

Decision-making in operating theatres



“The management of unplanned surgery”

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Management summary

In a former study of Emergency Surgery management Fitzgerald et al. (2005) the dynamic and complex nature of decision-making concerning the prioritisation of unplanned surgery is confirmed. Another outcome was also the little uniformity between and within NSW public hospitals when unplanned cases are scheduled. However, a recommendation was that a decision-making support tool can improve decision-making practices by acting as a catalyst for dialogue between and within professions when scheduling unplanned surgery. This report investigates the possibilities for improvement of the data collection for decision-making of scheduling unplanned surgery.

The biggest observed problem in decision-making are the unsatisfied stakeholders in the process and in particular surgeons. All the surgeons have their own vision on the emergency list and there needs to be an overview of the processes on the emergency list. Surgeons only receive information about what decision is made and not about the alternatives. Another observed problem is the stakeholder salience in the decision-making process. Stakeholders have influence based on: urgency, power and legitimacy. Urgency is directly related to the medical priority of a patient and is determined by the surgeons. The reliability of this medical priority is rather doubtful. Next to this, the power element in stakeholder salience has influence as well but should be minimised. Surgeons often put pressure on nurses and anaesthetists for their own interest, which decreases effective decision-making. Also, in the data-collection, some problems occur. Data is not always complete and reliable for the D.A. to make decision upon.

In order to improve decision-making practices, some recommendations have been made. First, new workflows for data-collection and decision-making practices have been designed. These workflows contain standardisation and formalisation of data-collection in order to guarantee completeness and correctness of data-collection. In this redesign, surgeons are not in direct contact anymore with nurses, which will eliminate the element of power in decision-making. Designs have been made for a manual and computerised system. Second the introduction of an online emergency queue will improve decision-making. This queue reflects the set of alternatives in the decision-making process and this online queue is visible for all stakeholders at any time. All surgeons should have access to the queue and this increases transparency of the decision-making process and eventually the decision will gain more understanding and acceptance. Another advantage is the self-monitoring outcome of the queue. All surgeons can see other cases on the queue, and the urgency code will be monitored between surgeons. This will increase the reliability of the medical priority assigned by surgeons. The third improvement is the introduction of a summary sheet for decision-making. This sheet only contains relevant data for decision-making and gives overview for the decision-maker.

When implementing these recommendations, workflow will improve but resistance to change will inevitably exist. Roles and responsibilities change for the benefit of the entire process but not for some stakeholders. A lot of cooperation is required from registrars/surgeons since they are the ones with all the information details. In order to successfully implement a new data collection tool, implementation needs to be executed on a trial-and-error base. This requires extra time from stakeholders to reflect and actively improve the data collection. When a computerised system is implemented, this will include high entry costs. However on the longer term costs will be reduced. Also a computerised system needs to be implemented on a trial-and-

error basis to optimise the functionality. The implementation of a new system should have an open system approach for further improvements of the overall management of unplanned surgery. A computerised system offers more potential for improvements and therefore should be integrated with existing procedures.

Preface

This report is the beginning for me of being a scientist but also the end of my student time which only leaves me with happy memories. Being able to conduct my masters' thesis in Australia has added much value in my life by social and cultural experiences. Living and participating in Australia has been a great experience and has opened my eyes to the unlimited opportunities in the world.

First of all, I would like to thank all the staff of the Liverpool hospital, Sydney Australia, with whom I had a chance to work with. Nurses, surgeons, anaesthetists and all the other people who were involved somehow or another in my research were always kind to me and always willing to participate.

Although the first period of my research was conducted in Australia and only had contact through email with my Dutch supervisors, I am very grateful for their support, supervision, feedback and participation for my masters' thesis. Without Prof. dr. ir. Krabbendam I would not have been executing my thesis in Australia so I am very thankful for that. He made sure I was in good hands and had the facilities to perform my thesis. Also his communication with dr. Fitzgerald made the communication process very smooth and pleasant. Although it was hard to give feedback every week he managed to support and supervise me on a regular basis with useful information.

My second supervisor, Prof. dr. Bijker, also brought a very social dynamic in my masters' thesis. Besides performing my research he also was aware of the cultural and social difference I would be confronted with and tried to prepare me for that. His knowledge and expertise on hospitals gave me the ability to get under the surface of the hospitals in Australia. His experience in hospitals and its culture gave me better insights in my thesis.

Although Dr. Lum was unavailable short after we were introduced he managed to coordinate and support me during my research. His involvement but also theoretical and practical experience made him a good resource for my research. I experienced Dr. Lum as an intelligent researcher with a great personality. I thought his previous research was very interesting and it was my honour to participate in that project.

Although mr. Scotcher was later introduced to the project, his involvement was crucial and very pleasant. His personality made it much easier for me to gain access in the hospital with the right people and receiving their attention and participation. He always thought with me in the process and was a good reference during my project.

Last but definitely not least I sincerely want to thank Dr. Fitzgerald! Without her commitment I would not have had a chance at all to perform this research. We started out communicating and setting this up through email and immediately I could feel her sincere involvement in the project and me. Her social but also intellectual knowledge were of great input in this research. Taking care of my research but also of me personally motivated and inspired me. Her personality and guidance were of immediate motivation to perform well during my research. It was really my honour to work with her and I would recommend her to anybody!

With help from all these people I have been able to perform a very interesting research. Action research really caught my interest but also gave me a chance to

struggle with the day-to-day operations at the operating theatre and the surrounding dynamics.

**Huong Pham
May 2007**

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1 Motivation for this research

In this chapter an outline is made of the motivation for this research. First, the importance of managing unplanned surgery is stated. Second, the problems encountered in managing unplanned surgery are stated.

1.1 The importance of managing unplanned surgery

Management of hospitals focus on the best possible care for their patients in their hospitals. The processes in hospitals are rather complex, since patients often have different injuries and diseases. Next to this, patients need specific care, which have to be determined for every case. Nevertheless, management strives for high quality of care for their patients and will optimise health care processes to reach this goal against lowest costs. This was concluded in a former research of Fitzgerald et al. (2005). In this report research has been done on the management of unplanned surgery. Although many factors influence the quality of care in hospitals, the management of unplanned surgery is an interesting spectrum, which has not extensively been discussed in earlier research.

Many people on a yearly basis are treated at the emergency theatre in hospitals. Despite this, empirical research specifically on scheduling unplanned surgery is sorely limited. Decision-making on scheduling unplanned surgery is influenced by many factors and is executed very differently in many hospitals according to Fitzgerald et al (2005). All stakeholders understate the importance of decision-making and the problems in decision-making have been identified in previous research. The main causes for decision-making of unplanned surgery rely on several factors. First, the lack of capacity in operating theatres is a factor that triggers decision-making. Also, lack of human resources and materials may cause a decrease in capacity of surgery time, which triggers decision-making. Besides the lack of capacity, the stakeholders that are influenced by decision-making have different opinions and interests. As found in previous research, stakeholders have different visions of factors that influence scheduling of unplanned surgery. The factors that cause decision-making can be illustrated as follows:

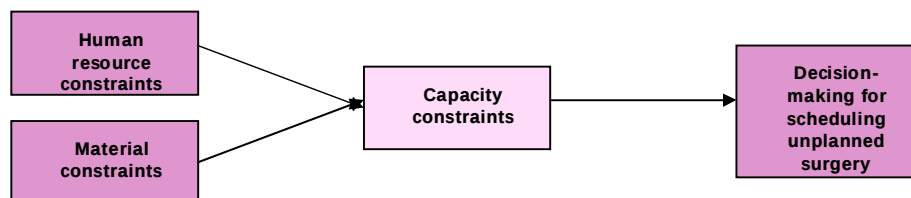


Figure 1: Factors that cause decision-making in scheduling unplanned surgery

According to Fitzgerald et al. (2005) inter-professional and interpersonal dynamics play a significant role in scheduling unplanned surgery. There appear to be unwritten rules that govern decision-making and prioritisation, whereby dynamics between and within professions can hinder the effective scheduling of cases. This is due to the inherent hierarchy that divides surgeons, anaesthetists, and nurses; the personal agendas that some individuals bring to the decision-making process; the difference

of medical opinion within a profession; the hybridity of roles assumed by those clinicians who have accepted a managerial role within the hospital; as well as personality discord.

These general problems have been identified in the literature worldwide and there are many examples of these problems. In Canada, for instance, it was found that the waiting times for elective surgery were not only determined by the number of patients on the waiting list, or by how urgently they require treatment, but also by the management of the waiting list. To improve the management of operating theatres in Canada, the Western Canada Waiting List Project (Western Canada Waiting List Project, 2001) was established to produce standardised criteria to determine patients' relative status on the waiting list. Focus groups involving members of the public suggested that the criteria had public support. Despite this, the criteria received little support from clinicians who managed the waiting lists. Research indicates that they were somewhat reluctant to change their waiting-list management practices, preferring to adhere to less standardised, conventional methods.

In the United Kingdom, Hadley and Forster (1993) found that operating theatre lists are typically compiled in an unplanned manner, and the negotiations and modifications that follow are also extemporised. Even when lists are established, they are seldom observed often because of the need to accommodate patients who require unplanned surgery, Ferrera et al., (2001). This gives rise to extended surgery delays. In light of such inconsistencies, the National Health Strategy (NHS) Executive circulated a national directive to guide good practice, Churchill (1994). The directive emphasised the significance of theatre service, the preminence of patient care: the effective management and supervision of theatre use, staff morale, and communication: efficient transportation for patients; and dependable activity and cost information.

A standardised approach to manage operating theatres is also lacking in Norway. Despite policies to guide this process, research indicates that the clinicians and nurses responsible for managing theatre lists found the regulations limiting, and thus preferred to follow professional norms, Lian & Kristiansen (1998).

Although the aforementioned international pursuits did not explicitly explore the management of unplanned surgery, they nevertheless suggest that such an area is worthy of further exploration. Given that the management of elective surgery influences the management of non-elective surgery according to Gabel et al. (1999), these endeavours indicate the inconsistent ways in which unplanned surgery is scheduled. The problems related with these inconsistent ways are discussed in the next section.

Summarized, the research is focused on management of unplanned surgery by improving decision-making of scheduling unplanned surgery, which will eventually improve the quality of care in hospitals.



Figure 2: Importance of improving decision-making of scheduling unplanned surgery

1.2 The problems of managing unplanned surgery

The previous research conducted by Fitzgerald et al. (2005) stated that unplanned surgery needs to be managed because of certain problems. Health outcomes are adversely affected because of lack of resources and ineffective organizational practices in the Australian Health Care. According to Fitzgerald et al. (2005) another negative outcome of limited access to unplanned surgery are economic costs. Poor patient health necessitates more health care services.

A recent report by NSW Health (2005) highlighted scheduling as one of the causes of serious clinical incidents within its facilities. The scheduling of unplanned surgery typically involves negotiating (and re-negotiating) established surgery list, whereby patients requiring non-elective surgery are attended to before those who require elective surgery according to Gabel et al. (1999). There are standards in the Australian Health care about prioritising unplanned cases as a standard in scheduling. Triage patients in the emergency department influences decision-making around the scheduling of unplanned surgery. However, research of Fitzgerald et al. suggested there are other factors influencing the decision-making. Clinical, time-related, and logistical factors all influence the management of unplanned surgery. However there is disparity in the views expressed by the different professions, and the priority assigned to particular factors.

New requests for emergency surgery arrive every day at the operating theatres and they need to be scheduled. It is in the best interest to schedule unplanned surgery as efficient as possible whilst maintaining quality of care. However, in this decision-making process of scheduling unplanned surgery many variables play a role.

First, it is unclear in many hospitals who the decision-maker should be. There is no clear division of responsibility in this decision-making process and many stakeholders are involved. All these stakeholders; surgeons, anaesthetists, and nurses, have their own vision and opinion on scheduling unplanned surgery. Second, besides the fact that many stakeholders are directly involved in decision-making, there are many variables that influence decision making. It is undetermined for decision-makers, which data is relevant and what the priority in criteria is. Third, all the stakeholders have different views on critical data for decision-making. They differ in variables but also in the values of the variables. Fourth, it is unclear which rules need to be governed in the decision-making process. Although there is a basic understanding of scheduling unplanned surgery, there are no clear defined rules.

As a result of these differences between and within the different professions, decision-making of scheduling of unplanned surgery can be problematic when there is shortage in capacity. For the different stakeholders, different visions on efficient scheduling exist. For surgeons, it is in their interest to schedule patients that best fit in their personal agendas. For anaesthetists, different factors influence their optimum schedule. Anaesthetists work on an hourly basis, so an efficient daily schedule is in their interest. Besides that, the insurance status of a patient plays a role as well. The monetary incentive is an important factor for anaesthetists. Nurses have fixed hours in a shift and would prefer an efficient schedule in those fixed hours. Another important difference is the incentive system between surgeons, anaesthetists and nurses. Surgeons and anaesthetists are rewarded per case and

nurses on an hourly bases. This affects the vision on optimised scheduling between the different professions as well. Summarized, the problems in scheduling unplanned surgery can be illustrated as follows:

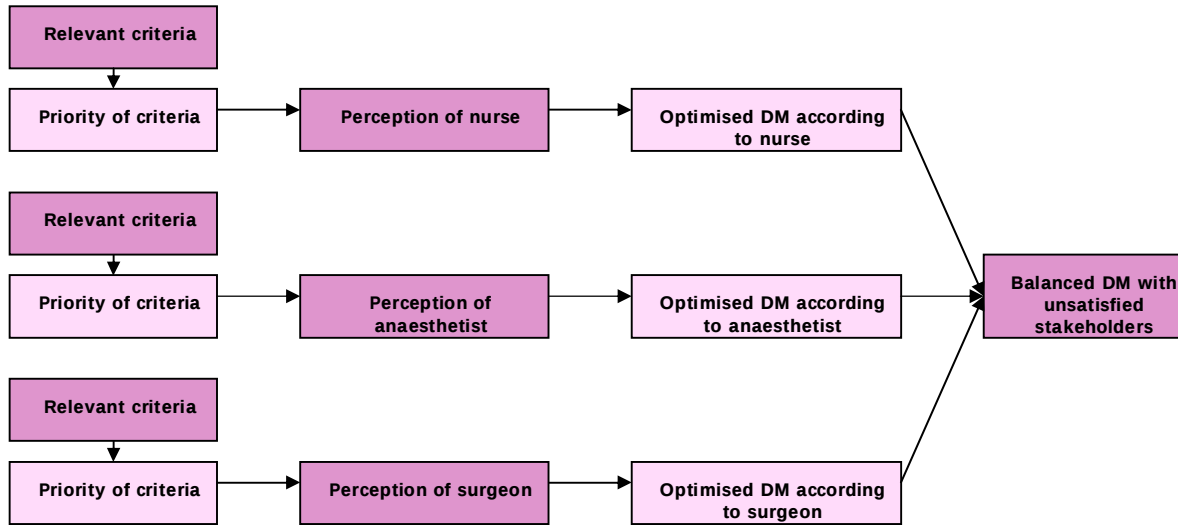


Figure 3: The causes of problems in decision-making of scheduling unplanned surgery

As illustrated above, the problem in decision-making is balancing the different perceptions of stakeholders. The best balance will give the most effective decision-making practices. However, stakeholders have different priorities themselves as well and this should influence the balance in decision-making as well. All these causes of problems in decision-making result in one main problem: unsatisfied stakeholders in the decision-making process. This report aims at resolving these problems in order to create acceptance in decision-making of scheduling unplanned surgery.

Despite differences in professional perspectives, there is an underlying consensus of the need for a conceptual framework to resolve professional tensions. The research participants generally acknowledged the potential role for a prototype triage tool in guiding the scheduling of unplanned surgery. Such a tool would facilitate greater consistency in surgical practice. It would also minimise the influence of untoward inter-professional and interpersonal dynamics on decision-making processes. This tool can aid decision-making practices by collecting relevant data.

In order to develop a tool, a case study has been done for this research at the Liverpool Hospital in Sydney, Australia. In the next chapter an introduction to the Liverpool hospital will be discussed.

2 Case study: Introduction to the Liverpool Hospital

In this chapter, the case study of the Liverpool Hospital is discussed. First, a brief introduction to the hospital is made and second, a brief analysis is made concerning the processes surrounding managing unplanned surgery. Third, the problems concerning decision-making of scheduling unplanned surgery are stated.

2.1 Liverpool hospital

The Liverpool Hospital has been operating continuously since the end of the eighteenth century. It was originally run as a hospital for soldiers and convicts, probably starting as a tent hospital in the 1790's. The first brick hospital was established in 1813 on a portion of land beside the Georges River. A larger stone hospital building was designed by Francis Greenway, built by convict labour and opened in 1825. This building still stands and is now occupied by the TAFE College next door. The entrance hall there contains pictures of the development of the campus during the early years of this century. The existing main hospital building was opened in 1958, Don Everett medical wing in 1975, Ron Dunbier House in 1979 and Alex Grimson surgical wing in 1983.

Liverpool Hospital became a principal teaching hospital of the University of N.S.W. in 1989. Associated with this and the needs of the increasing population of southwest Sydney, major redevelopment of the Hospital has taken place, with the current program now nearly complete. The Health Services Building, which houses Outpatient, Community Health and Academic Services opened in 1992, the Pathology (SWAPS) Building in 1993 and the Caroline Chisholm Centre for Women and Babies in 1994. The Cancer Therapy Centre and Brain Injury Unit were commissioned during 1995.

Construction of the Clinical Building commenced in 1994 and was completed in early 1997. The Clinical Building includes new facilities for the Emergency Department, Radiology, Outpatients, Nuclear Medicine, Renal Unit, Cardiology (CCU and Catheter Suite), Operating Theatres, Day Surgery and Intensive Care.

Mission

The mission of the Liverpool Health Service is to improve the health of the people of Liverpool and of other people referred for specialist services.

Vision

To develop a teaching and referral health service of high quality, which is sensitive to the needs of the people of South Western Sydney.

Sydney South West Health

Sydney South West Health looks after all public hospitals and healthcare facilities in central and south-western Sydney from Balmain to Bowral. It combines the former

Central Sydney and South Western Sydney area health services with the head office located at Liverpool.

This is the organization structure of the NSW Department of Health.

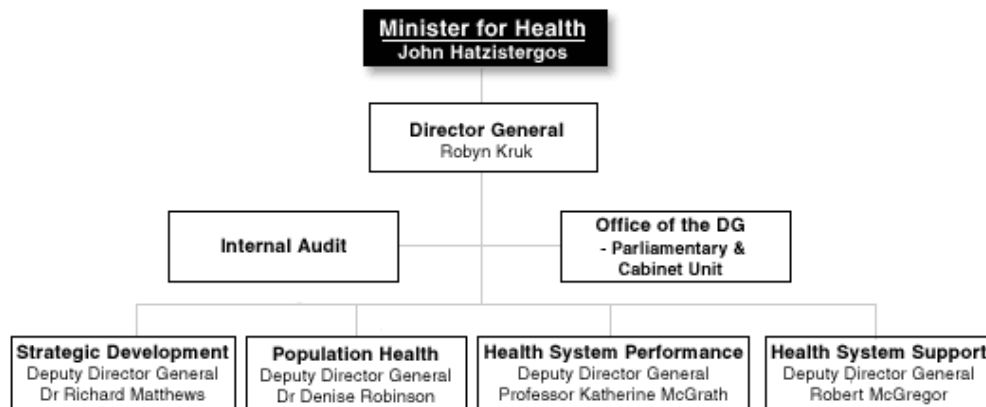


Figure 4: The organization structure of the NSW Department of Health

Culture of the Liverpool Hospital

The Liverpool Hospital is a part of the Sydney South West Health and is seen as a facility. To give an insight in the activities of the Liverpool Hospital the following statistics have been collected on an annual basis: Separations: 65,038- total bed days: 240,357 – daily average of inpatients: 658.5 – occupancy rate: 100% acute bed days: 231,434 – ED attendances: 51,794. The hospital has 10 operating theatres, and one of them is daily assigned as the emergency theatre. As clearly can be seen from these numbers, the Liverpool Hospital is a trauma centre in the Sydney South West Health.

2.2 Processes concerning unplanned surgery in the Liverpool Hospital

When a patient arrives at the emergency room at the Liverpool hospital, surgeons will determine if they want to place a patient on the emergency list for surgery. If a registrar/surgeon decides to do that, the registrar/surgeon will ring up the anaesthetist in charge of that day, the duty anaesthetist, at the operating theatres. The duty anaesthetist (D.A.) has to decide to accept a case on the emergency list or not. When a case is accepted, the registrar/surgeon will ring up to the front desk at the operating theatres to talk to the clinical coordinator. The clinical coordinator is the nurse who is in charge of nursing human resources for the day. The clinical coordinator writes down all the information regarding the case on a "pink sheet".

During the day, the D.A. is in charge of scheduling the emergency list. This decision made is based on several factors; the clinical status of patient, logistical considerations and other relevant factors, which will be discussed later in this report. In order to gather all the relevant data, the duty anaesthetist will discuss the sequencing process with the clinical coordinator and the concierge. The concierge is an anaesthetic nurse who is in charge of the anaesthetic nurses and equipment during the day.

The D.A. decides the sequence of the emergency list and when a patient can be operated, the D.A. will inform the concierge. There is one operating theatre available for emergency surgeries at the Liverpool Hospital. The concierge will hang out a green slip on a board, which will indicate the ward staff to pick up a patient at a ward and deliver them to the operating theatres in front of a red line. At the red line, the nurses and the concierge will check whether all procedures needed to be executed before going into surgery are complete. When this is done, the concierge is responsible for transporting the patient to the assigned operating theatre. A thorough analysis has been made of this workflow and can be found in appendix 1.

2.3 Problems at the Liverpool Hospital concerning decision-making

Due to constraints in capacity and lack of management in scheduling unplanned surgery, there is a queue on the emergency list at the Liverpool hospital. There is one emergency theatre, which can be used for emergency surgery during the day. It is not uncommon that patients need to be operated on the emergency list at the same time. The duty anaesthetist is the one in charge of scheduling the cases for the emergency theatre. When there is lack of capacity, the duty anaesthetist needs to sequence the surgeries based upon information about the patient and the injury.

Although the D.A. is responsible for scheduling, it is not uncommon that surgeons try to influence the decision-making process on scheduling unplanned surgery. The surgeons put pressure on the D.A. by personal interference in decision-making. Another way of influencing the decision-making process is manipulating data that is relevant for decision-making. These factors are barriers to efficient decision-making and optimum scheduling of the emergency list.

Another important barrier for the D.A. to make a decision is the incompleteness of data. The D.A. receives the "pink sheet" and on occasion, relevant data that influences scheduling is missing. These problems in data collection for the D.A. and dealing with different surgeons, makes it difficult to make good decisions.

It is in the interest of all patients to deliver the best possible care. When a D.A. cannot make the best decisions on scheduling unplanned surgery, the quality of care in the hospital will be affected.

When combining the problems found in managing unplanned surgery and the problems found in the Liverpool Hospital a clear relation can be identified. First, the available data will influence the decision-making process and this needs to be objective, complete and relevant. Second, since there are many stakeholders involved in the decision-making process, their perceptions on scheduling unplanned

surgery need to be balanced. Eventually, the D.A. will make a decision based upon the available data and the input of the stakeholders.

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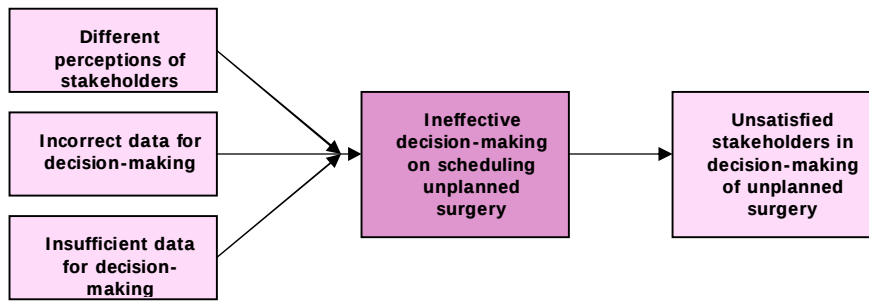


Figure 5: Causes for ineffective decision-making on scheduling unplanned surgery

3 Introduction to the research

In this chapter the research objective is stated and the research questions are formulated. Finally, the research approach is stated in the third paragraph.

3.1 Research objective

In order to solve the problems, a research objective has been formulated for this research. The research objective of the final project is:

to determine current decision-making practices and the gap with the desired performance

by making an analysis of the stakeholders concerning decision making in scheduling unplanned surgery, analysing current workflows concerning decision making of unplanned surgery, and analysing optimised decision-making practices in existing literature

in order to reflect improved decision-making practices and eventually improved quality of care.

3.2 Research questions

The research questions of the project are:

- 1.1 Who are the stakeholders concerning scheduling unplanned surgery in the staffing field? *Descriptive*
- 1.2 What are the roles of the stakeholders in scheduling unplanned surgery? *Descriptive*
- 1.3 What data is relevant for decision-making according to the stakeholders? *Descriptive*
- 2.1 What are the current workflows concerning decision-making of scheduling unplanned surgery? *Descriptive*
- 2.2 What are the current workflows concerning data-collection of decision-making of scheduling unplanned surgery? *Descriptive*
- 3 What are optimised decision-making practices according to existing literature? *Prescriptive*
- 4 What is the gap of current decision-making practices with the desired performance? *Descriptive*
- 5 What improvements have to be made to eliminate the gap? *Prescriptive*
- 6 What are the risk factors for decision-making? *Descriptive*

3.3 Research approach

In order to answer the research questions, literature review is conducted to gain more insight in; decision-making and implementing change. The stakeholders are identified with the stakeholders' analysis and through observing the current processes surrounding the scheduling of unplanned surgery and the data-collection, the current processes are analysed.

With help from the theoretical framework, improvements have been designed to fill the gap. With help from the literature review and interviews with stakeholders, the risk factors and boundaries have been determined for the implementation of improvements.

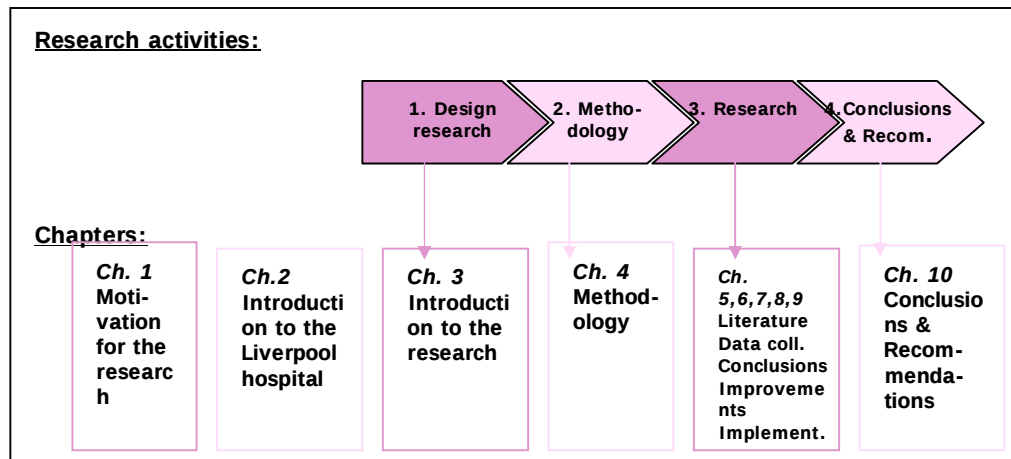


Figure 6: Research activities and report chapters

In order to answer the research questions, the following activities have been executed:

1. **Methodology:** For this research, an extensive literature review has been done on scheduling unplanned surgery. The case study at the Liverpool hospital provided insight in practices concerning scheduling unplanned surgery.
2. **Research:** The actual research is executed at the Liverpool hospital, Sydney, Australia.
3. **Conclusions and Recommendations:** Chapter 10 concludes the report and lists recommendations.

4 Methodology

In this chapter the methodology of the research is discussed. The methodology is build upon a framework, which can be presented as follows:

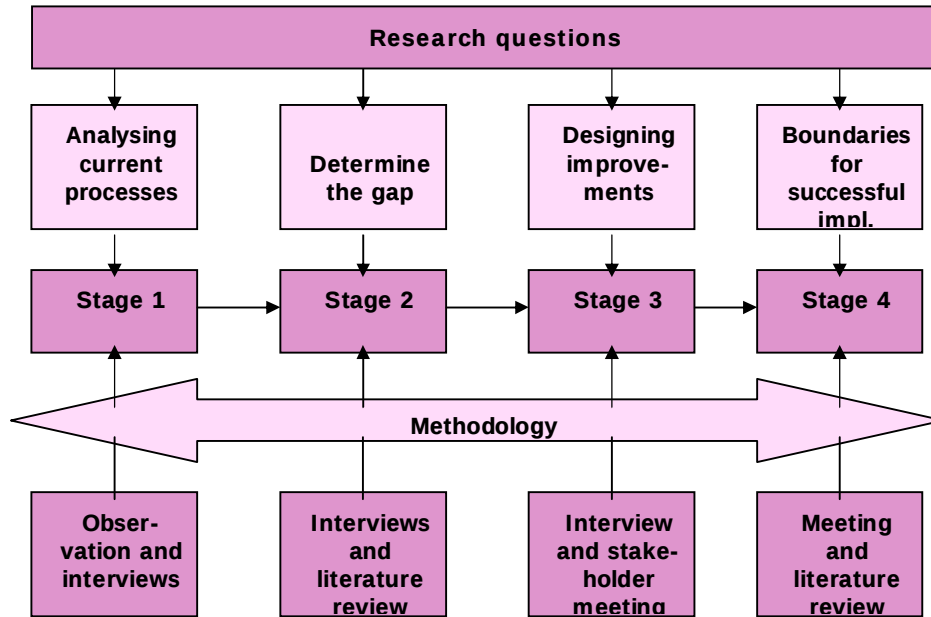


Figure 7: Research framework

The research is divided in the different stages and each of them answers the research questions as determined in paragraph 3.2.. The stages of the research are conducted as follows:

Stage 1

Research questions:

- Who are the stakeholders concerning scheduling unplanned surgery in the staffing field?
- What are the roles of the stakeholders in scheduling unplanned surgery?
- What data is relevant for decision-making according to the stakeholders?

Methodology:

- Observing current processes at the operating theatres to determine the stakeholders
- Interviewing stakeholders involved in scheduling and performing unplanned surgery
- Analysing paper trails concerning unplanned surgery
- Literature research on stakeholder theory and decision-making

Stage 2

Research question:

- What are the current workflows concerning decision-making of scheduling unplanned surgery?
- What are the current workflows concerning the data-collection of decision-making of scheduling unplanned surgery?
- What are optimised decision-making practices according to existing literature?
- What is the gap of current decision-making practices with the desired performance?

Methodology:

- Interviewing stakeholders involved in scheduling and performing unplanned surgery
- Literature research on decision-making and data collection

Stage 3

Research question:

- What improvements have to be made to eliminate the gap?

Methodology:

- Interviewing stakeholders on observed problems in decision-making
- Stakeholder meeting on determining problems in decision-making

Stage 4

Research question:

- What are the risk factors for decision-making?

Methodology:

- Meeting with stakeholders to evaluate the improvements
- Literature review on risk factors

Before the actual research can start, it is essential to identify stakeholders, ensure they all know who are involved in the project, its aims and events, and establish a positive climate of interaction and activity. A letter of introduction is distributed to all stakeholders inviting their participation. This letter will clearly state the aim, purpose and content of the research in order to receive commitment and involvement. This letter can be found in appendix 10. Then meetings are arranged with stakeholders and regular contact is kept, so that participants feel continuously involved and feel they have ownership of the project.

There are several sampling techniques and because of the great amount of staff, two techniques are used. With the key person of the hospital, purposive sampling is conducted. The key person leads to different key persons in the hospitals, who on their turn, lead to other important participants. The technique of snowballing is used.

The processes surrounding decision-making of unplanned surgery are observed and the data-collection process is analysed. Different cases of unplanned surgery at different days and times are observed and later discussed with participants. This form of observation is participant observation.

Interviews are conducted face-to-face in a semi-structured manner. During the interviews, notes are taken and are reflected with the interviewee. The notes of the interviews are written down on hardcopy and saved as research material. Through coding, the outcomes of the interviews are analysed.

5 Literature review

In this chapter the theories will be discussed. First, an extensive literature review is presented of decision-making. Second, the main problems in data collection are discussed according to the human decision-making process. These theories are combined in order to reveal the decision-making process at the operating theatre. In this process, theories about critical data, stakeholder salience, models of sequencing surgeries, and balancing stakeholder interest are involved. Third, a framework is discussed that reflects the relevant theories in decision-making of scheduling the emergency list.

In order to successfully implement the changes to eliminate the gap and accomplish the desired performance, literature is reviewed on implementing change. After implementation, relevant risk factors will measure and prescribe the success of implementation.

Decision-making

A thorough definition of decision-making process has to be examined. Daft (2000, p.269) defines decision-making as the process of identifying problems and opportunities and then resolving them. Harrison (1999, p.5) defines decision-making as:

“a moment in an ongoing process of evaluating alternatives for meeting an objective, at which expectations about a particular course of action impel the decision maker to select that course of action most likely to result in attaining the objective.”

Luthans (1995, p. 440) simplifies decision making by defining it as choosing between alternatives. As can be concluded from the literature decision-making is a process of defining the problems, searching for alternatives and finally choosing an alternative.

The functions of decision making according to Harrison(1999, p.38) are 1) setting managerial objectives, 2) searching for alternatives, 3) comparing and evaluating alternatives, 4) the act of choice, 5) implementing the decision, 6) follow-up and control. Daft (2000, p.276) has a comparable description of the decision-making steps; 1) recognition of decision requirement, 2) diagnosis and analysis of causes, 3) development of alternatives, 4) selection of desired alternative, 5) implementation of chosen alternative, 6) evaluation and feedback.

Mintzberg et al. (1976) defines the stages of decision making as 1) the identification, during which recognition of a problem or opportunity arises and a diagnosis is made, 2) the development phase, during which there may be a search for existing standard procedures or solutions or the design of a new tailor-made solution, 3) the selection phase, and there are three ways of doing this; by the judgment of the decision maker based on intuition and experience, by analysis of the alternatives on a logical, systematic basis, and by bargaining when the selection involves a group of decision makers.

The human decision-making model

To understand the role of data collection, it is necessary to understand the human decision-making process in greater depth. Simon (1960) has designed a model of

human decision-making as a three-stage process: 1) intelligence, 2) design, and 3) choice. The intelligence stage comprises problem identification and data collection, the design stage comprises formulating objectives in decision-making, and the choice stage comprises choosing between the alternatives.

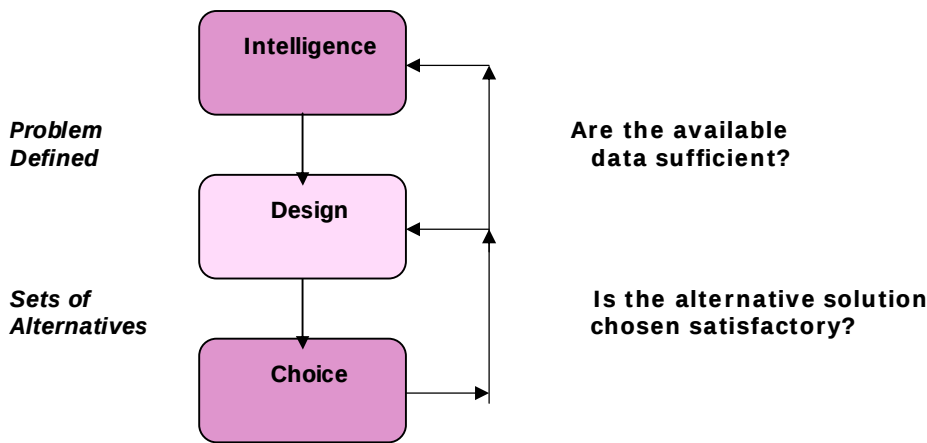


Figure 8: Simon's Model of the Human Decision-Making process

When comparing these models, a lot of similarities are captured. In this research the decision-making process is considered as a block box which has an input and output. The input at the intelligence stage contains relevant data for decision-making. At that stage it is important as well to define the stakeholders; the ones that are involved and influenced by decision-making. The output of the decision-making process is the sequence of the emergency list in this research. This model will be explained later in the literature review.

Critical data in decision-making

At the beginning of the intelligence stage sufficient data needs to be collected. A lot of literature has been written about scheduling elective surgery and emergency surgery. According to previous research of Fitzgerald et al. (2005), statistical analyses of unplanned surgery revealed that clinical, time-related, and logistical factors all influence the management of unplanned surgery.

Clinical priority

According to the research three types of urgencies can be distinguished; urgency 1, urgency 2 and urgency 3. This distinction is based on three factors or components; very urgent (urgency 1), semi-urgent (urgency 2), and non-urgent (urgency 3). There is difference of opinion between the professional positions in determining urgency 2. The opinion of anaesthetists is located between the opinions of surgeons and nurses/managers.

Logistical priority

In the previous research data items concerning logistical priority were grouped thematically; responding to others, availability of resources, and patient factors. All these items are ranked from highest to lowest priority.

- Responding to others:
 - Responding to surgeon opinion
 - Responding to anaesthetist opinion
 - Responding to nursing opinion
 - Responding to patient opinion
 - Responding to staff member or family/ friend at hospital
- Availability of resources:
 - Availability of surgical staff
 - Availability of anaesthetic staff
 - Availability of scrub nurses
 - Availability of ICU beds
 - Availability of instruments
 - Availability of ward bed

There are differences in opinion between doctors and nurses in determining the priority constructs, 'availability of instruments' and 'availability of ward bed'.

- Patient factors:
 - Optimising patient's co-morbid condition
 - Surgical specialist available onsite
 - Duration patient has been waiting for surgery
 - Completing consent
 - Time of day
 - Previous delayed surgery
 - Cancelling elective surgery
 - Age group
 - Duration patient has been waiting onsite for surgery
 - Morbid patient obesity
 - Demands from patient/family
 - Medical insurance status

There are differences in opinion between doctors and nurses in determining the priority constructs, 'duration patient has been waiting for surgery' and 'previously delayed surgery'.

Time

Urgency 1: items commence within 60 minutes, definitely no more than 6 hours;
Urgency 2: items commence within 2 hours, definitely no more than 12 hours; and
Urgency 3: items commence within 7 hours, definitely no more than 45 hours.
The boundaries of these construct are rather fluid and move along a spectrum according to the way in which other constructs have changed.

Models of sequencing surgeries

In the literature many models have been designed over the years to schedule elective surgery. Although this research focuses on unplanned surgery, some results of studies might help to explain the problems in decision-making of unplanned surgery.

Gerchak et al. (1996) investigated the optimal cutoff number for scheduling elective surgery in Canada. During their research they came to the conclusion that while the optimal policy is often not one of cutoff number, the relative loss in profit from using the best cutoff number policy is small. This formulation incorporates economic tradeoffs between capacity utilization on the one hand and overtime usage or delays on the other. But the computational effort required to find the best cutoff policy appears to be considerably larger than that required to find the optimal policy. From these findings we may conclude that many factors are involved in scheduling surgery and it is difficult to automate this process.

Dexter et al. (1999) have done research on sequencing urgent cases. Their main arguments for optimising the sequence of urgent cases are found in enhancing patient safety, increasing patient satisfaction with timeliness of surgery, and minimizing surgeons' complaints. According to them, an operating room suite must identify the primary scheduling objective to be satisfied when prioritising pending urgent cases before determining the optimal sequence of urgent cases. These scheduling objectives may include 1) perform the cases in the sequence that minimizes the average length of time each surgeon and patient waits; 2) perform the cases in the order that they were submitted; or 3) perform the cases based on medical priority, as prioritised by an OR director, or surgeons discussing the cases among themselves. Their research provides a mathematical structure, which can be used to program a computerized surgical services information system to assist in optimising the sequence of urgent cases. Their main conclusion is that the optimal sequence varies and depends on the scheduling objective chosen.

A lot of research has been done as well on mathematical computation of optimised scheduling of elective surgery. Ozkaharan (2000) has done research on allocation of surgeries to Operating Rooms by goal programming. When it comes to sequencing elective surgery Goldman et al. (1970) states as follows: the "longest case first" discipline yields the highest utilization rate, the lowest amount of overtime, and the largest number of delayed cases being transferred to another room, whereas the opposite results occur for the "shortest case first" discipline. When scheduling surgery is done, the following parameters are relevant: service priority, time, surgeon priority, and room preference. The available information of a case that are used are: name and age of the patient, name of the surgeon, the procedure and the special purpose equipment the surgeon wants in the OR. Their research suggests the following data needed for the computerized scheduling of unplanned surgery:

- Duration of operation
- Amount of time an OR is available for a day
- Room preference indicator
- Set of indices specifying operations of surgical specialty
- Set of indices specifying OR's where overtime is not allowed
- Weight assigned to operation i

Ogulata and Erol (2003) have designed a hierarchical multiple criteria mathematical programming approach for scheduling general surgery operations in large hospitals. They have formulated three stages at which scheduling of elective surgery can be computed. The stages are as follows: 1) patient acceptance planning, 2) assignment to surgeons, 3) scheduling of operations. Both researches are based upon the assumption that surgical services have limited staff and equipment and their conclusions are based upon many factors that influence scheduling elective surgery.

Stakeholder identification

A lot of theories have been established over the years about stakeholders and their influence on organizational behaviour. The work of Mitchell & Agle (1997) has added value to the stakeholder theories by identifying them and defining the principle of who and what really counts: salience. Their work is build upon the definition of stakeholders of Freeman (1994): "any group or individual who can affect or is affected by the achievement of the organization's objectives." Then it is proposed that classes of stakeholders can be identified by their possession or attributed possession of one, two, or all three of the following attributes: 1) the stakeholders' power to influence the firm, 2) the legitimacy of the stakeholders' relationship with the firm, and 3) the urgency of the stakeholders' claim on the firm. This theory produces a comprehensive typology of stakeholders based on the normative assumption that these variables define the field of stakeholders: those entities to which managers should pay attention.

The proposition made in this research is that when managers perceive all three attributes at a stakeholder, stakeholder salience will be high. When two attributes are perceived, the salience will be moderate and when only one attribute is perceived, the salience will be low.

According to Viljoen & Dann (2003) the process of stakeholder analysis can be summarised as:

- Identify each stakeholder explicitly, the personal and organizational form of the influencer.
- Specify what each stakeholder wants.
- Specify what each stakeholder gives in relation to what they want, in order to establish the power relationship.
- Cluster stakeholders into groups with similar needs or constraints.
- Analyse where stakeholders are likely to be in three years' time (or whatever the planning period). Where do you want them to be and can you influence their position (by how much and how hard will it be)?
- How can appropriate relationships with stakeholders be built?
- On the basis of this analysis it should be possible to allocate a priority to each stakeholder. It is not advisable to treat all stakeholders equally.
- Develop initiatives to deal with stakeholder needs and preferences according to priority.

Stakeholders' satisfaction in decision-making

At the stage of "selecting the alternative" the objectives of the stakeholders need to be balanced. In the literature a lot has been written about balancing stakeholders. Thompson (1997), postulates that the objectives of an organization will take account of the various needs of these different interested parties who will represent some type of informal coalition. Their relative power will be a key variable, and the organization will on occasion 'trade off' one against the other, establishing a hierarchy of relative importance. Stakeholders see different things as being important and receive benefits or rewards in a variety of ways.

In decision-making at the operating theatre it is very important to balance the interests of stakeholders to gain acceptance in decision-making. According to Reynolds et al. (2006) balancing stakeholders is: " a process of assessing, weighting

and addressing the competing claims of those who have a stake of the actions of an organization. For their research they have stated the following assumptions: 1) “Stakeholder claims of relatively equal saliency will lead to more balanced stakeholder interests than will stakeholder claims of relatively unequal saliency. 2) “Highly divisible resources will lead to more balanced stakeholder interests than will highly indivisible resources.” 3) There will be a significant difference in the balance of stakeholder interests between decisions that involve stockholders/owners and those that do not.

Next to these hypotheses they have described some balancing approaches. First, the within-approach represents a literal interpretation of the stakeholder admonition to balance stakeholder interests. The manager attempts to balance the interests of those stakeholders within the bounds of that decision and tries to satisfy the demands of each stakeholder as if it were the only decision to be considered. Second, the across-decision approach applies to the open systems perspective to the tactical deployment of stakeholder theory. Each stakeholder group receives the attention, resources and accommodations that it requires, not on every single decision, but rather in the overall scheme of organizational activity. They came to the following results: 1) individual resources and unequal levels of stakeholder saliency constrain managers’ efforts to balance stakeholder interest. 2) resource divisibility also influenced whether managers used a within decision or an across decision approach to balance stakeholder interests.

Based upon the results of the literature in decision-making, a framework can be established which captures all relevant information. This framework can be illustrated as follows:

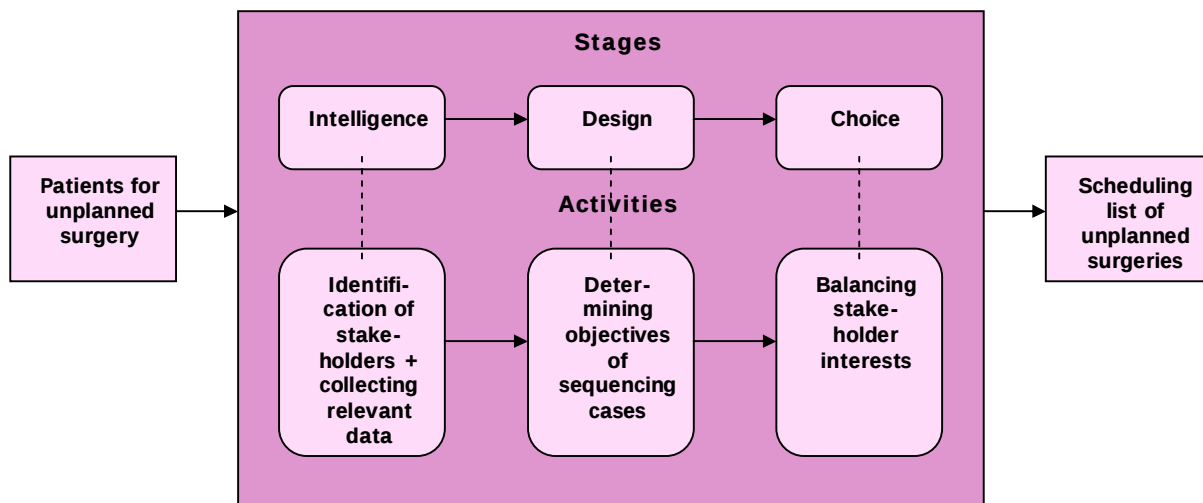


Figure 9: Literature framework for decision-making on scheduling unplanned surgery

As illustrated above, the input for sequencing emergency surgery are the patients who need emergency surgery. Then the black box of decision-making opens and starts with the “intelligence stage.” At this stage, the stakeholders are identified and the relevant data is collected. At the second stage of decision-making: “design

stage,” the objectives of sequencing cases are determined. At the last stage: “choice stage”, the stakeholders are balanced and a decision is made. When a decision is made, the black box is closed and the output is a schedule of the emergency list with a sequence of surgeries. Every time a patients is added to the emergency list, the black box starts all over again and the sequence is changed again.

Implementing change

After designing a data collection tool, this tool needs to be implemented. Inevitably, this will cause some changes in workflow and the literature prescribes some causes to resistance to change. According to Daft (2000, p.371) there are several causes for resistance to change within organizations:

1. Self-interest
2. Lack of understanding and trust
3. Uncertainty
4. Different assessments and goals

Another approach is the *Force Field Analysis* of Kurt Lewin (1951). He proposed that change was a result of the competition between driving and restraining forces. When a change is introduced, some forces drive it and other forces resist it. To implement a change, management should analyse the change forces. By selectively removing forces that restrain change, the driving forces will be strong enough to enable implementation. As restraining forces are reduced or removed, behaviour will shift to incorporate the desired changes.

According to Daft (2000, p.374) another approach to implement decisions is to adopt specific tactics to overcome employee resistance. Methods for dealing with resistance to change have been studied by researchers. The following five tactics have proven to be successful.

1. Communication, education: to use when; change is technical; users need accurate information and analysis to understand change.
2. Participation: to use when; users need to feel involved; design requires information from others; users have power to resist.
3. Negotiation: to use when; group has power over implementation; group will lose out in the change.
4. Coercion: to use when; a crisis exists; initiators clearly have power; other implementation techniques have failed.
5. Top management support: to use when; change involves multiple departments or reallocation of resources; users doubt legitimacy of change.

Hospitals have a different organization structure than commercial organizations and this needs to be considered during implementation. After designing a data collection tool, the improvements are presented in a stakeholder meeting which will clarify the forces of resistance to change. Recommendations towards implementation of this meeting can be made after analysing the meeting.

Risk factors for the implementation of decisions

Successful decisions can be measured on their quality and implementation. Nutt (2002) reported in a study predictors for the success of a decision. Some predictors can be found in deficiencies of technical aspects of the decision process. The best

predictors of success or failure can be found not in cognitive processes but social ones. These included the degree of involvement and participation of key stakeholders in the development of the problem solution. As can be concluded from this report, effective decision-making is not only a matter of decision quality, but also ensuring that the decision gains support and involvement for effective implementation.

There are several ways to determine the success, and these data also provide information to further improve decision-making practices. According to Trull (1966, B-270-B280) successful decision implementation is a product of

- a. avoidance of conflict of interest
- b. a positive risk-reward factor, and
- c. comprehensiveness of decision (Harrison, 1999, p.62).

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The determinants of successful decision implementation are thoroughly described in the next sections.

a. Avoidance of conflict of interest

Determinants of conflict

There are several determinants of conflict and according to Harrison (1999, p.259). One basic relationship in formal organizations that contributes greatly to the incidence of conflict is interdependence between individuals or units. According to Pondy (1969, p.73-84) normally the higher the level of interdependence the greater the opportunity for conflict in arriving at decisions. Another determinant of conflict in decision-making relates to performance criteria and rewards. Walton & Dutton (1969) say the following about this:

“The more the evaluations and rewards of higher management emphasize the separate performance of each department rather than their combined performance, the more conflict.”

Communication problems are a third determinant of conflict. According to Harrison these problems may result from semantic difficulties, misunderstandings, and “noise” in the channels of communication. Role dissatisfaction is another frequently cited determinant of conflict in managerial decision-making.

Daft (2000, p.615-616) adds a few other causes of conflict: scarce resources, jurisdictional ambiguities, personality clashes, power and status differences and goal differences.

Indicators of conflict

According to Harrison the indicators of conflict are those observable and non-observable symptoms that reflect the presence of conflict in formal organizations. Corwin (1969, p. 507-520) used indices of felt tension, reports of perceived disagreement, and overt disputes as indicators of conflict. In a comprehensive study,

Treatment of conflict

Harrison (1999, p. 261) has found several techniques to overcome conflicts:

1. The super ordinate goal
2. Smoothing
3. Making the system work

4. Conflict avoidance
5. Suppression
6. Compromise
7. Equilibrium

Daft (2000, p.617-618) adds to this list a few other techniques:

1. Competing
2. Accommodating
3. Collaborating

Luthans (1995, p. 280) suggest the following to effectively deal with conflicts:

1. Model the attitudes and behaviours you want your employees to emulate.
2. Identify the source of conflict, structural or interpersonal.
3. Focus on task, not personalities.
4. Address conflict in a timely way.
5. Learn from conflict.

b. Positive risk-reward factor

Teale et al. (2003, p. 26) define risk as “the chance of a negative outcome for a decision which has a possible uncertainty element, usually on the downside.” Daft (2000, p. 270) states that risk means a decision has clear-cut goals and that good information is available, but the future outcomes associated with each alternative are subject to chance.

According to Luthans (1995, p. 206-211) reward systems become critical to employee performance and organizational success. Monetary rewards systems play a dominant role, however, as organizations in recent years have become leaner and more efficient, monetary rewards have become very limited and increasingly are just not available.

Monetary rewards

Money can be used as an effective positive reinforcement intervention strategy to improve performance according to Luthans (1995, p. 207-208). The standard base-pay technique provides for minimum compensation for a particular job and is a type of continuous reinforcement schedule. A variable-pay technique is an intermittent type of reinforcement schedule and attempts to reward according to individual or group differences.

Non-financial rewards

Social rewards: Recognition, attention, and praise tend to be very powerful social rewards for most people. Social rewards should be administered on a contingent basis to have a positive effect on employee performance.

Feedback as a Reward: People generally have an intense desire to know how they are doing, especially if they have some degree of achieved motivation. A general guideline regarding feedback about performance is that it can be an effective component of the organizational reward system.

c. Comprehensiveness of decision

When looking at the understanding of the decision also means understanding which tasks need to be executed resulting from the decision. The decision must be communicated first to all the people that need to work with it. The task structure resulting from it must be clear then. According to Daft (2000, p. 512) task structure refers to the extent which tasks performed by the group are defined, involve specific procedures, and have clear, explicit goals.

All these factors can be measured when implementing a decision. Based on these determinants, the success of implementation of a decision can be measured and improved. For decision-making of unplanned surgery, it is important to focus on the success of implementation since this will reflect the acceptance of a decision made. Many stakeholders are involved in decision-making and it is difficult to satisfy all their interests. However acceptance can be increased when the quality of implementation of a decision is increased.

6 Case study at the Liverpool Hospital

In this chapter, the framework of decision-making is discussed at the Liverpool hospital based upon the literature framework. The stages of the decision-making process are separately discussed with the findings at the Liverpool Hospital. First, the findings of the “intelligence stage” are discussed followed by the “ design stage” and finalised with the “choice stage.”

6.1 Case study “Intelligence” stage

At this stage the identification of the stakeholders is discussed in section 6.1.1 and the determination of salience is discussed in section 6.1.2. In section 6.1.3., the relevant data collection for decision-making is discussed. It is important to remember that the decision-making process only starts when there are two or more patients that can and want to be operated at the same time in an operating theatre. When this is the case, the decision-making process starts.

6.1.1 Identification of the stakeholders

Stakeholder analysis is identifying critical actors in a process. The stakeholders help to clarify the decision making process when sequencing unplanned surgery. Analysing the processes surrounding scheduling unplanned surgery identifies the stakeholders. Key decision makers are identified by mapping the process at the lowest unit of analysis; the individual.

- **Surgeon**
Influence: The surgeon sees the patient first and determines the clinical status of the patient and the emergency code. The other actors in the decision-making process rely on this information to determine urgency. Furthermore they are the ones performing the surgery and have to be available.
- **Duty anaesthetist (D.A.)**
Influence: The duty anaesthetist is in charge of the allocation of unplanned surgery in the operating theatres. When a surgeon wants to book a case, the surgeon first calls the D.A. and the D.A. approves the case. They exchange details about the patient, determine urgency code, exchange clinical information and all other relevant details about the case. Based on this conversation the D.A. schedules the case according to its urgency relative to current activity.
- **Emergency anaesthetist (E.A.)**
This is the anaesthetist in charge of the emergency operating theatre.
Influence: The E.A. is in charge of the emergency cases for the day in the emergency theatre. The E.A. may receive a phone call from the surgeon direct rather than via the D.A., and obtains all the patient details mentioned above. The E.A. has to accept to do the case at a time determined by urgency relative to current activity, and therefore has a big influence on the scheduling.
- **Nurse unit manager (N.U.M.)**

Influence: The duty N.U.M. books those cases that are scheduled for the next day on the emergency list. Like the D.A. the duty N.U.M. has to approve the surgery for the next day based on the information details obtained from the surgeon. A N.U.M. also checks up with the progress of the emergency list during the day and can advice on decisions made on that list. The influence of the N.U.M. is advisory on allocation of resources.

- **Clinical coordinator**
Influence: After the D.A. has approved the surgery, the clinical coordinator receives a phone call from the surgeon with all other relevant details about the case. The clinical coordinator is responsible for the allocation of staff and materials at the theatres and has an overview of activity. When there is a scarcity of resource, the clinical coordinator will mention this to the duty anaesthetist.
- **Concierge**
The concierge is responsible for the anaesthetic arrangements for unplanned surgery including ensuring patient readiness. The concierge arranges the anaesthetic staff and if there is not enough staff available, the emergency list is adjusted.
- **Patient**
Influence: Patient specific barriers i.e. paperwork not done, infection risk, condition and other factors influence the scheduling. Since these are fixed variables, a patient is not an active decision maker but the objective in the decision-making process.

6.1.2. Saliency of stakeholders

After analysing the stakeholders, the saliency can be determined by the stakeholder typology of Mitchell and Agle, (1997). Based upon the stakeholder analysis, the stakeholders are classified by three factors; power, legitimacy, and urgency.

- **Surgeon (S)**
A surgeon has power and urgency and can be classified as a dangerous stakeholder. The surgeon is the only person who can perform a surgery on the emergency list and this gives the surgeon power. A surgeon assigns the medical priority and this determines the urgency in decision-making.
- **D.A.**
A duty anaesthetist has legitimacy and power and can be classified as a dominant stakeholder. The D.A. has the responsibility at the Liverpool hospital to determine the sequence in scheduling unplanned surgery, which gives the D.A. legitimacy in the decision-making process. Since other stakeholders have to accept the decision made by the D.A., the D.A. holds power in the decision-making process.
- **E.A.**
An emergency anaesthetist has power in the theatre and can be classified as a dormant stakeholder. The E.A. is the anaesthetist who has to perform a case and may decide whether to accept a case or not. Since this is the only available anaesthetist for the day, the E.A. holds power in the decision-making process.
- **N.U.M.**
The nursing unit manager has legitimacy and power and can be classified as a dominant stakeholder. The N.U.M. has the same responsibilities in the decision-making process as the D.A.
- **Clinical coordinator (Cl.C.)**

The clinical coordinator has legitimacy and can be classified as a discretionary stakeholder. The Cl.C. is responsible for the logistical constraints and human resources in the decision-making process and advises and supports the D.A. during the decision-making process.

- Concierge (C)
The concierge has legitimacy and can be classified as a discretionary stakeholder. The concierge is responsible for the logistical constraints and human resources in the decision-making process and advises and supports the D.A. during the decision-making process.
- Patient (P)
The patient has urgency and can be classified as a demanding stakeholder. The patient has the injury and this immediately determines the medical priority.

This can be illustrated as follows:

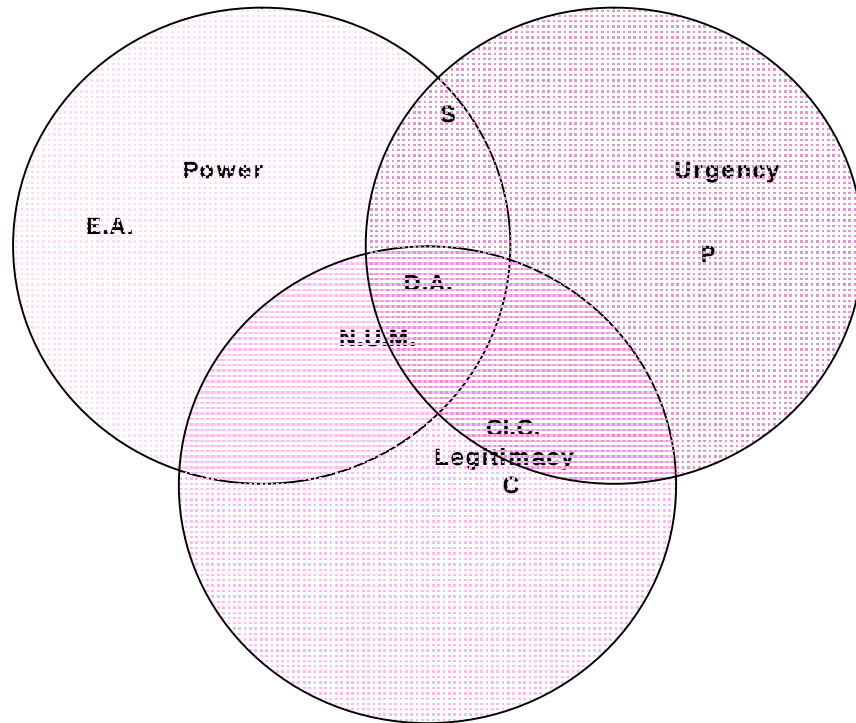


Figure 10: Salience of stakeholders at the Liverpool Hospital

6.1.3 Relevant data collection

At the “intelligence stage”, the relevant data for sequencing unplanned surgery is also determined. The literature provides several case studies where the relevant data collection is mentioned. The data differ in the researches, but they all relate to the following three factors: clinical factors, logistical factors and time. Besides these

findings in the literature, interviews with stakeholders at the Liverpool hospital resulted in relevant data that is expressed according to the several stakeholders.

- **Surgeon**
Although surgeons give different answers for the critical data for decision-making of unplanned surgery, the following data are common:
Specification of the category, the diagnosis of the patient, the current clinical conditions meaning; the vital signs, blood tests, and the chance on potential deterioration is crucial for the prioritisation of surgery.
- **Anaesthetist**
The anaesthetist makes decisions about the prioritisation and needs the following information:
name and location of patient, the operating surgeon, page number, fast time, proposed procedure, urgency category, comments, time of booking, specification of the category, insurance status, co-morbid conditions, fitness of the patient, and the need for an anaesthetic consult.
- **Clinical coordinator**
The clinical coordinator needs information to determine the scheduling of staff and other resources. The clinical coordinator needs the following information:
Patient's name and age, proposed procedure, co-morbid conditions, special equipment required, urgency code, the location of the patient, time and date of booking, and surgeon availability.
- **Concierge**
The concierge takes care of the equipment and staff for the anaesthetics and needs the following information:
post operation bed, ward bed, infection risk, surgeon availability, insurance status, cancellation of surgery and reason, patients' condition.

Workflow of the "intelligence" stage at the Liverpool hospital

In this section, the workflow of data collection for scheduling unplanned surgery is discussed. A thorough workflow analysis can be found in appendix 2. According to Fitzgerald et al. (2005) the stakeholders agree on the clinical determinants, time considerations, logistical influences, and decision are heavily influenced by professional identity.

During conversations with stakeholders, two-phase data-collection process became apparent between the several stakeholders. The first phase is to consider clinical factors that determine the decision made. The stakeholders of this process are the registrar, surgeon, duty anaesthetist, and emergency anaesthetist. The second phase is to consider logistical considerations, and the stakeholders of that decision-making process are the duty anaesthetist, clinical coordinator, and concierge.

Patient factors and time considerations are influences that concern all stakeholders through the decision-making process of unplanned surgery. At the Liverpool hospital the data are currently collected on a "pink sheet". A distinction can be made between patient information, time considerations and clinical considerations. This can be summarized as follows:

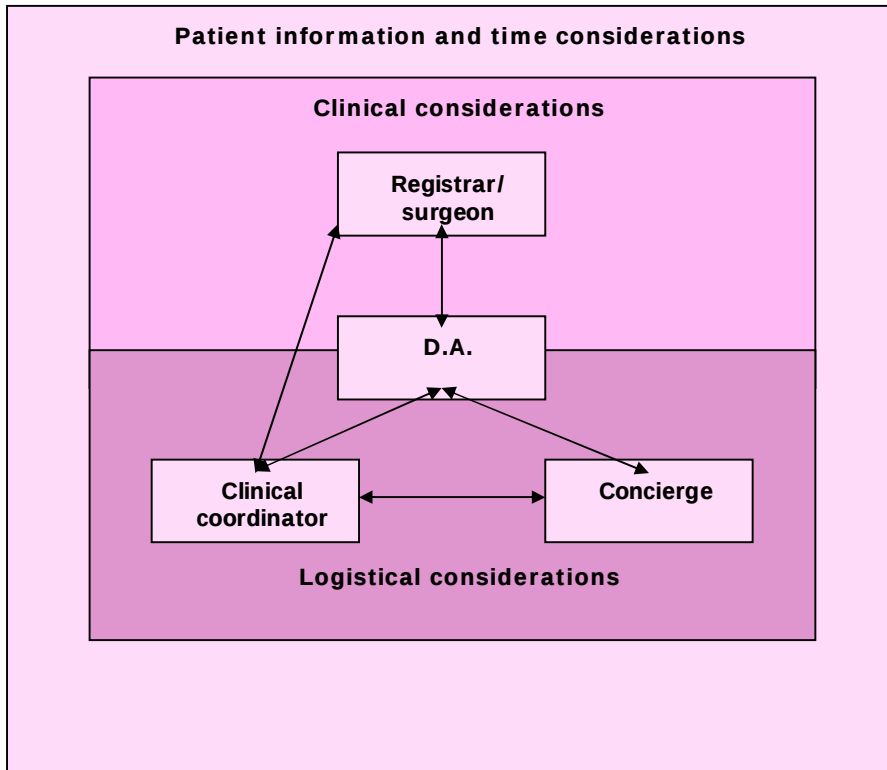


Figure 11: The data-collection processes among the prioritisation of unplanned surgery

6.2 Case study “Design” stage

At this stage, the objective of decision-making of unplanned surgery is established. According to Mintzberg (1976) at this stage, a decision can be made based on existing solutions or new tailor made solutions. With regard to the Liverpool Hospital, the current decision-making processes have been analysed.

Objectives in decision-making of unplanned surgeries

When analysing these processes, it is obvious that at the Liverpool hospital, a decision is made on the balance of the D.A. and the N.U.M. based upon the medical priority. This medical priority is not determined by the decision-maker but by the surgeons at the Liverpool hospital. However when two or more cases have the same priority, the objective in sequencing unplanned surgery changes. Then the cases are sequenced in the order they were submitted. Another critical point in sequencing unplanned surgery is the fact that the D.A. and the N.U.M. at the Liverpool Hospital differ in determining critical data for decision-making. When asking them in interviews what data is relevant for decision-making, they give different responses.

This may indicate that they use different information in prioritising unplanned surgery. The third objective in sequencing unplanned surgery is minimizing the average length of time each surgeon and patients wait.

Next to these objectives, the decision-makers at the Liverpool Hospital also have some other restrictions in sequencing unplanned surgery. First the surgeon availability influences the decision-making process; second the logistical considerations are important as well. The third constraint is the time factor, the maximum duration of time when surgery is needed. Within these logistical considerations, the availability of special equipment is included. Summarized, the objectives in sequencing unplanned surgery are:

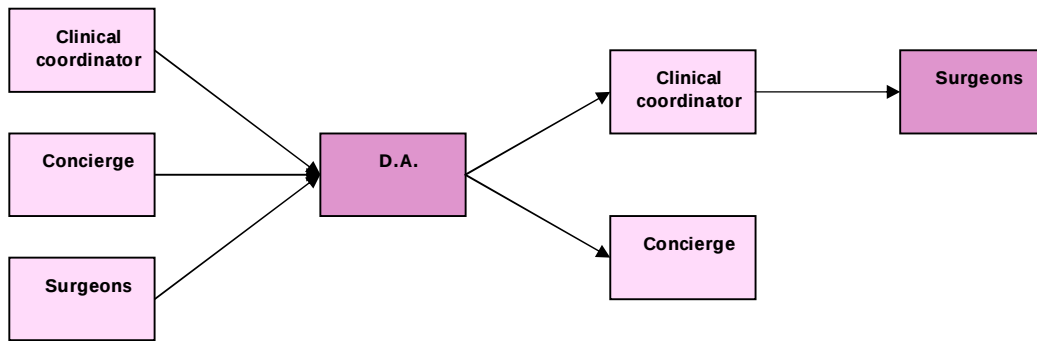
1. sequencing based on medical priority assigned by surgeons and prioritised by a D.A.
2. based upon the order of entering the emergency queue
3. while minimizing the average length of time each surgeon and patients wait.

It is important to note that the objectives in sequencing unplanned surgery are hierarchical.

6.3 Case study “Choice” stage

At this stage in the decision-making model, the interests of stakeholders are balanced. The D.A. is the decision-maker at the Liverpool hospital and eventually will determine the sequence of scheduling unplanned surgery for the day. The D.A. collects all relevant data and based upon conversations with surgeons, the clinical coordinator, and the concierge makes a decision. When a decision is made, this is communicated with the clinical coordinator and the concierge. The concierge and clinical coordinator prepare all the logistical requirements and human resources. The clinical coordinator rings up a surgeon when the schedule of unplanned surgery is determined. Very often surgeons will ring up to the clinical coordinator themselves in advance and the clinical coordinator will give details about the sequence of unplanned surgeries for the day. The “choice” stage in decision-making of unplanned surgery can be illustrated as follows:

Communication lines at the “choice” stage in the decision-making process



Data transmission at the “choice” stage in the decision-making process

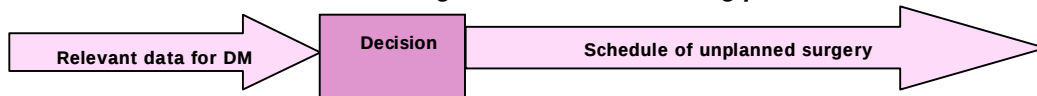


Figure 12: The workflow of the “choice” stage in the decision-making process

7 The gap between current decision-making practices and desired practices

In this chapter, the theories of decision-making practices are linked with the observations and results of the case study at the Liverpool hospital. First the “intelligence” stage in decision-making is discussed, second the “design” stage in decision-making is discussed, and third the “choice stage” in decision-making is discussed.

7.1 The gap at the “intelligence” stage

When determining priority of unplanned surgeries, the decision-maker should have priorities in stakeholder balancing according to Mitchell and Agle (1997). The three factors; legitimacy, power, and urgency, are balanced by the decision-maker. According to the literature, the patient, the E.A., the Cl.C., and the concierge are latent stakeholders and the surgeon, D.A., and N.U.M., are expectant stakeholders. This classification of stakeholders is important because they need different treatments in the decision-making process.

At the Liverpool Hospital, the D.A. and the N.U.M. are the decision-makers. According to the stakeholder analysis, the D.A. is an expectant stakeholder next to the N.U.M. and the surgeon, however the surgeons differ on the elements of stakeholders' influence. The surgeon has “urgency” and “power” and the decision-makers have “legitimacy” and “power”. Since the decision-makers have the legitimacy their stakes are decisive, but the surgeon can easily influence the decision-making process with their urgency. It is important to note that surgeons should give clarity about their urgency in the decision-making process. Since there are multiple surgeons, but one decision-maker at the Liverpool Hospital, it is important what the salience is between the separate surgeons. The relative salience between the surgeons can only be clear when urgencies are clear.

The gap at the intelligence stage is that the medical priority, given by surgeons, is not always correct. During interviews with stakeholders it became apparent that all stakeholders, including surgeons themselves, think that surgeons sometimes deliberately change the medical priority of a patient for their personal interests. According to the literature review, the medical priority is an important determinant in balancing stakeholder interest. Therefore this medical priority should be an exclusive and reliable determinant. Next to this gap, the data-collection for decision-making often contains important but also irrelevant data for decision-making. An overload of data reduces the quality of decision-making and transparency in the process. The literature underlines that effective decision-making contains relevant and critical data. At the Liverpool hospital administrative data is also collected at the intelligence stage. This data is needed by nurses, but not in the decision-making process. Finally, data collected on the “pink sheet” is not always complete and sufficient for decision-making. Some data is missing and not given by a surgeon. It is the responsibility of the clinical coordinator to collect data, but the clinical coordinator is dependent on the cooperation of the surgeon to provide all data.

7.2 The gap at the “design” stage

Next to the findings of objectives in decision-making at the Liverpool Hospital, the literature has also prescribed some theories about executing the “design stage” in decision-making. The previous research of Dexter et al. (1999) states that an operating room suite must identify the primary scheduling objective to be satisfied when prioritising pending urgent cases before determining the optimal sequence of urgent cases. Their main conclusion is that the optimal sequence varies and depends on the scheduling objective chosen.

The objectives suggested in the literature are: 1) sequencing cases that minimizes the average length of time each surgeon and patient waits, 2) sequencing cases in the order that they were submitted; or 3) perform the cases based on medical priority, as prioritised by an OR director, or surgeons discussing the cases among themselves.

The gap between the case study and the literature review is that at the Liverpool hospital there are objectives in decision-making. All stakeholders agree on the objectives when asked about them individually. However, the objectives in decision-making often do not fit with personal objectives in decision-making. Surgeons have the main objective to take best care of their own patient at the Liverpool hospital. They do not have the same objective as the D.A. when decision-making practices are needed since they do not possess the same information. Nurses have other objectives as well, since they do possess the same information as the D.A. but they do not have the same medical expertise, which inevitably delivers different objectives. They all have different problem identification in the decision-making process. Therefore the gap is difference in objectives when decisions need to be made between nurses, surgeons and anaesthetists.

These conclusions can be summarised as follows:

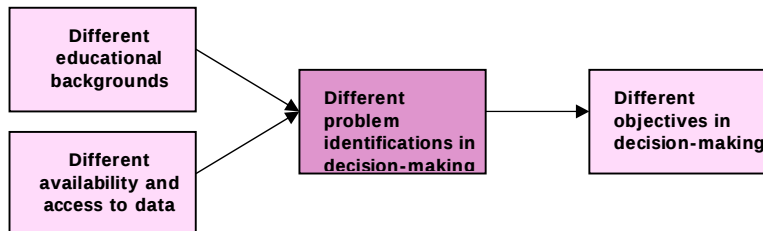


Figure 13: Causes for different objectives in decision-making

7.3 The gap at the “choice” stage

At this stage the stakeholders' interests need to be balanced. According to the literature review, this can be done in many ways. Reynolds et al. (2006) prescribe some balancing approaches as mentioned in chapter 4, and they have discovered the relation between stakeholders' interests. They came to the following results: 1) individual resources and unequal levels of stakeholder saliency constrain managers'

efforts to balance stakeholder interest. 2) resource divisibility also influenced whether managers used a within decision or an across decision approach to balance stakeholder interests. The gap will be discussed according to the previous factors influencing stakeholder interest.

Unequal levels of stakeholder saliency

With regard to the Liverpool Hospital, it is important to maintain equal level of stakeholders' saliency amongst the surgeons to balance their interests. When interviewing the anaesthetists, they stated that some surgeons differ in power in the decision-making process. Some surgeons never complain about the sequence of the emergency queue and other surgeons often put pressure on the nurses or the D.A.. This pressure immediately influences the "power" element of the stakeholder analysis of Mitchell & Agle (1997). This pressure does not benefit optimal and effective decision-making and should be eliminated in the decision-making process. When increasing power, the stakes of the surgeons are out of balance. It is difficult for the decision-makers to balance interests when they differ between surgeons. At the Liverpool Hospital it is important that surgeons cannot increase power amongst each other to gain more stake.

On the other hand, surgeons also have urgency in the decision-making process. The urgency element is directly related to the clinical priority of the surgery. In order to make good decisions, the clinical priorities need to be transparent. The division of urgency codes needs to be clear, and the correct urgency codes need to be assigned to the cases. At the Liverpool Hospital, there are directions for determining urgency codes. These are defined by 1) injury, and 2) maximum time before surgery is needed. These two elements prescribe which code can be assigned to a case. When a surgeon assigns an urgency code at the Liverpool Hospital to a patient, the surgeon is the only stakeholder who is in contact with the patient. The surgeons discuss the injury and urgency code with the anaesthetist through a telephone conversation, but the surgeon remains the only stakeholder in contact with the patient. Since the urgency codes greatly influence the balancing process in the decision-making process, it is important that surgeons assign the correct urgency codes to the cases.

The anaesthetist, clinical coordinator, and concierge all agree that the reliability of the choice of urgency code can be doubtful because different stakeholders may have different access to information and this can influence their perception of urgency. In addition, on occasion it became apparent that surgeons change the urgency code to influence the emergency queue in their favour. This is in line with the research of Fitzgerald et al. (2005), where it is stated by a participant that surgeons change categories differently for their own interest. This may indicate that because surgeons are the only ones in direct contact with the patients, they can change urgency codes.

Resource divisibility

In the process of sequencing unplanned surgery, the availability of the operating room is the biggest constrain in resource divisibility. At the Liverpool Hospital there is one operating room available for emergency surgery, therefore a decision needs to be made on the division of time. Since there is only one operating room at the Liverpool Hospital it is not possible to sequentially divide the resources, but only over time. Besides the operating room, there is also special equipment that needs to be

divided amongst the cases. Since some special equipment is expensive, these need to be divided as well.

7.4 The overall gap at the Liverpool hospital and the literature review

To give a clear overview of the gap, the previous findings are summarized as follows:

Stages in DM	Gap between case study and literature review
Intelligence	- The medical priority is not always correct and reliable - Overload of data for effective decision-making - Incomplete data for effective decision-making
Design	- The stakeholders have different objectives, because their problem identifications are different
Choice	- Surgeons differ in power in the decision-making process based on irrelevant factors - Surgeons differ in urgency in the decision-making process based on possible false data

8 Improvements

In this chapter, the improvements for problems in decision-making of unplanned surgery are discussed. The improvements are divided into the themes of decision-making as discussed in chapter 6. First, improvements have been designed for the “intelligence” stage and the improvements have been designed for the relevant data collection. Second, improvements have been designed for the “design” stage in the decision-making process. These solutions concern the overall objectives of the decision-making process. Third, improvements have been designed for the “choice” stage. At this stage improvements have been designed in balancing stakeholder interests. All these improvements have been designed based upon the gap determined in the previous chapter.

8.1 Improvements at the “Intelligence” stage

At this stage, improvements have been designed for decision-making of sequencing unplanned surgery. In order to improve decision-making, several redesigns in information flow and workflow have been made. These improvements are discussed with the gaps determined in chapter 7.

Gap 1: The medical priority is not always correct and reliable

Gap 2: Incomplete data for effective decision-making

In order to deal with these problems, the registrar/surgeon is made responsible for the data-collection and registration for decision-making. At the moment, the clinical coordinator has to collect and fill in all information details for decision-making on a “pink sheet”. With this improvement, a registrar/surgeon is responsible to fill in a data-collection tool. According to the literature, accuracy and reliable data-collection is important for decision-making. “First-hand” information improves accuracy and reliability.

When a registrar/surgeon fills in a form and delivers it to the operating theatres, the D.A. has to sign for approval. Before accepting a case at the operating theatres, the clinical coordinator and the D.A. have the possibility to check the case on completeness and correctness of data. In this way, there is a controlling system in data-collection and eventually in completeness and correctness of data-collection.

Gap 3: Overload of data for effective decision-making

In order to reduce data and eliminate an overload of data in decision-making, a summary sheet is introduced in the decision-making process. Further details of this summary sheet will be discussed in paragraph 9.1. The summary sheet is a part of the data-collection tool, which only contains relevant data for decision-making. As stated in the literature, relevant and simple information for decision-making

improves decision-making. Clinical information and other administrative data are not relevant for decision-making and therefore extracted from the summary sheet. It only contains information needed to improve decision-making. These redesigns can be summarised as follows:

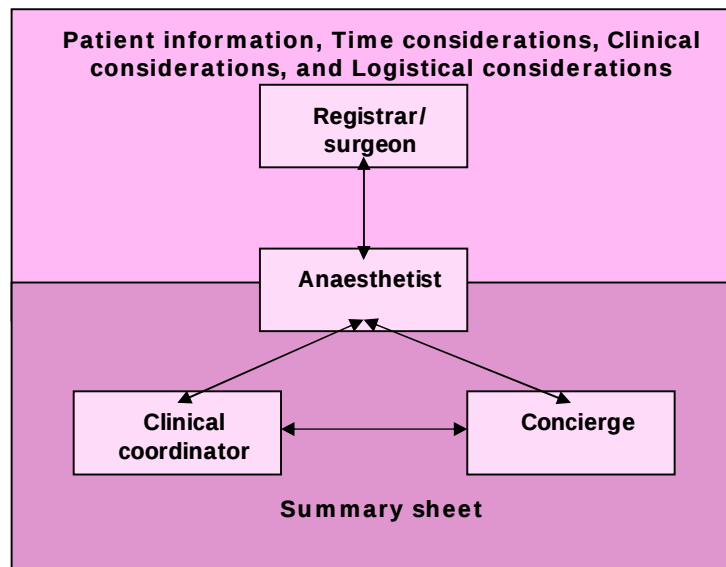


Figure 14: Redesigned decision-making processes among the prioritisation of unplanned surgery

As can be seen in this redesign, the registrar/surgeon receives and forwards information from the patient to the anaesthetist. The anaesthetist has to decide whether the case may be submitted or not. The data is collected on the summary sheet and is used for decision-making. For logistical considerations, the anaesthetist is in contact with the clinical coordinator and the concierge.

8.2 Improvements at the “Design” stage

Gap 4: The stakeholders have different objectives, because their problem identifications are different

The improvements found for this gap are divided in three parts. First the overall objectives are determined and all stakeholders agree on these objectives as stated in interviews. Second, the problem identification of the decision-maker, the D.A., is discussed and improvements have been designed to improve decision-making. Third, surgeons have different problem identification then the D.A. has and improvements have been designed for them as well to gain acceptance in decision-making.

The overall objective in decision-making

At this stage solutions to determining the objectives of decision-making are determined. As stated in the previous chapter, the following objectives are found in scheduling unplanned surgery:

1. sequencing based on medical priority as prioritised by the D.A.
2. based upon the order of entering the emergency queue
3. while minimizing the average length of time each surgeon and patients waits.

The boundaries in optimising these objectives are:

1. the surgeons' availability
2. the logistical considerations
3. the time factors (maximum duration before surgery is needed)

The problem identification according to the decision-maker: D.A.

The D.A. is the decision-maker and for every decision-maker in this process it is important that they obtain all relevant data. The D.A. is responsible at the Liverpool hospital to execute the overall objective in decision-making for the day. In other words, the D.A. needs all relevant data to fulfil the objectives mentioned above. Flowcharts have been improved to collect these data in an efficient manner to improve decision-making. Two redesigns have been made: a flowchart of a manual system and a computerised system. Implementing a computerised system is time-consuming and is only effective when it is applied to a well-functioning manual system. The literature underlines it is desirable to computerise an existing manual system to overcome resistance to change. Daft (2000) also underlines that resistance to change is often caused by uncertainty and lack of understanding. Hence, to make a computerised system work successfully, first a manual system is designed. This research is about suggesting improvement to a manual system with a view to expand this into a computerised system.

The big advantage of a computerised system is the elimination of steps in workflow, therefore formalising communication between different persons of different professions. Professional identity, personalities and attitudes all influence decision-making. When these influences can be reduced, decision-making will be improved. Another reason for implementing a computerised system according to the literature is to eliminate unnecessary paper. Enforcing rules and procedures in a computerised system without interference of stakeholders will benefit the decision-making process. For example, compulsory fields for data-insertion, enforces completeness of data.

Redesigned flowchart: manual

Ideally, the registrar/surgeon calls to the anaesthetist to discuss a case and the anaesthetist has to decide to accept a case. Since a lot of data needs to be exchanged instantaneously with fast feedback, a phone call is the best communication channel. The literature underlines this as well. If a case is approved, the registrar/surgeon fills in a form to request a case for booking. The anaesthetist decides on arranging an anaesthetic consult for a patient. Information details that previously were exchanged with a clinical coordinator through telephone conversation are now written down. When the form is filled in, it is handed over to the theatres, which can be done in several ways. The literature distinguishes several data outputs: screen outputs, paper outputs, and audio outputs. Depending on the facilities of the hospital, there are a few options to hand the form over:

1. The registrar/surgeon physically hands the form over to the anaesthetist.
2. The registrar/surgeon faxes the form over to the operating theatres.
3. The registrar/surgeon fills in the information on an electronic sheet and prints the form at the operating theatres.
4. The registrar/surgeon emails the form to the theatres on an electronic form.

Ideally, the clinical coordinator is in charge of handing the form over to the anaesthetist. The name of the clinical coordinator handing the form over has to be registered as well as the time, in order to formalise information processing. When the anaesthetist receives the form, the anaesthetist needs to register when the form was received. Then the anaesthetist determines if the case is accepted, depending on: 1) whether the registrar/surgeon has phoned the anaesthetist for approval and 2) the completeness of data on the form. Depending on the way the registrar/surgeon hands the form over to the theatres, the registrar/surgeon receives a notification of denial of booking a case. The following options are to be considered:

1. If the registrar/surgeon hands the form over face-to-face to the theatres, the anaesthetist can give immediate feedback about acceptance of the case.
2. If the registrar/surgeon hands the form over by one of the other options, the anaesthetist phones the registrar/surgeon.

When a case is accepted, the anaesthetist hands the form back to the clinical coordinator, and they can discuss the case. The clinical coordinator rings up the stock room to make preparations and the administrator inserts the data of the form on Surginet (a transaction processing system). In order to have overview of all the cases on the emergency queue, the summary sheet (will be discussed in the next paragraph) is cut off and placed on the whiteboard. The other part of the form is put in a folder.

Finally, when the anaesthetist asks for a patient, the clinical coordinator arranges the transport of the patient. The progress is registered on the summary sheet. When a case has finished at the operating theatre, the summary sheet is reattached to the rest of the form and the last information details are added. The thorough design of the workflow can be found in appendix 5.

Redesigned flowchart: computerised

The steps in the manual system are the same as in the computerised system. The difference is that a registrar/surgeon inserts the data on an online transaction processing system. When a case is booked it is printed at the theatres and handed over to the anaesthetist. The anaesthetist decides to accept a case or not, and when a case is accepted, the clinical coordinator confirms this. Ultimately, the information will remain computerised, not in hard copy.

The clinical coordinator fills in other details on the processing system and places the summary sheet. When a case is finished, the last information details are added to the form and the summary can be disposed of.

The advantage is that a few steps in workflow are eliminated; the step where the surgeon has to write down information and hand it over to an anaesthetist and the step where an administrator inserts information in a transaction processing system.

Not only are the steps eliminated, but also processes are monitored by the computerised system. Responsibilities about handing a form over and assuring it arrives at the right person are captured by the computerised system.

Another eliminated step is for an anaesthetist to check whether a surgeon has filled in all the details on the form; the compulsory fields of the computerised system eliminate this step. When a clinical coordinator receives a notification of a request for a new case, a case has to be accepted and this decision is communicated to the registrar/surgeon by the computerised system. When an anaesthetist does not accept a case, the registrar/surgeon receives a notification that a case has not been accepted with argumentation. An advantage is that it avoids personal communication between professionals. Since professional identity can influence decision-making, it is an improvement to reduce direct communication. The redesigned workflow can be found in appendix 7.

The problem identification according to surgeons

At the moment surgeons possess different data in the decision-making process. They only have information about their own case and not about other cases waiting on the emergency list. Their problem identification is only viewed from their case and they do not have an overview of the entire problem identification and therefore the entire decision-making process. In order to fill the gap, surgeons should be aware of other cases in the queue. An improvement to this problem can be found in the next paragraph: the introduction of an online emergency queue. Since the queue provides improvements for several gaps, it is introduced in the next paragraph.

8.3 Improvements at the “Choice” stage

Gap 5: Surgeons differ in power in the decision-making process based on irrelevant factors

Gap 6: Surgeons differ in urgency in the decision-making process based on possible false data

At this stage, the stakeholder saliency is discussed. In order to increase saliency amongst the relevant stakeholders in decision-making of sequencing unplanned surgery, the “power” and “urgency” element of the surgeons need to be balanced. The decision-makers, the D.A. and the N.U.M., have both the elements “power” and “legitimacy”. These elements need to be balanced for effective decision-making. This analysis results in the following improvements: 1) an online registration of the emergency queue, and 2) surgeons communicate through a formalised form with other stakeholders.

An online registration of the emergency queue

Urgency is an important element in decision-making and influences the balance of stakeholders’ interests. In order to control urgency and use it as a reliable element in

decision-making, the medical priority code at the Liverpool Hospital needs to be transparent to all other surgeons. In this way, surgeons can determine their relative “urgency” with other cases. It also gives more guarantees that surgeons fill in a correct priority code combined with the injury. Surgeons themselves control and monitor the transparency of assigning priority codes in this way. The personal agendas, as referred to by Fitzgerald et al. (2005), may be pursued less vigorously once overall decision-making process becomes transparent. Furthermore, monitoring of stakeholders increases participation in the decision-making process. As stated by Dickson (1985, p.93-115), participation increases acceptance of the decision by subordinates, and improves quality of the decision.

Gaining more clarity for all stakeholders at different times at different locations becomes possible with an online emergency queue. Stakeholders are located at many locations and cannot simultaneously receive information on the emergency queue. In order to establish an online emergency queue, a transaction processing system is needed. The emergency queue is up-to-date with information about cases in the queue, and the order of it. Critical data is visible on the online queue. Critical data are: patient details (name and age), emergency category, time and date of booking, clinical status, proposed procedure, and co-morbid conditions. Since these data are confidential, it is important that authorised stakeholders have access to this information. As explained in the literature review, ownership of information is difficult to maintain because it can be duplicated and distributed so easily. A draft of the layout of the online queue can be found in appendix 4.

The online emergency queue is visible for all surgeons and registrars but can only be modified by authorised stakeholders. An authorised stakeholder is assigned to be responsible for keeping the list up-to-date online. The network of communication between the stakeholders has the format of a “wheel”, whereas the centre is the person inserting the data and the wheel are the authorised stakeholders such as surgeons and anaesthetists. All stakeholders in the wheel process information to the centre and the person in the centre provides an up-to-date emergency queue for the stakeholders in the wheel. An important advantage is that registrars/surgeons do not have to ring up to the theatres to have an update of the queue, which reduces person-to-person communication.

Another advantage would be that many stakeholders monitor the queue. The input provided by the registrars/surgeons is monitored by the other registrars/surgeons. This improves reliability of input. The decision made by an anaesthetist is visible for stakeholders. The decision-making process becomes transparent and therefore the stakeholders have better opportunities to monitor the output of the decision-making process.

Surgeons communicate through a formalised form with other stakeholders

In order to minimize the element of “power” from surgeons in the decision-making process at the Liverpool Hospital, the surgeons should have minimum contact with other stakeholders in order to put pressure on them. At the moment, a registrar/surgeon phones the anaesthetist to request a case for booking and then phones the clinical coordinator to fill in the form. With this designed improvement as discussed in paragraph 7.1., the surgeons fill in the form themselves and this redesign of tasks has some advantages. First, the registrar/surgeon is not in direct contact with the clinical coordinator. As stated in the literature, communication can

be used to persuade and influence people. Research from Fitzgerald et al. (2005) stated that stakeholders tend to bring in their personal agendas in decision-making. Because surgeons have power in the decision-making process and the clinical coordinator does not, it is undesirable to create interaction between them. When communication is formalised, decision-making will be improved. Second, data collected on a form is "first hand", which minimises the chances on making mistakes.

Many steps in workflow are eliminated with this improvement. Overall several person-to-person communication processes are replaced through communication with a standardised form. As stated in the literature enforcing rules and procedures, for example when an anaesthetist approves a case by signing for it, improves decision-making. A thorough redesign of workflow can be found in appendix 3.

9 Implementation at the Liverpool Hospital

In this chapter the implementation of the improvements are discussed. First the tools designed for the Liverpool Hospital are discussed; second the implementation and its problems and resistances are discussed. Third, the risk factors are discussed in order to determine the success of the improvements.

9.1 Improvements of decision-making tools for scheduling unplanned surgery

In this paragraph, the communication support tools for decision-making are discussed. First, a redesigned form for data collection for decision-making in a manual system has been made. This form is based upon the current design of the “Pink sheet” at the Liverpool Hospital and has been designed based upon interviews and literature research. Second, user interfaces have been designed for the computerised system at the Liverpool Hospital. These interfaces are based upon research of the “Pink sheet” and extensive literature research. Third, the online emergency queue is discussed.

Communication support tools: Redesigned form

The redesigned form has four distinct parts; the first part is for the registrar/surgeon, the second part is for the anaesthetist to accept a case, the third part is for the clinical coordinator to complete the form, and the fourth part is for the concierge/anaesthetic nurse to register patient’ readiness.

The sequence of the data-capture is determined by the analysis of the data-collection process. According to literature, perceptual grouping of data is needed to find meaning in stimulus signals. The parts for the different professionals are determined by access of information; for example, the registrar/surgeon determines the proposed procedure and therefore fills in the details. As stated in the literature, extra person-to-person communication is expensive and also sensitive for making mistakes. The person receiving primary information details therefore is the most ideal person to record.

Decision-making is based on critical information. The critical information details for the different stakeholders are captured through interviews and previous research of Fitzgerald et al. (2005). Critical data are: patient details (name and age), Medical Record Number if available, ward, gender, insurance status, proposed procedure, expected duration, clinical status, co-morbid conditions, emergency category, fast time, surgeon and availability, contact details surgeon, comments, and date and time of booking. The summary sheet is designed on the form to capture data. The part is cut/torn off from the form and placed on the whiteboard. Since the emergency list is a queue that changes very often, separate summary sheets will reflect the order of the queue. Working with summary sheets creates overview with correct, up-to-date, and critical information details on a fixed place in the operating theatres.

Since the information details of patients' readiness are important for the prioritisation, these information details are put on the summary as well. There are many stakeholders who need information about the progress of patients' readiness, and this process needs to be monitored. Placing the information details on the whiteboard increases monitoring from different stakeholders enhances discussion about queue positions. This row is highlighted for the perception of data on the summary sheet. In this way, it is clear that the row belongs to patients' readiness.

In order to avoid duplication of information, the summary stroke has to be reattached to the original form. All changes made for that case are collected and kept together. This avoids duplication of information. The folder with all forms clearly distinguishes cases that are finished and cases that are on the queue, by having different sizes. The form can be found in appendix 6.

Communication support tools: user-interfaces

The same sequence is designed as in the manual form, to reduce barriers to change. Before a case is booked on the computerised system, a login name and password are required to identify the user. Some fields of the manual sheet are static and need not to be filled in. This data consists of: name of surgeon, date of booking, time of booking, page/mobile no. of the surgeon, and age of patient. This saves time in inserting information and as a result it reduces chance on mistakes and errors.

The introduction of compulsory fields avoids incomplete forms. The step of checking completeness of the form is eliminated. Furthermore, many information details can be selected, which saves time. The user-interface can be found in appendix 8.

For the clinical coordinator, a user-interface with the same sequence of the manual system is designed. After the summary stroke is printed and the anaesthetist has accepted the case, other information details are inserted by the clinical coordinator. Since the steps of information processing are not simultaneous for the clinical coordinator every step has to be submitted. When all steps are submitted the case is finished and removed out of the system. The user-interface can be found in appendix 9.

9.2 Expected problems and resistance to implementation

There are several factors that trigger resistance to change. First, the stakeholders are sceptic about leaving the responsibility to a surgeon to fill in a form. Especially anaesthetists and nurses are sceptic about surgeons and their willingness to fill in a form. Since the D.A. and clinical coordinator are dependent upon information from surgeons, they would rather pull the information from surgeons to keep control on data-collection.

Surgeons on the other hand are afraid it would cost them lots of time when they have to either fill in a form and hand it over or insert it themselves on a computer. According to them it is quicker and easier to ring up the theatres to process information. Simply the fact that computers are not always available could make it difficult for surgeons to digitally process information.

Surgeons also think it is very important to have two-sided contact when it comes to processing information about a patient. They think inserting data on a computerised form will miss out on other uncommon relevant data, which will not reduce time of processing a case. Clinical coordinators could need other relevant data that is not standard and eliminating communication between a surgeon and clinical coordinator may increase risk of mistakes.

Nurses were also critical about the summary sheet on the whiteboard to reflect the queue of the emergency list. They think these sheets will easily get lost because of its mobility. It can only be successful when a good copy is made and saved in a folder. Many people work on the queue and a summary will easily be removed from the whiteboard and this will decrease the overview of the queue.

9.3 Risk factors for implementation

In this paragraph, the improvements are analysed by the risk factors found in the theory. Also expert interviews are input for reflecting designed improvements. The following risk factors will be discussed: 1) avoidance of interest of conflict, 2) positive risk-reward factor, 3) comprehensiveness of decision.

1) Avoidance of interest of conflict

A lot of the determinants found in the literature are triggered with the implementation of the improvements. First, interdependence between the different stakeholders is an important determinant for conflicts. When a form is not filled in by a registrar/surgeon, this directly negatively influences the other stakeholders. Anaesthetists decide on the scheduling of unplanned surgery and their decisions directly influence the work of registrars/surgeons. Between registrars/surgeons an important interdependence exists, they have patients in the queue and changes in the queue influence their work. During the stakeholder meeting it became obvious that implementing some improvements can cause conflict. The interdependence of the stakeholders is foreseen as a big problem in implementation.

Second, the performance criteria and rewards are directly related to the workflow. The quantity of cases determines the quantity of the rewards for registrars, surgeons, and anaesthetists. Nurses are monetary rewarded on an hourly basis, so this difference in rewarding systems can inflict conflicts.

Third, communication influences conflict in the redesigned workflows and communication support tools. Stakeholders communicate through telephone and a form about a lot of important information. Misunderstandings are easily made, since the stakeholders have different professions. As stated in the literature, fewer difficulties are experienced when communicating with members of the same group. Furthermore in health care, experience is an important factor for effective communication. During the stakeholder meeting it was pointed out as well that communication does not always occur in decision-making between the different professionals. Anaesthetists feel the surgeons are ignoring them when a case is booked on the emergency list.

Fourth, registrars/surgeons can experience role dissatisfaction since they are performing tasks in the improvements, which were previously done by other stakeholders. Registrars/surgeons might experience lack of task significance when filling in a form.

Fifth, scarce resources in the hospital are of important influence of conflict. The queue is the mirror for the lack of capacity, and the stakeholders of the queue have a conflict of interest. Environmental stress can be linked with scarce resources. Stress is common at the operating theatres, since it is difficult to predict the input.

2) Positive risk-reward factor

As stated above, there are different reward systems for the different stakeholders. For emergency cases of category 1 and 2, there is a big risk if the cases are delayed before operation. The risk-reward factor does not affect a decision made, since solely the risk factor influences decision-making. However for cases with the lowest priority, risk is at minimum so the risk factor is of much less importance. The reward factor becomes more interesting and important for some stakeholders. Surgeons and anaesthetists depend on the insurance status of a patient and this status determines the reward factor. For nurses, the rewards factor is hourly-driven, so effective management of time is important.

These distinct reward systems will always influence decision-making and affect the success of it. Nevertheless, transparency of the decision-making process will decrease room for discussion between these two reward forces. Although, risk factors are small with lowest emergency cases, there is a consensus about professionals that patients should not wait too long.

3) Comprehensiveness of decision

When an anaesthetist decides on doing a case during the day, this information is communicated with the clinical coordinator and the surgeon. All the contact details are registered on the data-collection tool. Although no problems have been identified about task execution after a decision has been made, it can be said that the actions are not registered. Task execution after a decision has been made is beyond the scope of the research. However, with regard to data collection, this data could be collected as well. More standardisation in workflow improves the quality of the implementation of the decision that has been made. A data collection tool offers potential to capture workflows, but also responsibilities. With regard to decision-making, where a lot of stakeholders are involved, capturing progress and responsibilities is recommendable. This can improve the overall processes in managing unplanned surgery.

10 Conclusions and Recommendations

The research objective is

to determine current decision-making practices and the gap with the desired performance

by making an analysis of the stakeholders concerning decision making in scheduling unplanned surgery, analysing current workflows concerning decision making of unplanned surgery, and analysing optimised decision-making practices in existing literature

in order to reflect improved decision-making practices and eventually improved quality of care.

First, the answers to the sub questions of the research objective are answered in 10.1. All the conclusions are outlined in paragraph 10.2. The academic relevance of the report will be discussed in paragraph 10.3 and paragraph 10.4 will address the practical relevance. Finally in paragraph 10.5 recommendations will be discussed.

10.1 Answers of research sub questions

1.1 Who are the stakeholders concerning scheduling unplanned surgery in the staffing field?

The following stakeholders have been identified during the stakeholders' analysis at the Liverpool Hospital:

- Surgeon
- Duty Anaesthetist
- Nursing Unit Manager
- Emergency Anaesthetist
- Clinical coordinator
- Concierge
- Nurses
- Patient

1.2 What are the roles of the stakeholders in scheduling unplanned surgery?

The stakeholders have been analysed by three factors defined by Mitchell & Aigle (1997), these factors are: "urgency, power, and legitimacy". The most important stakeholders based upon this analysis are the surgeon, the duty anaesthetist, and the nursing unit manager. The surgeons possess the elements of "urgency" and "power" in scheduling unplanned surgery and therefore become a dangerous stakeholder. Both the duty anaesthetists and the nursing unit managers possess the elements of "power" and "legitimacy" and become dominant stakeholders. Other stakeholders have only one element and receive less priority and importance when it comes to scheduling unplanned surgery.

The roles of the stakeholders can be defined as follows:

Surgeon: The surgeon is the only person in the decision-making process that is in direct contact with a patient. The surgeon determines the clinical status of a patient and the medical priority. These factors influence the scheduling of unplanned surgery.

Duty Anaesthetist (D.A.): The D.A. is the decision-maker of scheduling unplanned surgery for the day. The D.A. receives a request from a surgeon to accept a case on the emergency list or not. Based upon collected data from the cases on the emergency list, the D.A. decides on the sequence of the emergency list.

Nursing Unit Manager (N.U.M.): The N.U.M. has the same role in decision-making as the D.A., but after daily hours. The N.U.M. decides on accepting cases on the emergency list after regular working hours and books cases on the emergency list for the next day.

Emergency Anaesthetist (E.A.): The E.A. is the anaesthetist at the emergency theatre for the day and performs all surgeries from the emergency list.

Clinical Coordinator: The clinical coordinator is responsible for collecting relevant data for decision-making of scheduling unplanned surgery at the operating theatres. The clinical coordinator receives a phone call from a surgeon and fills in the details on a sheet. The clinical coordinator is responsible for allocating nurses, theatres, and equipment during the day at the operating theatres.

Concierge: The concierge is responsible for the anaesthetic nursing staff and equipment at the theatres. When decisions are made on sequencing unplanned surgery, the concierge allocates the nurses and equipment.

Nurses: There are different kinds of nurses at the operating theatre but they are involved and needed during surgery.

Patient: The clinical status of a patient is the most relevant factor in decision-making. It is in the best interest of patients to receive high quality of care, which directly means that they should receive care as soon as possible.

1.3 What data is relevant for decision-making according to the stakeholders?

In this report, the relevant data for each stakeholder is determined. Many similarities have been identified and also in the priorities of the data for decision-making of scheduling unplanned surgery. However, some differences have been identified which might explain conflicts at the operating theatres. The following similarities in data have been found:

Similarities:

Name, age and location of patient, time of booking, specification of the emergency category, clinical status of the patient, fast time, proposed procedure, co morbid conditions, and availability of the surgeon.

Besides these similarities some stakeholders define other relevant data. These are the differences:

Anaesthetist: Insurance status, fitness of the patient, and need for an anaesthetic consult.

Clinical coordinator: special equipment required, and infection risk.

Concierge: post operation bed, ward bed, infection risk, and fitness of patient.

When analysing these differences, differences in stakes are identified. First, anaesthetists and surgeons are paid by cases and their wages are dependent upon the insurance status of patients. Nurses on the other hand are paid on an hourly bases, which may indicate a cause of difference of opinion in decision-making of scheduling unplanned surgery. Second, the nurses indicate factors that are relevant after surgery for patients. This may indicate that nurses make decisions in an open system, since nurses are intensively involved in after-care. Surgeons and anaesthetists on the other hand, make decisions in a closed system. This closed system ends when a patient is operated at the operating theatre. A third difference lies in the fact that anaesthetists and anaesthetic nurses need information about the fitness of patients. This factor influences scheduling cases as well, but are only identified by these stakeholders.

2.1 What are the current workflows concerning decision-making of scheduling unplanned surgery?

Current decision-making practices are based upon a two-phased process. In the first process, the clinical considerations are discussed. The emergency priority is discussed between the surgeon and duty anaesthetist. In the second phase, the logistical considerations are discussed between the anaesthetist, clinical coordinator, and concierge. This can be illustrated as follows:

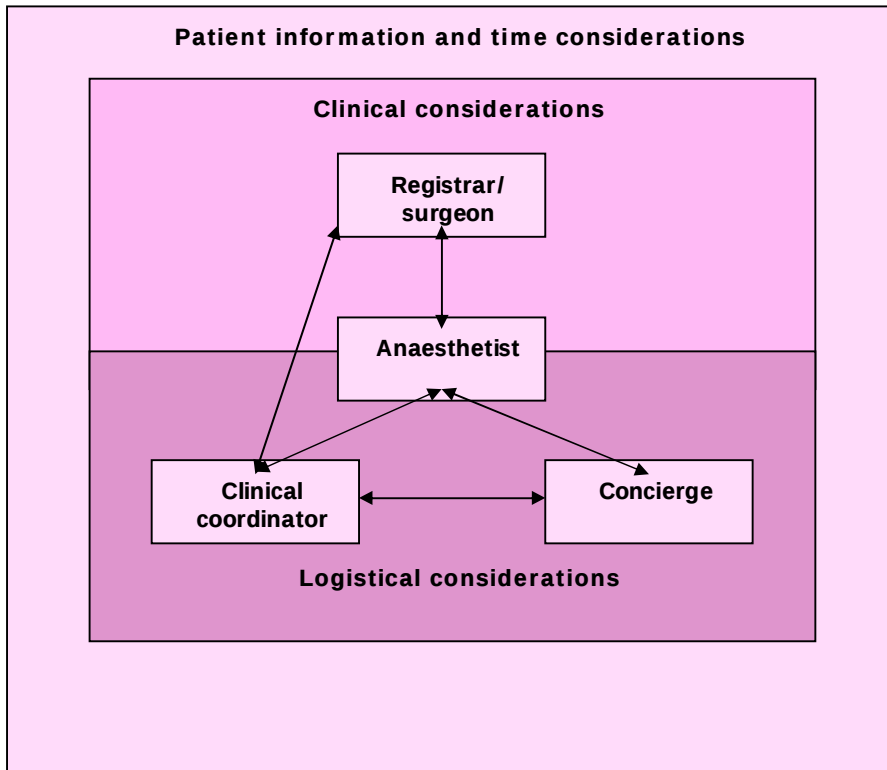


Figure 15: The decision-making processes among the prioritisation of unplanned surgery

This figure clarifies the fact that decision-making of scheduling unplanned surgery is a hierarchical process with multiple goals. The goals of decision-making of scheduling unplanned surgery can be defined as follows:

1. sequencing based on medical priority as prioritised by the D.A.
2. based upon the order of entering the emergency queue
3. while minimizing the average length of time each surgeon and patients waits.

The first goal is linked with the first phase of decision-making. The second and third goal concern the logistical considerations.

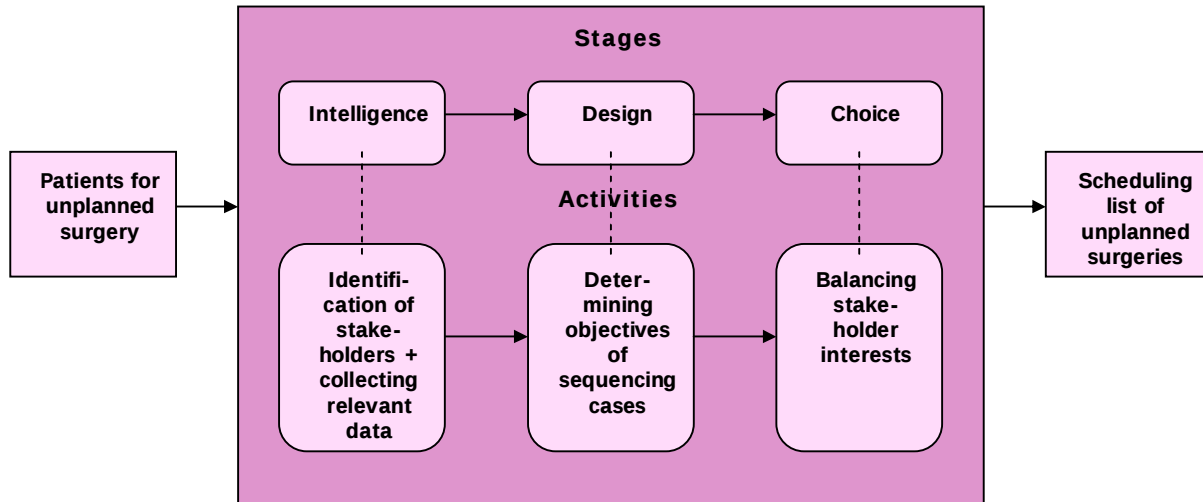
2.2 What are the current workflows concerning data-collection of decision-making of scheduling unplanned surgery?

In the current workflow, the clinical coordinator is responsible for the data-collection of decision-making for scheduling unplanned surgery. All data at the Liverpool Hospital is collected on a "pink sheet" and decisions are made based upon the data from the "pink sheet". The surgeon is in contact with a patient and possesses the relevant data for decision-making. This relevant data is communicated with the D.A. and when a case is accepted, the surgeon contacts the clinical coordinator at the

operating theatres. At the operating theatres, the clinical coordinator fills in a standardised form with the relevant data of a case for decision-making of scheduling unplanned surgery. The D.A., the clinical coordinator and other relevant stakeholders use this form for the decision-making process during the day. A thorough description of the workflow can be found in appendix 1.

3. What are optimised decision-making practices according to existing literature?

The literature provides many models in decision-making and in this research the model of Simon (1960) is used as a basis for optimising decision-making practices. The following literature framework has been constructed to analyse current decision-making practices at the Liverpool hospital and improve it:



As can be seen in the framework, the first stage in decision-making is the “intelligence” stage where data is collected and stakeholders in the decision-process are determined. The stakeholders each have their own problem identification in the decision-making process. The second stage is the “design” stage, where the objective(s) in decision-making are determined. Since stakeholders have different problem identification, they have different objectives as well. The third stage is the “choice” stage where a decision is made by the decision-maker.

4. What is the gap of current decision-making practices with the desired performance?

Stages in DM	Gap between case study and literature review
Intelligence	- The medical priority is not always correct and reliable - Overload of data for effective decision-making - Incomplete data for effective decision-making
Design	- The stakeholders have different objectives, because their problem identifications are different
Choice	- Surgeons differ in power in the decision-making process based on irrelevant factors - Surgeons differ in urgency in the decision-making process based on possible false data

5. What improvements have to be made to eliminate the gap?

For each stage in decision-making, improvements have been designed to eliminate the gap.

Improvements at the “intelligence” stage:

New workflows for data-collection have been designed in order to reflect improvements. At the moment the clinical coordinator collects all data, but in the new design the registrar/surgeon is responsible for collecting and registering data for decision-making. When a registrar/surgeon wants to book a case, he has to fill in a form and hand it over to the D.A. and the clinical coordinator. The D.A. and clinical coordinator have to sign for approval and therefore they can check on reliability and completeness of data.

In order to eliminate an overload of data, a summary sheet has been designed on a data-collection tool, which captures only relevant data for decision-making. The D.A. at the operating theatres can use this sheet for effective decision-making. There is no administrative data on the summary sheet, which provides more overview for the D.A..

Improvements at the “design” stage:

At this stage different objectives in decision-making have been analysed. Since the D.A. is the decision-maker, he should possess all relevant data for decision-making. Workflows of data-collection have been designed in order to improve decision-making practices. These designs in workflows have been made in a manual and computerised system.

Surgeons have different problem identification, since they only see the problem from their point of case of view. This does not cover the entire problem identification, and therefore an online emergency queue has been designed. On this queue, all surgeons can look at the entire queue on the entire emergency list. They are aware of the set of alternatives in the decision-making process and their problem identification will be the same with the D.A. and other surgeons.

Improvements at the “choice” stage:

In order to deal with the validity of surgeons and their “urgency” stake, the above-mentioned online emergency queue is an improvement for this gap as well. The urgency codes assigned by surgeons can be controlled and monitored by all surgeons themselves. It is visible to all other surgeons when a surgeon assigns an urgency code to a patient.

In order to deal with the “power” stake of surgeons, new designs in workflows have been made. If a surgeon wants to book a case, he has to fill in and hand over a form to a D.A.. The surgeon is not in direct contact anymore with nurses or the clinical coordinator. When contact between those professions is minimised, surgeons’ ability to put pressure at the operating theatres will be minimised as well. Eventually this will improve effective decision-making practices.

6. What are the risk factors for decision-making?

The following risk factors should be considered:

1. avoidance of interest of conflict

Many factors could cause conflict with these improvements and these are the most important factors: interdependence between stakeholders, different monetary reward systems for the stakeholders, communication problems, role dissatisfaction of stakeholders, and scarce resources for stakeholders.

2. positive risk-reward factor

The risk factor for decision-making practices changes when cases do not have high priority and can easily be moved in the emergency queue without risk factors. However, when risk reduces, reward factors become more important. The monetary reward factor differs for the stakeholders and for nurses there is no positive risk reward factor.

3. comprehensiveness of decision

Decisions on scheduling unplanned surgery are made in a closed system at the operating theatres. After a patient gets into surgery, there is no further registration of actions. More standardisation and formalisation at the theatres will improve the overall processes at the operating theatres.

10.2 Academic relevance

The academic relevancies are:

- This research determined which stakeholders are relevant in the decision-making process
- This research determined how to balance the stakeholder interests
- This research determined the relevant data for a decision-making support tool
- This research determined the fact that a decision will be accepted when there is transparency in the process
- This research determined that prioritisation is not the crucial problem in decision making
- This research determined that there should be clear objectives in decision-making of scheduling unplanned surgery

- This research determined that different stakeholders have different problem identification in the decision-making process

10.3 Practical relevance

- New data-collection tool for scheduling unplanned surgeries
- Draft design for a computerised data-collection system
- Improved and formalised workflows at the Liverpool hospital

10.4 Recommendations

These are the recommendations:

- A thorough analysis needs to be made with current information processing systems. To streamline the designed computerised system with current systems; opportunities and possibilities need to be analysed. Since a computerised system offers opportunities for other activities to be computerised, a total design needs to be made.
- Implementation based on a trial-and-error process with users to increase participation is needed. As stated in the literature, it is recommendable to involve users during the implementation phase and evaluate the implementation with them. Since they are the end-users of the data-collection tool, they can provide immediate feedback, which will lead to improvements during implementation.
- To overcome barriers in implementation: inform the stakeholders about the benefits of the improvements.
- Underline the mutual shared goals of the different professionals. Since there are many professions at the operating theatre, the mutual goals are not always clear. Reward systems differ, but the mutual shared goal is providing the best quality of care for patients.
- A data-collection tool provides opportunities for capturing and standardising other workflows. The steps that follow after a decision has been made by an anaesthetist are not registered yet, but could be captured in this tool. This will improve the management of unplanned surgery. The data-collection tool should be integrated in an open system at the theatres.
- Revise the lowest category, since these categories are not always real emergencies. Since there is no positive risk reward factor for these cases, the cases are not always of interest for stakeholders to execute. The variability of the queue of the emergency list will always negatively influence the scheduling of these cases. These cases could better be targets for elective scheduling and possibilities for elective scheduling for these cases should be considered.

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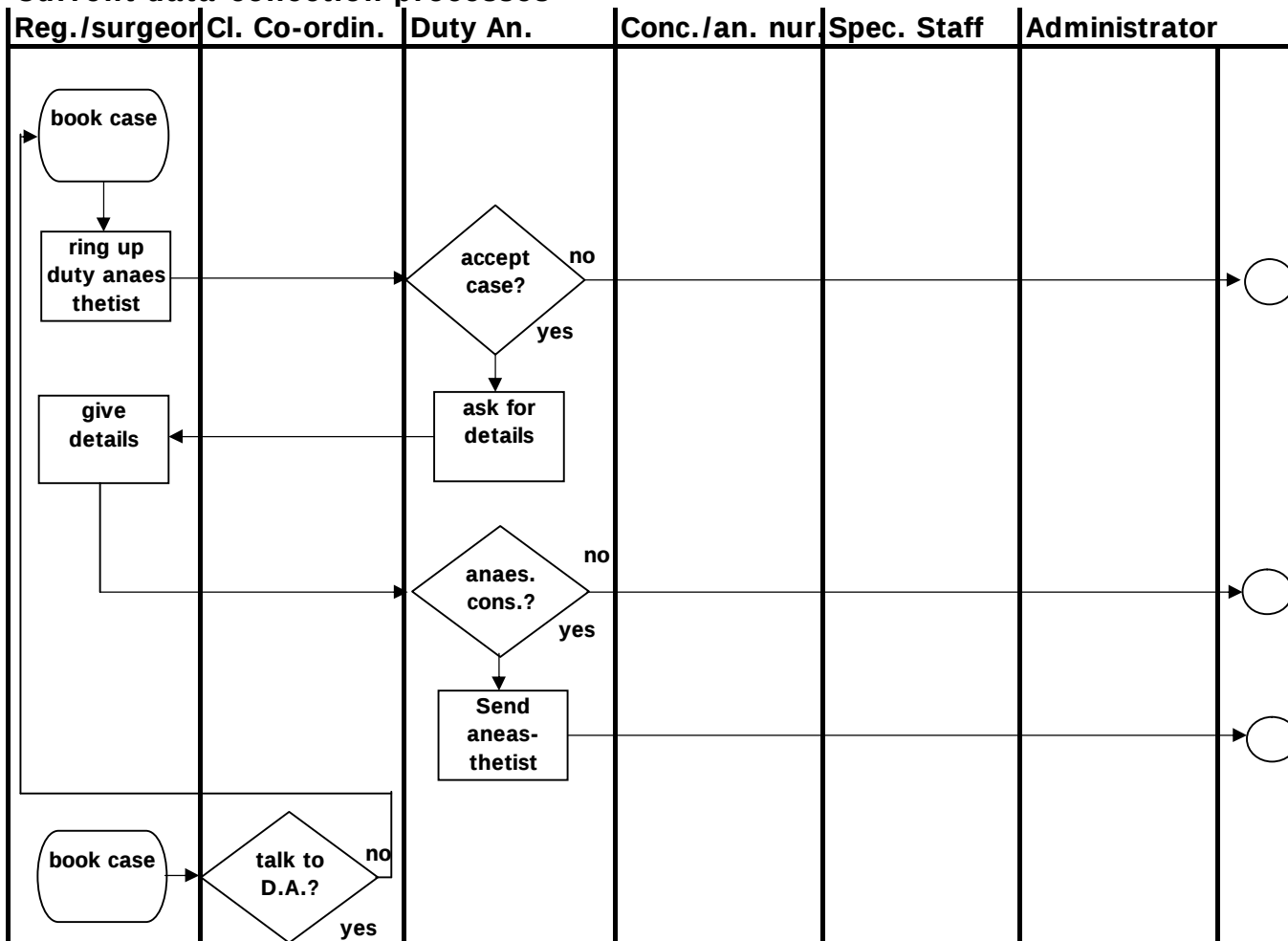
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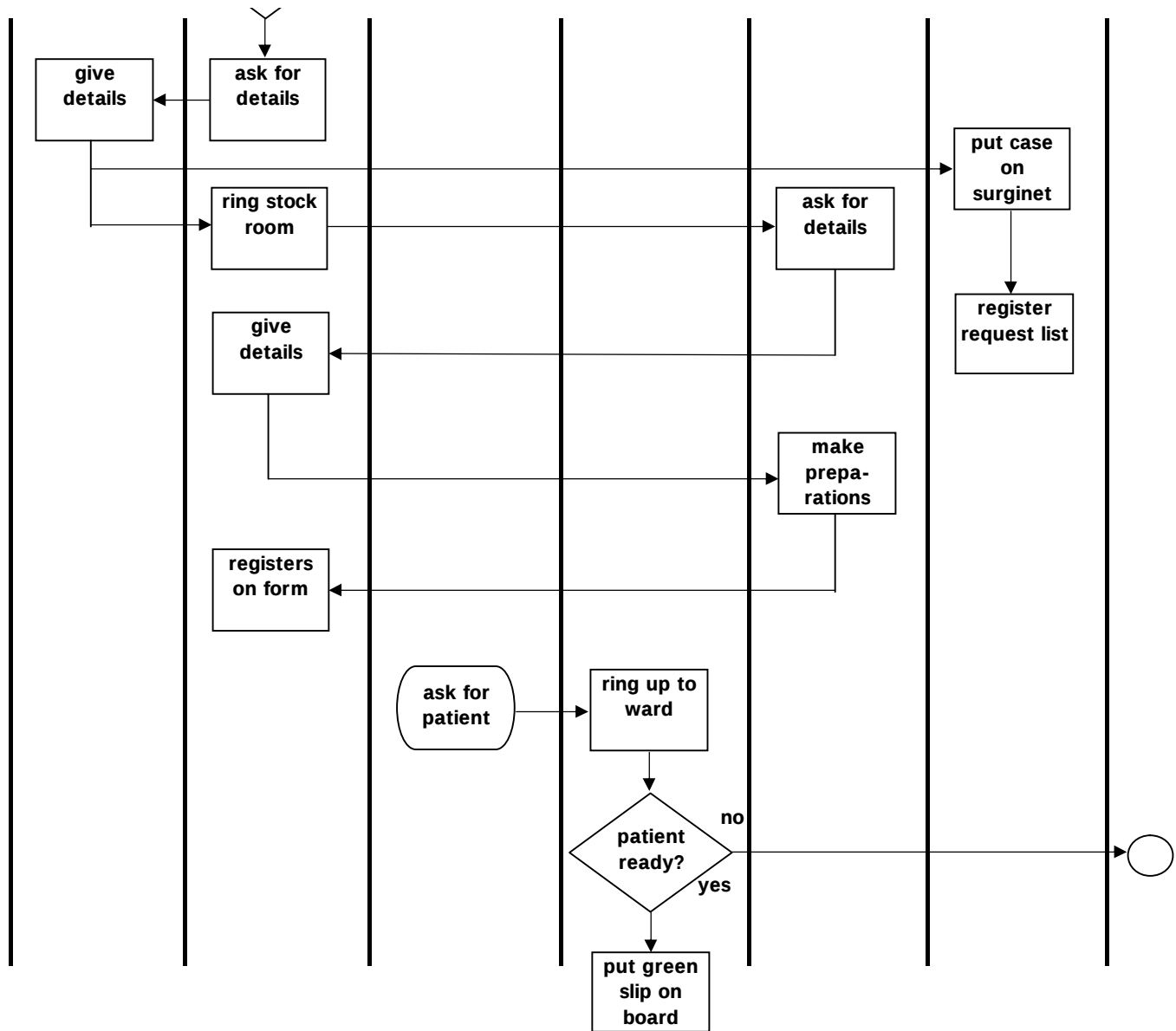
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Appendix 1

Current data-collection processes





put green
slip on
board



register
that ward
is rung



send
ward
staff



register
ward staff
is sent



check
patient at
red line



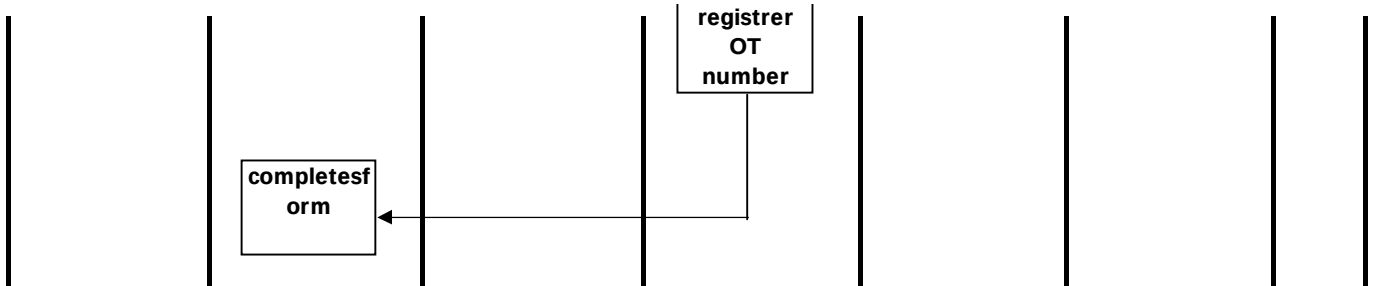
registrer
patient
arrived



send
patient to
OT



registrer
OT
number



Appendix 10

Dear

A research team from the University of Western Sydney have investigated Emergency Surgery Management (Fitzgerald, Lum, Dadich 2005) in which the dynamic and complex nature of decision-making concerning the prioritisation of unplanned surgery was confirmed. Another outcome was the identification that there is little uniformity between and within NSW public hospitals when unplanned cases are scheduled. In light of this, efforts to develop standardised practices through policy development may be somewhat futile, for they fail to appreciate the contextual differences of each hospital setting. Nonetheless, a decision-making tool can improve decision-making practices by acting as a catalyst for dialogue between and within professions when scheduling unplanned surgery.

I have been assigned to investigate the “Pink sheet” and design the decision-making tool. It may bring to the surface the unwritten rules used by competing professional perspectives; it may provide a common vocabulary for the effective discussion of priority-setting; it may act as a catalyst for dialogue between and within professions when scheduling unplanned surgery; and it may ultimately enhance inter-professional cooperation.

This research will be conducted over the next four months under the guidance of Mr Brad Scotcher, Clinical Manager – Surgical Services, SSWAHS Western Zone. It is important to collect information from several key stakeholders in the decision-making process. In collaboration with Mr. Scotcher we came up with your name to ask to participate in this research because of the relevance your position has in the decision-making process. Participation in the research is entirely voluntary. The interview will be conducted for analysis purposes only and your identity will be protected by your personal details not appearing in any raw data or in any written reports.

The design of the research is to first analyse the current processes surrounding the “Pink sheet” and scheduling unplanned surgery. I would request your participation after this analysis has occurred. At first an interview will be conducted to gain more insight into the current problems surrounding scheduling unplanned surgery. You will be asked for your observed gap with the desired performance (if any) and for possible solutions.

After this stage a new decision tool will be designed and implemented and your further participation would be necessary. Individual interviews and focus groups will be conducted to gain insight into the experiences of the stakeholders with the new and improved tool. Further refinements will then be made accordingly.

After the improved decision-making tool is refined and implemented, individual interviews and focus groups will be held once again. Focus groups will also be conducted

for the purpose of increasing group dynamics, stimulate discussion and to provide ownership of the new process.

The principles of action research will be applied meaning that these processes may be repeated several times in those four months.

Thank you for taking the time to read this request. I hope you are willing and able to participate in this interesting but also very important research.

Yours sincerely,

Huong Pham t.v.h.pham@student.utwente.nl