with the purchasing function, and this in turn also defines the financial aspects of hospital as a business. The hospital comes into contact with external suppliers through the purchasing function, andwith the payer as wellthrough the financial function.

Figure 27: Flow of patients, services, products and information

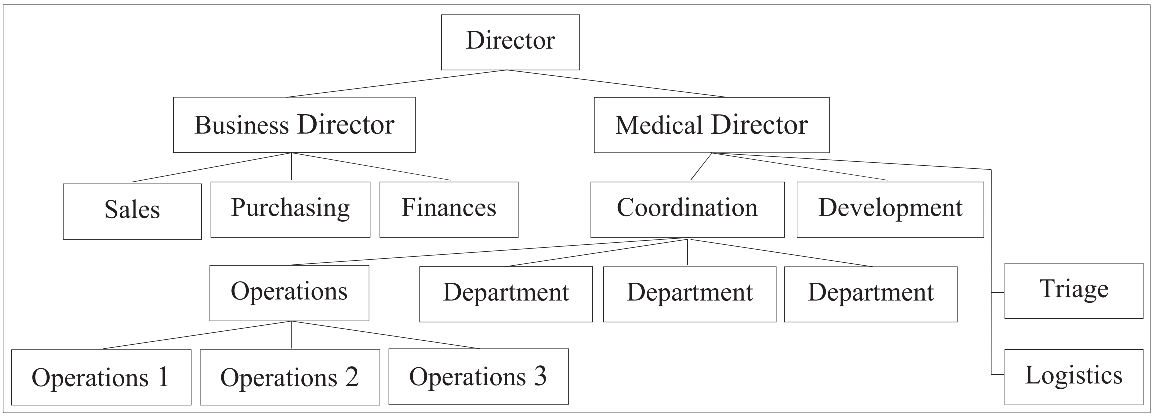


An unavoidable and necessary flow of information arises at the same time. In this manner, information on the number of patients flows to the decision-making point of CP and patient care coordination; at this point, information is produced regarding the triage of the patient, along with attribution of the appropriate CP type. These two types of information, coupled with knowledge of the technologies associated with an individual CP, allow for the coordination of tasks within departments and the appropriate regulation of vertical production processes within the hospital. Individual CPs also receive information from the finance department, where information on the price of CP implementation and the budgeting activities of each department are particularly important. The finance department also receives information from the purchasing function on capacity utilisation, which in turn enables it to establish financial decisions on investments in individual departments and within the vertical production processes. At the same time, information from horizontal and vertical processes flows into the development department, which is crucial for CP design at the hospital.

6.1.12 Basic organisational structure following CP implementation

A CP may also be expected to influence the basic organisational structure of the hospital, as illustrated in Figure 28. This structure may be described as U-shaped, in that it exposes the basic units tied to the business functions of the hospital; these are the sales, purchasing and financing activities carried out by the director's business assistant, and the operations and development functions carried out by the medical director's assistant of the hospital. The operations function is also a direct function of the coordination of those departmental activities that enable CP implementation. The departments in which the CPs are implemented represent the fourth level within the structure of the hospital. The last level (the level below the medical director), which is also linked to the coordination of tasks within each department, constitutes the vertical production processes, which are support processes to the core business processes for CP implementation within individual departments. In conjunction with professional medical operations, the hospital requires the appropriate triage of patients in order to attribute the appropriate CP, and thus requires a logistics department.

Figure 28: CP-based hospital organisation



Given the above, a hospital is therefore characterised by a multi-departmental structure with a relatively complex organisation, a high degree of formalisation that is also related to CP implementation, and a low degree of centralisation.

7 GOLNIK HOSPITAL CAP CP VER.2 AS A PROCESS

As mentionedinthe introduction, thefundamental objectiveof this dissertation is to study the impact of CP implementation on the business functions of Golnik Hospital – or put differently, I will study the impact of CP implementation in relation to healthcareactivities in the hospital, analyse its effects on the hospital process model, and attempt to answer the question of what impact the CP has on the hospital's business functions.Methodological tools and bases first need to be developed in order to study the use of CP at Golnik Hospital from the point of view of processes; this should be followed by a study of the impact of the CP on the business functions of Golnik Hospital.

In order to analyse the CP and its impact on the business functions at Golnik Hospital, I will use thestaticprocess model or 'snapshot' of the hospital using process modelling. I start out by describing and examiningthe CP at the lowest levelsof observationof internal processes, i.e. at the level of sub-processesandactivities, and studythe impact of the CP on the processes of five main business functions: sales, purchasing, operations, financing and organisation (an analysis that has not been attempted before). I will then illustrate therelationship betweeninputsandoutputsat the businessprocess and overarching business process levels.

In order to be able to identify and define the impact of CPs on processes, we need to take internal processes into consideration, as well as the inter-organisational flows within specific organisational units or within units and departments. Processes can be observed and studied at various process levels: business processes, sub-processes or activities. The choice of the type and level of observation depends on the purpose of analysis. For the purpose of this study, I will observe the impact of CPs on the processes, and therefore on the business functions, of Golnik Hospital.

CPs are related to internal and inter-organisational processes; to be able to study a CP, we need to take the following into account: (a) that a CP appears in and covers a greater number of processes, which means that it is important to observe its impact in relation to the process and between organisational units, and therefore from the point of view of the entire hospital; (b) that a CP that is bound to inter-organisational processes has an impact on the hospital that implemented that CP, as well as on the other sections of the organisation that participate in its implementation,and an inter-organisational CP has an impact on the hospital that implemented the CP; (c) that a CP must be studied at the lowest level of the observed process, since a CP emerges as an innovation at the lowest or most decomposed level of processes, i.e. at the level of sub-processes and activities. Only at this level is it therefore possible to further study the direct impact of the CP on inputs and outputs, timeframe, and the other characteristics of activities and sub-processes.

This dissertation presents the CP from the point of view of processes; I therefore break the CP down to a level appropriate for observation with the help of the process diagram technique. With a designed process model, I will be able to (a) identify the related points, (b) insert the CP into the appropriate parts of the organisation or unit and (c) study the impact of the CP on the business functions and ensure that the observed impact of the CP is not limited to specific or individual processes and organisational units.

It is also important to take into account the relationship between inputs and outputs and between individual processes and organisational units. In the case of inter-organisational processes, the correlation and links of the organisation that contribute towards these kinds of processes also require study. The relation and dependence of processes is observed in relation to processes and organisational units, i.e.it is possible to study and analyse the changes that arise as a result of CPs at the level of business processesfrom the point of view of the entire organisation. Studying the impact at the lower observed process levels or at the level of processes that are limited to a specific organisational unit could lead us to maximise the impact of individual parts of processes or individual organisational units at the expense of the impact on the organisation as a whole.

In my case, I will study the impact of CPs on internal processes and business functions, since this is one of the ways in which a hospital can directly change the characteristics of its internal processes.

In order to analyse the impact of the use of the CP at Golnik hospital, I will analyse and study the internal processes, those processes that run within individual organisational units, and the processes that run between units and departments. I will observe the CP at different levels of process decomposition. Since the main goal is to study the impact of CP on the business functionsof Golnik Hospital, it is of key importance to study and understand the core processes. Along the same lines, management and support processes are also important factors in understanding business functions.

Since I plan to study the impact of Golnik Hospital's CP on business functions at the level of internal business processes and core processes, and their relationship to the internal and external environment, I will take into account the fact that the business processes are influenced by (a) the environment, through the characteristics of Slovenia's healthcare system, i.e. the 'General Agreement' that states that hospitals need to develop CPs, and (b) Slovenia as the background setting that forms the basis for defining the external environment of the Slovenian hospital.

The organisational structure of this type of hospital through which the activities and processes run represents the internal environment of processes, since the boundaries between the organisational units influence the flow, implementation and 'borders' of processes. The role of the hospital and the entire value chain of the healthcare system and organisational structure of the hospital will both be addressed when defining the demographic characteristics of the hospital, where I study and analyse the impact of CP implementation on the business functions.

Harmon's (2007, p. 233) basic elements for designing a process diagram, which are also used in any process notation, are presented in Diagram 7; but for the purpose of this dissertation, I usealmost the same elements of the open source internet application *Activiti* as described below when modelling the business processes on the basis of CAP CP.

Business process modelling tools have been designed to describe the procedures used to deliver services or products on a repetitive basis, where it is appropriate to indicate the optimal way of processing each step in the usual manner. Some aspects of medical care fall into this category; others, such as clinical decision-making, do not. Clinical processes are particularly difficult to model with existing tools, partly because they are inherently complex but, more importantly, because each patient is different and each clinician may adopt a different path depending on the specific clinical situation of the individual patient (Benson, 2008).

For the purpose of this dissertation, I use the open source program *Activiti* to draw the processes on CAP CP ver.2, as presented in Appendix E.

7.1 Description of CAP CP ver.2 as a business process

In this section I first analyse and then assess Golnik Hospital's CAP CP ver.2 from the process point of view.

As a process, CAP CP ver.2 contains a starting point and an end or termination point. The process also contains a number of decision-making points of exclusive gateways (a gateway is used when two or more alternative paths appear at one point in the process), parallel gateways and activities (tasks), and events indicating the reception and sending of messages, linked with arrows to indicate the sequential flow, as illustrated in Appendix E. The elements also show whether the task is a user task or a manual task (i.e. the nature of the action to be performed). All these process elements are set within pools and lanes, where in the case of CAP CP ver.2 there are three pools (admission, ward and discharge), with each pool being split into two lanes: the doctor's (or MD's) and nurse's lane.

The starting point begins with admission to the 'admission pool', where the doctor is faced with an exclusive gateway (i.e. a decision-making point) at which he needs to decide whether the criteria for CAP have been met. If CAP is not diagnosed, the patient is discharged. However, if the criteria for CAP have been met, the next task follows: the doctor (or user of the tasks) needs to investigate whether the patient has any other chronic disease co-morbidities. The next task is to measure blood pressure, pulse, body temperature and saturation. If these vital signs have already been measured in the emergency department (and, as a consequence, this information is available), the process moves on to the next gateway; however, if no measurements have been taken, the nurse conducts them. In the next gateway, a completed or not completed task or activity is one that follows the measurement of vital signs (ECG and chest X-ray). If this task was not previously conducted in the emergency department or prior to the patient's arrival at the admissions office, the doctor orders an ECG and chest X-ray. Once this is completed, the next gateway assesses whether the doctor has obtained the patient's arterial blood gas analysis; if he has not, the nurse needs to perform these measurements. If the results are provided, the doctor moves on to analyse the blood sample laboratory results, if they exist; if they do not exist, he then sends a message or order for a basic blood sample test (CBC, WBC, CRP, Na, K, blood urea and sugar level) to be analysed, expecting to receive the results for further assessment and monitoring.

The gateway that follows concerns whether two specific blood cultures have been ordered or not. If they have been, the process then moves on to the next activity (the collection of other biological samples for analysis); if not, the nurse takes the samples and sends them for analysis. Once these activities have been conducted, the doctor's next task is to score the patient's condition using the Pneumonia Severity Index, which is followed by the prescribing of antibiotics within four hours of the established diagnosis. This task is an ordering task that is then executed, usually by the nurse. Where the doctor is unable to prescribe a specific antibiotic for any reason (e.g. some parameters will not become clear until the laboratory results are provided), the doctor's process is interrupted. Nevertheless, no matter which activity follows the gateway of antibiotic prescription, the nurse (still in the admissions office) undertakes his/her task and completes the nursing documentation, proceeding to the next user task and estimating the complications expected upon discharge.

The process of care then continues in the 'ward pool', which contains an overall and parallel activity, i.e. an assessment of whether the patient still needs hospitalisation. This is an activity undertaken by the doctor, who makes a daily assessment of whether the patient needs further hospitalisation. Otherwise, after the tasks and activities in the 'admission pool' have been completed, the first parallel gateway is the physical examination, where three parallel user tasks take place: an evaluation of the level of consciousness, a measurement of vital signs, and an evaluation of the quantity and quality of sputum. These three user tasks merge into the next parallel gateway and into an exclusive gateway, which is where the doctor assesses whether the prescribed antibiotic complies with the recommendations. If it does not, the doctor's task is to prescribe a different antibiotic; if it does, the process moves to the next exclusive gateway, which is where the doctor assesses whether an oral antibiotic is suitable. If not, the doctor's task is to prescribe a different antibiotic; if it is, the process moves to the next exclusive gateway, where the doctor's task is to assess whether the prescribed antibiotic has been adjusted to the patient's weight and to his/her liver and kidney functions. If this is not the case, the doctor then adjusts the antibiotic dose; if it is, the next exclusive gateway is for the doctor to assess whether oxygen therapy is needed. If the answer is yes, the nurse performs this task and provides the patient with oxygen therapy. Whether oxygen therapy is required or not, the next exclusive gateway concerns infusion therapy. If the doctor assesses that infusion therapy is required, the nurse carries it out. In either case, i.e. whether infusion therapy is performed or not, the process then moves on to the next three user or doctor tasks: an assessment of the need for an additional aetiological examination, a basic follow-up diagnostic examination, and an assessment of whether the clinical course of disease is as expected.

All these tasks performed by the doctor in the 'ward pool' can be run in parallel with the nurse's activity lane. There are user tasks that run simultaneously; they then merge and wait for all incoming branches to be completed before they trigger the outgoing flow. These user (nurse) tasks are: an evaluation of the threat of falling and of pressure sores; an assessment of the required level of nursing care; and the monitoring of vital signs. All these tasks then reach the next exclusive gateway, where the nurse informs the doctor of any changes in the patient's condition. If the patient's condition has changed, the doctor is informed, i.e. the nurse takes action and 'sends a message' to the doctor; if the patient's condition is stable, the doctor is not informed. In either case, the next gateway involves the nurse assessing whether to request a visit from the duty doctor. If yes, then the 'message' is sent to the duty doctor, who then responds to the request. In both cases, i.e. whether the doctor on duty responds to the nurse's request or not, the nurse's task is to assess possible complications and any potential barriers to discharge. This leads to the next exclusive gateway: informing or not informing the social worker. If the social worker is informed, a 'message is sent' to him/her. Whether the social worker is informed or not, the process in the 'ward pool' then reaches the parallel gateway in the doctor's lane and merges with or branches off from the assessment of the clinical course of the disease, before triggering the output flow to the overarching exclusive gateway of whether or not the patient still requires hospitalisation. If further hospitalisation is required, the process starts again the following day from the beginning (the manual task of physical examination by the doctor and the parallel gateway undertaken by the nurse in the nurse's lane). If the patient no longer requires hospitalisation, the process moves to the 'discharge pool', which is also split into two lanes, the doctor's and nurse's.

The doctor's task is then to write the final discharge letter. An exclusive gateway then appears regarding the question of whether the patient needs antibiotics. If the answer is yes, another exclusive gateway appears to check whether the prescription has been completed; if it has not, the doctor's task is to write out an antibiotic prescription. This then leads to the next gateway: whether a subsequent check-up is expected. If it is, the doctor schedules a check-up. Regardless of whether the patient needs a check-up or not, the branches merge into one incoming branch and trigger the next user task of providing recommendations on vaccination and information on the disease to the patient and his/her carers. Once these tasks have been completed, the flow moves on to the nurse's lane, where the nurse's task is to hand the patient the discharge letter. This is then followed by the exclusive gateway concerning whether to send a notice to the nursing care service or not; if yes, a 'message is sent'. After completion, the branches merge together again to trigger the next user (nurse's) task – that of providing the patient and his/her carer(s) with instructions on care. This triggers the end of the process of CAP treatment on the basis of CAP CP ver.2.

In the above description of the process of care for CAP based on CAP CP ver.2, elements such as exclusive and parallel gateways are marked, and the nurse's and doctor's tasks are also identified; however, there are some pitfalls in the process. For instance, it is not clear from the process when exactly a certain task should be carried out – it lacks a clear timeline. Are all the tasks to be undertaken in the morning hours or throughout the day? It is also not clear what the exact sequencing of tasks is: are any conditions to be observed, in the sense that a certain task cannot be undertaken until the initial one is completed, or could two tasks be undertaken at the same time and, if so, when? Moreover, we are unable to clearly see how long any of the tasks last, e.g. there is no clear indication of how soon laboratory results need to be presented to the doctor and nurse (or when the laboratory results can be expected), as many of the tasks involve assessment.

It is not clear from CAP CP ver.2 what the other sub-processes and other required inputs are for providing care to a CAP patient, e.g. laboratory diagnostics, the preparation of intravenous antibiotics and the taking of blood. Despite its crucial importance to CAP treatment (according to the CAP clinical guidelines), CAP CP ver.2 does not provide a clear indication as to when exactly the laboratory is to report back (feedback loop) to the team regarding drug resistance so that the most suitable antibiotic can be prescribed. As senior staff informed me, it takes two days to receive laboratory results for biological cultures. Another observation is made on the exclusive gateway concerning when a nurse notifies the duty doctor that there has been a change in the patient's condition, i.e. it is not clear what happens next or what the tasks undertaken by the doctor are.

We can observe many of the horizontal processes in CAP CP ver.2; however, in some cases, as highlighted above, feedback loops are not provided when one would expect them to be. Similarly, timing is not provided for any of tasks and there is a basic reliance on an incremental approach to the planning of CAP care. Vertical processes are hidden. We do not observe the inputs (e.g. the needles needed for taking blood, the materials used in the diagnostics laboratory, the labour required by laboratory technicians, the biologist, etc.), but only the outputs and activities (various types of medical assessment, drug prescriptions, the writing of discharge letters, etc.) that depend on the ability of healthcare staff to objectively assess the medical condition of the CAP patient.

A CP is a formal record of all steps in the treatment or care process. CAP CP ver.2 does not encompass all the steps in the CAP treatment process; for example, when exactly does the switch from intravenous to oral antibiotics take place? CAP CP ver.2 does, however, carry the three basic elements of the process: inputs, outputs and activities. The patient is diagnosed with CAP in the 'admission pool', which is the input; he/she is then 'processed' through various hospital activities, which begin in the 'admission pool' and then move into the 'ward pool' and finally the 'discharge pool', to finally emerge in a better medical condition than when he/she was admitted initially. Throughout this process (journey, pathway), the patient is subject to medical decision-making points (exclusive and parallel gateways), events (e.g. the placing of an order to examine biological samples), and tasks and activities (where it is not clear how often, when and for how long some of these activities are to be repeated, e.g. when exactly to switch from intravenous to oral antibiotics, or for how long or when the doctor would assess the patient's need to receive oxygen therapy). CAP CP ver.2 is clear on how the tasks and activities are shared between the doctor and nurse (as it is a matter of hierarchy as well). Furthermore, it provides a plan on the further steps to be taken, but not at every level;

for instance, it is not clear for how long infusion therapy would need to last and whether is a matter of daily assessment. Lastly, CAP CP ver.2 does not allude to any of the business or managerial activities that would need to be undertaken within an activity – purchasing and organising the availability of intravenous and oral antibiotics, for instance, or managing the diagnostics laboratory shared by all the wards in the hospital.

7.2 Analysis of CAP CP ver.2 as a business process

Golnik Hospital's CAP CP ver.2 is part recording of a process and part activities checklist/*aide-mémoire*. It has elements of the chain coordination mechanism, with a high level of predictability and agreement, which allows us to call it a chain CP. It has an entry point (admission to the ward) and an end-point (discharge from hospital), and those involved in the treatment of patients on the CP (doctor and nurse) enjoy an overview of the CAP patient's pathway. CAP CP ver.2 is not shared with any other entities in the hospital, such as the diagnostics laboratory, financing department, purchasing department, sales department, logistics or operations department, or the social worker.

The patient's clinical condition is defined at the admissions office at the beginning of CAP CP ver.2, with information normally being collected in the pre-admission phase. CAP CP ver.2 does clearly define what medical condition is required in order for treatment to come to an end, i.e. upon discharge, at the end of the CP.

CAP CP ver.2 encompasses a number of activities to be undertaken by either the doctor or the nurse. Decision-making points are identified, but the feedback loops are not always explicit in terms of when the information is supposed to return. CAP CP ver.2 contains a series of activities that run sequentially, but does not make clear what the concurrent or parallel activities undertaken by the nurse, doctor, laboratory staff, etc. are, nor when and how decisions are taken, i.e. on what basis they are initiated, undertaken, and how and when the loops take place.

CAP CP ver.2 is not explicit on how much staff time is needed for a certain activity or task; however, it does outline which activities are to be performed respectively by the doctor and the nurse. However, when the doctor places an order (e.g. by prescribing oral instead of intravenous antibiotics, or requesting additional laboratory diagnostics tests), it is not clear how soon after the doctor's order the nurse is to undertake the activity, when the blood test results can be expected from the laboratory, or indeed which inputs are required in order to carry out those tests.

Information is limited. There is no space on CAP CP ver.2 for other types of information, such as laboratory values that may be crucial for activities or for decision-making (this type of information is supposedly collected separately on the medical chart), nor can we be certain what type of information would trigger the next activity. CAP CP ver.2 does, however, provide space for deviations from the expected CAP care journey. The information that CAP CP ver.2 offers the doctor and nurse is the information necessary to trigger the next activity.

In terms of timing, however, the activities are spread throughout the day, but no clear definition of the schedule is provided, nor there is any information on the tolerances expected in terms of the times at which individual stages are carried out. To give an example, CAP CP ver.2 says nothing about when to expect laboratory results so as to better adjust the antibiotic dose; an assumption is made the doctor will initiate orders after his morning visit, which the nurse will carry out most likely before noon.

If CAP CP ver.2 did not have elements of a process, it would not be recorded in its present form, but would be recorded on the basis of general or generic hospital forms such as the medical chart and nursing care logbook, where care provision would be less integrated, with no process of care in place. It would be even less clear when to expect feedback information from the diagnostic laboratory, for example, or a discharge plan, or to know for sure whether an activity had been carried out or when the next task is due to take place. The nurse would carry out his/her activities and record them in the nursing care logbook; the information in the logbook would not be shared with the doctor *per se*, and the nurse would have to look in the medical chart to carry out the doctor's order. It can therefore be said that care is provided by two different professional groups according to their own respective timing sequences and in a fragmented manner, with the limited communication increasing the likelihood of mistakes, duplication and waste of resources, not to mention presenting challenges to the organisation of hospital functions.

CAP CP ver.2 is not recorded as a combination of horizontal processes and a series of vertical processes. Only an assumption can be made about when two horizontal processes are to take place (planning discharge and foreseeing complications upon discharge, and providing care which the patient is on the ward) and when a series of vertical processes are triggered (e.g. laboratory activities).

Explicit outputs on CAP CP ver.2 are the output of the vertical processes such as the laboratory diagnostics tests. On the horizontal process of CAP CP ver.2, the doctor orders the testing of the patient's blood sample; this in turn means that the nurse will take the blood sample and send it, or walk down to the diagnostics laboratory. The diagnostics laboratory runs a vertical process to provide the input on the horizontal process of CAP CP ver.2, i.e. the laboratory results become the input for the doctor to use in order to decide on the next task. This input is therefore a combination of the products used in the laboratory to run the tests and the laboratory technician or microbiologist's time and capacity.

We can observe the entrance of vertical processes on CAP CP ver.2 when the doctor or nurse decides to order a task outside the ward to which the patient has been admitted – as mentioned above, the testing of blood samples and the planning of discharge, where it is assumed that the nurse will contact the social worker if problems are foreseen upon discharge.

However, these vertical processes are not observed on CAP CP ver.2; instead, they can only be assumed. The horizontal process of CAP CP ver.2 expects inputs to allow the doctor or nurse to be able to decide on the next step. For instance, it is impossible to see all the work undertaken by the social worker to ensure proper discharge home or into the community, and all the vertical processes that are undertaken by any of the business functions. The processes and activities undertaken by the purchasing function to provide antibiotics, for example, cannot be identified on CAP CP ver.2.

The only vertical process that is important from the point of view of the efficiency of the horizontal process of CAP CP ver.2 is the process undertaken in the diagnostics laboratory that provides the information necessary to ensure that the horizontal process runs smoothly. Without this piece of information, it would be difficult for the doctor to adjust or prescribe the necessary antibiotics.

CAP CP ver.2 carries elements of the chain CP model, as the patient remains on the ward to which he/she was admitted (even if it is true that some of the vertical processes take place outside the ward). If the patient were to be taken to the radiology department for a further diagnostics test such as imaging, it could then be considered to carry elements of the hub model. However, we can say that the CP model is appropriate for the treatment of CAP, given the patient group and the care technology involved, as the patient does not have to leave his/her primary ward. The patient remains on his ward and the vertical processes always enter the patient's pathway on the same ward.

CAP CP ver.2 assumes that there is one doctor and one nurse in the team responsible for treating CAP (it is difficult to say whether other professionals are involved in treating CAP in general). It may be worthwhile to consider the physiotherapist, who ensures that a bed-bound patient remains agile and flexible, and perhaps also the pharmacist, who is charged with monitoring antibiotic intake. CAP CP ver.2 does not show whether the nurse and doctor take part in any other CPs used in the hospital; this makes it impossible to examine how their capacities and labour are shared.

It is possible to a certain extent to observe the capacity required on CAP CP ver.2. In terms of space, it is clear in which ward the patient is being treated and the fact that he/she needs one bed; access to and the use of the diagnostics laboratory is also clear. It can be assumed that if the patient's medical condition worsens, he/she may have to be taken, at a certain point, to the imaging department, but this would then be marked as a variance on CAP CP ver.2. For this reason, and given the nature of the disease, the team may schedule an imaging procedure, which in turn would trigger the use of additional labour and resources outside the expected treatment of CAP on the CP, thus leading to a deviation. Furthermore, CAP CP ver.2 does not provide any specific timeframes or any other standards for the use of capacities.

It is not possible, on the basis of CAP CP ver.2, to identify all the capacities Golnik Hospital has to offer, nor is it possible to see from CAP CP ver.2 when the doctor is obliged to refer the patient to another hospital or send him/her to a different department for further assessment. CAP CP ver.2 does make it possible for the doctor to choose alternative forms of treatment – depending on the patient's physical state and the laboratory results, the doctor may choose to keep the patient on intravenous antibiotics, or order a switch from intravenous to oral antibiotics. This decision is clearly marked on CAP CP ver.2; it is also a turning-point in CAP treatment under the CAP clinical guidelines, and constitutes a reduction in the costs and labour incurred.

CAP CP ver.2 does not provide any information on the type of antibiotic or of any other drug the patient is obliged to take, although the CAP clinical guidelines do show several alternatives. Likewise, CAP CP ver.2 provides no information on where in the hospital, or indeed outside it, the doctor and/or nurse can obtain the drug or any kind of medical device (e.g. a nasogastric mask), nor is it possible to see what the costs of the drugs are or the costs of the therapies and services provided on CAP CP ver.2 by the doctor and nurse.

The CAP team (doctor and nurse) cannot see what type of payment is given for the services provided on CAP CP ver.2, i.e. whether it is based on DRGs, capitation or fee-for-performance, etc. It is possible to estimate the costs on the outputs and labour provided; however, this costing exercise would still be far from comprehensive, as the inputs are not identified on CAP CP ver.2 but can only be assumed. CAP CP ver.2 carries implicit information on the costs of different kinds of input.

My discussions with senior staff revealed that CAP CP ver.2 had not had any impact on changing the organisational structure of Golnik Hospital. Given that CAP CP ver.2 was, in effect, an additional document observed by both doctor and nurse, the organisational structure had remained more or less the same. The only major contribution made by implementation of CAP CP ver.2 related to the planning of discharge upon admission (an additional task to be undertaken by the admissions nurse), which makes it easier to discharge patients at the right time. Improved communication, teamwork and workflow on the ward, along with increased transparency (who does what and when) and accountability, are the other elements that have contributed to organisational change; and while they cannot be observed on CAP CP ver.2, they were mentioned in the course of my discussions with senior hospital staff.

It is not possible to say how CAP CP ver.2 affects or has affected organisation at the macro-level of Golnik Hospital. It has not had an impact on any of the patient admission procedures, for example, since it is the doctor in the admissions office who decides on admission, and hence the insertion of the patient into CAP CP ver.2 based on the common clinical indications for CAP.

Implicitly, it is the doctor's job to monitor the implementation of CAP CP ver.2, as it is he/shewho is in charge of care of the patient. It appears from the transparent layout of the expected activities that the implementation of CAP CP ver.2 is self-monitored. The nurse is not allowed to carry out the next step until the doctor decides on that next step.

CAP CP ver.2 does not make clear who needs to process or analyse the information on its implementation; once completed, CAP CP ver.2 is filed away. A completed CAP CP ver.2 may be used to analyse the length of stay and the drugs used; moreover, the business functions could benefit from enabling a more rational and efficient hospital business.

A CP would normally provide the information required for the purchasing function to plan and undertake its activities, and to ensure that the appropriate products or services are purchased on time or for a period of time. However, in the case of CAP CP ver.2, there does not seem to be any kind of relation between the purchasing function and CAP CP ver.2 implementation, with purchasing activities appearing to rely on historical data. There is also a question of how, for example, the purchasing function is notified of the use of a new drug that has been highly recommended by the updated clinical guidelines.

There is a lack of relation between the financing function of Golnik Hospital and CAP CP ver.2 – or at least, it is not to be found on CAP CP ver.2. On the basis of discussions with senior staff, CAP CP ver.2 is hardly ever analysed retrospectively, even for a very basic understanding of clinical work. It would have been useful to involve a finance officer in the design of CAP CP ver.2 so as to get a better understanding of where financial resources are being used.

Ideally, it is the CAP team that is in charge of modifications to or the improvement of CAP CP ver.2 based on updated clinical guidelines or changes in technologies.

The authors of CAP CP ver.2 should be all those involved in the care of a specific patient group. In the case of CAP CP ver.2, the authors, or those who have designed it, are the doctor and nurse. It would have been beneficial to have involved the pharmacist, microbiologists and management in the design of CAP CP ver.2.

At the end of the treatment or upon discharge, the patient receives no feedback or a debriefing on CAP CP ver.2 implementation, nor on the journey he/she has undertaken in the course of CAP treatment.

7.3 Lessons from CP design

It is evident that CP implementation in a hospital leads to significant impacts both on the organisational structure of the hospital and on the processes running within the hospital. All influences are related to the efficiency and effectiveness of hospital business operations. The above analysis not only reveals the influence of CP implementation on the organisational structure, but also on the business functions and processes in the hospital. The transformation or redesign of a hospital in response to CP implementation requires certain CP characteristics if we wish CP implementation to make a proper contribution to increasing the effectiveness and efficiency of the hospital.

On the basis of the Golnik Hospital case study and observations made on the impact of CPs on business functions, there are **16 points** to observe:

1. Every **CP is a process** in itself, which means that it must be designed and modelled as a process. Every CP must have a beginning and an end, main activities, decision-making points and waiting-time points. It can also carry different information on the monitoring of the

progress of CP implementation. The beginning of each CP is of a diagnostic nature, as it is quite rightly the diagnosis that presents the condition for classifying or attributing patients to an appropriate CP. A CP must also identify the intermediate results of treatment processes. At the end it must provide information on the effectiveness of the CP, i.e. the difference between the initial medical condition and the patient's final health outcome.

2. CPs can vary in structure and form. It is reasonable to classify them into **chain, hub and web CPs**. This type of classification stems from the technology of care and the classification of coordination mechanisms.

3. One very important aspect of any CP is the **time dimension**. We have characterised a CP as a horizontal process in which the patient is located throughout. It is therefore necessary to define the sequence and duration of each activity, each decision-making point and the waiting times. In terms of CP coordination, it is very important that we also consider a certain degree of tolerance in terms of sequence and time; such tolerance does not affect health outcomes, but can be used in the process of coordinating the implementation of different CPs for different patients.

4. A CP is linked to the effectiveness of the healthcare process and must always strive to cure or at least ameliorate the medical condition for which the patient was admitted. It must therefore include all those **activities** that can lead to a positive health outcome. The basic form of the CP must include only those activities, decisions and waiting times necessary within a standardised process of care. From this point of view, it is essential that, as activities, the CP also encompasses standard, required, measurable and controllable (can be monitored) and optional decision-making points.

5. The CP must be able to identify the cost of every activity, every decision-making point and every waiting time. This cost must also be transparent to the provider of the CP in relation to the types of activity that are classified under the usual method of care. It is also possible to extrapolate the total cost of CP implementation for one patient under standardised CP implementation without additional activities, decisions and waiting times.

6. The CP does not cover all the activities within the hospital that affect its efficiency; that said, due regard must be paid to the fact that capturing activities, decisions and waiting times within a CP can inappropriately offset the effects that form in the vertical production processes in the hospital and that influence hospital efficiency.

7. A CP that incorporates measurements and controls needs to be **coordinated** with the vertical production processes so that these types of activity are not repeated within the vertical production processes. This can have a significant impact on the efficiency of the hospital.

8. CPs must be designed in such a way that they can be coordinated and streamed despite the different activities that take place within them. This means that they must have‘**owners or managers**’; as we have found, these will vary depending on the type of CP and CP coordinator and the type of care provided to different patient groups.
9. A CP requires the **triage of patients** and their attribution to a CP appropriate to their patient group type.
10. A CP should be able to **record health services and products** that directly enter the CP in such a way as to link them in practical terms to the timely onset of activities, decision-making or waiting times, and to the use of a specific health service or product. It is not reasonable to demand from the CP that it record inputs which enter the vertical production processes and which, in turn, provide the health services and products as output that are required for CP implementation.

11. A CP must also include a warning on the sets of information that the implementer or user of the CP is obliged to communicate to the relevant departments and bodies within the hospital.

12. It also makes sense, in terms of the **time dynamics of CP implementation**,to record those management decisions that affect CP implementation. These decisions relate to the coordination and harmonisation of CP implementation, the transfer of patients from one department to another, and the information obtained from the purchasing and financing departments.

13. A CP should be able to record changes in techniques irrespective of whether these changes arise from changes in the technology of care or from the substitution of inputs and techniques.

14. A CP must, after its completion, be processed analytically and transformed into a **‘completed’ CP**. For this reason, it is necessary to organise or set up within the hospital a specific development department on the basis of a completed CP which also defines or anticipates potential changes or improvements in the CP. Such changes may also occur in the payer’s method of payment. It is very important for the CP to record all variances. This is particularly possible when the CP encompasses the activities, decisions and waiting times defined in a standard CP format.

15. A hospital’s development department should always **draw up a report or provide feedback** on CP implementation, and draw attention to any differences between the CPs being implemented (by providers within the hospital) and those that have been completed. On the basis of this, new developments and updates can be introduced into the CP; these must be discussed beforehand within the disciplinary team or by other entities within individual departments involved in CP implementation. A CP is a ‘living’ tool.

16. It also makes sense to organise a department or unit for **reporting on CP implementation to patients**. A service of this kind can be performed by the hospital's sales department responsible for acquiring patients and communicating with them. The report would present all aspects of importance for the patient, but would not reveal the intrinsic characteristics of the processes within the hospital (their disclosure would remain at the discretion of the hospital). This type of report can also be associated with the invoice through which the hospital charges the patient or payer.

DISCUSSION AND CONCLUSION

Overview of dissertation

In summary, I defend my hypothesis regarding the impact of CP implementation on the organisational structure of hospitals by stating that processes within hospitals need to be reorganised in the form of business process reengineering. I expound the hypothesis theoretically and, at the same time, test it by means of a practical case study: that of the treatment of CAP at Golnik Hospital, Slovenia.

Three different areas are discussed: CPs themselves, business functions and organisational structures, and business processes within organisations. The dissertation consists of an introduction, conclusion, discussion and seven sections; tables of content for figures, tables and diagrams are also provided. The last part of the dissertation consists of seven appendices and a summary of the dissertation in the Slovenian language.

I start from the hypothesis that CP implementation in hospitals requires a radical change in business functions and the use of business process reengineering methods and techniques. My hypothesis is based on research into existing analyses of CPs. I also note that previous studies of CPs have ignored the interdependence of a wide range of business functions and processes, making it impossible to precisely define the organisational and other changes required by hospitals following the implementation of CPs. CPs need to be shaped in such a way that their introduction and implementation improves the efficiency and effectiveness of hospitals.

As a point of departure for researching CAP treatment at Golnik Hospital, I introduce my second hypothesis: that Golnik Hospital needs to carry out certain organisational and process reengineering measures following implementation of the CAP CP. The impetus for this came from an absence of studies on the interdependence of functions, organisations and processes within hospitals and their impact on CP implementation. The absence of this kind of research has enabled the author to define the specific characteristics of CPs, thereby making a significant contribution to improving the effectiveness and efficiency of hospitals.

CPs are discussed in the first and second sections of the dissertation. On the basis of these discussions, a CP label would identify different types of protocols which denote certain steps and procedures needed for the treatment of different types of diseases or patient groups. These steps are based on best practices and patient expectations, and determine the mode of communication between healthcare providers within the hospital, the sequencing of the operations that need to be carried out, documentation, supervision and monitoring, and the evaluation of results and their variances. They also often define the resources required for the treatment of certain diseases or patient groups.

I also adopt different categorisations or types of CP depending on their coordination mechanisms (web, hub or chain) and group them into four CP models depending on the technology of treatment of a specific type of disease or patient group. CP implementation can influence the volume of diagnostic services, the length of stay of patients in hospitals, and the planning of capacities and hospital assets.

In the third section of the dissertation I present a case study of Golnik Hospital. I also describe the treatment process in the form of a CP for community-acquired pneumonia. The case study is also used to elaborate on the design process of the CP.

The fourth section deals extensively with the impact of CP implementation on the business functions of hospitals. I work from an assumption that these sorts of impact greatly necessitate a need for changes to hospitals' organisational structures and processes. I argue that these impacts are not dependent on the type of healthcare system used, and briefly present the most common European healthcare models: Bismarck and Beveridge.

I then go on to observe that CP implementation highlights the role of the purchasing function, which is usually neglected in both healthcare systems. CPs indicate which healthcare services hospitals can offer to patients and payers. They specify the products and services provided by hospitals, and prevent the emergence of induced supply related to moral hazard. CP implementation also increases trust between hospital and patients. It enables the classification of complex demands by patients, which leads to the appropriate adjustment of medical procedures within hospitals. CPs allow payers of healthcare services to set the appropriate quantity and price policy for an individual hospital. Where there is greater horizontal mobility on the part of patients, a CP presents a path for the enforcement of a hospital's trademark and its marketing policy. Different CP models encompass different scope and lead to different outcomes. The purchasing function is also addressed, emphasising that CP implementation leads to an appropriate purchasing policy. It determines the necessary services and other inputs required in order for a hospital to function adequately, provides a specification of these inputs, and finally has an impact on price policy for the purchasing of services depending on the complexity of individual activities within the CP.

The findings suggest that CPs are crucial to the production function within hospitals. From this perspective, CPs are important because they define the capacity and resources required for a certain output of a hospital, the relevant inputs that occur in the processes within the hospital and the transformation of inputs into an appropriate output within the hospital, which determines the hospital's efficiency. Meanwhile, efficiency is linked to the technology used and, in particular, the logistics occurring between specific CPs in a hospital. Based on a review of the literature, I point out that the hospital production function is, in fact, linked to the conversion of adequate inputs into outputs, which from the perspective of CPs emerges as their inputs because they enable patient treatment and the implementation of various stages within the CP. A CP reveals the necessary facilities, together with the bottlenecks, and sets the restrictions which need to be taken into account by hospitals when trying to achieve technical, allocative and cost efficiency. I also note that the type of health technology used has an impact on CP design; that is why CPs are mostly defined or developed on the basis of disease or patient groups and the treatment technology employed.

I present the four CP models in use. Each model is linked to the practical treatment experience of a particular disease type by the professionals that developed the CP. CP implementation can affect the scope of diagnostic services, the time a patient spends in hospital, the quality of healthcare outcomes, legal security, hospital organisation, capacity planning and assets, depending on the latest developments.

CPs are of key importance for the financial function because they provide basic information on the generation of costs; they also provide the payer with information on payment arrangements, depending on the health system. A CP helps improve budgetary planning within a hospital. Consideration must be given to the fact that the organisation of the financial function is affected by the shape and design of CPs. Much attention is paid to the organisation function and the impact of a CP on the organisation function. A CP defines the complexity of organisation, specialisation and division of labour. It requires some form of formalisation and also affects changes in the informal organisation of hospitals. The CP model defines the form of management, since it has an impact on the level of conflict and motivation. With CP implementation, certain organisational changes need to take place within the formal organisation, such as the modification of the hospital's organisational chart.

The fifth section discusses the impact of CPs on business functions; they also affect the business processes running within a hospital and require certain processes to undergo a certain reengineering. In this section, I first identify the types of processes and the method used to model business processes. By doing so, I also define the process map of the hospital, which enables the identification of those points within hospital business processes which are influenced by changes in business functions and the organisational structure of hospitals resulting from the implementation of CPs.

The key section of the dissertation is the sixth section, where I summarise the findings from the analyses of CPs, business functions, organisational changes and process modelling. This is where I also attempt to defend the core of my dissertation: the fact that CP implementation requires changes in organisational structure and the reengineering of business functions.

This section highlights the need for CPs to be understood as one of the processes within the hospital. The hospital is comprised of horizontal and vertical processes (a combination of core and support processes), with CPs representing the horizontal dimension of these processes. Vertical processes are actually linked to production in the hospital and are key to the efficiency of hospital operations. As a horizontal process, a CP is crucial to a hospital's effectiveness. I also highlight the fact that different CP models require different schemes of process modelling; CPs also affect the vertical processes, even though they basically represent the horizontal dimension of the processes within the hospital. In this section I also specify the way in which it is necessary to understand the relationship between a CP and individual business functions. I describe the core figure or scheme of the processes that occur with CP implementation. This scheme shows the flow of patients, the flow of services and healthcare products, and the flow of information. This section also demonstrates how CPs should be shaped so that they can provoke changes to the organisational structure in the everyday functioning of hospitals, and changes to processes so as to improve the effectiveness and efficiency of a hospital.

The seventh section tests the findings from the third section based on the case study of the CAP CP at Golnik Hospital. I conclude that CP implementation requires certain changes in the hospital's organizational structure and inner processes, as well as changes in the design and formulation of the CP. The findings of this particular case study correspond with my general findings and confirm my theoretical findings. These findings are based on the fact that Golnik Hospital needs to adjust its organisational and procedural structure in line with CP implementation, and that the hospital is not taking full advantage of the CP.

Hospitals are complex institutions whose greatest challenge lies in transforming their processes to ensure optimal delivery, not only for the business functions in question, but also for the patient and the hospital itself.

Healthcare providers, which include management as well as clinicians, need to reconsider the role of CPs in their hospitals and to redesign services accordingly. Since CPs are customised to reflect local needs, the potential use of resources, practices and experiences, every business function in the hospital will know best how to make full use of its capacities. The business functions of a hospital will most often carry out their activities and processes in isolation. The main challenge is to coordinate all the activities of the different business functions in order to ensure that the hospital functions properly and efficiently. It is of the utmost importance, if the complex and dynamic processes characteristics of a hospital are to be implemented properly, that there is adequate coordination and cooperation between the staff of different professional groups and specialisations from various departments and organisations.

As noted in the core of this dissertation, I start from an assumption that the fundamental characteristic of a CP is always a change from a patient's initial impaired state of health to an ultimate improvement in their health or their return to full health, taking into account the potential side-effects of treatment. From the point of view of the typical production function in healthcare, a CP aims to achieve adequate success in treatment and care that is reflected and can be measured in a change to the patient's medical condition. Hospitals use a variety of health services to achieve a better state of health for the patient. They do that by turning various inputs into outputs in their production process. The relationship between inputs and outputs is determined by the efficiency of the activities undertaken at the hospital.

CPs have effectively been in place in Europe for the past ten years. I conclude that they have had a limited impact on hospitals' business functions; as we know, it is difficult to achieve radical changes – and a CP is an innovation or tool that brings radical changes – within settings, structures and organisational principles that have been in place for decades. It is worth noting that a CP calls for and introduces a more process-based hospital and less of a hierarchical hospital; in other words, one of the reasons for the lack of impact on business functions, and perhaps also for the resistance within hospitals to the use of CPs, is the question of the notion of hierarchy. A more process-based approach to the functioning of hospitals would be a more favourable environment for CPs to flourish.

There are many ways of describing processes in a hospital. They are normally presented as maps of processes from the perspective of the clinical team on the ward, and involve barely anyone or anything beyond the boundaries of the ward. There have been attempts to study the common processes within the clinical setting, but none of these studies have discussed the impact of CPs on business functions.

Golnik Hospital, of which I make a case study, has shifted from the traditional line-item approach to a more performance-oriented approach and, at the time of writing, is using the second version of the CAP CP, which shows that a CP is a 'living' tool that is evolving in response to the needs and knowledge of the members of the multidisciplinary team. This hospital offers no direct incentive to physicians to increase the level of compliance of CAP treatment with CAP CP, but it is assumed that providing high-quality care is a staff priority and commitment.

Since the fundamental objective of this dissertation is to study the impact of CP implementation on business functions, in my case study of Golnik Hospital I analyse CAP CP ver.2 in the light of my findings on the impact on business functions. I use the static process model, using process-modelling for CAP CP ver.2; I then address the 16 lessons learned and apply them in my analysis of CAP CP ver.2, where I pinpoint those instances where there is a need to revisit and reengineer the processes in order to fully support the business functions of the hospital.

By redesigning the CP process and taking into account the elements of the most vital business functions, the hospital can achieve improvements in sales, purchasing, financing, operations and organisation; by doing so, the CP then automatically helps the hospital introduce improvements in services, quality and costs, especially for high-volume patient groups, which usually account for between 60 and 70% of inpatient care within hospitals, e.g. cataract surgery, hip replacement, stroke, acute appendicitis, etc. Managing these patient groups better gives the hospital more time and capacity for more complex patients with a variety of co-morbidities; and reconsidering and radically redesigning the provision of healthcare services means that hospitals have to shift away from silo or vertical structures to stronger horizontal structures, allowing them to provide more integrated and coordinated care and respond to current economic trends and patient demands.

The two hypotheses and the findings

The basic finding is that CPs have an impact on the business processes and organisational structure of hospitals. In this section I base my conclusions on CPs in general and on Golnik Hospital's CAP CP ver.2 in particular. I will first restate my arguments regarding the impact of CPs on hospitals in general, and then move on to present my concluding remarks on CAP CP ver.2. In a similar manner, I will present my concluding remarks on how a CP influences the business processes of a hospital, with the focus then shifting to CAP CP ver.2.

A CP is an illustration of a standard plan of a multidisciplinary healthcare team for a specific patient type. The sequence of activities of all the participants in the care process is defined by the CP. The CP therefore illustrates the lowest level of processes undertaken by healthcare providers, i.e. the level of the 'activity'.

In the introductory section I present the purpose of the dissertation, which is to outline the features of CPs and determine their influence on hospitals' business functions. To my knowledge and at the time of writing, the issue of business functions in relation to CPs has not been subject to examination or discussion. It is for this reason that I undertook the dissertation.

I examine how a CP affects processes within the hospital and how it contributes to improving effectiveness and efficiency on the basis of *two hypotheses*: the first is based on theoretical analyses and studies of the introduction and implementation of CPs in general, and states that a hospital or provider is required to radically rearrange its business functions and use the modalities and techniques of business process reengineering. In other words, practical implementation of the theories underlying CPs in an acute hospital setting requires an understanding and adoption of the techniques of business process reengineering.

The second hypothesis concerns the empirical testing of the first hypothesis. This empirical testing is carried out on the basis of a case study of Golnik Hospital CAP CP ver.2. The case study leads to the conclusion that Golnik Hospital should, on the basis of CP introduction and implementation, focus on reengineering its business processes. As we have seen, CAP CP ver.2 differs from most other CPs, e.g. the CPs for hip replacement, natural delivery, cataract surgery, etc., in that it is structured in such a way that the patient moves from one phase of the pathway to the next when the clinical milestones are reached; by contrast, most other CPs are structured so that the patient moves from step to the next based on the expected number of days spent in hospital. The time it takes to move a CAP patient from one phase to the next can therefore vary from patient to patient.

Since the first hypothesis was proved, this leads us to the second hypothesis: that Golnik Hospital should, on the basis of CP introduction and implementation, focus on the reengineering of its business processes in order to make optimal use of the information provided by CAP CP ver.2 or any other CP that may exist.

To test the two hypotheses, I provide an extensive backdrop and define CPs in general through a review of the literature. I discuss the possible coordination mechanisms (chain, hub and web CPs), and then move on to identifying the four common CP models, providing examples from the international literature. In the third part I present the two most common healthcare models in Europe, Beveridge and Bismarck, and observe that, regardless of the setting, a hospital in either system will have a similar if not the same kind of approach to CPs, even though the method of payment for the healthcare delivered may differ.

The fourth section of the dissertation provides an extensive discussion of the five main business functions of the hospital: sales, purchasing, operations, financing and organisation. Through a definition and understanding of these functions, I observe and discuss CP coordination mechanisms and their influence on various elements of the business functions identified; I also make observations on the impact of the four CP models on these functions.

The core of the dissertation, which is also its scientific contribution, discusses the findings relating to business functions in hospitals and the impact of different CP models. This section is fundamental to an understanding of the behaviour and impact of CPs in hospitals. As we have seen, it is evident that CP implementation has a greater impact on the organisational structure of a hospital and processes within that hospital. A CP is a horizontal process in which the patient is located throughout.

After discussing these findings and providing the scientific contribution, I then move on to provide a theoretical background to business processes in organisations, discuss the development of the concept of business processes in organisations, define the concept of the business process and the process types, and present business process modelling in order to better illustrate the case study of Golnik Hospital CAP CP ver.2. A CP addresses the lowest level of processes, i.e. the activity (different sets of activities, the sequence and timing of implementation) and it is thus adapted to each patient group. In order to be effective, a hospital must, by means of reengineering, adapt existing processes to the process models, taking into account the CP. This means that where a hospital carries out healthcare services on the basis of a different CP, it also has to implement a variety of process models.

Impact of CPs on the organisational structure

In general, a CP has an impact on organisational structure because it is a process that intertwines horizontal and vertical processes, and most intensively affects the operations function of the hospital.

We see that different types of CP model with different coordination mechanisms will involve different approaches to the provision of care, and thus call for a more flexible hospital organisational structure.

Implementing a CP by taking into account the impact on the vertical production processes, financing and purchasing (with a number of specialised services) will have an impact on the organisational structure and processes within the hospital, and will call for the establishment of a 'development department', centralised or shared purchasing, the coordination of operations for specific CPs, CP financing and costing, and the organisation of quasi-sales services.

Another impact that a CP will potentially have on the organisational structure is that a new scheme of processes would need to follow CP implementation to capture the flow of patients, the flow of services and health products, and the flow of information, where triage would need to take place upon admission of the patient to decide which type of CP to assign when the patient starts his/her treatment. This would necessitate a redesign of the basic organisational structure, where one or two new units or departments would need to be added: triage and logistics. As a new organisational entity, the triage department would be the bridge between the earlier forms, or diagnosis from outside the admitting hospital, and entrance onto the new CP. The second entity, logistics, would deal with coordination of the operations of the CP vital for an efficient and effective hospital; it would need to deal with CP implementation in relation to time, space, health services, labour, products, activities, waiting times and decisions. Whatever the type of CP, and especially for hub and web CPs, it would make sense to establish a logistics unit at the hospital.

A U-shaped organisational structure may therefore be the type of structure a hospital using CPs should work towards in order to ensure a multi-departmental structure with a relatively complex organisation, a high degree of formalisation and a low degree of centralisation.

We can also say that Golnik Hospital CAP CP ver.2 has an impact on the organisational structure within the hospital and affects the operations within it. CAP CP ver.2 is understood as a process taking place within the hospital which intertwines horizontal and vertical processes (on the ward and outside the ward, in the diagnostics laboratory) and most intensively affects the operations function of the hospital. Given that it has elements of a chain CP, it may not call for the organisational structure of the hospital to be more flexible.

However, were there to be more CPs of the same kind or a more complex CP sharing resources, Golnik Hospital would then have to rethink its organisational structure.

Given that CAP CP ver.2 starts in the admissions office where the patient is diagnosed with CAP, treated on the basis of CAP CP ver.2 and then, following a change to the initial medical condition, completes the CP, it can be said that, in terms of the organisational structure and processes within Golnik Hospital, there is a need to establish a 'development department' and to consider centralised or shared purchasing, coordination of operations for specific CPs, CP financing and costing activities, and organised quasi-sales services.

This kind of CP has a potential impact on the organisational structure. The organisational structure would need to follow CP implementation, if properly set, as a process for capturing the flow of patients, the flow of services and health products, and the flow of information. A triage unit could be set up to deal with patient admissions and to decide which type of CP to assign when the patient begins his/her treatment. This would necessitate a redesign of the basic organisational structure of the hospital, where one or two new units or departments would need to be added (triage and logistics, as discussed earlier). Similarly, as with any kind of CP, the hospital might consider a U-shaped organisational structure, which provides a multi-departmental structure with a high degree of formalisation and a low degree of centralisation, and ensures an efficient and effective flow of complex organisational processes.

The first hypothesis is tested and accepted. CAP CP ver.2 will have an impact on the organisational structure of the hospital, just like any chain or hub CP; however, the web type may, because of its *ad hoc* formation, have less of an impact on the organisational structure of the hospital, but would then greatly depend on the logistics unit.

Impact of CPs on business processes

From a general point of view, a CP has a significant impact on business processes. It is a horizontal process. As we observe, CPs can make a proper contribution to increasing the effectiveness and efficiency of hospitals if every CP is understood as a process in itself, with a beginning and an end, main activities, a decision-making point and a waiting times point.

Regardless of whether CPs are classified as chain, hub or web, when redesigning processes it is crucial to take into account the time dimension – in most cases, it is missing. A CP would normally provide information on its effectiveness, i.e. the difference between the initial medical condition and the patient's final health outcome (or improvement in his/her health condition). Therefore, for a CP to lead to a positive health outcome, it may need to standardise processes of care and make them measurable, controllable and optional.

As we have seen from the analysis, a CP mainly indicates the outputs in its horizontal process and does not cover all the activities within the hospital that affect its efficiency – that is, it does not say anything about the vertical processes or the inputs required. This makes it difficult to calculate the costs of the CP in any meaningful way. Furthermore, it is not always clear whether CPs have owners or managers to coordinate different care activities on the CP. A CP will start once it is assigned to the patient, and this seems to be a matter of pre-admission, where the patient is provided with a specific diagnosis.

A CP should be able to record the health services and products that directly enter the CP. It may not be reasonable to demand that a CP record the inputs which enter the vertical production processes, and so indicate the health services and products as output that are required for CP implementation.

A CP must also include a notification of the sets of information to be communicated to the relevant departments and bodies within the hospital. CP implementation should record those management decisions that affect CP implementation.

We have also learned that a CP should be able to record changes in techniques irrespective of whether these changes arise from changes in the technology of care or from the substitution of inputs and techniques – in other words, a CP should be flexible and enable changes in procedures of care and/or the substitution of inputs or techniques.

It is not clear from any of the CPs studied whether a completed CP shares its information with, for example, the financing department or purchasing department for the purpose of further analysis. As observed, a special development department within the hospital could draw up a report or provide feedback on CP implementation for new developments and updates, to be discussed beforehand within the disciplinary team or by other entities within individual departments involved in CP implementation – after all, a CP is a 'living' tool. In most cases, it is not clear whether the sales department of a hospital reports on CP implementation to patients, or prepares the report on the completed CP with the invoice.

Golnik Hospital has shifted from the traditional line-item approach to a more performance-oriented approach and, at the time of writing, is using the second version of the CAP CP. This demonstrates that a CP is a 'living' tool that is evolving in response to the needs and knowledge of the members of the multidisciplinary team. Golnik Hospital offers no direct incentive to physicians to increase the compliance of CAP treatment with the CAP CP, but it is assumed that providing quality of care is a staff priority and commitment. CAP treatment seems to still be carried out implicitly in the usual manner. CAP CP ver.2 will start once it is assigned to the patient; this is an activity within the admissions office, where the patient is diagnosed with CAP.

In the case of Golnik Hospital, CAP CP ver.2 is to some extent a process in which outputs are observed; in some cases, these outputs are the result of vertical processes. However, CAP CP ver.2 lacks some of the elements of a process. It is not always clear where certain activities begin and end, which activities run concurrently, where exactly the decision-making and waiting time points are, when a technology can be substituted, when decisions are taken and how soon they are then implemented, what the inputs in terms of healthcare services and products are, and how the CP shares resources and capacities – nor is it possible to identify whether the information obtained on this CP affects the hospital at the macro level, especially the five identified business functions. The CP also lacks a time dimension and information on its effectiveness, i.e. the difference between the initial medical condition and the patient's final health outcome (or improvement in his/her health condition). It is not clear how this is measured or controlled.

As we have seen from the analysis, CAP CP ver.2 mainly indicates the outputs on its horizontal process and does not cover all the activities within the hospital that affect its efficiency – it does not say anything about the vertical processes or the inputs required. It would therefore be difficult to make a proper calculation of the costs of CAP CP ver.2. It is also not always clear whether there are owners or managers charged with coordinating different activities of care on CAP CP ver.2.

CAP CP ver.2 does record the health services and products that enter the CP directly, and does record health services and products as outputs required for CP implementation/treatment of the CAP patient. However, it does not include the information to be communicated to the relevant departments within the hospital (such as the purchasing department), nor does it record management decisions that affect CP implementation.

CAP CP ver.2 is a living tool, but it is not clear whether it is able to record changes in techniques irrespective of whether these changes arise from changes in the technology of care or from the substitution of inputs and techniques. It does, however, record possible deviations.

It is not clear from the observed and analysed CAP CP ver.2 whether the information on its completed form is shared with, for example, the financing department or purchasing department for further analysis.

My analysis of Golnik Hospital CAP CP ver.2 shows that there is a need for staff at the hospital – and not only clinical staff, but also staff in other organisational units – to understand and adopt business process reengineering techniques and to re-evaluate and therefore redesign or further develop the CAP CP to encompass the necessary elements of various business functions.

The 16 lessons learned or key findings

There are 16 lessons that can be drawn from the observation and analysis of the design of CPs. What we learn from CP implementation can make a proper contribution to increasing the effectiveness and efficiency of a hospital if the following are taken into account: (1) that **every CP is a process in itself** and must have a beginning and an end, main activities, a decision-making point and a waiting time point. A CP must provide information on its effectiveness, i.e. the difference between the initial medical condition and the patient's final health outcome (or improvement in his/her health condition).

CPs are (2) **classified into chain, hub and web** CPs depending on the technology of care and the coordination mechanisms required; these that can be crucial when redesigning processes within the hospital because tolerance in terms of sequence and time does not affect health outcomes, but can be used for the coordination of different CPs for different patient groups. Another important lesson to take into account when redesigning a CP is (3) **the time dimension**. A CP is a horizontal process, which means that the sequence and duration of each activity, decision-making point and waiting time must be defined.

As we have seen, a CP is linked to the effectiveness of the healthcare process and must always strive (4) **to cure or at least ameliorate the medical condition** for which the patient has been admitted. It must therefore include all those activities that can lead to a positive health outcome. These activities may need to be standardised processes of care, and should be measurable, controllable and optional.

Another lesson learned concerns the costs incurred for the care provided on the basis of a CP. A CP must be able (5) **to identify the cost of every activity, every decision-making point and every waiting time**. A CP mainly records the outputs in its horizontal process and does not cover all the activities within the hospital that affect its efficiency – it says nothing about the vertical processes or the inputs required. It is therefore difficult to make a proper calculation of the costs of the CP. For this reason, the lesson that follows is that a CP that (6) **incorporates measurements and controls** needs to be coordinated with the vertical production processes so that these types of activity are not repeated within the vertical production processes. This can have a significant impact on the efficiency of the hospital.

CPs must have (7) **owners or managers** so that (8) **care can be coordinated and streamed** by owners or managers despite the different activities that take place within them. As we have found, coordination will vary depending on the type of CP and the type of care provided to different patient groups.

We have also learned that what is needed initially, especially prior to admission to the ward, is triage of patients and their assignment to the CP most appropriate to their patient group type. Once the patient is assigned to a CP, the CP can start. There is a need for (9) **proper triage**.

A CP should be able to (10) **record health services and products** that directly enter the CP. It may not be reasonable to demand that a CP record inputs which enter the vertical production processes, and so provide health services and products as output that are required for CP implementation.

A CP must also include a warning on (11) the **sets of information** that the person implementing or using the CP is obliged to communicate to the relevant departments and bodies within the hospital. Moreover, CP implementation should record those management decisions that affect CP implementation, e.g. the transfer of patients from one department to another, and the information obtained from the purchasing and financing departments, especially in terms of (12) the **time dynamics**.

We have also learned that a CP should be able to record changes in techniques irrespective of whether these changes arise from changes in the technology of care or from the substitution of inputs and techniques; in other words, the CP should be (13) **flexible and enable changes in procedures of care and/or the substitution of inputs or techniques**.

One very important lesson is the need to analyse the (14) **completed CP**, which should preferably be done by a special development unit or department and shared with the financing department for further financial analysis. This hospital development department should always draw up a report or provide (15) **feedback on CP implementation** for new developments and updates that could potentially be introduced into the CP; these must be discussed beforehand within the multi-disciplinary team or by other entities within individual departments involved in CP implementation.

The final lesson concerns the setting-up of a department or unit by the sales department for (16) **reporting on CP implementation to patients**. This type of report can also be associated with the invoice through which the hospital charges the patient or payer.

In all, we can say that CPs are essential to clinical practice improvement and to the design of healthcare service delivery. High-quality service delivery models are an essential input if a hospital is to operate efficiently and effectively.

General findings and significance

Since the fundamental objective of this dissertation is to study the impact of CP implementation on business functions, in my case study of Golnik Hospital I analyse CAP CP ver.2 in the light of my findings on the impact on business functions. I employ the static process model, using process-modelling for CAP CP ver.2; I then address the 16 lessons learned and apply them in my analysis of CAP CP ver.2, where I pinpoint those instances where there is a need to revisit and reengineer the processes in order to fully support the business functions of the hospital on the basis of the following:

(1) Given that there has, up to the time of writing, been no study produced of the changes in business functions that have occurred upon CP implementation in healthcare systems in Slovenia and elsewhere, this dissertation will likely lead to a better understanding of the

interdependence of the various business functions and work processes involved in CP implementation.

(2) The dissertation identifies the pitfalls of the common CP models. From the point of view of business processes, a number of necessary items of different business functions are missing in almost all the CPs studied (CP Models 1, 2, 3 and 4, and CAP CP ver.2).

(3) The dissertation will facilitate the introduction and implementation of new CPs in healthcare systems by properly involving and engaging all the relevant staff, from management to clinicians to other allied services.

(4) The dissertation suggests that proper CP implementation, from the point of view of various elements of business functions and by redesigning processes to fully optimise operations and processes within the hospital, will improve the efficiency and effectiveness of hospital performance.

(5) The findings of the dissertation suggest that hospitals should consider an in-depth analysis of the changes required and consider reengineering their processes so as to fully exploit CP use, not only at the clinical level but also at the macro level of the hospital. For instance, Golnik Hospital's updated version of a potential new CP or the CAP CP would need to rely on the findings of this dissertation.

(6) A CP can have an impact on efficiency and effectiveness in all the aspects of the production function if it is properly aligned with the processes of the various business functions.

(7) The dissertation identifies the fact that, in order for providers to provide continuous and integrated care for a specific type of patient, CPs must provide accurate information not only at the clinical level but also at the macro level of the hospital.

Other issues to consider in the future

One limitation of my study is that the research method is based on a single case study and may carry elements of bias on my behalf and on those of the two medical experts interviewed at Golnik Hospital. Another limitation is that I could not directly observe the preparation of the design of CAP CP ver.2, nor was I able to follow a patient on CAP CP ver.2. It may be worthwhile studying the intertwining of several and more complex CPs, and their impact on business functions. One further possible study would involve observing high-volume case-types such as stroke or chronic diseases (e.g. diabetes) that would call for a CP to cross several boundaries or levels of the healthcare system (emergency, acute inpatient episode, rehabilitation, community care and so on).

More studies should be conducted in the future concentrating specifically on the implementation of one or more CPs and a specific business function, or a CP designed that would carry all the required business process elements and produce in-time information for any of the core functions of the hospital. This would most likely require an electronic platform.

REFERENCES

Academy Health. (2006). *Efficiency in Health Care: What Does it Mean? How is it Measured? How Can it be Used for Value-Based Purchasing?*Retrieved 19 April 2013 from http://www.academyhealth.org/files/publications/EfficiencyReport.pdf

Activiti. (2011). *User Guide*. Retrieved 17 May 2013 from http://www.activiti.org/userguide/index.html

Åhgren, B. (2001). *Creating Integrated Health Care*. Göteborg: Nordic School of Public Health.

Albreht, T., Turk, E., Toth, M., Ceglar, J., Marn, S., Pribaković Brinovec, R., & Schäfer, M. (2009). Slovenia: Health system review. *Health systems in transition,11*(3): 1–168.

Allen, D., & Rixson, L. (2008). How has the impact of 'CP technologies' on service integration in stroke care been measured and what is the strength of the evidence to support their effectiveness in this respect? *International Journal of Evidence-Based Healthcare, 6*(1), 78–110.

Allen, D., Gillen, E., & Rixson, L. (2009). Systematic review of the effectiveness of integrated CPs: what works, for whom, in which circumstances? *International Journal of Evidence-Based Healthcare, 7*(2), 61–74.

Archer, S. B., Burnett, R. J., Flesch, L. V., Hobler, S. C., Bower, R. H., Nussbaum, M. S., & Fischer, J. E. (1997). Implementation of a clinical pathway decreases length of stay and hospital charges for patients undergoing total colectomy and ileal pouch/anal anastomosis. *Surgery, 122*(4), 699–703, discussion 703–705.

Australian Institute of Health and Welfare. (2013). Australian refined diagnosis-related groups (AR-DRG) data cubes. Retrieved 19. April 2013 from http:// www.aihw.gov.au/

Bainton, D. (1995). Building blocks. *Health Service Journal, 105*, 25–27.

Ball, M. J., Simborg, D. W., Albright, J. W., & Douglas, J. V. (1995). *Healthcare Information Management Systems: A Practical Guide*. New York: Springer-Verlag.

Bandolier. (2003). *Independent evidence-based health care: On CPs*. Retrieved 8 July 2011 from http://www.medicine.ox.ac.uk/bandolier/Extraforbando/Forum2.pdf

Barbieri, A., Vanhaecht, K., Van Herck, P., Sermeus, W., Faggiano, F., Marchisio, S., & Panella, M. (2009). Effects of clinical pathways in the joint replacement: a meta-analysis. *BMC Medicine, 7*(32), 1–11.

Barnes, R. V., Lawton, L., & Briggs, D. (1994). Clinical benchmarking improves clinical paths: experience with coronary artery bypass grafting. *Joint Commission Journal on Quality Improvement, 20*(5), 267–276.

Benson, T. (2008). *CPs. Version 1.0 (final)*. London: National Health Service (NHS).

Berginc Dolenšek, A., Hajnrih, B., Kadivec, S., Kersnik, J., Kramar, Z., Lednik, L., Marušič, D., Mlakar, J., Robida, A., Yazbeck, A-M., & Zorman I. (2006). *Metodološka priporočila za oblikovanje in uvajanje kliničnih poti*. Ljubljana: Ministrstvo za zdravje.

Bergman, R. (1993). The measuring stick. Is health care ready for full-scale outcomes measurement? *Hospitals & Health Networks, H&HN, 67*(23), 36–38, 40, 42.

Berliner BPM-Offensive. (2011). *BPMN 2.0 – Business Process Model and Notation*. Retrieved 17 May 2013 from http://www.bpmb.de/images/Poster_en.png

Bertrand, B., & de Vries, G. (2005). Lessons to be learned form operations management. In J. Vissers & R. Beech (eds.), *Health operations management: patient flow logistics in health care* (pp. 15–38). New York: Routledge.

Board, N., Brennan, N., & Caplan, G. A. (2000). A randomised controlled trial of the costs of hospital as compared with hospital in the home for acute medical patients. *Australian and New Zealand Journal of Public Health, 24*(3), 305–311.

Bogoch, E. R., Elliot-Gibson, V., Beaton, D. E., Jamal, S. A., Josse, R. G., & Murray, T. M. (2006). Effective initiation of osteoporosis diagnosis and treatment for patients with a fragility fracture in an orthopaedic environment. *The Journal of Bone & Joint Surgery, 88*(1), 25–34.

Booz-Allen & Hamilton. (1988). *Operational Restructuring: A Recipe for Succes*. London: Booz-Allen & Hamilton.

Boyson, S., Harrington, L. H., & Corsi, T. M. (2004). *In Real Time: Managing the New Supply Chain*. Westport: Praeger Publishers.

Braithwaite, J., Hindle, D., Iedema, R., & Westbrook, J. I. (2002). Introducing soft systems methodology plus (SSM+): why we need it and what it can contribute. *Australian Health Review, 25*(2), 191–198.

British Thoracic Society (2009). *Guidelines for the management of community acquired pneumonia in adults: update 2009.* Retrieved 1 May 2011 from http://www.brit-thoracic.org.uk/Portals/0/Clinical%20Information/Pneumonia/Guidelines/CAPGuideline-full.pdf

Brodersen, J., & Thorwid, J. (1997). Enabling sustainable change for healthcare in Stockholm. *British Journal of Healthcare Computing and Information Management, 14*(4), 23–26.

Burns, L. R. (1989). Matrix Management in Hospitals: Testing Theories of Matrix Structure and Development. *Administrative Science Quarterly, 34*(3), 349–368.

Burns, L. R., DeGraaff, R. A., Danzon, P. M., Kimberly, J. R., Kissick, W. L., & Pauly, M. V. (2002). The Wharton School Study of the Health Care Value Chain. In L. R. Burns (ed.), *The health care value chain: producers, purchasers, and providers* (pp. 3–26). San Francisco: Jossey-Bass.

Burns, T., & Stalker, G. M. (1961). *The Management of Innovation*. London: Tavistock Publications.

Bush, R. W. (2007). Reducing waste in US health care systems. *The Journal of the American Medical Association, 297*(8), 871–874.

California State University. (2013). Operations Management. Retrieved 10 May 2013 from http://www.calstate.edu/

Campbell, H., Hotchkiss, R., Bradshaw, N., & Porteous, M. (1998). Integrated CPs. *BMJ, 316*(7125), 133–137.

Campbell, N. C., Murray, E., Darbyshire, J., Emery, J., Farmer, A., Griffiths, F., Guthrie, B., Lester, H., Wilson, P., &Kinmonth, A. L. (2007). Designing and evaluating complex interventions to improve health care. *BMJ, 334*(7591), 455–459.

Chase, R. B., Aquilano, N. J., & Jacobs, F. R. (2001). *Operations management for competitive advantage* (9th ed.). New York: Irwin McGraw-Hill.

Cheah, T. S. (1998). Clinical pathways – the new paradigm in healthcare?*Medical Journal of Malaysia, 53*(1), 87–96.

Chilingerian, J. A., & Glavin, M. P. (1994). Temporary firms in community hospitals: elements of a managerial theory of clinical efficiency. *Medical Care Research and Review, 51*(3), 289–335.

Chu, S. (2001). Computerised clinical pathway management systems and the implications. *Collegian, 8*(2), 19–24.

Chu, S., & Cesnik, B. (1998). Improving clinical pathway design: lessons learned from a computerised prototype. *International Journal of Medical Informatics, 51*(1), 1–11.

Coalition, W. M. (1999). *Workflow Management Coalition*. Retrieved 14 February 2012 from http://www.wfmc.org/

Coffey, R. J., Richards, J. S., Remmert, C. S., LeRoy, S. S., Schoville, R. R., & Baldwin, P. J. (1992). An introduction to critical paths. *Quality Management in Health Care, 1*(1), 45–54.

Colucciello, M. L., & Mangles, L. M. (1997). Clinical pathways in subacute care settings. *Nursing Management, 28*(6), 52–54.

Cooper, D., Jauch, E. & Flaherty, M. L. (2007). Critical pathways for the management of stroke and intracerebral hemorrhage: a survey of US hospitals. *Critical Pathway Cardiology*. Mar; 6(1):18–23.

Coulson-Thomas, C. (1996). Re-engineering hospital and healthcare processes. *British Journal of Healthcare Management, 2*(6), 338–342.

Courtright, J. A., Fairhurst, G. T., & Rogers, L. E. (1989). Interaction patterns in organic and mechanistic systems. *Academy of Management Journal, 32*(4), 773–802.

Crocker, T. F., Johnson, O. A., & King, S. F. (2007). *Towards a formalisation of CPs to embody good practice in healthcare*. Paper presented at the eGovernment Workshop '07, Leeds, UK. Retrieved 31 August 2012 from http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.106.446&rep=rep1&type=pdf

Crocker, T. F., Johnson, O. A., & King, S. F. (2009). The suitability of care pathways for integrating processes and information systems in healthcare. *Transforming Government: People, Process and Policy,3*(3): 289–301.

Cumbler, E., Zaemisch, R., Graves, A., Brega, K., & Jones, W. (2011). Improving stroke alert response time: applying quality improvement methodology to the inpatient neurologic emergency. *Journal of Hospital Medicine, 7*(2): 137–141.

Currie, G., & Harvey, V. L. (2000). The use of CPs as tools to support the implementation of evidence-based practice. *Journal of Interprofessional Care, 14*(4), 311–324.

Currie, L., & Harvey, G. (1997). *The origins and use of CPs in the USA, Australia and the United Kingdom* (ReportNo. 15). Oxford: RCN Institute.

Currie, V. L., & Scrivener, R. (2002). Tracking CP activity across the UK National Health Service. *Journal of Clinical Excellence, 4*(2), 231–236.

Daft, R. L. (1995). *Organisation Theory and Design* (5th ed.). Minneapolis: West Publishing Company.

Daft, R. L., & Marcic, D. (2009). *Understanding management* (6th ed.). Mason: South-Western.

Daft, R. L., & Marcic, D. (2011). *Understanding management* (6th ed.). Cinncinati: Cengage.

Davenport, T. H. (1993). *Process innovation: reengineering work through information technology*. Boston: Harvard Business School Press.

Davenport, T. H., & Short, J. E. (1990). The New Industrial Engineering: Information Technology and Business Process Redesign. *Sloan Management Review, 31*(4), 11–27.

De Luc, K. (1999). *Developing, implementing and evaluating CPs in the UK: The way to go* (HSMC Research Report No. 34). Birmingham: University of Birmingham, Health Services Management Centre.

De Luc, K. (2001). *Developing CPs*. Abingdon: Radcliffe Publishing.

Degeling, P., Maxwell, S., Kennedy, J., & Coyle, B. (2003). Medicine, management, and modernisation: a "danse macabre"? *BMJ, 326*(7390), 649–652.

Devriese, S., Lambert, M. L., Eyssen, M., Van De Sande, S., Poelmans, J., Van Brabandt, H., Sermeus, W., Vlayen, J., & Ramaekers, D. (2005). *The use of clinical pathways and guidelines to determine doctors' hospital fees prospectively: Easier said than done* (KCE Report 18A). Brussels: Belgian Healthcare Knowledge Centre (KCE).

Dimovski, V., & Penger, S. (2004). Attaining The Knowledge Organisational Paradigm: Theoretical Views Of The 21st Century Organisation And The Case Of Slovenian Institute For Learning Enterprises. International Business & Economics Research Journal, Volume 3, Number 7, pp. 31–45.

Dimovski, V., Škerlevaj, M., Škrinjar, R., Jaklič, J., & Indihar Štemberger, M. (2006). *Organizational learning culture as the link between business process orientation and organizational performance.* Retrieved 11 March 2014 fromhttps://www.google.si/search?q=Organizational+learning+culture+as+the+link+between+business+process+orientation+and+organizational+performance.&oq=Organizational+learning+culture+as+the+link+between+business+process+orientation+and+organizational+performance.&aqs=chrome..69i57j69i59.841j0j7&sourceid=chrome&espv=210&es_sm=122&ie=UTF-8

Directive 2007/47/EC of the European Parliament and of the Council of 5 September 2007 amending Council Directive 90/385/EEC on the approximation of the laws of the Member States relating to active implantable medical devices. *Official Journal* of the Europe Union No. 247/2007.

Donaldson, C., & Gerard, K. (2005). *Economics of health care financing: the visible hand* (2nd ed.). Basingstoke, Hampshier: Palgrave Macmillan.

Došenović Bonča, P. (2010). *Inovacije kot dejavnik učinkovitosti in uspešnosti bolnišnic v Sloveniji* [Innovations as Determinants of Hospital Efficiency and Performance: the Case of Slovenia]. Ljubljana: Faculty of Economics.

Drury, C. (1985). *Management and cost accounting*. Wokingham: Van Nostrand Reinhold.

DuBrin, A. J. (2009). *Essentials of Management* (8th ed.). Mason: South-Western Cengage Learning.

DuBrin, A. J. (2012). *Leadership: Research findings, practice, and skills* (7th ed.). Mason: South-Western Pub.

Dunn, R. (2006). *Haimann'S Healthcare Management*. Chicago: Standard Publishers Distributors.

Dunnette, M. D., Hough, L. M., & Triandis, H. C. (1994). *Handbook of industrial and organisational psychology*. Palo Alto: Consulting Psychologists Press.

Eatock, J., Giaglis, G. M., Paul, R. J., & Serrano, A. (2000). The Implications of Information Technology Infrastructure Capabilities for Business Process Change Success. In P. Henderson (Ed.), *Systems Engineering for Business Process Change* (pp. 127–137). London: Springer-Verlag.

Eccles, M., & Mason, J. (2001). How to develop cost-conscious guidelines. *Health Technology Assessment, 5*(16), 1–69.

Elkhuizen, S. G., van Sambeek, J. R., Hans, E. W., Krabbendam, K. J., & Bakker, P. J. (2007). Applying the variety reduction principle to management of ancillary services. *Health Care Management Review, 32*(1), 37–45.

Eržen, R., Mušič, E., & Košnik, M. (2006). *Clinical pathway as a tool of improving quality of care in patients with CAP*. Golnik: Golnik Hospital – University Clinic of Respiratory and Allergic Diseases Golnik.

Ettorre, B. (1995). Reengineering Tales from the Front. *Management Review, 84*(1), 13–18.

European Pathway Association. (2011). *Clinical/CPs*. Retrieved 3 May 2013 from http://www.e-p-a.org/clinical---care-pathways/index.html

Evans-Lacko, S., Jarrett, M., McCrone, P., & Thornicroft, G. (2010). Facilitators and barriers to implementing clinical CPs. *BMC Health Services Research, 10*, 182.

Every, N. R., Hochman, J., Becker, R., Kopecky, S., & Cannon, C. P. (2000). Critical pathways: a review. Committee on Acute Cardiac Care, Council on Clinical Cardiology, American Heart Association. *Circulation, 101*(4), 461–465.

Feinstein, A. H., & Stefanelli, J. M. (2008). *Purchasing: Selection and Procurement for the Hospitality Industry* (7th ed.). New Jersey: John Wiley.

Fetter, R. B., Shin, Y., Freeman, J. L., Averill, R. F., & Thompson, J. D. (1980). Case mix definition by diagnosis-related groups. *Medical Care, 18*(2), 1–53.

Fine, M. J., Auble, T. E., Yealy, D. M., Hanusa, B. H., Weissfeld, L. A., Singer, D. E., Coley, C. M., Marrie, T. J., & Kapoor, W. N. (1997). A prediction rule to identify low-risk patients with community-acquired pneumonia. *The New England Journal of Medicine, 336*(4), 243–250.

Fine, M. J., Hough, L. J., Medsger, A. R., Li, Y. H., Ricci, E. M., Singer, D. E., Marrie, T. J., Coley, C. M., Walsh, M. B., Karpf, M., Lahive, K. C., Kapoor, W. N. (1997). The hospital admission decision for patients with community-acquired pneumonia. Results from the pneumonia Patient Outcomes Research Team cohort study. *Archives of Internal Medicine, 157*(1), 36–44.

Flynn, A. M., & Kilgallen, M. E. (1993). Case management: a multidisciplinary approach to the evaluation of cost and quality standards. *Journal of Nursing Care Quality, 8*(1), 58–66.

Folland, S., Goodman, A. C., & Stano, M. (1997). *The economics of health and health care*. Upper Saddle River: Prentice Hall.

Forkner, J. (1996). Clinical pathways: benefits and liabilities. *Nursing Management, 27*(11), 35–38.

Fox, N. S., Brennan, J. S., & Chasen, S. T. (2008). Clinical estimation of fetal weight and the Hawthorne effect. *European Journal of Obstetrics & Gynecology and Reproductive Biology,* *141*(2), 111–114.

Gallagher, C. (1994). Applying quality improvement tools to quality planning: pediatric femur fracture clinical path development. *Journal for Healthcare Quality, 16*(3), 6–14.

Garvin, D. A. (1998). The processes of organisation and management. *Sloan management review, 39*(4), 33–50.

Gaynor, M., & Anderson, G. F. (1995). Uncertain demand, the structure of hospital costs, and the cost of empty hospital beds. *Journal of Health Economics, 14*(3), 291–317.

Giles, M., Van Der Kallen, J., Parker, V., Cooper, K., Gill, K., Ross, L., et al. (2011). A team approach: implementing a model of care for preventing osteoporosis related fractures. *Osteoporosis International, 22*(8), 2321–2328.

Gillespie, A. (2011). Foundations of Economics 2e – Additional chapter on Business Strategy. Retrieved 10 January 2013, from http://www.oup.com/uk/orc/bin/9780199586547/01student/additional/page_08.htm

Giuliano, K. K., & Poirier, C. E. (1991). Nursing case management: critical pathways to desirable outcomes. *Nursing Management, 22*(3), 52–55.

Goldberg, R., Chan, L., Haley, P., Harmata-Booth, J., & Bass, G. (1998). Critical pathway for the emergency department management of acute asthma: effect on resource utilization. *Annals of emergency medicine, 31*(5), 562–567.

Golnik Hospital. (2012). *Clinical activity*. Retrieved 21 April 2013 from http://www.klinika - golnik.si/en/hospital-activities/activity/clinical-activity/

Govan, L. J. W. (2009). Optimising service organisation for stroke patients (PhD thesis). Retrieved 26 January 2012 from http://theses.gla.ac.uk/796/

Gray, J. A. M. (2009). *Evidence-based healthcare and public health: how to make decisions about health services and public health* (3rd ed.). Edinburgh: Churchill Livingstone.

Green, L. V. (2003). How many hospital beds? *Inquiry, 39*(4), 400–412.

Griffin, D. J. (2012). *Hospitals: What They Are and How They Work* (4th ed.). Sudbury: Jones & Bartlett Learning.

Griffith, R. (2007). CPs: a legal sword or shield? *British Journal of Community Nursing, 12*(8), 374–377.

Guha, S., Kettinger, W. J., & Teng, J. T. C. (1993). Business process reengineering. *Information Systems Management, 10*(3), 13–22.

Hackman, J. R., & Wageman, R. (1995). Total Quality Management: Empirical, Conceptual, and Practical Issues. *Administrative Science Quarterly, 40*(2), 309–342.

Hammer, M. (1990). Reengineering Work: Don't Automate, Obliterate. *Harvard Business Review, 68*(4), 104–112.

Hammer, M. (1996). *Beyond reengineering: how the process-centred organisation is changing our work and our lives*. London: HarperCollins Business.

Hammer, M. (2000). *The Process Starts Here*. *An interview*: CIO.

Hammer, M., & Champy, J. (1993). *Reengineering the corporation: a manifesto for business revolution*. New York: Harper Business.

Hammer, M., & Champy, J. (2003). *Reengineering the corporation: a manifesto for business revolution* (1st HarperBusiness Essentials pbk. ed.). New York: HarperBusiness Essentials.

Hammer, M., & Stanton, S. (1999). How process enterprises really work. *Harvard business review, 77*(6), 108–120.

Hanna, E., Schultz, S., Doctor, D., Vural, E., Stern, S., & Suen, J. (1999). Development and implementation of a clinical pathway for patients undergoing total laryngectomy: impact on cost and quality of care. *Archives of Otolaryngology-Head & Neck Surgery, 125*(11), 1247–1251.

Harmon, P. (2007). *Business process change: a guide for business managers and BPM and six sigma professionals*. Amsterdam: Elsevier/Morgan Kaufmann Publishers.

Hart, R., & Musfeldt, C. (1992). MD-directed critical pathways: it's time. *Hospitals, 66*(23), 56.

Hauck, L. D., Adler, L. M., & Mulla, Z. D. (2004). Clinical pathway care improves outcomes among patients hospitalized for community-acquired pneumonia. *Annals of Epidemiology, 14*(9), 669–675.

Haywood-Farmer, J., & Nollet, J. (1991). *Services Plus: Effective Service Management*. Boucherville: Morin.

Henriksen, K., Battles, J. B., Marks, E. S., & Lewin, D. I. (2005). *Advances in Patient Safety: From Research to Implementation (Volume 2: Concepts and Methodology)*. Rockville: Agency for Healthcare Research and Quality.

Hindle, D., & Yazbeck, A.-M. (2005). Clinical pathways in 17 European Union countries: a purposive survey. *Australian Health Review, 29*(1), 94–104.

Hindle, D., Dowdeswell, B., & Yazbeck, A.-M. (2004). *Report of a Survey of Clinical Pathways and Strategic Asset Planning in 17 EU Countries*. Utrecht: Bouw College.

Hoffman, P. (1997). Critical Path Method: An Important Tool for Coordinating Clinical Care. *Journal of Quality Improvement, 19*(7), 235–246.

Holtzman, J., Bjerke, T., & Kane, R. (1998). The effects of clinical pathways for renal transplant on patient outcomes and length of stay. *Medical Care, 36*(6), 826–834.

Horne, M. (1996). Involving doctors in clinical pathways: an example for perioperative knee arthroplasty. *Joint Commission Journal on Quality Improvement, 22*(2), 115–124.

Hoverman, J. R., Cartwright, T. H., Patt, D. A., Espirito, J. L., Clayton, M. P., Garey, J. S., Kopp, T. J., Kolodziej, M., Neubauer, M. A., Fitch, K., Pyenson, B., & Beveridge, R. A. (2011). Pathways, outcomes, and costs in colon cancer: retrospective evaluations in 2 distinct databases. *Journal of Oncology Practice, 7*(3S), 52s–59s.

Huby, G., & Rees, G. (2005). The effectiveness of quality improvement tools: joint working in integrated community teams. *International Journal for Quality in Health Care, 17*(1), 53–58.

Hurst, D. K. (1995). *Crisis & renewal: meeting the challenge of organisational change*. Boston: Harvard Business School.

Institute of Medicine. (1990). *Clinical Pathways.* Retrieved 11 May 2013 from http://www.iom.edu/

International Network of Agencies for Health Technology Assessment. (2013). *Glossary: Health Technology.* Retrieved 19 April 2013 from http://www.inahta.net/

Jessup, R. L. (2007). Interdisciplinary versus multidisciplinary care teams: do we understand the difference? *Australian Health Review, 31*(3), 330–331.

Kaplan. (2012). *The business' finance function*. Retrieved 11 May 203 from http://financial.kaplan.co.uk/Documents/ICAEW/Chapter_7.pdf

Keeler, T. E., & Ying, S. C. (1996). Hospital Costs and Excess Bed Capacity: A Statistical Analysis. *The Review of Economics and Statistics, 78*(3), 470–481.

Kent, P., & Chalmers, Y. (2006). A decade on: has the use of integrated CPs made a difference in Lanarkshire? *Journal of Nursing Management, 14*(7), 508–520.

Kettinger, W. J., & Grover, V. (1995). Special Section: Toward a Theory of Business Process Change Management. *Journal of Management Information Systems, 12*(1), 9–30.

Khawaja, P. M. I., & Mushtaq, A. (2003). Itemized bill: novel method to audit the process of laparoscopic cholecystectomy. *World journal of surgery, 27*(6), 666–670.

Kimball, L. (1993). Collaborative care: a quality improvement and cost reduction tool. *Journal for Healthcare Quality, 15*(4), 6–9.

King, S. F., & Johnson, O. A. (2006). VBP: An approach to modelling process variety and best practice. *Information and Software Technology, 48*(11), 1104–1114.

Kitchiner, D., Davidson, C., & Bundred, P. (1996). Integrated CPs: effective tools for continuous evaluation of clinical practice. *Journal of Evaluation in Clinical Practice, 2*(1), 65–69.

Koechlin, F., Lorenzoni, L., & Schreyer, P. (2010). *Comparing Price Levels of Hospital Services Across Countries* (Paper No. 53). Paris: OECD.

Kornai, J., & Eggleston, K. (2001). *Welfare, choice, and solidarity in transition: reforming the health section in Eastern Europe*. Cambridge: Cambridge University Press.

Košnik, M., Stariha, J., Kadivec, S., Martinčič, R., Ulčnik, L., Šprajcar, D., Tomič, V., Blažun, A., Novak, M., Potočnik, R., Zakrajšek, B., Knific, T., Kocjančič, P., Kozina, A., Gaber, M., & Gazvoda, B. (2011). *Letno poročilo Bolnišnice Golnik –Kliničnega oddelka za pljučne bolezni in alergijo Golnik za leto 2010* [Annual Report Golnik Hospital – Clinical Department of Respiratory and Allergic Diseases Golnik 2010]. Golnik: Hospital Golnik – Clinical Department of Respiratory and Allergic Diseases.

Košnik, M., Stariha, J., Kadivec, S., Martinčič, R., Ulčnik, L., Šprajcar, D., Tomič, V., Blažun, A., Novak, M., Potočnik, R., Zakrajšek, B., Knific, T., Kocjančič, P., Kozina, A., Gaber, M., & Gazvoda, B. (2013). *Letno poročilo Bolnišnice Golnik –Kliničnega oddelka za pljučne bolezni in alergijo Golnik za leto 2013* [Annual Report Golnik Hospital – Clinical Department of Respiratory and Allergic Diseases Golnik 2013]. Golnik: Hospital Golnik – Clinical Department of Respiratory and Allergic Diseases.

Kotler, P., Armstrong, G. M., Saunders, J. A., & Wong, V. (1999). *Principles of marketing*. London: Prentice Hall Europe.

Kovačič, A. & Bosilj Vukšić, V. (2005). *Management poslovnih procesov: prenova in informatizacija poslovanja s praktičnimi primeri*. Ljubljana: GV založba.

Kovačič, A., Jaklič, J., Indihar Štemberger, M., & Groznik, A. (2004). *Prenova in informatizacija poslovanja*. Ljubljana: Ekonomska fakulteta.

Kuntz, L., Scholtes, S., & Vera, A. (2007). Incorporating efficiency in hospital-capacity planning in Germany. *The European Journal of Health Economics, 8*(3), 213–223.

Kwan, J. (2007). CPs for acute stroke care and stroke rehabilitation: From theory to evidence. *Journal of Clinical Neuroscience, 14*(3), 189–200.

Kwan-Gett, T. S., Lozano, P., Mullin, K., & Marcuse, E. K. (1997). One-year experience with an inpatient asthma clinical pathway. *Archives of Pediatrics & Adolescent Medicine, 151*(7), 684–689.

Langabeer II, J. R. (2008). *Health Care Operations Management: A Quantitative Approach to Business and Logistics*. Burlington: Jones & Bartlett Learning.

Langenbrunner, J. C., & Wiley, M. M. (2002). Hospital payment mechanisms: theory and practice in transition countries. In M. McKee & J. Healy (Eds.), *Hospitals in a changing Europe*. Buckingham, Philadelphia: Open University Press.

Lau, C., Cartmill, T., & Leveaux, V. (1996). Managing and understanding variances in clinical path methodology: a case study. *Journal of Quality in Clinical Practice, 16*(2), 109–117.

Lawton, A., & Rose, A. (1994). *Organisation and Management in the Public Sector*. London: Pitman.

Laxade, S., & Hale, C. A. (1995). Managed care 2: An opportunity for nursing. *British Journal of Nursing, 4*(6), 345–346, 348–350.

Layton, A. (1993). Planning individual care with protocols. *Nursing Standard, 8*(1), 32–33.

Lemmens, L., Van Zelm, R., Vanhaecht, K., & Kerkkamp, H. (2008). Systematic review: indicators to evaluate effectiveness of clinical pathways for gastrointestinal surgery. *Journal of evaluation in clinical practice, 14*(5), 880–887.

Lenz, R., & Reichert, M. (2007). IT support for healthcare processes–premises, challenges, perspectives. *Data & Knowledge Engineering, 61*(1), 39–58.

Lindsay, A., Downs, D., & Lunn, K. (2003). Business processes—attempts to find a definition. *Information & Software Technology, 45*(15), 1015.

Lodewijckx, C., Sermeus, W., Panella, M., Deneckere, S., Leigheb, F., Decramer, M., & Vanhaecht, K. (2011). Impact of CPs for in-hospital management of COPD exacerbation: a systematic review. *International Journal of Nursing Studies, 48*(11), 1445–1456.

Luc, K. D., & Todd, J. (2003). *E-Pathways: Computers and the Patient's Journey Through Care*. Abingdon: Radcliffe Medical Press.

Lumsdon, K., & Hagland, M. (1993). Mapping care. *Hospitals & Health Networks, 67*(20), 34–40.

Lutfiyya, M. N., Henley, E., Chang, L. F., & Reyburn, S. W. (2006). Diagnosis and treatment of community-acquired pneumonia. *American family doctor, 73*(3), 442–450.

Mandell, L. A., Bartlett, J. G., Dowell, S. F., File, T. M., Musher, D. M., Whitney, C., & Infectious Diseases Society of America. (2003). Update of practice guidelines for the management of community-acquired pneumonia in immunocompetent adults. *Clinical Infectious Diseases, 37*(11), 1405–1433.

Manganelli, R. L., & Klein, M. M. (1994). A Framework for Reengineering. *Management Review, 83*(6), 9–16.

Map of Medicine (2012a). *Breast cancer – suspected*. Retrieved 19 April 2013 from http://healthguides.mapofmedicine.com/choices/map-open/breast_cancer1.html

Map of Medicine (2012b). *Secondary care – triple assessment clinic*. Retrieved 19 April 2013 from http://healthguides.mapofmedicine.com/choices/map-open/breast_cancer2.html

March, L. M., Cameron, I. D., Cumming, R. G., Chamberlain, A. C., Schwarz, J. M., Brnabic, A. J., O'Meara, P., Taylor, T. F., Riley, S., & Sambrook, P. N. (2000). Mortality and morbidity after hip fracture: can evidence based clinical pathways make a difference? *Journal of Rheumatology, 27*(9), 2227–2231.

Marchisio, S., Ferraccioli, K., Barbieri, A., Porcelli, A., & Panella, M. (2006). CPs in obstetrics: the effectiveness in reducing the incidence of episiotomy in childbirth. *Journal of Nursing Management, 14*(7), 538–543.

Marrée, J., & Groenewegen, P. P. (1997). *Back to Bismarck: Eastern European Health Care Systems in Transition*. Aldershot: Avebury.

Marrie, T. J. (2000). Community-acquired pneumonia in the elderly. *Clinical Infectious Diseases, 31*(4), 1066–1078.

Marrie, T. J., Lau, C. Y., Wheeler, S. L., Wong, C. J., Vandervoort, M. K., & Feagan, B. G. (2000). A controlled trial of a critical pathway for treatment of community-acquired pneumonia. CAPITAL Study Investigators. Community-Acquired Pneumonia Intervention Trial Assessing Levofloxacin. *JAMA – The Journal of the American Medical Association, 283*(6), 749–755.

Maxwell, C. N. (1998). Casemix perspectives for clinicians in the private sector. *Medical Journal of Australia, 169*(8), 48–50.

Mc Nicol, M. (1992). Achieving quality improvement by structured patient management. *Quality in Health Care, 1*(3), 40–41.

McCarney, R., Warner, J., Iliffe, S., van Haselen, R., Griffin, M., & Fisher, P. (2007). The Hawthorne Effect: a randomised, controlled trial. *BMC Medical Research Methodology, 7*(1), 30.

McCormack, K.P., & Jonhson, W.C. (2001). Business Process Orientation: Gaining the E-business competitive Advantage, CRC Press LLC, p.194.

McGuire, A., Henderson, J., & Mooney, G. (1988). *The economics of health care: an introductory text*. LondonRoutledge & Kegan Paul.

McNulty, T., & Ferlie, E. (2004). *Reengineering health care: the complexities of organisational transformation*. Oxford: Oxford University Press.

Melão, N., & Pidd, M. (2000). A conceptual framework for understanding business processes and business process modelling. *Information Systems Journal, 10*(2), 105–129.

Metcalf, E. M. (1991). The orthopaedic critical path. *Orthopaedic Nursing, 10*(6), 25–31.

Middleton, S., & Roberts, A. (2000). *Integrated CPs: a practical approach to implementation*. Edinburg: Butterworth-Heinemann.

Ministrstvo za zdravje (2006). *Metodološka priporočila za oblikovanje in uvajanje klinicnih poti* [Methodological recommendations for the development and implementaiton of clinial pathways]. Ljubljana: Ministrstvo za zdravje Republike Slovenije [Ministry of Health of the Republic of Slovenia].

Ministry of Health (2005). Internal document. Ljubljana: Ministrstvo za zdravje Republike Slovenije [Ministry of Health of the Republic of Slovenia].

Mintzberg, H. (1983). *Power in and around organisations*. Englewood Cliffs: Prentice-Hall.

Mitchell, G. K., Tieman, J. J., & Shelby-James, T. M. (2008). Multidisciplinary care planning and teamwork in primary care. *Medical Journal of Australia, 188*(8), 61–64.

Morris, A. H. (2000). Developing and implementing computerized protocols for standardization of clinical decisions. *Annals of Internal Medicine, 132*(5), 373–383.

Morris, S., Devlin, N., & Parkin, D. (2010). *Economic analysis in health care*. Chichester: John Wiley.

Možina, S. (Ed.). (1994). *Management*. Radovljica: Didakta.

Možina, S., Bernik, J., & A., S. (2004). *Osnove managementa*. Piran: GEA College – Visoka šola za podjetništvo.

Možina, S., Rozman, R., Tavčar, M. I., Pučko, D., Ivanko, Lipičnik, B., Gričar, J., Glas, M., Kralj, J., & Tekavčič, M. (2002). *Management: nova znanja za uspeh*. Radovljica: Didakta.

Mulej, M., Kajzer, S., Potocan, V., Rosi, B., & Knez-Riedl, J. (2006). *Interdependence of systems theories – potential innovation supporting innovation.*Kybernetes, Vol. 35 Iss: 7/8, pp.942–954.

Mullins, L. J. (2002). *Management and organisational behaviour*. Harlow: Financial Times Prentice Hall.

Mušič, E., Osolnik, K., Tomič, V., Eržen, R., Košnik, M., Beović, B., Lejko–Zupanc, T., Strle, F., Vodopivec-Jamšek, V., Živčec-Kalan, G., Švab, I., & Sočan, M. (2010). Priporočila za obravnavo zunajbolnišnične pljučnice odraslih (prenovljena in dopolnjena izdaja, 2010). *Zdravniški vestnik, 79*(3), 245–264.

Mušič, E., Vencelj, B., Bajrović, N., Eržen, R., & Šorli, J. (1999). Hospitaly treated community-acquired pneumonia (CAP) in the elderly. *Atemwegs- und Lungenkrankheiten, 25*(9), 468–471.

Mušič, E., Vencelj, B., Bajrović, N., Eržen, R., & Šorli, J. (2006). *Usmeritve za obravnavo zunajbolnišnične pljučnice (ZBP) pri odraslih* [Guidelines for the treatment of community-acquired pneumonia in adults]. Golnik: Golnik Hospital – University Clinic of Respiratory and Allergic Diseases Golnik.

Nathwani, D., Williams, F., Winter, J., Winter, J., Ogston, S., & Davey, P. (2002). Use of Indicators to Evaluate the Quality of Community-Acquired Pneumonia Management. *Clinical Infectious Diseases, 34*(3), 318–323.

National Institute for Health and Clinical Evidence (2011a). *Diabetes type 2 CP*. Retrieved 5 September 2012 from http://pathways.nice.org.uk/pathways/diabetes/ managing-type-2-diabetes

National Institute for Health and Clinical Evidence (2011b). *Identifying and managing long-term complications*. Retrieved 5 September 2012 from http://pathways.nice.org.uk/pathways/ diabetes/diabetes-overview#path=view%3A/pathways/diabetes/identifying-and-managing-long-term-complications.xml&content=close

Nedelko, Z., & Potočan, V. (2013). The role of management innovativeness in modern organisations. *Journal of Enterprising Communities: People and Places in the Global Economy*. Vol. 7, Iss: 1, pp. 36–49.

Nelson, E. C., & Batalden, P. B. (1993). Patient-based quality measurement systems. *Quality Management in Health Care, 2*(1), 18–30.

Newell, S., Edelman, L., Scarbrough, H., Swan, J., & Bresnen, M. (2003). 'Best practice' development and transfer in the NHS: the importance of process as well as product knowledge. *Health Services Management Research, 16*(1), 1–12.

NHS Lothian-University Hospitals Division Royal Infirmary of Edinburgh. (2004). *Laparoscopic Cholecystectomy Integrated Care Pathway*. Edinburg: Royal Infirmary of Edinburgh.

Oates, B., Murray, J., & Hindle, D. (1998). The second national hospital costing study: background, results and implications. *Australian Health Review, 21*(3), 241–254.

Object Management Group (OMG). (2011). *Business Process Model And Notation (BPMN) Version 2.0.* Needham: Object Management Group (OMG).

Object Management Group (OMG). (2013). *Object Management Group. Business Process Model and Notation*. Retrieved 17 May 2013 from http://www.bpmn.org/

Ochoa-Gondar, O., Vila-Córcoles, A., de Diego, C., Arija, V., Maxenchs, M., Grive, M., Martin, E., Pinyol, J. L., & EVAN-65 Study Group. (2008). The burden of community-acquired pneumonia in the elderly: the Spanish EVAN-65 study. *BMC Public Health, 8*, 222.

Ogilvie-Harris, D. J., Botsford, D. J., & Hawker, R. W. (1993). Elderly patients with hip fractures: improved outcome with the use of care maps with high-quality medical and nursing protocols. *Journal of Orthopaedic Trauma, 7*(5), 428–437.

Ohno, T. (1988). *Toyota production system: beyond large-scale production*. Portland: Productivity Press.

Ould, M. A. (1995). *Business Processes: Modelling and analysis for re-engineering and improvement*. Beverly Hills: Wiley.

Øvretveit, J. (1992). *Health Service Quality*. Oxford: Blackwell Scientific Press.

Ozcan, Y. A. (2009). *Quantitative Methods in Health Care Management: Techniques and Applications* (2nd ed.). San Francisco: Wiley.

Panella, M., Marchisio, S., & Di Stanislao, F. (2003). Reducing clinical variations with clinical pathways: do pathways work? *The International Journal for Quality in Health Care, 15*(6), 509–521.

Panella, M., Marchisio, S., Barbieri, A., & Di Stanislao, F. (2008). A cluster randomized trial to assess the impact of clinical pathways for patients with stroke: rationale and design of the Clinical Pathways for Effective and Appropriate Care Study [NCT00673491]. *BMC Health Services Research, 8*, 223.

Panella, M., Marchisio, S., Demarchi, M. L., Manzoli, L., & Di Stanislao, F. (2009). Reduced in-hospital mortality for heart failure with clinical pathways: the results of a cluster randomised controlled trial. *Quality & Safety in Health Care, 18*(5), 369–373.

Panella, M., Marchisio, S., Gardini, A., & Di Stanislao, F. (2007). A cluster randomized controlled trial of a clinical pathway for hospital treatment of heart failure: study design and population. *BMC Health Services Research, 7*, 179.

Papadopoulos, T., & Merali, Y. (2008). Stakeholder network dynamics and emergent trajectories of Lean implementation projects: a study in the UK National Health Service. *Public Money and Management, 28*(1), 41–48.

Pass, C., Lowes, B., Pendleton, A., & Chadwick, L. (1995). *Collins dictionary of business*. Glasgow: HarperCollins Publisher.

Pearson, S. D. (1999). Et tu, critical pathways? *American Journal of Medicine, 107*(4), 397–398.

Pearson, S. D., Goulart-Fisher, D., & Lee, T. H. (1995). Critical pathways as a strategy for improving care: problems and potential. *Annals of Internal Medicine, 123*(12), 941–948.

Pease, N. J., Harris, R. J., & Finlay, I. G. (2004). Development and audit of a CP for the management of patients with suspected malignant spinal cord compression. *Physiotherapy, 90*(1), 27–34.

Penner, S. J. (2004). *Introduction to Health Care Economics and Financial Management: Fundamental Concepts With Practical Application*. Philadelphia: Lippincott Williams & Wilkins.

Pindyck, R. S., & Rubinfeld, D. L. (1998). *Microeconomics*. Upper Saddle River: Prentice Hall.

Poortmans, P., Aznar, M., & Bartelink, H. (2012). Quality indicators for breast cancer: revisiting historical evidence in the context of technology changes. *Seminars in Radiation Oncology, 22*(1), 29–39.

Porter, M. E. (1985). *Competitive advantage: creating and sustaining superior performance*. New York: The Free Press.

Poulymenopoulou, M., Malamateniou, F., & Vassilacopoulos, G. (2003a). Emergency healthcare process automation using workflow technology and web services. *MedicalInformatics and the Internet* in *Medicine, 28*(3), 195–207.

Poulymenopoulou, M., Malamateniou, F., & Vassilacopoulos, G. (2003b). Specifying workflow process requirements for an emergency medical service. *Journal of Medical Systems, 27*(4), 325–335.

Praetorius, T. (2012). *The changing organisation of hospitals: the influence of CPs*. Retrieved 21 April 2013 from http://static.sdu.dk/mediafiles/9/3/B/%7B93BE498A-18C1-422E-BB59-6E330BE1A465%7DThim.pdf

Pritts, T. A., Nussbaum, M. S., Flesch, L. V., Fegelman, E. J., Parikh, A. A., & Fischer, J. E. (1999). Implementation of a clinical pathway decreases length of stay and cost for bowel resection. *Annals of Surgery, 230*(5), 728–733.

Ransom, S. B., Studdert, D. M., Dombrowski, M. P., Mello, M. M., & Brennan, T. A. (2003). Reduced medicolegal risk by compliance with obstetric clinical pathways: a case-control study. *Obstetrics & Gynecology, 101*(4), 751–755.

Rechel, B., Wright, S., Barlow, J., & McKee, M. (2010). Hospital capacity planning: from measuring stocks to modelling flows. *Bulletin of the World Health Organisation, 88*(8), 632–636.

Remenyi, D., Williams, B., Money, A., & Swartz, E. (2000). Doing research in business and management: an introduction to process and method. *Sage Publications.*

Richter-Ehrenstein, C., Heymann, S., Schneider, A., & Vargas Hein, O. (2012). Effects of a clinical pathway 3 years after implementation in breast surgery. *Archives of Gynecology and Obstetrics, 285*(2), 515–520.

Robbins, S. P. (1990). *Organisation Theory: Structures, Designs, And Applications* (3rd ed.). Englewood Cliffs: Prentice Hall.

Robbins, S. P. (2009). *Organisation Theory: Structure, Design, And Applications, 3/E*. New Delhi: Pearson Education.

Robida, A., Yazbeck, A.-M., Kociper, B., Mate, T., & Marušič, D. (2006). *National policy for the development of quality in healthcare*. Ljubljana: Ministry of Health of the Republic of Slovenia.

Roth, A. V. (1993). World class health care. *Quality Management in Healthcare, 1*(3), 1–9.
Rummler, G. A., & Brache, A. P. (1990). *Improving performance: how to manage the white space on the organisation chart*. San Francisco: Jossey-Bass.

Russell, R. S., & Taylor, B. W. (2005). *Operations management: Quality and competitiveness in a global environment*. New Jersey: Wiley.

Salhiyyah, K., Elsobky, S., Raja, S., Attia, R., Brazier, J., & Cooper, G. J. (2011). A clinical and economic evaluation of fast-track recovery after cardiac surgery. *Heart Surgery Forum, 14*(6), E330–334.

Samour, P. Q. (2006). *Hospitals: What They Are and How They Work*. Boston: Jones and Bartlett Publishers.

Santoso, U., Iau, P. T., Lim, J., Koh, C. S., & Pang, Y. T. (2002). The mastectomy clinical pathway: what has it achieved? *Annals of the Academy of Medicine, Singapore, 31*(4), 440–445.

Schriefer, J., Engelhard, J., DiCesare, L., & Miller, M. (2000). Merging clinical pathway programs as part of overall health system mergers: a ten-step guide. Spectrum Health. *Joint Commission Journal on Quality and Patient Safety, 26*(1), 29–38.

Scott, S. D., Grimshaw, J., Klassen, T. P., Nettel-Aguirre, A., & Johnson, D. W. (2011). Understanding implementation processes of clinical pathways and clinical practice guidelines in pediatric contexts: a study protocol. *Implementation Science, 6*, 133.

Seawright, A. H., & Taylor, L. (2011). A systematic approach to postoperative management of deceased donor kidney transplant patients with a clinical pathway. *Progress in Transplantation, 21*(1), 43–52.

Sedman, A. B., Bahl, V., Bunting, E., Bandy, K., Jones, S., Nasr, S. Z., Schulz, K., & Campbell, D. A. (2004). Clinical redesign using all patient refined diagnosis related groups. *Pediatrics, 114*(4), 965–969.

Sermeus, W., & Vanhaecht, K. (2009). *From clinical pathways to CP*. Mechelen: Kluwer.

Shaw, N. T., Mador, R. L., Ho, S., Mayes, D., Westbrook, J. I., Creswick, N., Thiru, K., & Brown, M. (2009). Understanding the impact on intensive care staff workflow due to the introduction of a critical care information system: a mixed methods research methodology. *Studies in Health Technology and Informatics, 143*, 186–191.

Shortell, S. M., & Kaluzny, A. D. (2006). *Health care management: organisation, design, and behavior*. Clifton Park: Thomson Delmar Learning.

Showell, C., Thomas, M., Wong, M. C., Yee, K. C., Miller, S., Pirone, C., & Turner, P. (2010). Patient safety and sociotechnical considerations for electronic handover tools in an Australian ehealth landscape. *Studies in Health Technology and Informatics, 157*, 193–198.

Slack, N., & Lewis, M. (2002). *Operations Strategy*. Harlow: Financial Times Prentice Hall.

Slack, N., Chambers, S., & Johnston, R. (2007). *Operations management*. Harlow: Financial Times Prentice Hall.

Smith, H., & Fingar, P. (2003). *Business Process Management: The Third Wave*. Tampa: Megan-Kiffer Press.

Staggers, N., Weir, C., & Phansalkar, S. (2008). Patient Safety and Health Information Technology: Role of the Electronic Health Record. In R. G. Hughes (Ed.), *Patient Safety and Quality: An Evidence-Based Handbook for Nurses* (pp. 91–133). Rockville: Agency for Healthcare Research and Quality.

Stidham, K. R., & Roberson, J. B. (2001). Implementation of a clinical pathway in management of the postoperative vestibular schwannoma patient. *Laryngoscope, 111*(11 Pt 1), 1938–1943.

Škerlavaj, M., Dimovski, V., & Desouza, K. C. (2010). Patterns and structures of intra-organisational learning networks within a knowledge-intensive organisation. *Journal of Information Technology*, 25, 189–204.

Škerlavaj, M., Dimovski, V., Mrvar, A. & Pahor M. (2010). Intra-organisational learning networks within knowledge intensive learning environments. *Interactive Learning*

Environments, Vol. 18, No. 1, pp. 39–63.

Škrinjar, R., Indihar Štemberger, M., Jaklič, J., Dimovski, V., & Škerlavaj, M. (2006). *Rezultati raziskave procesne usmerjenosti v Sloveniji* [Results of business process orientation study in Slovenia]. Paper presented at the Dnevi slovenske informatike, Portorož.

Štruc, N. (2006). Merjenje uspešnosti poslovanja zdravstvenega doma s pomočjo uravnoteženega sistema kazalnikov [Measuring performance of health center using balanced system of indicators]. Ljubljana: Ekonomska fakulteta.

Tahan, H. A. (2002). A ten-step process to develop case management plans. *Lippincott's Case Management, 7*(6), 231–242.

Tajnikar, M. (2000). *Tvegano poslovodenje: knjiga o poslovodenju rastočih poslov* [Risk management: a book on the management of growing businesses]. Portorož: Visoka strokovna šola za podjetništvo.

Tajnikar, M., & Došenović Bonča, P. (2004). Transitional adjustment of the public sector: the case of the health care system in Slovenia: institutional and human issues. *From transition to development: globalisation and political economy of development in transition economies: conference proceedings. Part 1-2 / Second International Conference of the Faculty of Economics in Sarajevo, October 9–11 2003, ICES 2003* (pp. 723–744). Sarajevo: Faculty of Economics.

Taylor, F. W. (1913). *The principles of scientific management*. New York, London: Harper & Brothers.

Toussaint, E., Herengt, G., Gillois, P., & Kohler, F. (2001). Method to determine the bed capacity, different approaches used for the establishment planning project in the University Hospital of Nancy. *Studies in health technology and informatics, 84*(2), 1404–1408.

Trowbridge, R., & Weingarten, S. (2011). *Making health care safer, a crtitical analysis of patient safety practices. Chapter 52: Critical Pathways*. Retrieved 8 July 2011 from http://archive.ahrq.gov/clinic/ptsafety/chap52.htm

Tzortzopoulos, P., Codinhoto, R., Kagioglou, M., & Koskela, L. (2008). *Design for operational efficiency–linking building and service design in healthcare environments.* Paper presented at the Health and Care Infrastructure Research and Innovation Centre (HaCIRIC) International Conference 2008, London.

Van Herck, P., De Smedt, D., Annemans, L., Remmen, R., Rosenthal, M. B., & Sermeus, W. (2010). Systematic review: Effects, design choices, and context of pay-for-performance in health care. *BMC Health Services Research, 10*, 247.

Vanhaecht, K., De Witte, K., & Sermeus, W. (2007). *The Impact of Clinical Pathways on the Organisation of Care Processes*. Leuven: ACCO.

Vanhaecht, K., De Witte, K., Depreitere, R., & Sermeus, W. (2006). Clinical pathway audit tools: a systematic review. *Journal of Nursing Management, 14*(7), 529–537.

Vanhaecht, K., De Witte, K., Depreitere, R., Van Zelm, R., De Bleser, L., Proost, K., & Sermeus, W. (2007). Development and validation of a care process self-evaluation tool. *20*(3), 189–202.

Vanhaecht, K., De Witte, K., Panella, M., & Sermeus, W. (2009). Do pathways lead to better organised care processes? *Journal of Evaluation in Clinical Practice, 15*(5), 782–788.

Vanhaecht, K., Panella, M., Van Zelm, R., & Sermeus, W. (2010). An overview on the history and concept of CPs as complex interventions. *Internal Journal of CPs, 14*(3), 117–123.

Vergidis, K., Turner, C. J., & Tiwari, A. (2008). Business process perspectives: Theoretical developments vs. real-world practice. *International Journal of Production Economics, 114*(1), 91–104.

Vissers, J. (2005). Unit logistics: allocation and utilisation of resaurces. In J. Vissers & R. Beech (Eds.), *Health Operations Management: Patient Flow Logistics in Health Care* (pp. 51–69). New York: Routledge.

Vissers, J. M. H. (1994). *Patient Flow-based Allocation of Hospital Resources.* Eindhoven: University of Technology, Eindhoven.

Vissers, J., & Beech, R. (2005). *Health operations management: patient flow logistics in health care*. New York: Routledge.

Völkner, P., & Werners, B. (2000). A decision support system for business process planning. *European Journal of Operational Research, 125*(3), 633–647.

Vrooman, W. P. (1996). Care mapping: measuring clinical and financial outcomes. *Healthcare information management, 10*(1), 31–36.

Wakamiya, S., & Yamauchi, K. (2009). What are the standard functions of electronic clinical pathways? *International Journal of Medical Informatics, 78*(8), 543–550.

Walsh, M. (1997). *Models and critical pathways in clinical nursing: conceptual frameworks for care planning* (2nd ed.). London: Baillière Tindall.

Walsh, M. (2002). *Watson's Clinical Nursing and Related Sciences*. London: Baillière Tindall.

Walsh, M. (2004). *Watson's clinical nursing pocket book*. Edinburgh: Baillière Tindall.

Waring, J., McDonald, R., & Harrison, S. (2006). Safety and complexity: inter-departmental relationships as a threat to patient safety in the operating department. *Journal of Health Organisation and Management, 20*(2–3), 227–242.

Waterer, G. W., Kessler, L. A., & Wunderink, R. G. (2004). Medium-term survival after hospitalization with community-acquired pneumonia. *American Journal of Respiratory and Critical Care Medicine, 169*(8), 910–914.

Westerdijk, M., Zuurbier, J., Ludwig, M., & Prins, S. (2012). Defining care products to finance health care in the Netherlands. *European Journal of Health Economics, 13*(2), 203–221.

Whittle, C. L., McDonald, P., Dunn, L., & de Luc, K. (2004). Developing the Integrated CP Appraisal Tool (ICPAT): a pilot study. *Journal of Integrated CPs, 8*(2), 77–81.

Williamson, O. E. (1995). *Organisation Theory: From Chester Barnard to the Present and Beyond*. Oxford: Oxford University Press.

Willis, J. (2000). Patient compliance. *Nursing Times, 96*(35), 36–37.

Woodyard, L. W., & Sheetz, J. E. (1993). Critical pathway patient outcomes: the missing standard. *Journal for Healthcare Quality, 8*(1), 51–57.

World Health Organisation. (2013). *Technology, Health*. Retrieved 19 April 2013 from http://www.who.int/topics/technology_medical/en/

Yan, Y. H., Chen, Y., Kung, C. M., & Peng, L. J. (2011). Continuous quality improvement of nursing care: case study of a clinical pathway revision for cardiac catheterization. *Journal of Nursing Research, 19*(3), 181–189.

Yazbeck, A. (2004). *Introducing clinical pathways in the Slovene hospital (clinical) setting: professional cultures and changes in organizational behaviour.* Ljubljana: Faculty of Economics.

Zakon o zdravstveni dejavnosti. *Uradni list RS št. 9/1992 (26/1992 popr.), 45I/1994 Odl.US: U-I-104/92, 37/1995, 8/1996, 59/1999 Odl.US: U-I-77/98, 90/1999, 98/1999-ZZdrS, 31/2000, 36/2000-ZPDZC, 45/2001,131/2003 Odl.US: U-I-60/03-20, 135/2003 Odl.US: U-I-137/01-23, 2/2004, 36/2004-UPB1, 80/2004, 23/2005-UPB2, 15/2008-ZPacP, 23/2008, 58/2008-ZZdrS-E, 77/2008-ZDZdr.*

Zander K., & Bower, K. A.(2000). *Implementing strategies for managing care*. Boston: Center for case management.

Zander, K. (1988a). Managed care within acute care settings: design and implementation via nursing case management. *Health Care Supervisor, 6*(2), 27–43.

Zander, K. (1988b). Nursing case management: strategic management of cost and quality outcomes. *Journal of Nursing Administration, 18*(5), 23–30.

Zander, K. (1992). Quantifying, managing, and improving quality. *The New Definition, 7*(4), 1–4.

Zander, K. (2002). Integrated CPs: eleven international trends. *Journal of Integrated CPs, 6*, 101–107.

Zakon o zavodih [Institutional Act]. *Uradni list RS št. 12/1991, 45I/1994 Odl.US: U-I-104/92, 8/1996, 18/1998 Odl.US: U-I-34/98, 36/2000-ZPDZC, 127/2006-ZJZP.*

Zavod za zdravstveno zavarovanje Slovenije (2006a). *Splošni dogovor za pogodbeno leto 2006* [General Agreement with Hospitals for Year 2006]. Ljubljana: Health Insurance Institute of Slovenia.

Zavod za zdravstveno zavarovanje Slovenije (2006b). *Področni dogovor za zdravstvene domove in zasebno zdravniško dejavnost za pogodbeno leto 2006* [Programme Agreement for Primary Healthcare Centres and Private Healthcare Services for Year 2006]. *Občasnik Zavoda za zdravstveno zavarovanje Slovenije. Akti & navodila, 19*(4), 1–20. Ljubljana: Health Insurance Institute of Slovenia.

Zavod za zdravstveno zavarovanje Slovenije (2010). *Splošni dogovor za pogodbeno leto 2006* [General Agreement with Hospitals for Year 2010]. Ljubljana: Health Insurance Institute of Slovenia.

Zavod za zdravstveno zavarovanje Slovenije (2011). *Splošni dogovor za pogodbeno leto 2006* [General Agreement with Hospitals for Year 2011]. Ljubljana: Health Insurance Institute of Slovenia.

Zavod za zdravstveno zavarovanje Slovenije (2012). *Splošni dogovor za pogodbeno leto 2006* [General Agreement with Hospitals for Year 2012]. Ljubljana: Health Insurance Institute of Slovenia.

Zavod za zdravstveno zavarovanje Slovenije (2013). *Splošni dogovor za pogodbeno leto 2006* [General Agreement with Hospitals for Year 2013]. Ljubljana: Health Insurance Institute of Slovenia.

Zur Mühlen, M. (2004). *Workflow-Based Process Controlling: Foundation, Design, and Application of Workflow Driven Process Information Systems (Advances in information systems and management science)*. Berlin: Logos.

APPENDICES

LIST OF APPENDICES

Appendix A: Pneumonia Severity Index

Table 16: Pneumonia Severity Index

Patient characteristics or clinical data	**Points**
Demographics	
Male	Age
Female	Age – 10
Nursing home resident	+10
Comorbidities illness	
Neoplastic disease	+30
Liver disease	+20
Congestive heart failure	+10
Cerebrovascular disease	+10
Renal disease	+10
Physical examination findings	
Altered mental status	+20
Respiratory rate > 30 breaths per minute	+20
Systolic blood pressure < 90 mmHg	+20
Temperature >39°C or <35°C	+15
Pulse rate > 125 beats per minute	+10
Laboratory and radiographic findings	
Arterial pH <7.35	+30
Urea > 11 mmol per L	+20
Sodium < 130 mmol per L	+20
Glucose > 14 mmol per L	+10
Hematocrit < 30 %	+10
Oxygen percent saturation ≤ 90 %	+10
Pleural effusion	+10
Total points	_____

Source: Adapted from Mušič et al., Priporočila za obravnavo zunajbolnišnične pljučnice odraslih (prenovljena in dopolnjena izdaja, 2010), 2010, p. 250

The Pneumonia Severity Index (PSI) is a clinical prediction rule that medical practitioners use to calculate the probability of mortality and morbidity among patients with CAP (Fine, Auble, Yealy et al., 1997). On the basis of the total point of the PSI, the risk, risk class, mortality and recommended site of care are defined as described in the table below.

Table 17: PSI total points

Points total	Risk	Risk class	Mortality %	Recommended site of care
< 50	Low	I	0.5	Outpatient
< 70	Low	II	0.9	Outpatient
71–90	Low	III	2.8	Outpatient
91–130	Moderate	IV	12.5	Inpatient
>130	High	V	Up to 31	Inpatient

Source: Adapted from Mušič et al., Priporočila za obravnavo zunajbolnišnične pljučnice odraslih (prenovljena in dopolnjena izdaja, 2010), 2010, pp. 249–250

Appendix B: Golnik Hospital Medical Chart

Copy of Golnik Hospital Medical Chart

Please note: only the hardcopy of the dissertation thesis carries the copy of the Original Golnik Hospital Medical Chart (in *Slov*., terapevtski list)

nalepka bolnika

klinika GOLNIK

UNIVERZITETNA KLINIKA ZA PLJUČNE BOLEZNI IN ALERGIJO GOLNIK

Datum:

Ura	RR	Pulz $[min^{-1}]$	Temp. [°C]	Frekvenca dih.	Sat. O_2	Bilanca tekočin				
						Urna diur.	Infuzije	Per os	NGS	Bruhanje

Datum:

Ura	RR	Pulz $[min^{-1}]$	Temp. [°C]	Frekvenca dih.	Sat. O_2	Bilanca tekočin				
						Urna diur.	Infuzije	Per os	NGS	Bruhanje

Opomnik

- kadilski status
- raven obravnave
- pogovor s svojci
- klinične poti

Transfuzije

TERAPEVTSKI LIST

nalepka bolnika

Klinika Golnik

Oddelek: ________ **Soba:** ________ **PREOBČUTLJIVOST za zdravila:** ______________________________ **Datum sprejema:** ______________ **Zaporedna št. lista:** __________

		Datum	Datum	Datum	Datum	Datum
		6h 12h 18h	6h 12h 18h	6h 12h 18h	6h 12h 18h	6h 12h 18h
Temperatura [°C]						
Arterijski pritisk [mmHg] **L D** manseta						
Frekvenca pulza [min⁻¹]						
Frekvenca dihanja [min⁻¹]						
Volumen urina [mL]						
Zaužite tekočine [mL]						
Izmeček [mL]						
TT/TV (kg/cm), ITM						
Odvajanje blata						
Pulzna oksimetrija [%]						
Predpis kisika (pretok/kateter, maska)						
UČINKOVINA / ZDRAVILO, farmacevtska oblika	pot	ODMERJANJE / Parafa / BELEŽENJE DAJANJA	ODMERJANJE / Parafa / BELEŽENJE DAJANJA	ODMERJANJE / Parafa / BELEŽENJE DAJANJA	ODMERJANJE / Parafa / BELEŽENJE DAJANJA	ODMERJANJE / Parafa / BELEŽENJE DAJANJA
Profilaksa GVT in TE	s.c.					
infuzije	i.v.					
infuzije	i.v.					
infuzije	i.v.					
Dieta **NGS** (obkroži)						
Fizioterapija						
Ovirnice						
DIABETIČNA LISTA dieta / per os / inzulin (obkroži); **TZKD** ________ **L/min**; **NIMV** (obkroži) **CPAP tlak** ________	Preiskave					
	Opombe	Vizita ob ______ h parafa:	Vizita ob ______ h parafa:	Vizita ob ______ h parafa:	Vizita ob ______ h parafa:	Vizita ob ______ h parafa:

Nalepka bolnika

Oddelek________soba_______ PREOBČUTLJIVOST za zdravila___________________ TERAPEVTSKI LIST **Datum sprejema:_____________ Zaporedna št.lista: _________**

Klinika Golnik - KOPA	Datum			Datum			Datum			Datum			Datum		
	6h	12h	18h	6h	12h	18h	6h	12h	18h	6h	12h	18h	6h	12h	18h
Temperatura [ºC]															
Arterijski pritisk [mmHg] **L D** manseta:															
Frekvenca pulza [min^{-1}]															
Frekvenca dihanja [min^{-1}]															
Volumen urina [mL]															
Zaužite tekočine [mL]															
Izmeček [mL]															
TT/TV (kg/cm), ITM															
Odvajanje blata															
Pulzna oksimetrija [%]															
Predpis kisika (pretok/kateter, maska)															

UČINKOVINA / ZDRAVILO, Farmacevtska oblika	pot	ODMERJANJE mg	parafa	BELEŽENJE DAJANJA	ODMERJANJE mg	parafa	BELEŽENJE DAJANJA	ODMERJANJE mg	parafa	BELEŽENJE DAJANJA	ODMERJANJE mg	parafa	BELEŽENJE DAJANJA	ODMERJANJE mg	parafa	BELEŽENJE DAJANJA
Profilaksa GVT in TE	s.c															
Infuzije	i.v.															
	i.v.															
	i.v.															
Dieta **NGS**																
Fizioterapija																
Ovirnice																

DIABETIČNA LISTA
dieta / per os / inzulin (obkroži)

TZKD__________L/min

NIMV **CPAP tlak___________**
(obkroži)

Preiskave					
Opombe	Vizita ob _________h parafa:	Vizita ob _________h parafa:	Vizita ob _________h parafa:	Vizita ob _________h parafa:	Vizita ob _________h parafa:

Nalepka bolnika

DATUM:

ura	RR	pulz [min^{-1}]	temp [°C]	Frekvenca dih.	sat. O_2	bilanca tekočin				
						Urna diureza	infuzije	per os	NGS	bruhanje

DATUM:

ura	RR	pulz [min^{-1}]	temp [°C]	Frekvenca dih.	sat. O_2	bilanca tekočin				
						Urna diureza	infuzije	per os	NGS	bruhanje

OPOMNIK

- kadilski status
- raven obravnave
- pogovor s svojci
- klinične poti

TRANSFUZIJE

Key:

Page 1

Nalepka: Label
Datum: Date
Ura: Time
RR: Blood Pressure
Pulz: Pulse
Temp.: Temperature
Sat.: Saturation
PEF: Peak Expiratory Flow
Bilanca tekočin: Fluid balance
Infuzije: Infusion
Per os: Per mouth
NGS: Nasogastric tube
Bruhanje: Vomit
Urna diur.: Timed urinary collection

Pages 2–3

Terapevtski list: Medical chart
Oddelek/soba: Ward/room
Dan/ura sprejema: Day/time of admission
Zaporedna št. lista: Serial number of sheet
Datum: Date
h: Hour
Temperatura: Temperature
Arterijski pritisk: Blood pressure
Frekvenca pulza: Pulse rate
Frekvenca dihanja: Breathing rate
Volumen urina: Urinary volume
Zaužite tekočine: Fluid intake
Izmeček: Sputum
TT/TV, ITM: Body weight, body height, body mass index
Odvajanje blata: Stool
Pulzna oksimetrija: Pulse oxymetry
Predpis kisika (pretok/kateter, maska): Prescribed oxygen (flow/nasal catheter, mask)
Preobčutljivost za zdravila: Allergies
Učinkovina/zdravilo: Drugs
Odmerjanje: Treatment schedule

Parafa: Initials
Beleženje dajanja: Signing off and dispensing the dosage
Infuzije: Infusion fluids

Dieta: Diet
Fizioterapija: Physiotherapy
Preiskave: Diagnostic procedures
Opombe: Notes
Drenaža: Drainage

Page 4

Transfuzije in drugi zaznamki: Observations

Navodila za predpisovanje in belezenje dajanja zdravil: instructions for prescribing and taking notes on dispensing/giving medicines

Appendix C: Golnik Hospital Nursing Care Logbook

The Golnik Hospital Nursing Care Logbook is presented in its original format in Slovenian and was translated into English for the purpose of this dissertation.

Please note: only the hardcopy of the dissertation thesis carries the copy of the Original Golnik Hospital Nursing Care Logbook (in *Slov*., list zdravstvene nege*)*

bolnišnica GOLNIK
KLINIČNI ODDELEK ZA PLJUČNE BOLEZNI IN ALERGIJO

LIST ZDRAVSTVENE NEGE

PODATKI PACIENTA

		datum	D	P	N	datum	D	P	N	datum	D	P	N	datum	D	P	N	datum	D	P	N
Odvisnost od postopkov ZN (PS, DO, PO)																					
Ocena ogroženosti po Waterlow lestvici																					
Ocena ogroženosti za padec (O=ogrožen, NO= neogrožen)																					
Ocena NAO																					
Dihanje		**Načrt**	**D**	**P**	**N**	**Načrt**	**D**	**P**	**N**	**Načrt**	**D**	**P**	**N**	**Načrt**	**D**	**P**	**N**	**Načrt**	**D**	**P**	**N**
	čiščenje maske																				
	menjava nosnega katetra																				
	aspiracija zg. dihalnih poti																				
	pomoč pri izkašljevanju																				
	menjava nastavka za inhalacije																				
	drugo																				
Osebna higiena	posteljna kopel																				
	osvežilno umivanje v postelji																				
	umivanje v kopalnici																				
	umivanje pri umivalniku																				
	tuširanje, kopanje,																				
	pomoč pri umivanju																				
	priprava pripomočkov za umivanje																				
	ustna nega																				
	vlaženje ust, nega ustnic																				
	čiščenje zobne proteze																				
	anogenitalna nega																				
	umivanje las																				
	striženje nohtov																				
	drugo																				
Prehranjevanje in pitje	hranjenje																				
	pomoč pri hranjenju																				
	* pomoč pri pitju																				
	* spodbujanje, nadzor																				
	NGS, Ch…………..dne…………. oznaka………..																				
	nosnica……..																				
	menjava NGS																				
	hranjenje po NGS/gastro. *OBROKI *KONTINUIRANO																				
	menjava brizge in sistema za hranjenje																				
	kontrola lege NGS in asp. *PRED OBROKI *NA 6 UR																				
	preveza NGS																				
	drugo																				
Izločanje, odvajanje	*sobni WC																				
	*urinska steklenica																				
	nadzor pri odvajanju																				
	*spremstvo na stranišče																				
	namestitev in menjava inkontinenčnega sistema																				
	Urinski kateter dan……. CH……																				
	menjava urinskega katetra………																				
	menjava urinske vrečke																				
	oskrba po potenju in bruhanju																				
	drugo																				
Gibanje	*pomoč pri posedanju, vstajanju, hoji																				
	*pomoč pri nameščanju v ustrezen položaj																				
	*spodbuda k spremembi položaja																				
	nadzor izpostavljenih mest za nastanek RZP																				
	lista obračanja *DA *NE																				
	aktivna zračna blazina *DA *NE datum namestitve:																				
Varnost	opazovanje bolnika																				
	nameščanje ograjic / manšet / Segufix pas																				
	pogovor o varnosti																				
	drugo																				
Znanje o bolezni in zdravem načinu življenja	učenje vsebin																				
	učenje veščin																				
	učenje jemanja inhalacijske terapije																				
	preverjanje jemanja inhalacijske terapije																				
	vključitev v organiziran ZV program																				
	preverjanje znanja																				
	vključitev svojcev																				
	drugo																				
Komuni-kacija	odstopanja																				
	planiran pogovor z : …………………………																				
	vključitev svojcev																				
	drugo																				
Medicinsko tehnične intervencije/preveze/menjave	**Venska kanila G….. dne…….lokacija…….**																				
	preveza																				
	menjava infuzijskega sistema																				
	ocena vbodnega mesta																				
	Venska kanila G….. dne………. lokacija…….																				
	preveza																				
	menjava infuzijskega sistema																				
	ocena vbodnega mesta																				
	Oskrba rane, kože, sluznic - lokacija………..																				
	preveza rane																				
	material za prevezo																				
	prijava rane, datum:																				
	Oskrba rane, kože, sluznic - lokacija…………																				
	preveza rane																				
	material za prevezo																				
	prijava rane, datum:																				
	Oskrba ran- list Vodenje kronične rane																				
Legenda: **vbodno mest**o/preveza G-gnojno, R-rdečina, K- krvavi, H- hematom, bp-brez posebnosti																					
PARAF MS/ZT/DMS																					

OBR 111-030-2/4.6.2008

PRILOGA

NEGOVALNO POROČILO

Datum	Ura	Dodatna opozorila in opažanja	Vrednotenje ZN	Podpis med. sestre

NEGOVALNE DIAGNOZE

datum	NEGOVALNE DIAGNOZE	CILJI ZDRAVSTVENE NEGE	VREDNOTENJE CILJEV

Translation of the original Golnik Hospital Nursing Care Logbook

Please note: only the hardcopy of the dissertation thesis carries the Translation of the original Golnik Hospital Nursing Care Logbook

NURSING CARE LOGBOOK

PATIENT INFORMATION OR DATA PATIENT IDENTIFICATION DATA

		Date	Morning	Afternoon	Night
Dependence on procedures of nursing care, degree of nursing care support (TI = Totally independent, PD = Partially dependent, TD = Totally dependent)					
Assessment of risk according to Waterloo scale					
Assessment of risk to fall (at risk present; not at risk)					
Rating of non-acute care level					
		Plan	**Morning**	**Afternoon**	**Night**
Breathing	Cleaning of oxygen mask				
	Replacing nasal catheter				
	Aspiration of upper airways				
	Help with coughing				
	Replacing the nozzle for inhalation				
	Other				
Personal hygiene	Bed bath				
	Refreshing wash in bed				
	Washing in the bathroom				
	Washing in the sink				
	Showering, bathing				
	Help with washing				
	Preparing items for washing				
	Oral care				
	Moistening the mouth, lip care				
	Cleaning dentures				
	Anogenital care				
	Washing hair				
	Nail clipping				
	Other				
Eating and drinking	Feeding				
	Help with feeding				
	* Help with drinking				
	*Positive reinforcement, monitoring				
	Nasogastric tube, Stands for Charriere (unit to measure external diameter of a tube)..........Day........ Type of nasogastric tube........				
	Nostril (left or right)				
	Replacing the nasogastric tube				
	Feeding through the nasogastric tube *MEALS *CONTINUOUS				
	Replacement of syringe and system for feeding				
	Monitoring the nasogastric tube position and aspiration *BEFORE MEALS *EVERY 6 HOURS				
	Nasogastric bandage				
	Other				
Secretion	*Toilet in the room				
	*Urinary container				
	Monitoring of defecation and urination				
	*Escorting to the toilet				
	Installation and replacement of the system for treating urinary incontinence				
	Urinary catheter Day........ STANDS FOR CHARRIERE (UNIT TO MEASURE EXTERNAL DIAMETER OF A TUBE)........				
	Replacement the urinary catheter				
	Replacement of urinary bag				
	Care after sweating or vomiting				
	Other				
Physical activity competence	*Help with sitting up, standing up, walking				
	*Help to take up comfortable body position				
	*Encouragement to change body position				
	Monitoring exposed sites for the emergence of pressure sores				
	Sheet (or journal) for rotation sheet YES........ NO........				
	Active airbag YES........ NO........ date of installation:				
Safety	Observing the patient				
	Installing security bars / Arm restraints / Segufix belt				
	Talk about safety				
	Other				
Knowledge about the disease and healthy lifestyle	Teaching about the disease				
	Teaching skills				
	Teaching about taking inhalation therapy				
	Monitoring therapy inhalation				
	Inclusion in organized educational programs				
	Knowledge assessmentInvo				
	lvement of carers				
	Other				
Communi - cation	Difficulties in speaking and communicating				
	Setting up an appoint for conversation with an expert				
	Involvement of relatives				
	Other				
Medical technical interventions / Bandages / Replacements	**Venous cannula suppurative........ Day........ Location........**				
	Bandage				
	Replacement of the infusion system				
	Assessment of the injection site				
	Venous cannula suppurative........ Day........ Location........				
	Bandage				
	Replacement of the infusion system				
	Assessment of the injection site				
	Care for wound, skin, mucosa - Location........				
	Bandage				
	Bandage material				
	Wound reported				
	Care for wound, skin, mucosa - Location........				
	Wound bandage				
	Bandage material				
	Wound reported				
	Care for wounds- sheet Managing chronic wounds				
Legend: **Injection site** / bandage S-suppurative, R-redness, B-bloody, H-hematoma, Wp-without particularities					
INITIALS Medical nurse/ Nurse technician / Registered nurse					

ANNEX

NURSING REPORT

Date	Time	Additional warnings and observations	Assessment by nursing care team	Signature of nurse

NURSING DIAGNOSES

Date	NURSING DIAGNOSES	OBJECTIVES OF NURSING CARE	ASSESSMENT OF OBJECTIVES

Appendix D: Original Golnik Hospital CAP CP ver.2

Golnik Hospital CAP CP ver.2, pg. 1

bolnišnica GOLNIK	ZUNAJBOLNIŠNIČNA PLJUČNICA KLINIČNA POT	OBR 103-001
Bolniški oddelek 300		Izdaja: 2
		Stran: 1 od 3

SPREJEM
DATUM IN URA:

NALEPKA S PODATKI BOLNIKA

IZPOLNI SPREJEMNI ZDRAVNIK ali zdravnik ob sprejemu na oddelek			INICIALKE
1. Izpolnjeni kriteriji za zunajbolnišnično pljučnico	DA	NE	
2. Poizvedba o pridruženih kroničnih boleznih	DA	NE	
3. Izmera RR, pulza, temperature, saturacije	DA	NE	
4. Bolnik ima narejen Rtg pc in EKG	DA	NE	
5. Izvedena PAAK	DA	NE	
6. Bolnik ima narejen hemogram, DKS, CRP, Na, K, retente, KS	DA	NE	
7. Naročeni 2 hemokulturi	DA	NE	
8. Naročen odvzem drugih kužnin	DA	NE	
9. Narejena ocenjena teža pljučnice (SOP 103-001)	DA	NE	
10. Predpis antibiotika znotraj 4 ur od postavljene diagnoze	DA	NE	
IZPOLNI SPREJEMNA MS ali MS ob sprejemu na oddelek			
11. Negovalna dokumentacija izpolnjena	DA	NE	
12. Ocena pričakovanih zapletov glede odpusta	DA	NE	

Odgovor NE zahteva obrazložitev v tabeli ODMIKI

Veljaven od:	Pripravil: Renato Eržen	Pregledal:	Odobril: Mitja Košnik
Dokumenti so obvladovani računalniško. Na papir natisnjeni dokumenti predstavljajo kopijo. V primeru razlik med dokumenti se uporabi izvirni dokument (elektronski ali pisni overjeni dokument), ki se nahaja pri skrbniku dokumenta.			

Golnik Hospital CAP CP ver.2, pg. 2

OBR 103-001	Izdaja: 2	Zunajbolnišnična pljučnica – klinična pot	Stran 2 od 3

	Datum: Dan 1 2 3 ...			Datum: Dan 1 2 3 ...			Datum: Dan 1 2 3 ...			Datum: Dan 1 2 3 ...			Datum: Dan 1 2 3 ...			Datum: Dan 1 2 3 ...		
IZPOLNI ZDRAVNIK			INICIALKE			INICIALKE			INICIALKE			INICIALKE			INICIALKE			INICIALKE
13. Telesni pregled narejen	DA	NE		DA	NE		DA	NE		DA	NE		DA	NE		DA	NE	
14. Ocenjeno stanje zavesti	DA	NE		DA	NE		DA	NE		DA	NE		DA	NE		DA	NE	
15. Izmerjen RR, pulz, frekvenca dihanja, temperatura, saturacija	DA	NE		DA	NE		DA	NE		DA	NE		DA	NE		DA	NE	
16. Ocenjena količina in gnojnost sputuma	DA	NE		DA	NE		DA	NE		DA	NE		DA	NE		DA	NE	
17. Predpisan antibiotik je v skladu s priporočili – (SOP 103-001)	DA	NE		DA	NE		DA	NE		DA	NE		DA	NE		DA	NE	
18. Zadostuje peroralni antibiotik	DA	NE		DA	NE		DA	NE		DA	NE		DA	NE		DA	NE	
19. Odmerek antibiotika je prilagojen telesni teži iter funkciji jeter in ledvic	DA	NE		DA	NE		DA	NE		DA	NE		DA	NE		DA	NE	
20. Bolnik danes potrebuje kisik	DA	NE		DA	NE		DA	NE		DA	NE		DA	NE		DA	NE	
21. Bolnik danes potrebuje infuzijo	DA	NE		DA	NE		DA	NE		DA	NE		DA	NE		DA	NE	
22. Ocenjena potreba po dodatnih preiskavah za etiologijo (kužnine, atipični povzročitelji)	DA	NE		DA	NE		DA	NE		DA	NE		DA	NE		DA	NE	
23. Ocenjena potreba po kontrolnih preiskavah (Rtg, hemograma, DKS, biokemija)	DA	NE		DA	NE		DA	NE		DA	NE		DA	NE		DA	NE	
24. Bolnik še vedno potrebuje hospitalizacijo	DA	NE		DA	NE		DA	NE		DA	NE		DA	NE		DA	NE	
25. Klinični potek bolezni danes je pričakovan	DA	NE		DA	NE		DA	NE		DA	NE		DA	NE		DA	NE	
IZPOLNI MS																		
26. Ocena nevarnosti za razjedo zaradi pritiska	DA	NE		DA	NE		DA	NE		DA	NE		DA	NE		DA	NE	
27. Ocena ogroženosti zaradi padca	DA	NE		DA	NE		DA	NE		DA	NE		DA	NE		DA	NE	
28. Ocena stopnje zahtevnosti ZN	DA	NE		DA	NE		DA	NE		DA	NE		DA	NE		DA	NE	
29. Spremljanje vitalnih znakov	DA	NE		DA	NE		DA	NE		DA	NE		DA	NE		DA	NE	
30. Zdravnik obveščen o spremembi stanja	DA	NE		DA	NE		DA	NE		DA	NE		DA	NE		DA	NE	
31. Potreben obisk dežurnega zdravnika	DA	NE		DA	NE		DA	NE		DA	NE		DA	NE		DA	NE	
32. Pričakujemo zaplete ob odpustu	DA	NE		DA	NE		DA	NE		DA	NE		DA	NE		DA	NE	
33. Prisotne ovire za odpust	DA	NE		DA	NE		DA	NE		DA	NE		DA	NE		DA	NE	
34. Obveščen socialni delavec	DA	NE		DA	NE		DA	NE		DA	NE		DA	NE		DA	NE	

Odgovor v osenčenem polju zahteva obrazložitev v tabeli ODMIKI

Golnik Hospital CAP CP ver.2, pg. 3

OBR 103-001	Izdaja: 2	Zunajbolnišnična pljučnica – klinična pot	Stran 3 od 3

ODPUST

DATUM:

IZPOLNI ZDRAVNIK			INICIALKA
35. Napisana dokončna odpustnica	DA	NE	
36. Če bolnik potrebuje antibiotik: ali je dobil recept?	DA	NE	
37. Predviden kontrolni pregled	DA	NE	
38. Dana priporočila za cepljenje	DA	NE	
39. Informacija o bolezni podana bolniku/skrbniku	DA	NE	

IZPOLNI MS			INICIALKA
40. Bolnik dobi odpustnico v roke	DA	NE	
41. Poslano obvestilo službi zdravstvene nege	DA	NE	
42. Navodila o zdravstveni negi dana bolniku/skrbniku	DA	NE	

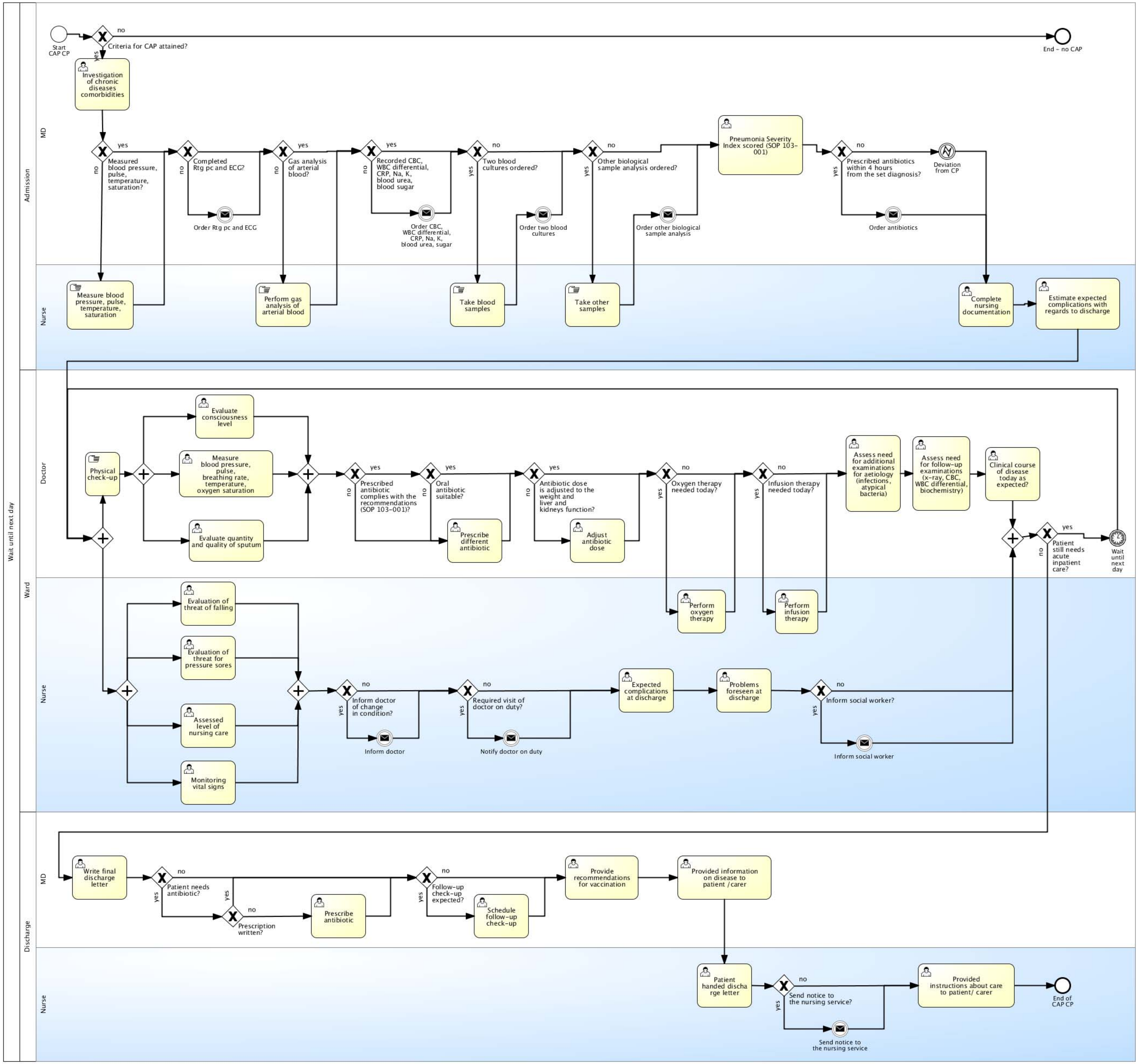
Odgovor v osenčenem polju zahteva obrazložitev v tabeli ODMIKI

ODMIKI OD KLINIČNE POTI

DATUM	ODMIK OD KLINIČNE POTI, KOMENTAR.........	INICIALKA

Appendix E: CAP CP ver.2 as a process

Please note: only the hardcopy of the dissertation thesis carries the drawing of CAP CP ver.2 as a process



Wait until next day
Admission
MD
Nurse
Ward
Doctor
Nurse
Discharge
MD
Nurse
Start CAP CP
Criteria for CAP attained?
no
yes
End – no CAP
Investigation of chronic diseases comorbidities
Measured blood pressure, pulse, temperature, saturation?
Completed Rtg pc and ECG?
Order Rtg pc and ECG
Gas analysis of arterial blood?
Recorded CBC, WBC differential, CRP, Na, K, blood urea, blood sugar
Order CBC, WBC differential, CRP, Na, K, blood urea, sugar
Two blood cultures ordered?
Order two blood cultures
Other biological sample analysis ordered?
Order other biological sample analysis
Pneumonia Severity Index scored (SOP 103-001)
Prescribed antibiotics within 4 hours from the set diagnosis?
Order antibiotics
Deviation from CP
Measure blood pressure, pulse, temperature, saturation
Perform gas analysis of arterial blood
Take blood samples
Take other samples
Complete nursing documentation
Estimate expected complications with regards to discharge
Physical check-up
Evaluate consciousness level
Measure blood pressure, pulse, breathing rate, temperature, oxygen saturation
Evaluate quantity and quality of sputum
Prescribed antibiotic complies with the recommendations (SOP 103-001)?
Oral antibiotic suitable?
Prescribe different antibiotic
Antibiotic dose is adjusted to the weight and liver and kidneys function?
Adjust antibiotic dose
Oxygen therapy needed today?
Perform oxygen therapy
Infusion therapy needed today?
Perform infusion therapy
Assess need for additional examinations for aetiology (infections, atypical bacteria)
Assess need for follow-up examinations (x-ray, CBC, WBC differential, biochemistry)
Clinical course of disease today as expected?
Patient still needs acute inpatient care?
Wait until next day
Evaluation of threat of falling
Evaluation of threat for pressure sores
Assessed level of nursing care
Monitoring vital signs
Inform doctor of change in condition?
Inform doctor
Required visit of doctor on duty?
Notify doctor on duty
Expected complications at discharge
Problems foreseen at discharge
Inform social worker?
Inform social worker
Write final discharge letter
Patient needs antibiotic?
Prescription written?
Prescribe antibiotic
Follow-up check-up expected?
Schedule follow-up check-up
Provide recommendations for vaccination
Provided information on disease to patient /carer
Patient handed discharge letter
Send notice to the nursing service?
Send notice to the nursing service
Provided instructions about care to patient/ carer
End of CAP CP

Appendix F: Summary in the Slovenian language

DALJŠI POVZETEK

Večji del zdravstvenih storitev je stvar vsakodnevne rutine. Viri namenjeni zdravstvenemu varstvu so omejeni, zaradi česar so ljudje še bolj zaskrbljeni. Gre za pomemben podatek, če vemo, da je znaten delež zdravstvenih storitev izbirne (oziroma elektivne ali planirane) narave. V nujnih primerih ima bolnik agenta, to je zdravnik, ki sprejme odločitev v njegovem imenu, medtem ko se pri izbirnih storitvah bolnik sam odloči ali bo koristil storitev ali ne in iz tega razloga igra cena pomembno vlogo pri sprejemanju končne odločitve (Folland, Goodman, & Stano, 1997, str. 13).

V bolnišničnem okolju je na voljo približno 60% do 70% vseh zdravstvenih storitev. Vzporedno v današnjem času skorajda ni mogoče izpostaviti evropske države, ki se ne bi spopadala z javno političnim vprašanjem financiranja bolnišnic, ki v veliki meri celo postavlja pod vprašaj obstoj bolnišnic v obliki, kot jih poznamo. V preteklosti so bolnišnice dobile v celoti povrnjena sredstva za storitve, ki so jih nudile svojim strankam / bolnikom /pacientom. Danes temu ni več tako. Bolnišnice ne morejo več samo čakati strukturne reforme, ki naslavljajo vprašanje njihovega financiranja, zaradi česar bolnišnice aktivno uvajajo upravljavske prijeme, preko katerih skušajo izboljšati svojo lastno organizacijsko zmogljivost. Na ta način postajajo bolnišnice zapleten mehanizem, sestavljen iz prepletajočih se funkcij.

Učinkovito upravljanje v zdravstvenih ustanovah zahteva vključevanje poslovnih postopkov, financiranje zdravstvenih programov ter vključevanje storitev, ki omejujejo stroške in obenem izboljšujejo kakovost. Zaradi povečanega poudarka na varstvo bolnikov, sprememb v pogledu na kakovost zdravstvenih storitev ter višjih stroškov v zdravstvu, se vse več direktorjev bolnišnic pri svojih upravljalskih nalogah zgleduje po praksi iz gospodarstva. Več pozornosti posvečajo bolniku in ne toliko samemu sistemu. Prav tako je bolj izpostavljena učinkovitost samih procesov, vse s ciljem zadovoljevanja potreb bolnika.

Klinična pot predstavlja vrsto procesnega orodja, ki ga je mogoče zaslediti tudi v industriji, na primer v avtomobilski ali pa gradbeni industriji. Številne države so prevzele klinično pot, kot obliko procesnega orodja in jo uporabile v bolnišnicah. Prav uporaba kliničnih poti v zdravstvenem varstvu je omogočila upravljanje poslovnih funkcij v bolnišnicah. Mnogi so prepričani, da uporaba kliničnih poti, še zlasti pri bolnišnični oskrbi, pripomore h kakovostnejši izvedbi zdravstvene oskrbe in zmanjšanju pojava zdravniških napak (Trowbridge & Weingarten, 2011).

Kot ponazoritev, Trowbridge in Weingarten (2011) razumeta klinično pot kot sredstvo za usmerjanje in racionalizacijo procesov, ki vodijo do vnaprej pričakovanih rezultat. Langenbrunner in Wiley (2002, str. 172) poročata, da so se v preteklosti mnoge evropske države odločile za premik od tradicionalnega pristopa k bolj »v rezultate« usmerjenemu pristopu, kar je do neke mere vplivalo na spremembo poslovnih funkcij in delovnih procesov v bolnišnicah.

Hammer in Champy (2003) trdita, da mora preoblikovanje poslovnih procesov vključevati temeljni premislek in korenito prenovo organizacijskih procesov, če želimo bistveno izboljšati stroškovne, časovne in storitvene zmogljivosti. Bolj kot posvečanje posebnostim proizvodnje, financiranja, računovodenja in upravljanja posamezne organizacije, avtorja predlagata pregled postopka kot celote skupaj z nalogami, ki jih vsaka izmed procesnih funkcij izvaja.

Velika Britanija velja za primer dobre prakse, kako je potrebno preoblikovati poslovne postopke v bolnišnicah. V devetdesetih letih je namreč Velika Britanija temeljito reformirala predvsem način organiziranja dela v bolnišnicah znotraj sistema zdravstvenega varstva. S tem je postala prva evropska država, ki je vpeljala koncept kliničnih poti. Postopoma so ji sledile tudi druge države, kot na primer: Kanada, Avstralija, Slovenija, Nemčija, Italija, Belgija, Nizozemska, Danska, Švedska, Francija, Španija in Romunija ter Mongolija.

Klinične poti lahko razumemo kot standard oziroma kot načrtovano pot zdravstvene nege za posamezne konkretne primere. Slovenski zdravstveni sistem je prvič predstavil koncept kliničnih poti leta 2002, primarno kot orodje za doseganje organizacijskih sprememb in izboljšanje kakovosti zdravstvene nege.

Na reorganizacijo v zdravstvenih ustanovah najbolj vplivajo dinamika odnosov in prepričanja med zaposlenimi (Yazbeck, 2004). Strokovno in vodstveno osebje mora oblikovati lastni slog dela. V praksi to pomeni, da mora vodstvo izbrati primerne tehnike, s pomočjo katerih lahko poveča učinkovitost dela zaposlenih v zdravstveni ustanovi (Štruc 2006, str. 22). Lahko bi rekli, da so zdravstvene ustanove podobne »podjetjem«, zaradi česar jih je moč upravljati kot »gospodarske subjekte«.

Doktorska disertacija se osredotoča na vprašanje uporabe kliničnih poti v bolnišničnem okolju. Klinična pot je orodje, ki omogoča multidisciplinarni skupini strokovnjakov, da na preprostejši način skupaj zagotovijo ustrezno zdravstveno nego bolnikom. Klinične poti temeljijo na predhodnih izkušnjah. Čeprav obravnavajo isto skupino bolnikov, se klinične poti razlikujejo od ene zdravstvene ustanove do druge. Zato je smiselno klinične usmeritve obravnavati kot smernice in ne absolutna pravila. Preko kliničnih poti in smernic si prizadevamo zagotoviti enake postopke ravnanja in izboljšati primerljivost rezultatov v podobnih primerih (Robida, Yazbeck, Kociper, Mate & Marušič 2006, str. 11-15).

Pomembno je, da ostane zdravstvena nega cenovno dostopna širokemu krogu ljudi. Hkrati je potrebno upoštevati zahteve in potrebe bolnikov. To je potrebno storiti na način, da tisti, ki zdravstveno storitev v danem trenutku najbolj potrebujejo, to tudi dobijo. Hkrati se ne sme zgoditi, da bi zaradi takšnega pristopa podaljšali čakalne dobe za preostale bolnike (Kornai & Eggleston, 2001, pp. 48-65). Državljani postajajo vedno bolj osveščeni, ko je govora o njihovih zdravstvenih pravicah, o konkurenci in o investicijah v medicinsko tehnologijo. Ko se znajdejo v vlogi bolnika, si zato želijo v večji meri sodelovati pri načrtovanju zdravstvene oskrbe.

Klinične poti lahko povežejo in učinkujejo na poslovne procese bolnišnice na različne načine in v različnih obsegih. V dotični doktorski disertaciji je razprava omejena na pet glavnih poslovnih funkcij: prodaja, nabava, poslovanje, financiranje in načrtovanje oziroma organiziranje. V doktorski disertaciji je predstavljena študija primera in analiza uporabe klinične poti v primeru zunaj bolnišnične pljučnice (ZBP). Razprava se predvsem osredotoča na vprašanje, kako obravnavana klinična pot lahko vpliva na poslovne procese v zdravstveni ustanovi, konkretno v primeru Univerzitetne Klinike za pljučne bolezni in alergijo Golnik (v nadaljevanju Bolnišnica Golnik).

Predmet raziskovanja ter namen, cilji in osrednja domneva doktorske disertacije

Klinična pot je relativno novo orodje, ki služi izboljšanju postopkov in načrtovanju zdravstvenih storitev. Strokovnjaki so ugotovili, da načela poslovnega reinženiringa v bolnišničnem okolju, vplivajo na kakovost zdravstvene oskrbe, zadovoljstvo bolnikov s storitvami, ki jih prejmejo, zadovoljstvo zaposlenih in povečano učinkovitost bolnišnice (Booz-Allen & Hamilton, 1988; Dunnette, Hough & Triandis, 1994). Dokaze, ki govorijo v prid preoblikovanja poslovnih procesov v bolnišnicah je mogoče zaslediti v številnih evropskih državah, vključno z Veliko Britanijo (Hurst, 1995), Nizozemsko (Bainton, 1995), Španijo (Coulson-Thomas, 1996) in Švedsko (Åhgren, 2001, Brodersen & Thorwid, 1997).

Doktorska disertacija želi predstaviti značilnosti klinične poti in hkrati skuša določiti vpliv, ki naj bi ga obravnavana klinična pot imela na poslovne procese v bolnišnici. Preučuje vplive klinične poti na vsakodnevne delovne naloge, ki potekajo v bolnišnici ter kako vse skupaj posledično prispeva k boljši in povečani prepustnosti bolnikov, boljši izkoriščenosti posteljnih kapacitet v bolnišnici, zmanjšanju števila napak, izboljšanju kakovosti oskrbe, izboljšanje zadovoljstva bolnišničnega osebja, itd. Navsezadnje se doktorska disertacija dotika temeljne dileme, in sicer kako klinične poti izboljšajo učinkovitost v bolnišnicah.

V doktorski disertaciji je obravnavana konkretna klinična pot – klinična pot za ZBP, ki je v uporabi v Bolnišnici Golnik za specifično skupino bolnikov. Z uporabo dotične klinične poti so v Bolnišnici Golnik ubrali modernejši in »v rezultate« usmerjen pristop, ko govorimo o načrtovanju zdravstvene oskrbe. Bolnišnica Golnik ima okoli 230 postelj. Vsako leto Bolnišnica Golnik oskrbi približno 7.000 do 8.000 hospitaliziranih bolnikov in 50.000 ambulantnih bolnikov. V uporabi je druga verzija klinične poti, kar govori v prid tezi, da je klinična pot "živo" orodje, ki se nenehno razvija, in sicer glede na potrebe, ki se pojavljajo in nova znanja, do katerih prihaja multidisciplinarna skupina strokovnjakov.

V središču doktorske disertacije leži glavno vprašanje: Kateri izmed dejavnikov najbolj vplivajo na izboljšanje bolnišnične oskrbe, izid zdravljenja, dolžino zdravljenja v bolnišnici, vnovični sprejem v bolnišnico, umrljivost, sprejem in odpust, kakovost zdravljenja ter seveda ceno zdravljenja?

Klinična pot zagotovo predstavlja ustrezno podlago za izračun in določitev stroškov zdravljenja. Predstavlja metodo, preko katere lahko vnaprej predvidimo proces zdravljenja in zagotovimo najboljše zdravstvene izide v okviru omejenih finančnih sredstev, ki so nam na voljo. Če želimo doseči dobre izide zdravljenja, je potrebno predhodno vzpostaviti sistem, v katerem je mogoče te iste izide izmeriti na podlagi vnaprej določenih (strukturnih in procesnih) kazalnikov. Na podlagi zgoraj navedenih opažanj in ugotovitev, so bile v doktorski disertaciji preučevane naslednji dve hipotezi:

»Bolnišnica ali katerikoli drugi izvajalec zdravstvenih storitev je primoran temeljito prenoviti svoje poslovne postopke oziroma procese, ter uporabiti tehnike in načine poslovnega preoblikovanja, sodeč po teoretičnih analizah in študijah o uvajanju in implementaciji kliničnih poti. Z drugimi besedami, praktična implementacija teorij, ki obravnavajo klinične poti, zahteva razumevanje in sprejemanje tehnik poslovnega preoblikovanja«.

»Prva hipoteza je empirično preverjena, kar nas pripelje do zaključka, da bi se morala Bolnišnica Golnik, na temelju uvedbe in implementacije klinične poti, osredotočiti na prenovo poslovnih postopkov oziroma procesov. Če je prva hipoteza dokazana, potemtakem sledi, da bi se morala Bolnišnica Golnik osredotočiti na spremembo svojih lastnih poslovnih procesov«.

Namen in cilji preučevanja

Glede na dejstvo, da do zdaj še nihče ni preučeval sprememb poslovnih procesov, kot posledic uvajanja kliničnih poti v slovenski zdravstveni sistem, nam bodo rezultati analize pripomogli k boljšemu razumevanju medsebojne prepletenosti in soodvisnosti različnih poslovnih in delovnih procesov, ki so vključeni v klinične poti. Ravno tako lahko rezultati analize v prihodnje olajšajo vpeljavo in implementacijo novih kliničnih poti v slovenski zdravstveni sistem, s tem ko vključimo primerno strokovno osebje.

Namen raziskave je preučiti uporabo klinične poti ZBP, ki je v uporabi v Bolnišnici Golnik, analizirati njene učinke, ki jih ima v primerjavi z drugimi bolj običajnimi metodami oskrbe in določiti, kakšne spremembe poslovnih procesov v bolnišnicah so potrebne, da bi izboljšali učinkovitost in uspešnost zmogljivosti bolnišnice.

Cilj je ugotoviti, katere poslovne procese je potrebno preurediti v Bolnišnici Golnik in seveda na kakšen način doseči spremembe. Doktorska disertacija:

1. Definira klinično pot na splošno in za ZBP, ki je v uporabi v Bolnišnici Golnik;
2. Opisuje vpliv kliničnih poti na splošno in klinične poti ZBP na poslovne procese bolnišnice in potrebo po poslovnem preoblikovanju;
3. Oriše ter analizira učinek, ki ga ima klinična pot na učinkovitost in uspešnost v okviru procesov bolnišnice.

Prva in glavna skrb plačnika je vedno zdravstveni izid – to je, raven zdravstvenega počutja, ki ga zasledujemo s pomočjo dobro zasnovanih kliničnih poti. Poleg zagotavljanja zdravstvenega počutja bolnika, klinične poti ravno tako zagotavljajo široko paleto zanesljivih informacij in podatkov za večnamensko uporabo (Berginc Dolenšek et al., 2006, str. 33). Od leta 2006 je izvajalec zdravstvenih storitev primoran implementirati vsaj dve klinični poti, kar je zapisano tudi v drugem odstavku 29. člena Splošnega dogovora za bolnišnice za leto 2006 (ZZZS, 2006).

Struktura doktorske disertacije

Poleg uvodnega in zaključnega dela, je doktorska disertacija sestavljena iz sedmih poglavij. V *prvem poglavju* je najprej predstavljena definicija klinične poti: kaj predstavlja klinična pot, kako in kdaj jo uporabljamo ter kako je razvita in izvedena v kliničnem okolju. V tem delu je ponujena široko sprejeta definicija kliničnih poti, hkrati pa so navedeni tudi najbolj reprezentativni primeri študij iz tuje in domače literature, ki poročajo o učinkih uvedbe kliničnih poti v praksi: usklajevanje in racionalizacija postopkov v fazi postavljanja diagnoze, skrajšanje bivanja (oziroma ležalne dobe) bolnikov v bolnišnicah, povečana kakovost oskrbe in boljši zdravstveni izidi, zmanjšanje števila postopkov sproženih zaradi malomarnosti pri oskrbi, izboljšana delovna klima med zaposlenimi in vpliv na načrtovanje zmogljivosti in razpoložljivost virov v bolnišnicah.

V *drugem poglavju* so raziskane in analizirane skupne strukturne lastnosti koordinacijskega načina dela (verižna, središčna in mrežna), ki jih prevzemajo klinične poti, odvisno od narave določenih skupin bolnikov. Na podlagi dostopnih primerov kliničnih poti in literature, so bili identificirani štirje najpogostejši modeli kliničnih poti (Model CP 1, Model CP 2, Model CP 3, Model CP 4).

Tretje poglavje je namenjeno predstavitvi Bolnišnice Golnik. Osredotoča se predvsem na opis zadnje verzije klinične poti za ZBP, ki je v uporabi v Bolnišnici Golnik.

V *četrtem poglavju* se nadaljuje z razpravo o poslovnih funkcijah in kakšni so morebitni vplivi, ki jih imajo lahko klinične poti na poslovne procese. Najprej sta predstavljena dva glavna evropska zdravstvena sistema (Bismarckov in Beveridgeov model), iz katerih izhajajo obravnavane klinične poti. Nato sledi opis učinkov, ki jih imajo različni modeli kliničnih poti na pet temeljnih poslovnih funkcij v bolnišnicah: prodaja, nabava, poslovanje, financiranje in načrtovanje oziroma organiziranje. Bistvo je v razumevanju, kako in v kolikšni meri različni koordinacijski sistemi in identificirani štirje modeli kliničnih poti vplivajo na vsako izmed petih poslovnih funkcij. Klinična pot opredeljuje procese in dejavnosti in ima tako neposreden vpliv na posamezne poslovne funkcije. Seveda se pri tem nivo vpliva na poslovne funkcije razlikuje od modela do modela. Lahko se tudi zgodi, da klinična pot učinkuje na nekatere izmed elementov poslovnega procesa posredno ali pa celo nima nikakršnih učinkov. To je še posebej značilno v primerih, ko je govora o vertikalnih procesih (vložkih). Zgodi se lahko tudi, da vsi štirje modeli zagotavljajo informacije o horizontalnih procesih (izidih) oskrbe bolnika, ne ponudijo pa nikakršnih podatkov o vertikalnih procesih.

Peto poglavje ponudi generalni pregled poslovnih procesov v organizacijah: razvoj koncepta poslovnih procesov, opredelitev pojma poslovnih procesov ter opis procesov v ustanovah. Poglavje se zaključi s pregledom poslovnih procesov pri izvajalcih zdravstvenih storitev.

V opisanih scenarijih pa pravzaprav tudi izražen glavni znanstveni prispevek doktorske disertacije. je torej predstavljen znanstveni prispevek, skupaj z nadaljnjo razpravo o tem, do kolikšne mere klinične poti kot procesi vplivajo na poslovne funkcije v bolnišnicah (znanstveni prispevek je predstavljen spodaj). Vse skupaj je zajęto v *šestem poglavju*.

Zadnje, *sedmo poglavje*, ponudi opažanja, kako obravnavana klinična pot dejansko vpliva na vertikalne procese, prodajo, nabavo, poslovanje, financiranje in organizacijo, in kaj bi morali v Bolnišnici Golnik še spremeniti, da bi ta ista klinična pot postala še ustreznejše procesno orodje, kot to je v sedanji obliki. Predstavijo se glavni točke, ki jih je potrebno upoštevati pri oblikovanju klinične poti.

Znanstveni prispevek doktorske disertacije

Uvedba kliničnih poti v bolnišnico vodi torej do znatnih vplivov, tako na organizacijsko strukturo bolnišnice kot na procese, ki tečejo znotraj bolnišnice. Vsi vplivi pa so povezani z učinkovitostjo in uspešnostjo delovanja bolnišnice. Ob tem pa ni nepomembno, da analiza ne odkriva zgolj vpliva uvedbe klinične poti na organizacijsko strukturo, poslovne funkcije in procese v bolnišnici. Preoblikovanje bolnišnice v skladu z uvedbo klinične poti namreč zahteva določene značilnosti klinične poti, če želimo, da uvedba kliničnih poti v resnici lahko prispeva k povečanju uspešnosti in učinkovitosti bolnišnice.

Prvič, tako se je potrebno zavedati, da je vsaka klinična pot proces, kar pomeni, da mora biti načrtovana v obliki tehnologije procesnega modeliranja. Vsaka klinična pot mora imeti začetek, konec, glavne aktivnosti, točke odločanja in točke čakanja. Prav tako ima lahko tudi določene informacije različnega značaja o poteku izvedbe klinične poti. Začetek vsake klinične poti je diagnostičnega značaja, saj je prav diagnoza pogoj za razvrščanje bolnikov po posameznih kliničnih poteh. Klinična pot mora prikazati tudi vmesne rezultate procesov zdravljenja, na koncu pa mora podati informacije o uspešnosti klinične poti, in sicer kot razlike med začetnih bolezenskim stanjem in končnim stanjem bolnika.

Drugič, klinične poti so lahko različne po svoji strukturi in obliki. Smiselno pa jih je razdeliti v verižne klinične poti, središčne klinične poti in mrežne klinične poti. Takšna delitev namreč izhaja iz tehnologije zdravljenja bolnika in se zato tem oblikam pri klinični poti ni mogoče izogniti.

Tretjič, zelo pomemben vidik klinične poti je časovna dimenzija. Klinično pot smo označili v bolnišnici kot horizontalni proces, v katerem se ves čas nahaja bolnik. Zato je potrebno opredeliti zaporedje in čas izvajanja posameznih dejavnosti, odločanja in čakanja. Kot smo videli, je z vidika usklajevanja klinične poti zelo pomembno, da pri izvedbi sukcesivnosti in časa izvajanja upoštevamo tudi določene tolerance, ki ne vplivajo na zdravstveni izid in ki jih lahko uporabimo v procesih koordinacije in usklajevanja izvajanj različnih kliničnih poti pri različnih bolnikih.

Četrtič, klinična pot je vezana na uspešnost zdravstvenega proces in mora na koncu vedno težiti k odpravi bolezenskega stanja pri bolniku. Zato mora vsebovati vse tiste dejavnosti, ki lahko pripeljejo do takšnega končnega rezultata. Mora pa osnovna oblika klinične poti vsebovati zgolj tiste aktivnosti, odločanja in čakanja, ki so nujna pri standardnem procesu zdravljenja bolnika. S tega vidika je nujno, da tako aktivnosti odločanja kot čakalna obdobja klinične poti razdelimo na standardna, nujna, merilna in nadzorna ter izbirna.

Petič, klinična pot mora ob vsaki aktivnosti, odločanju in čakanju opredeliti tudi strošek izvajanja posamezne aktivnosti, odločitve ali čakanja. Ta strošek mora biti viden za izvajalca klinične poti tudi v primerjavi s tipom aktivnosti, razvrščene glede na enotnost izvedbe. Prav tako je možno podati v klinično pot celotni strošek izvedbe klinične poti na enega bolnika v primeru enotne izvedbe klinične poti brez izrednih aktivnosti, odločitev in čakalnih obdobji.

Šestič, klinična pot ne obsega dejavnosti znotraj bolnišnice, ki vplivajo na njeno učinkovitost. Zavedati pa se je potrebno, da neustrezno zajemanje aktivnosti, odločitev in čakanj v klinični poti lahko izniči učinke, ki nastajanje pri vertikalnih proizvodnih procesih v bolnišnici in ki odločajo o učinkovitosti bolnišnice.

Sedmič, klinična pot, ki vsebujejo merjenje in kontrole, je potrebno usklajevati z vertikalnimi proizvodnimi procesi, da se take oblike aktivnosti pri vertikalnih proizvodnih procesih ne ponavljajo. S tem lahko bistveno vplivamo na učinkovitost bolnišnice.

Osmič, klinične poti morajo biti zasnovane tako, da jih je možno med seboj koordinirati in usklajevati. To pa pomeni, da morajo imeti natančno določene skrbnike kliničnih poti, ki so, kot smo opredelili, različni glede na tip klinične poti in koordinatorja klinične poti in zdravljenja različnih bolnikov.

Devetič, klinične poti zahtevajo triažo bolnikov in razporeditev v ustrezno klinično pot.

Desetič, klinične poti morajo imeti možnost evidentiranja zdravstvenih storitev in proizvodov, ki neposredno vstopajo v posamezno klinično pot, in sicer na način, da je to vidno povezano s časovnim pojavom aktivnosti, odločanja ali čakanja in uporabo določene zdravstvene storitve ali proizvoda. Ni pa smiselno od klinične poti zahtevati evidentiranje inputov, ki vstopajo v vertikalne proizvodne procese in ki kot output dajejo zdravstvene storitve in proizvode, potrebe za izvedbo klinične poti.

Enajstič, klinična pot mora vsebovati tudi opozorilo o naboru informacij, ki jih mora izvajalec klinične poti poslati ustreznim službam in organom znotraj bolnišnice.

Dvanajstič, prav tako je smiselno v klinično pot glede na časovno dinamiko izvajanja klinične poti zabeležiti tiste managerske odločitve, ki vplivajo na izvedbo klinične poti. To so managerske odločitve, ki so povezane s koordinacijo in usklajevanjem izvajanja klinične poti, s premeščanjem bolnikov iz oddelka na oddelek in z odločitvami, ki so sprejete pri izvedbi klinične poti na osnovi informacij oddelkov nabave in financ.

Trinajstič, klinična pot mora imeti možnost beleženja sprememb v tehniki oziroma pristopa obravnave ne glede, ali te spremembe nastajajo iz spremenjene tehnologije zdravljena ali iz zamenljivosti inputov ter tehnik.

Štirinajstič, klinično pot se mora po zaključku analitično obdelati in preoblikovati v tako imenovano dokončano klinično pot. Prav zaradi tega je potrebno v bolnišnicah organizirati posebni razvojni oddelek, ki na osnovi zaključenih kliničnih poti opredeljuje tudi bodoče spremembe v klinični poti. Takšne spremembe lahko nastajajo tudi z vidika načinov plačevanja plačnika. Pri tem je zelo pomembno, da v klinični poti zabeležimo vse odstopanja od predpisane klinične poti, kar pa je možno predvsem v primeru, če klinična pot obsega aktivnosti, odločitve in čakalnega obdobja, ki so opredeljene v standardni obliki.

Petnajstič, razvojni oddelek znotraj bolnišnice mora vedno pripravljati poročila o uresničevanju klinične poti in opozarjati na razlike med operativnimi kliničnimi potmi, ki jih izvajajo izvajalci, in zaključenimi kliničnimi potmi. Na tej osnovi nastajajo dopolnitve operativnih kliničnih poti, o katerih morajo pred izvedbo razpravljati tudi v posameznih oddelkih, ki so vključeni v realizacijo klinične poti.

Šestnajstič, smiselno je organizirati znotraj posameznih izvajalcev klinične poti tudi službo za poročanje o izvedbi klinične poti, ki pripravlja poročila za paciente. Takšno nalogo lahko opravlja oddelek za prodajo, ki skrbi za pridobivanje pacientov in ima hkrati tudi komunikacijo z njimi. V tem primeru v poročilu o izvajanja klinične poti izpostavimo vse tisto, kar je pomembno z vidika bolnika. Ne odkrivamo pa notranjih značilnosti procesov v bolnišnici. Takšno poročilo je lahko povezano tudi z računom, če bolnišnice izdajo račun bolniku oz. plačniku.

Hipotezi in zaključki

Na podlagi zgornjih 16 ugotovitev, se sprejmeta obe hipotezi in sicer: Bolnišnica Golnik ali katerikoli drugi izvajalec zdravstvenih storitev je primoran temeljito prenoviti svoje poslovne postopke oziroma procese, ter uporabiti tehnike in načine poslovnega preoblikovanja ali reinžiniringa.

Teorije o poslovnih funkcijah in procesih ob uvajanju in implementaciji kliničnih poti težijo k temu, da je potrebno razumeti, upoštevati ter obravnavati klinično pot kot procesno orodje za čim boljši izkoristek v prid poslovnih procesov. To pomeni, da bi bolnišnice morale uporabiti preoblikovanje oziroma reinžiniring poslovnih procesov znotraj svojih poslovnih funkcij. In ker je prva hipoteza empirično preverjena, nas pripelje do zaključka, da bi se morala Bolnišnica Golnik, na temelju uvedbe in implementacije klinične poti, osredotočiti na prenovo poslovnih postopkov oziroma procesov.

Klinična pot za ZBP Bolnišnice Golnik zelo nazorno prikazuje outpute v svojem horizontalnem procesu, a se vsi potrebni inputi (ki se obnašajo kot vertikalni procesi in izhajajo v output na horizontalnem procesu klinične poti ZBP) ne zaznavajo in so stvar interpretacije.

Na podlagi ugotovitev, klinična pot za ZBP je verižnega koordinacijskega značaja, a bi morala biti načrtovana v obliki tehnologije procesnega modeliranja, mora imeti svoj začetek, konec, glavne aktivnosti, jasne točke odločanja in točke čakanja. Klinična pot ZBP bi morala prikazati tudi vmesne rezultate procesov zdravljenja, na koncu pa mora podati informacije o uspešnosti klinične poti, in sicer kot razlike med začetnih bolezenskim stanjem in končnim stanjem bolnika.

Kot smo ugotovili, je zelo pomembni vidik klinične poti časovna dimenzija, kar manjka pri ZBP klinični poti. Če označimo klinično pot kot horizontalni proces, bi potemtakem morali ves čas vedeti, kje točno se nahaja bolnik. Zato je potrebno opredeliti zaporedje in čas izvajanja posameznih dejavnosti,odločanja in čakanja.

Ker je ZBP klinična pot vezana na uspešnost zdravstvenega proces, mora na koncu vedno težiti k odpravi bolezenskega stanja pri bolniku. Zato mora vsebovati vse tiste dejavnosti, ki lahko pripeljejo do takšnega končnega rezultata. Mora pa osnovna oblika klinične poti vsebovati zgolj tiste aktivnosti, odločanja in čakanja, ki so nujna pri standardnem procesu zdravljenja bolnika. S tega vidika je nujno, da tako aktivnosti odločanja kot čakalna obdobja klinične poti razdelimo na standardna, nujna, merilna, nadzorna in izbirna.

ZPB klinična pot bi tudi morala ob vsaki aktivnosti, odločanju in čakanju opredeliti tudi strošek izvajanja posamezne aktivnosti, odločitve ali čakanja. Ta strošek mora biti viden izvajalcu (oziroma drugim poslovnim funkcijam bolnišnice) klinične poti tudi v primerjavi s tipom aktivnosti, razvrščanje glede na enotnost izvedbe. Prav tako bi moralo biti možno podati v ZBP klinično pot celotni strošek izvedbe te klinične poti na enega bolnika, v primeru standardne izvedbe ZBP klinične poti brez izrednih aktivnosti, odločitev in čakalnih obdobji.

ZBP klinična pot ne obsega dejavnosti znotraj Bolnišnice Golnik, ki vplivajo na njeno učinkovitost. Potrebno je ustrezno zajemati aktivnosti, odločitve in čakanja v klinični poti, da ne bi izničili učinke, ki nastajajo pri vertikalnih proizvodnih procesih v Bolnišnici Golnik in ki odločajo o učinkovitosti Bolnišnice Golnik.

Pri ZBP klinični poti manjkajo meritve in kontrole za boljše usklajevanje z vertikalnimi proizvodnimi procesi zato, da se določene oblike aktivnosti pri vertikalnih proizvodnih procesih ne ponavljajo, kar lahko bistveno vpliva na učinkovitost Bolnišnice Golnik.

Če nadaljujem, pri ZBP klinični poti ni moč identificirati, katere so zdravstvene storitve in proizvodi, ki neposredno vstopajo v posamezno klinično pot, in sicer na način, da je to vidno povezano s časovnim pojavom aktivnosti, odločanja ali čakanja in uporabo določene zdravstvene storitve ali proizvoda. Sicer pa ZBP klinična pot relativno dobro evidentira inpute, ki vstopajo v vertikalne proizvodne procese in ki kot output dajejo zdravstvene storitve in proizvode, potrebe za izvedbo te klinične poti.

Na ZBP klinični poti je nabor informacij, ki morajo biti poslane ustreznim službam in enotam znotraj bolnišnice; manjkajo tudi managerske odločitve (npr. na osnovi informacij oddelkov nabave in financ), ki vplivajo na izvedbo ZBP klinično pot.

Kot smo tudi ugotovili, ZPB klinična pot bi morala imeti možnost beleženja sprememb v tehnikah oziroma pristopov do obravnave ne glede, ali te spremembe nastajajo iz spremenjene tehnologije zdravljena ali iz zamenljivosti inputov ter tehnik.

Kot je bilo ugotovljeno, se ZBP klinična pot ne obdeluje analitično, zato bi morda Bolnišnica Golnik morala organizirati posebni razvojni oddelek, ki na osnovi zaključenih kliničnih poti opredeljuje tudi bodoče spremembe v kliničnih poteh. Takšne spremembe lahko nastajajo tudi iz vidika načinov plačevanja plačnika. Vsekakor pa ZPB klinična pot omogoča zdravstvenemu timu zabeležiti vse izjeme od predpisane klinične poti. Smotrno bi bilo, da bi ta posebni razvojni oddelek sproti poročal o uresničevanju ZPB klinični poti in opozarjal na razlike med operativnimi in zaključenimi kliničnimi potmi.

Kot zadnja točka, smiselno bi bilo organizirati tudi službo za poročanje o izvedbi ZPB, ali katerikoli drugi klinični poti, ki pripravlja poročila za paciente, npr. oddelek za prodajo, ki skrbi za pridobivanje pacientov in ima hkrati tudi komunikacijo z njimi.