2016

Research to practice gap:

A qualitative study into the use of visualisation when implementing a new technology

Author:

Angelique Olde Meierink

Supervisors:

Professor Anneke Fitzgerald

Associate Professor Joanne Curry

Professor Erwin Hans

Dr Ingrid Vliegen

UNIVERSITY OF TWENTE.

Griffith UNIVERSITY

Abstract

Introduction: This case research investigates how visualisation techniques can assist with bridging the research to practice gap. Adapting and adopting new technologies is proven to be problematic in any organisation. This is well described in the implementation research literature. Research indicates that the majority of innovations fail to be adopted, particularly in healthcare. This is mainly due to implementation failure rather than to failure of the innovation itself. One solution for embedding a new technological solution may be the use of visualisation techniques such as 'Patient Journey Modelling' (PJM). This technique focusses on the human interactions when introduced to and asked to implement new technologies. To overcome the problem of failure to convince stakeholders to implement new technologies, this research investigates the effects of Essomenic, a patient journey modelling software. The primary objective of this study is to demonstrate the functionality of visualisation techniques (such as Essomenic) to assist with convincing stakeholders to implement a new scheduling technology, such as UltraGenda. In this context, technology is used to bridge the gap between research and practice.

Methodology: A comprehensive literature review and context description was undertaken as part of background research. Further to extensive background research, a qualitative approach was employed to investigate how the visualisation technique, Essomenic, assists with the implementation of a scheduling software, UltraGenda. This case research focusses on the experiences of healthcare managers and clinicians who are charged with the change process and work toward successful adoption and implementation of new practices. To gain a better understanding of the research problem, nine face to face semi structured interviews were conducted. Two methods of explaining and introducing new software were presented, and the views and opinions of the use of patient journey modelling for the implementation of new software formed the basis of data gathering. Interview data was transcribed and text data was analysed using thematic analyses.

Findings: This research added to existing implementation process theory that using a visualisation technique, such as Essomenic, can assist with the implementation of new software by putting the focus on human interaction. It found that implementation strategies should emphasise the preparation of the people involved and the preparation of their work environment. The preparation of people and their environment needs to be better articulated in the implementation plan. In addition, this research found that the use of patient journey modelling software is extremely powerful in visualising new practices and educating staff about the new practices to be adopted.

Conclusion: Patient journey modelling such as Essomenic that visualises human interactions with new processes, can lead to significant improvements in the engagement of stakeholders and

improved understanding of complex technologies or softwares. Hence, Patient Journey Modelling is a suitable approach to aid the implementation of new technological interventions and demonstrate the functionality and improvements that UltraGenda may lead to. The focus on human interaction with the new processes assists with bridging the research to practice gap. In addition, patient journey models are of high value for the introduction and education of new technologies.

Keywords: Visualisation, implementation research, patient journey modelling, technology, healthcare, implementation frameworks

Table of Contents

List of tables

List of figures

Abbreviations

CSC:	Computer Science Consulting
GP:	General practitioner
PJM:	Patient journey modelling
UG:	UltraGenda
QIF:	Quality Improvement Framework
PARTI:	Participatory Action Research Translation and Implementation

Statement of authorship

This work has not previously been submitted for a degree or diploma in any university. To the best of my knowledge and belief, the dissertation contains no material previously published or written by another person except where due reference is made in the dissertation itself.

Signed:

_____

A.H.R. Olde Meierink

Acknowledgments

Undertaking this thesis has been challenging and would not have been possible without the support and encouragement from my family, supervisors, colleagues and friends.

To my parents, Henk and Charlotte, and my brothers, Michel, Patrick and Jeffrey, I thank you for your continued support, love, encouragement and patience.

To my supervisors in The Netherlands, Professor Erwin Hans, Dr Ir Ingrid Vliegen, and in Australia, Professor Anneke Fitzgerald and Associate Professor Joanne Curry, your support, guidance and encouragement have been invaluable.

To the employees of CSC Sydney and Brisbane, thank you for the opportunity to use their software and the critical thoughts about my models.

To Dr Ryan Gould and Dr Katrina Radford, I thank you for their advice and guidance and making my Australian adventure [drop] bearable.

To my Australian family, Wilma, Kimberley, Jonathan, Tana, Lilly-Janna, Chris, Jessica, Michael and Claire for letting me be part their lives. Thanks to you I have a great time in Australia and I never felt home sick.

To the research participants who gave up their time to attend the interviews.

Angelique Olde Meierink

Gold Coast, June 2016

Chapter 1: Introduction

1 Introductory Chapter

1.1 Introduction

This research focusses on the use of technology to implement another technology as one implementation strategy overcoming the research to practice gap. The research focus therefore is on implementation research. It is answering a theoretical question, that of reducing the "failure to implement" issue, and the use of the visualisation technique becomes the context to understand and advocate for use when implementing. The objective of this research is the use of a technology to implement another technology in order to overcome the research to practice gap. In this thesis, the visualisation tool that is used is Essomenic. The example investigated in this research is the first introduction to implement the scheduling software UltraGenda with the use of the patient journey modelling technique, Essomenic. This first chapter is the introduction to the entire thesis and gives an introductory description of the background, research issues and practical and theoretical contributions of this research. It also outlines the justification of this research. In addition, a description of the methodology and outline of this report is given, as well as the delimitations of this research.

1.2 Background to the research

One of the most consistent findings in research of healthcare services is the gap between research evidence and practice (Grol & Grimshaw, 2003). Implementation research is concerned with bridging this gap through the study of methods to promote the uptake of research into routine practice. Although the majority of innovations are shown to be effective in research, they often fail to be adopted in healthcare (Kuo, Gase, & Inkelas, 2015). According to the literature (Aarons, Hurlburt, & Horwitz, 2011; Greenhalgh, Robert, Macfarlane, Bate, & Kyriakidou, 2004), this is mainly due to implementation failure rather than to failures of the innovation itself. This might be a result of the lack of involvement of organisations and their staff in the implementation process, leading to an insufficient understanding of the intended benefits and outcomes of the innovation. In addition, this gap exists because of the extended time it takes for evidence based research to become operational. This gap hinders the implementation process of innovations, such as the implementation and uptake of the new scheduling technology UltraGenda, which is the focus of this research. Using visualisation techniques may be one answer for the problem. This thesis investigates to what extent visualisation techniques, such as Essomenic, are useful when adapting to new technology.

1.3 Research issues and contributions

The literature points to several problems when implementing new technologies. Most of the time these new technologies sound very useful upon implementation but full adoption is seldom reached

or takes a long time to reach. Having a better understanding of difficulties in implementation research and visualisation tools, such as Patient Journey Modelling, will lead to a possible solution to bridge the gap between theory and practice. Essomenic is such a patient journey modelling technique.

The aim of this research is to investigate how technology can be implemented in healthcare facilities by using visualisation technologies, and how the use of the visualisation techniques can assist in convincing people to adopt a new technology. Therefore, the research question is:

"How can Patient Journey Modelling (PJM) assist in the implementation of new technologies in healthcare organisations?"

Sub questions are formulated to assist in answering the main research question. These questions, the method to answer them and the belonging chapter are presented in table 1.

Table 1: Research questions

Research questions	Method for answering	Which chapter?
What is implementation research and what are the issues around implementation?	Literature review	Chapter 2 Literature review
What is PJM? - **What is visualisation** - **What is Essomenic? How does it work?** - **What is UltraGenda? How does it work?**		Chapter 2 Literature review
	Literature review	
	Literature review, discussing with inventor and practice this program	Chapter 3 Context description
	Literature review, discussing with owners, practice this software	
How can UltraGenda be modelled within Essomenic?	Using Essomenic and UltraGenda	Appendices G-J
What are the difficulties experienced by change managers and healthcare workers?	Interviews	Chapter 5 Findings
Which method is preferred in introducing new software (UltraGenda) to staff, with or without the use of Essomenic?	Interviews, show 2 different methods of explaining new software for a first introduction to staff.	
Why is this method preferred?	Interviews	

1.4 Justification of the research

The literature is clear about the length of time to implement new interventions into practice (Green, Ottoson, Garcia, & Hiatt, 2009; Morris, Wooding, & Grant, 2011) and the average length of time is said to be 17 years. Thus the practice-theory gap remains lengthy and inconsistent. To date, no research has been undertaken to investigate visualisation as an aid for implementation. Therefore, the more we know about implementation of technology and use of visualisation techniques, the better we will understand how to implement innovations or new technologies. This research uses patient journey modelling technique, Essomenic, to implement new scheduling software, UltraGenda.

1.5 Methodology

This research is a retrospective theoretical exploration of possibilities for implementation of technologies. This case research studies the use of a technical intervention (Essomenic) to implement the software called UltraGenda. This research presents case research that uses a scenario toolbox. The methodology for this research arises from a pragmatic paradigm and has practical implications.

The research protocol starts with background research meaning a thorough understanding of the existing literature, deep understanding of visual analysis technique using the patient journey modelling technique Essomenic and undertaking practical experience using Essomenic for the introduction of a new technology 'UltraGenda'. The scheduling software UltraGenda will be modelled within two practical examples: 1) patient journey of endoscopic intervention, and 2) patient journey of a knee replacement. Firstly, using these practical examples, the current scheduling process is visualised using Essomenic. Secondly, the new scheduling software is modelled, showing the benefits to the patient journey when using the new scheduling software. These patient journey models are used in interviews to get insight in the use of visualisation for the implementation and first introduction of new technologies. This information forms the background to the research.

The next step was to interview nine stakeholders, consisting of people who work in the health industry as change champions and who had experience with change management techniques. Face to face semi structured interviews is the basis of the data source and a thematic analysis of the qualitative data followed. These outcomes are discussed in the findings chapter and linked back to existing implementation research. The full research plan is detailed in Chapter 4, Methodology.

1.6 Outline of the report

This chapter, Chapter 1, is the introduction to the thesis. Chapter 2 outlines the background to the research problem and critically assess the existing literature on implementation of innovations in the

context of health. Chapter 3 gives a greater insight into the patient journey technique and software used for this research. Hence, chapter 2 and 3, literature and context chapters, are the background chapters to this research. Chapter 4 outlines the methodology and methods used to investigate the research problem. Chapter 5 outlines the findings and Chapter 6 addresses the implications for theory and practice, and concluding remarks.

1.7 Definitions

This section gives the definitions of the frequently used terms, implementation, patient journey modelling (such as Essomenic) and UltraGenda.

For the purpose of this research the term implementation is defined as *"all the processes and outcomes which accrue to a strategic decision once authorisation has been given to go ahead and put the decision into practice (Miller, Wilson & Hickson, 2004; p. 203)."*

Patient journey modelling (PJM), such as Essomenic, is a visualisation modelling technique, which focusses on visualising healthcare processes creating a story board from the patient viewpoint. This technique is used in this research to map the patient journey using UltraGenda to schedule the patients in an Endoscopy unit, and patients who will undergo a knee replacement. These maps created two methods: one explanation using Essomenic to introduce new scheduling practices, UltraGenda, and one method that explains UltraGenda using the information manual provided by the company CSC.

1.8 Delimitations of scope and key assumptions

This research is limited to the context of the Australian health industry. It is also limited by the use of unique modelling technique 'Essomenic' as well as the software that is to be implemented, UltraGenda.

Further, the scope of this research is restricted to the length of time that I was able to do this research in and the willingness of the people working at the Computer Science Consulting company (CSC) that sponsored this research in-kind.

Some key assumptions that are in place when undertaking this research include:

- UltraGenda will be implemented, with or without visualisation techniques
- Participants have knowledge about management of change in their healthcare environment.

1.9 Summary

There is a well-known gap between science and practice. This gap hampers the implementation of new technologies. Using a visualisation technique, such as Essomenic, might assist with the

implementation of new software. This qualitative research investigates if visualisation techniques can assist in implementing a software, such as UltraGenda. The case under investigation in this thesis is the act of implementing UltraGenda, using patient journey modelling technique “Essomenic”. Hence, case research determines what problems are noticed by managers and clinicians during the implementation process in the context of healthcare. In doing this study, comments are made on the use of technology for the purpose of implementing new technologies in healthcare. This research is engaging a qualitative approach, using nine semi-structured face to face interviews, and is linking the findings back to existing implementation research. As such, this research has implications for practice – the use of technology to improve uptake of new technology - and implications for theory - confirming and firming up existing implementation theories-.

Chapter 2: Literature review

2 Implementation of new technology: a literature review

This chapter discusses implementation research including implementation process models that can be used to assist with the introduction and adoption of a new technology. The search strategy and search terms can be found in Appendix A. First, I briefly discuss the gaps between knowledge and practice. Then, I will define implementation research in order to explain theoretical concepts that deal with the uptake of new interventions. Before I discuss process models, I will outline theory about the implementation of innovation and innovative processes. Further, I will discuss visualisation techniques which are in this research important in assisting users to adopt new interventions. Finally, I touch on stakeholder identification and engagement, which need to be considered for the implementation process of an intervention.

2.1 Gap between knowledge and practice

Transferring of research findings into practice has been haphazard, slow and unpredictable (Glasgow et al., 2012; Rubenstein & Pugh, 2006). The research-practice gap is a result of some interacting factors. These include the lack of explanations for the use of the evidence based practice, limited time and resources of the healthcare workers, lack of proper training and feedback and poor infrastructure to support the implementation (Glasgow, Lichtenstein, & Marcus, 2003; Green, 2001). Several studies (Green et al., 2009; Morris et al., 2011) have stated that it takes on average 17 years for a new clinical innovation to be routinely implemented in practice. This number is based on a minimum of 1 year and a maximum of 24 years. As well as the extended time it takes for evidence based research to become operational, there is a failure of organisations to completely implement innovations they wish to adopt (Rycroft-Malone et al., 2012) or experience the desired results (Parry, Carson-Stevens, Luff, McPherson, & Goldmann, 2013). Although, the majority of innovations are shown to be effective in research, they often fail to be adopted in healthcare (Kuo et al., 2015). According to the literature (Aarons et al., 2011; Greenhalgh et al., 2004) , this is mainly due to implementation failure rather than failures of the innovation itself. This might be due to the lack of involvement of organisations and their staff in the implementation process, leading to an insufficient understanding of the intended benefits and outcomes of the innovation. Thus, due to limitations in the innovation process, the gap between knowledge and practice exists (Cochrane et al., 2007). This gap hinders the implementation process of innovations, such as the implementation and uptake of the new technology UltraGenda, which is the focus of this research. This research will add to implementation research, which will be defined next.

2.2 Defining implementation research

There is an increasing interest in the success of implementing innovations in a timely manner (Ellen et al., 2013). Hence, it is crucial to consider the definitions of implementation, implementation science and implementation research. When analysing the definitions that exist, I found that implementation science and implementation research is interchangeably used in literature (Eccles, Foy, Sales, Wensing, & Mittman, 2012; Wensing, 2015). As such, finding one definitive expression of implementation research was difficult to find and articulate.

For example, Miller et al. (2004) provides the following definition of implementation: Implementation is *"all the processes and outcomes which accrue to a strategic decision once authorisation has been given to go ahead and put the decision into practice" (Miller et al., 2004; p. 203)*

Implementation science can also be defined as "*the scientific study of the methods to promote the uptake of research findings into routine practice*" (Eccles et al., 2012; p. 2) Further to this definition, Eccles et al. (2012) add that the aim of implementation science is to improve the quality and effectiveness of health promotion, health services, and healthcare (Eccles & Mittman, 2006; Tabak, Khoong, Chambers, & Brownson, 2012).

Further still, Peters et al. (2014) state that implementation research aims to understand how innovations work in practical settings, whereby it is important to consider the audience, the context wherein the implementation occurs, the audience that will use or implement the research and the factors that can influence the implementation process (Peters, Adam, Alonge, Agyepong, & Tran, 2014).

So putting the definitions and aims together, and for the purpose of this research, implementation research is the scientific study of processes used in the implementation of innovations and the consideration of contextual factors that affect these processes with the aim to overcome the research-to-practice gap. This thesis will focus on where support can bridge the gap in an implementation process.

2.3 The implementation of innovation and innovative processes

Fleuren's et al. (2004) model for the transition from innovation determinants, via innovation strategy to innovation processes (Figure 1) gives an overview of the different phases in the innovation process. As indicated in this model, implementation is only one phase of the innovation process. It is important to note that the two steps before (dissemination and adoption) and one step after the implementation phase (continuation) need to be acknowledged as part of the overall innovation

process. In other words, the four phases are not mutually exclusive. Dissemination strategies and adoption strategies are essential for implementation, as is continual monitoring of success of intended outcomes. Figure 1 serves to explain that, whilst this thesis is about implementation, we cannot ignore that the act of implementation is a part of one whole: the innovation process. Hence, Fleuren's framework is appropriate to show where implementation fits in the entire process.

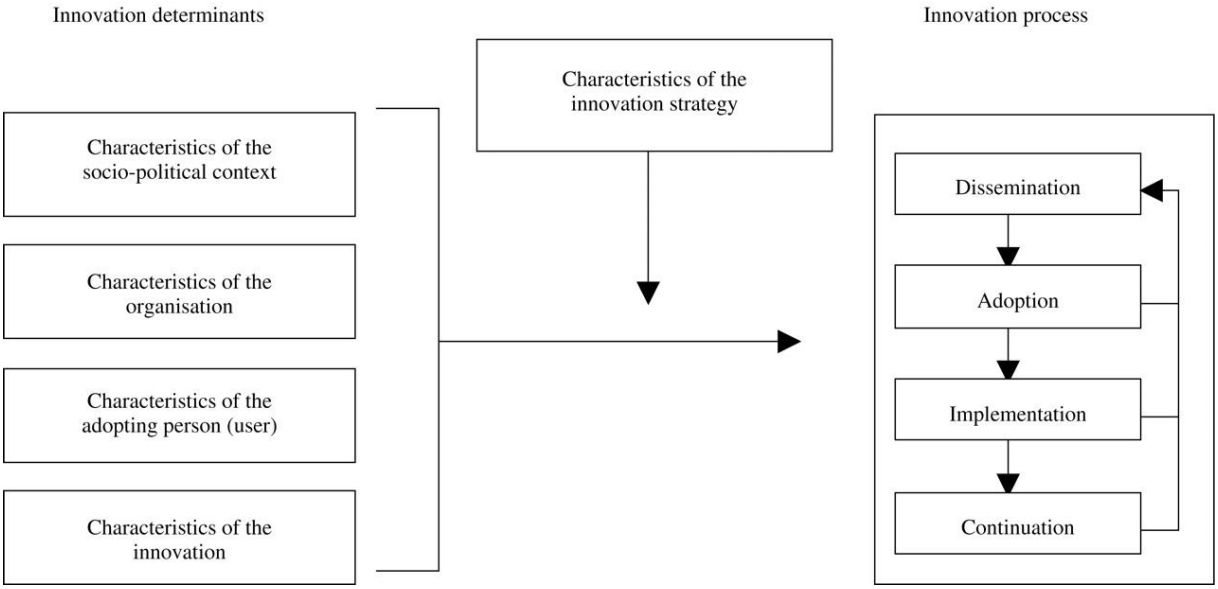


Figure 1: Framework representing the innovation process and related categories of determinants, (Fleuren et al. 2004)

Whilst the theoretical model, depicted in Figure 1, outlines categories of determinants for implementation of innovations and processes for innovation, the practice of actual implementation is aided by frameworks and models. The next section outlines some theoretical approaches in implementation research that help provides a bridge between theory and practice.

2.4 Implementation process models

Implementation research has made progress with regards to the increased use of theoretical approaches to provide a better understanding and elucidation of why and how implementation fails or succeeds. According to Nilsen (2015) the used theoretical approaches in implementation research have three overachieving aims:

- Description and guidance of the process of translating research into practice
- Understand and explain what factors will influences implementation results
- Evaluate the implementation (Nilsen, 2015)

Several different frameworks are distinct in implementation research. These frameworks can be assigned to five different categories, in accordance with the three aims as mentioned by Nilsen (2015). As Figure 2 suggests, the taxonomy of five different categories are:

- *Process models*: specify steps, describe and/or guide the translation of research into practice, e.g. QIF (Meyers, Durlak, & Wandersman, 2012).
- *Determinant frameworks*: aim to predict or understand/explain influences on implementation outcomes, e.g. CFIR (Damschroder & Hagedorn, 2011).
- *Classic theories*: are theories originating outside implementation science that can be applied to provide understanding or explanation, e.g. Theory of Diffusion (Rogers, 2010).
- *Implementation theories*: Provide understanding and/or explanation of aspects of implementation, e.g. Normalization Process Theory (May & Finch, 2009).
- *Evaluation frameworks:* describe the aspects of implementation that could be evaluated to determine implementation success, e.g. RE-AIM (Glasgow et al., 2012)

However, these categories are not always recognised as separate types of approaches in the literature. This distribution of aims and categories of theoretical approaches used in implementation research is presented in Figure 2 below (Nilsen, 2015).

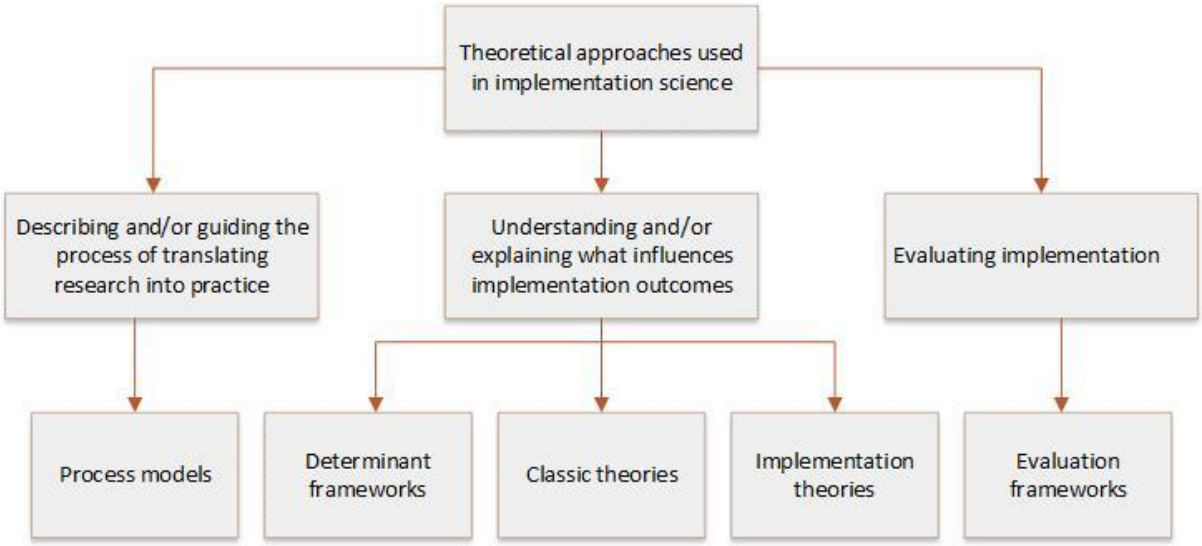


Figure 2: Three aims of the use of theoretical approaches in implementation science and the five categories of theories, models and frameworks (Nilsen, 2015)

Process models are about describing and guiding processes of translating research into practice. All stages in the translation process are specified in process models. Models, theories and frameworks are different concepts, however these terms are used interchangeably in implementation research (Nilsen, 2015). Process models can be used in assisting with the introduction and adoption of a new technology.

The focus of this thesis will be describing and guiding practice, i.e. the process models. The reason for this is that Essomenic is about patient journey modelling (PJM), which concerns all processes in healthcare delivery from a patient's point of view. PJM visualises processes in healthcare delivery, including scheduling practices provided by new technology: UltraGenda. Therefore, visualisation techniques are discussed in the next section.

2.5 Visualisation techniques

Visual analytics is the science of analytical reasoning, which is facilitated by interactive visual presentation (Thomas & Cook, 2006). It is an iterative process that combines the strengths of technologies and humans. Visual analytics techniques and techniques are used to combine information and acquire insight from large, dynamic, unclear, and often contradictory data. In addition, these techniques identify the expected and detect the unexpected. Furthermore, visual analytical techniques deliver appropriate, justifiable, and understandable assessments. Four main reasons show that technologies that are visual as well as interactive can be very helpful (Cook, Earnshaw, & Stasko, 2007). The first reason is that it is helpful for users to understand complex data and situations, whereas models alone are insufficient. Secondly, these techniques immediately discover trends, abnormalities and unexpected connections, and can evaluate hypotheses. Thirdly, these techniques can help the users in interpreting the information that is presented through the use of contextual suggestions. Lastly, these techniques stimulate users to engage with and examine big datasets that might otherwise be overwhelming (Wong et al., 2006). The strength of visual analytics is its pragmatism. Using graphical computer software, macro and micro processes can be depicted and modified, and subsequent effects can be identified.

Given its practical value, in this research I argue that visual analytics assist in the implementation process of new software in healthcare. It can help to visualise the impact of local decisions on entire systems (Wang Baldonado, Woodruff, & Kuchinsky, 2000). Thanks to its visual abilities of Essomenic, it helps in explaining and giving a better understanding of the innovations, UltraGenda. For example, a theory driven implementation framework has a higher chance of being successful when direct links are established between the intervention and behaviour change (Michie, van Stralen, & West, 2011). Visualisation will achieve this. Frameworks based on theory, instead of on practical or research intuition, can only help increase understanding of how and why an intervention works. However visual display of the process can ensure implementation. Visual analytics in combination with theoretical process models can be applied in different situations, to increase the understanding of implementation frameworks in general (Michie, Johnston, Francis, Hardeman, & Eccles, 2008).

In summary, implementation is one part of the innovation process which includes the dissemination of innovation, adoption of innovation, implementation of innovation and continuation. According to Nilsen's (2012) theoretical categorisation of implementations, the use of technology to implement an innovation would fall under the 'process theory'. The mode of implementation in this thesis is visualisation of the process. Hence, this research is novel in that it combines innovation theory, process theory and visualisation. To date I have not come across any literature doing the same. The next step is to understand the role of stakeholder identification and assessing who matter most.

2.6 Stakeholder identification and engagement

When implementing innovations, it is important to identify *who* is critical to the success of the implementation process (stakeholder identification) and how to involve them (stakeholder engagement).

Stakeholder identification focusses on mapping all persons and organisations that have interest in the project. Identifying these stakeholders gives project managers an overview of their internal and external stakeholder environment. First steps in this process is identifying the key stakeholders (individual and organisation) who have an interest or impact in the process, and matter most.

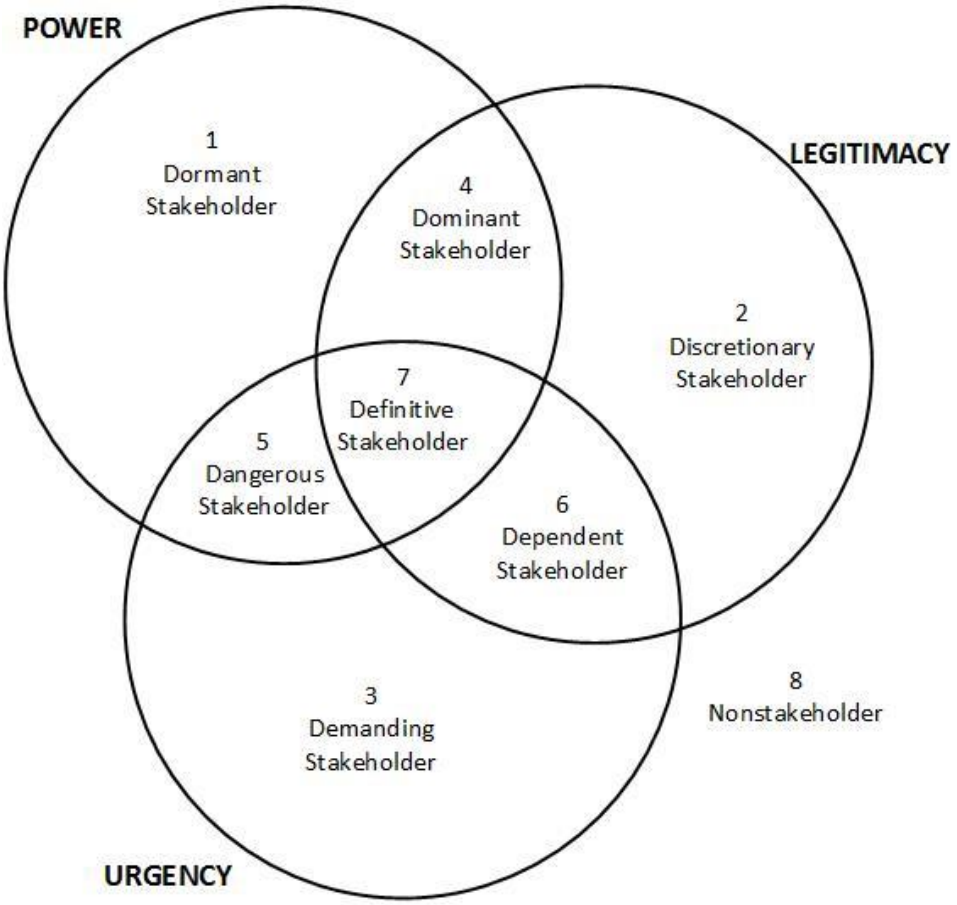


Figure 3: Stakeholder typology (Mitchell, Agle, & Wood, 1997)

The concept of stakeholder salience is an essential concept in understanding key stakeholders (Mitchell, Agle, & Wood, 1997). Stakeholder salience is defined as the degree to which managers give priority to competing stakeholder claims (Mitchell et al., 1997). Mitchell et al. (1997) suggested a theory of the stakeholder identification and stakeholder salience as a response to the many competing definitions of the stakeholder and the lack of agreement who and what really matters in an organisation. Considering the principle of who and what really matter, Mitchell et al. (1997) says that the first question requires a normative theory which defines who should be considered as stakeholders of an organisation. The second question asks for the descriptive theory of stakeholder salience, which explains the conditions when an organisation considers certain people or entities as stakeholders (Mitchell et al., 1997). A new normative theory for stakeholder identification is developed by Mitchell et al. (1997), which is based on three variables: power to influence an organisation, legitimacy of the stakeholders' relationships with the organisation and the urgency of the stakeholders claim on the organisation (Mitchell et al., 1997), see Figure 3. The more a stakeholder owns these variables, the more attention an organisation must give to this stakeholder. It is possible for a stakeholder to only possess one of these variables, these are named the latent stakeholders (Mitchell et al., 1997). An organisation does not recognise these stakeholders as salient. Definitive stakeholders are the stakeholders that possess all the three variables and matter most. Once identified, an organisation must give priority to these stakeholders (Mitchell et al., 1997). All three variables are dynamic, as the position of a stakeholders could change in time. The salience is based on an organisation's view and the stakeholder could or could not be aware that they own a particular quality or could not be willing or wish to act on that quality (Berg, 2001; Mitchell et al., 1997). Project managers should do a comprehensive stakeholder analysis to get a complete overview of their external stakeholder environment.

The second step is to focus on engaging with stakeholders and getting them to participate, either through acceptance or enabling them to exert a level of influence on the process and its outcome. Meaning, it is also important to focus directly on stakeholders during implementation (Bryson, 2004; Goggin, 1990).

Most research involving implementation frameworks does not necessarily include human factors, such as emotions and behaviour. Emotions can have a big influence on the implementation process and should be taken into account when undertaking a stakeholder analysis. Emotional engagement of the stakeholders during the implementation process can influence and contribute to the success of the implementation (Lapointe & Rivard, 2005; Piderit, 2000). This is also confirmed by Pandi-Perumals et al. (2015) who state that emotional engagement of the stakeholders is vital to the success and outcome of the process (Pandi-Perumal et al., 2015). By following the above two steps

and incorporating the ideas and opinions of stakeholders there is a higher chance of success in the implementation and maintenance phase. It is my premise that visualising how an innovation might assist with simplifying existing work processes will stir strong emotions, and engage stakeholders more quickly and readily.

2.7 Summary

In summary, there is a gap between research and practice, which is about managing change. Much is written about implementation frameworks and models, but less is known about how to use other techniques for implementing innovations. Existing frameworks on implementing innovations focus on 'the *what* and *how'* of the process. However, the act of implementing an innovation in healthcare is a human action.

Success or failure of the implementation of innovations depends on emotional engagement of the stakeholders, understanding and explaining 'the *why* and *how'*. Visual analytics is likely to assist in explaining the '*why'* and '*how'* of the process in a specific context. Thus, one way to embed an innovation may be the use of patient journey modelling technique, such as Essomenic, which uses visualisation. In the next chapter, Essomenic and UltraGenda are explained in more detail.

Chapter 3: Context

3 Context description: Essomenic and UltraGenda

This chapter provides the context description of this research. The patient journey modelling technique Essomenic and the software UltraGenda, used in this research are discussed. Essomenic is a visualisation technique that focusses on visualisation of healthcare processes and creates a story board from a patient point of view. This technique is used in this research to map the patient journey using UltraGenda to schedule the patients in an Endoscopy unit, and patients who will undergo a knee replacement. These maps created two scenarios: one scenario without the use of UltraGenda, i.e. current situation, and one scenario with UltraGenda implemented in the patient journey of both case examples. These scenarios are used in the interviews as one of the methods to explain and introduce the software, UltraGenda. The other method explains UltraGenda using the information manual provided by the company. Section 3.1 discusses Essomenic and section 3.2 outlines UltraGenda.

3.1 Essomenic

Essomenic is Patient Journey Modelling and is a relatively new innovation in healthcare quality improvement (Curry, 2008; Curry, Fitzgerald, & Eljiz, 2011; Curry, Fitzgerald, Prodan, Dadich, & Sloan, 2014). Modelling the healthcare processes with Essomenic gives a clear view of the patient's process through the healthcare system. Several contributing cross-discipline technologies have been developed to better understand workflows in hospitals. These are: Joint Application Development, Process reengineering, Lean Thinking and Workflow modelling. However, all these techniques have deficiencies in relation to Patient Journey Modelling as they were designed for other industries (Curry, 2008). Still, there are precise needs of healthcare transformation initiatives. For this reason, a new communication technique was developed, Essomenic. Essomenic is specially designed for the healthcare sector and its goal is supporting healthcare providers to develop new care processes to realise new and emerging models of care (Curry, 2008). These patient journey models can provide problem insights that would otherwise not be noted, e.g., interactions between patient and certain staff members, and showing where waiting time exist in the process. The goal of Essomenic is improving the healthcare quality by eliminating unproductivity and decreasing variability within the healthcare process.

3.1.1 Advantages of Essomenic

Essomenic shows the patient's movements through the healthcare organisation are modelled from a patient centric perspective. Due to several settings in which Essomenic has been successfully conducted, the achievements of the patient journey modelling technique have been proven. Especially in healthcare improvement projects in the areas of midwifery, mental health, neonatal,

ambulatory care, chronic kidney diseases, lymphoma and osteoarthritis, Essomenic has shown added value (Curry & Prodan, 2013). Patient journey processes can be improved by (Curry, 2008):

- Eliminating the excessive and unproductive activities
- Collecting the required information only once
- Compliance to evidence-based best practice
- Eliminating or reducing unnecessary or duplicated activities
- Decreasing the number of movements of a patient in the care process
- Decreasing duplicate activities
- Providing clear information to the patient
- Improving communications between patient, care takers and physicians involved with the particular journey

3.1.2 Layers of Essomenic models

The delivery of patient journey improvements in healthcare involves three layers; the logical model, physical model, and construction and implementation environment. The relationship between these layers is shown in Figure 4. The first layer is the logical model, and encompasses the requirements of an individual patient journey, which is without any technological restrictions or considerations. Next, the physical layer that involves the considerations of which technology should be used and what the best option is in applying it for the delivery of the patient journey requirements, which were defined in the logical model. The last layer is the construction and implementation of supporting information systems. This layer deals with the actual building and supply of suitable technological solutions for the healthcare provider and patient community. This layer is based on the physical model (Curry, 2008).

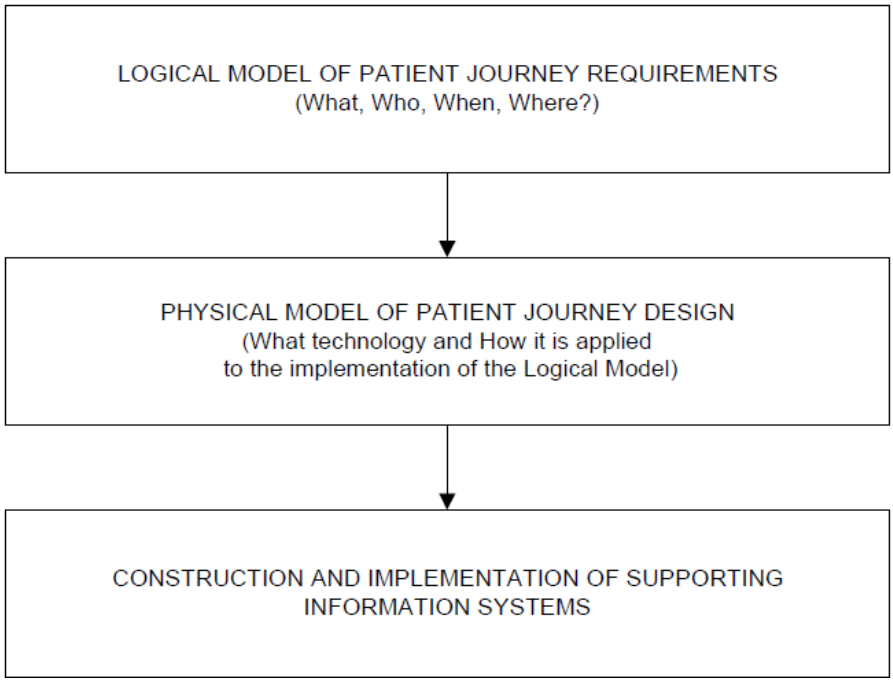


Figure 4: Relationship of the Different Layers of Abstraction Involved in the delivery of Patient Journey Improvements in Healthcare (Curry, 2008).

Essomenic is easy and clear to understand. It is build up out multiple dimensions that are shown as individual layers, which are (Curry, 2008):

- ***Patient movement;*** the patient dimension shows when, where and how often the patient attends or is moved as part of its journey.
- ***Staff roles;*** this second layer shows which staff members are involved and where they interact in the process.
- ***Processes;*** The third layers describes every step of the patient journey and relates the processes that are involved in this journey.
- ***Information creation/update;*** this layer presents where the information of the patient is stored, e.g., medical record.
- ***Patient needs/practice guidelines/policies;*** the fifth layer is used to show if there are any patient needs, e.g., an interpreter, or guidelines are needed.
- **Measurement;** the last layer explain the values of the measurements, e.g., how long the waiting time is between two steps. These measurements can be used to determine the effectiveness of the patient journey.

The models are read from top to bottom, and left to right. Every layer has its own value in helping to understand the patient journey process (Curry, 2008). See appendices G up to and including J for examples.

3.2 UltraGenda

In the past, diagnoses and treatments were based on the knowledge and competency of the healthcare professionals. Nowadays, healthcare delivery becomes more and more a multidisciplinary approach, which results in an increasing complexity of the scheduling process. (UltraGenda, 2010). UltraGenda can be a technological solution in this complex scheduling of appointments.

UltraGenda is an enterprise scheduling solution which enables hospitals and outpatient clinics to manage the scheduling process across entire hospitals and hospitals departments. As presented in Figure 5, UltraGenda consists of several layers, which are:

- UltraGenda Broka: booking or referring by GPs or referring practices
- UltraGenda Pro: scheduling of appointments or rooms
- UltraGenda Track Pro: follow up of patients
- UltraGenda Contact Store: reporting, analytics

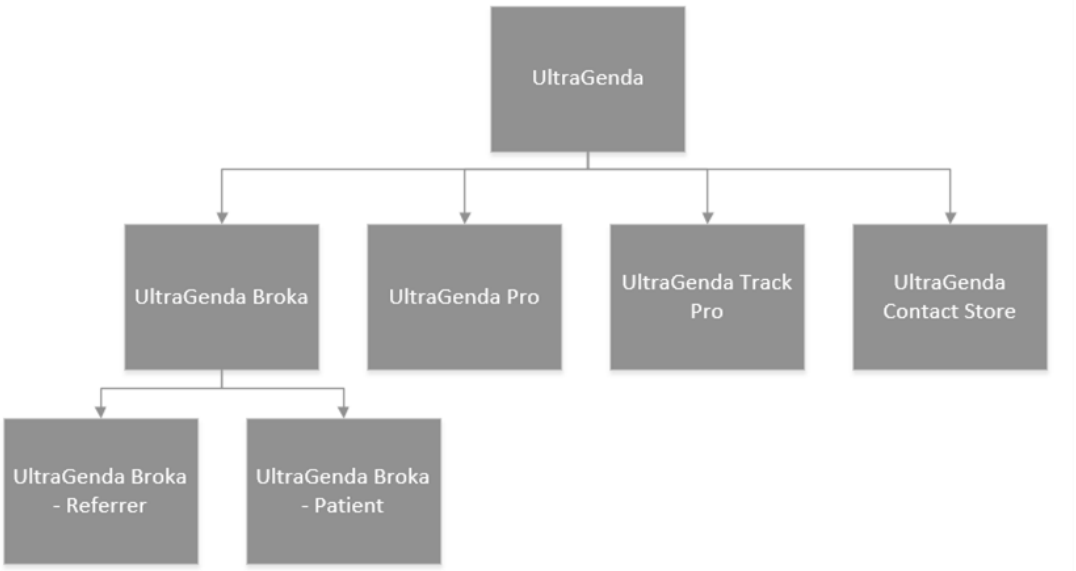


Figure 5: Division of UltraGenda

All these layers are connected with each other. The scope of this research will focus on UltraGenda Broka and UltraGenda Pro. Therefore, only these two programs will be discussed in more detail.

3.2.1 UltraGenda Broka

UltraGenda Broka is a platform for online referrals and bookings. This software consists of two portal applications, one for the referrers and one for the patient. In such electronic referrals the decision making is central. By using the decision tree, the referrer is routed to initiate the correct clinical action with the right priority. UG Broka's patient portal allows patients to pick up their referral and book an appointment themselves, and it allows patients to manage their appointments (UltraGenda, 2010).

3.2.2 UltraGenda Pro

UltraGenda Pro is software for planning of primary and secondary resources, such as appointments with physicians, or operating rooms and modalities. This software is clinically driven and rules based, ensuring the patient is seen by the correct clinician based on the patient's reasons for having an appointment. Different types of appointments can be scheduled with UltraGenda Pro, these are single resource, multiple-resource appointments and an order set of consecutive appointments. Multiple-resource appointments are appointments that concern more than one schedule. Order sets appointments are sequential appointments, whereof the duration between each of the sequences is fixed. Rescheduling or cancelling is also possible with this software.

UltraGenda Pro provides specific questionnaires before scheduling an appointment, gives recommendations and offers instructions for the patient. After filling in these questions of the decision tree and receiving recommendations for an appointment type, UltraGenda presents which doctors are available for this certain type of disease. Site selection is another possible preference option. This automated specified selection of doctors makes it easier for the patient and administrator, because it saves a lot of unnecessary appointments and referrals. (UltraGenda, 2010).

3.2.3 Interaction between UltraGenda Broka and Pro

UltraGenda Broka interacts electronically with UltraGenda Pro. Referrals made in UG Broka are sent to UG Pro, and added to the external referral request list. In case the patient is not authorised, the patient can contact the hospital for their appointment or vice versa. If patients are authorised, they can pick up their referral and schedule an appointment online (UltraGenda, 2010).

3.2.4 Advantages of UltraGenda

UltraGenda is an enterprise scheduling solution for healthcare settings. The main advantages are listed below:

- *Multi (resource) appointments can be scheduled in one go:* Multi-resource planning is planning of appointments for multiple departments simultaneously. Without this, the patient or administrator needs to contact several departments to book every appointment

separately. Using UltraGenda will save a lot of time, because the patient does not need to contact all departments separately.

- *Multiple resource appointments can be scheduled on the same day:* Hence, a patient can schedule all appointments at different departments on the same day.
- *Recommendations give the correct physician, leading to prevent unnecessary appointments and second correct referrals.* UltraGenda Broka gives a questionnaire concerning the complaints of patients. This questionnaire gives a recommendation for an appropriate doctor. This recommendation helps in deciding which physician to refer to. All physicians which are specialised with this medical complaint are shown. A result of this is that the patient will be referred to the correct specialist. Nowadays, if the administrator lacks the knowledge on the specialisms of the physicians, patients are referred to the wrong physician. Consequently, the patient needs to get a new referral via the general practitioner.
- *Time saving:* Instead of booking appointments by phoning every department, and waiting until you can speak to the administrator, appointments are booked digital. This saves time because unnecessary waiting on phone calls is gone (UltraGenda, 2010).

3.2.5 Summary

Essomenic, and UltraGenda Broka and Pro are the main focus in this research. Essomenic represents the patient's perspective and provides a common language for all stakeholders, in a single visual output. The aim of patient journey modelling, such as Essomenic, is improving patients' safety, the total healthcare quality and outcomes by decreasing variabilities in the healthcare process. For the purpose of this research, UG Broka and UG Pro will be modelled within two practical examples, i.e., patient journey of endoscopic intervention and knee replacement. Once the two examples are modelled, I have enough experience and understanding of the techniques to use these as scenarios for the qualitative part of this research: seeking an understanding of implementation barriers and facilitators in Australian healthcare context and to investigate if the use of Essomenic would assist with an early engagement in a change process. In other words: do the participants believe that explaining a new innovation with the aid of Essomenic is helpful. The next chapter will outline the methodology and methods used.

Chapter 4: Methodology

4 Methodology

As discussed in the literature review chapter, a gap between theory and practice exists. Visualisation techniques, e.g. Essomenic, is considered to be a useful technique for the implementation of a new technology in healthcare, e.g. UltraGenda. Hence, the goal of this thesis is to investigate if visualisation techniques would be appropriate to use to implement innovations.

This research is unconventional and the methodology chapter may look slightly different than what qualitative research traditionally dictates. Qualitative reports often include the use of the first person, which is accepted practice (Webb, 1992).

This chapter will describe and justify case research to demonstrate the use of visualisation to implement new software. In doing so, this chapter outlines the process of knowledge creation, including a description and justification of the methods for data collection, and outlines methods of analysis.

Section 4.1 presents a justification for the philosophical stance, pragmatism, and as such, it outlines the criteria for establishing valid and reliable knowledge, leading to the identification of a suitable methodology. Section 4.2 presents a stepwise protocol for the collection of data. Section 4.3 will outline the analysis and how I came to the conclusions.

4.1 Method of knowledge creation

4.1.1 Justification

This research is qualitative in nature. According to Hassar (1990) a qualitative methodology requires a research problem encompassing people's opinions, experiences and interpretations which have not previously been examined. Qualitative research involves detailed exploration and analysis of a particular topic. This research investigates the opinions of people about visualisation when implementing technology. Therefore, qualitative research is appropriate.

4.1.2 Ontological, epistemological and methodological implications

A qualitative research paradigm includes ontological, epistemological and methodological aspects (Guba & Lincoln, 1994).

Ontology is the study of ‘being’ and concerns the researcher’s views on the nature of reality (Bristow & Sauders, 2015). It questions in whose reality the findings are interpreted and requires reflection of the reality within the researcher who is interpreting the findings. The interpretations made in this research, are based on the view of the participants, who share their views about management of change and the aspects that impact their organisational practices. Pragmatism is considered a

philosophical stance for research that is real-world practice oriented, problem centred and looks at the consequences of actions (Creswell, 2009; p.6). The ontological assumptions of this research are based on pragmatism as the interpretations of the data collected from the participants will have implications for future practice.

Epistemology is philosophically allied to ontology, and concerns warranted knowledge (Bristow & Sauders, 2015), or how knowledge is created. Epistemology is about the ways of knowing what you know (Yin, 2011; p 18). Interpretivism underpins the epistemological assumptions of this research. In an interpretivist research the aim is to understand and interpret the implications of human behaviour rather than to generalise and predict causes and effects (Neuman & Wiegand, 2000). In this type of research, it is important to understand, opinions, explanations, motives and other subjective experiences that are context and time bound (Neuman & Wiegand, 2000). The role of the researcher, me, is to construct an impression of the world as the participants see it (Ratner, 2008). The participants own experiences are the main area of the research for this study and these experiences are interpreted by the researcher.

Thus the methodology for this research is underpinned by a pragmatic reality and interpretivist creation of knowledge. The combination of pragmatism and interpretivism guides the researcher to what she believes can be known (Guba & Lincoln, 1994). Methods refer to how evidence about the issues are collected. Methods refer to the protocol for data collection.

4.1.3 Etic and emic

When discussing a qualitative research methodology, the perspective of the researcher needs to be considered. The view can be etic or emic or both. In an etic study, the researcher keeps a certain distance from the object of research and views the phenomenon from the *outside* (Ellinger, Watkins, & Marsick, 2005). An emic research attempts to study a phenomenon from the *inside*, through the eyes of the participant culture that is being studied. In this research, I investigate the influence of the use of visualisation technology to implement a new technology in healthcare settings, which is an etic approach. However, as I am emerged in the technology, representing the method and representing the tools, it can be said that this research is also approached from an emic perspective. My being is influencing the research outcomes. My technique for data collection is influencing the research outcomes and therefore considered emic research. Applying etic and emic perspectives are operationalised by undertaking open-ended interviews and field observations.

4.1.4 Research design

As stated in the introduction, this research is a retrospective theoretical exploration of possibilities for implementation of technologies. In this case, I am looking at the use of a technical intervention

(Essomenic) to implement a new technology: UltraGenda. This research presents case research that uses a scenario toolbox.

According to Yin (2011) case research

> "investigates a contemporary phenomenon (the 'case') in depth and within its real-world context, especially when the boundaries between phenomenon and context may not be evident". (Yin, 2014, p. 16) Existing circumstances are viewed by the case study to best answer the 'how' and 'why research questions as argued by (Yin, 2004, 2009).

Qualitative case studies aim to promote and advance learning in contrast to the quantitative case study that tests a hypothesis (Flyvbjerg, 2006). It is therefore particularly suitable for '*how'* and '*why'* research questions focussing on a contemporary phenomenon with situations where the researcher cannot control behavioural events (Yin, 2011). Case research enables a holistic view to be obtained about the institutional complexity as a result of studying stakeholder behaviour in their natural context (Benbasat, Goldstein, & Mead, 1987).

Case research is most applicable in an exploratory type of research (Saunders, Lewis, & Thornhill, 2009). An exploratory research can be used if someone wants to determine "what is happening, to seek new insights, to ask questions, and to assess phenomena in a new light" (Robson, 2002, p. 59). The case under investigation in this thesis is the act of implementing UltraGenda, using patient journey modelling technique 'Essomenic'. Hence, case research determines what problems are noticed by managers during the implementation process in the context of healthcare. The aim of this research is to investigate how technology can be implemented in healthcare facilities by using visualisation technologies. Therefore, this research is exploratory.

According to Yin (2012) there are 5 defined steps in case research:

Table 2: Steps in case research

Step in case research	Description of step
1. ***Define your case***	The implementation of UltraGenda using Essomenic
2. ***Chose a case study design***	This research is a simple single case research. The unit of analysis is the individual who are presented with two experiences: explanation of new technology without using visualisation techniques; the explanation of new technology with using visualisation techniques.
3. ***Consider the role of***	As mentioned in chapter 2, theory exists about the

theory	implementation of innovations in healthcare, however a gap between research and practice exists. In this research I am linking implementation research to assist with the implementation and uptake of new technology using visualisation techniques.
4. *Triangulation of evidence*	In this research I am making use of source triangulation, given the fact that I have identified different groups of participants. Triangulation adds rigour, richness and depth to the design and to the data. Randomisation of the sources also adds rigour: the sequence of 'with or without using visualisation techniques' was randomly assigned.
5. *Develop the protocol*	The research procedure and subsequent protocol is discussed in the next section.

Research procedure

This research is considered negligible risk to the Griffith University and gained full ethical clearance GU Ref No: 2016/147. This paragraph elaborates which steps are taken order to answer the research question. These steps are shown in Figure 6.

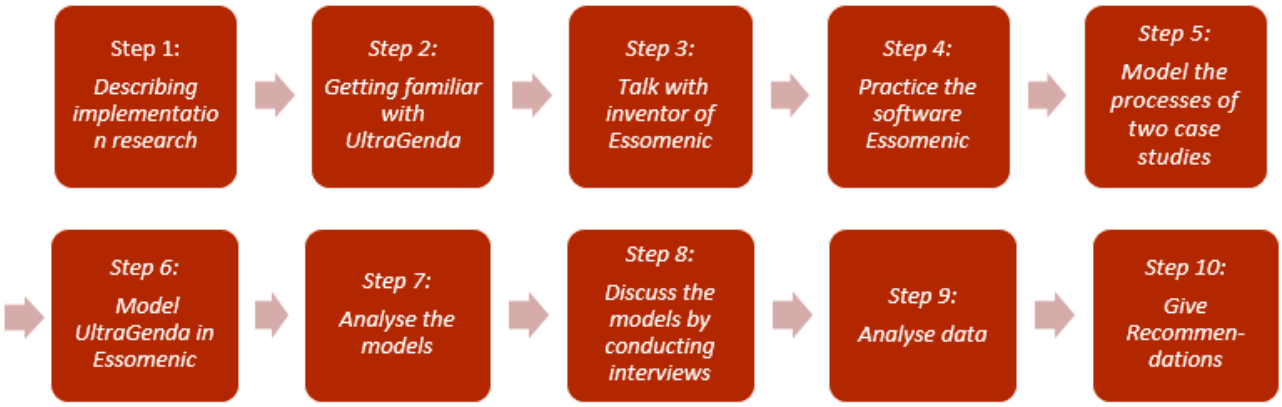


Figure 6: Research procedure

The steps of the research procedure in this research are as follows:

- *Step 1: Describing implementation research*

  The first step in this study is describe what implementation research is about, and why this research is of added value.
- *Step 2: Getting familiar with the software UltraGenda*

The second step in this research is to learn about UltraGenda. It is necessary to fully understand this software and try to use the software.

- *Step 3: Talk with the inventor of Essomenic*

  The next step is to learn about Essomenic. What is the goal of Essomenic and how can it be used in different settings.

- *Step 4: Practice the software Essomenic*

  Fully understanding of the software is done by practice with the software. In this case it will be easier to understand where Essomenic can be used in this research. It support in understanding all parts of the software.

- *Step 5: Model the processes of two case examples.* For this research, two cases will be modelled (Appendix H and Appendix J) to show what the current healthcare process is of the patient with a certain medical complaint. In order to model the correct processes, these will be discussed with persons who are familiar with the process from experience of undergoing the procedure or working within this area. Hence, in other to improve the healthcare process and to know where UltraGenda interacts in the process, the current situation of the healthcare process of the case study is needed.

- *Step 6: Model UltraGenda in Essomenic*

  Thereafter, the process with the implementation of UltraGenda in the healthcare process will be modelled (Appendix I and Appendix K). It shows where UltraGenda is of influence in the process, and it helps in understanding how this software UltraGenda functions. I will verify these models with the clinicians and the people who are familiar with Essomenic and UltraGenda.

- *Step 7: Analyse the models*

  Once the processes without and with UltraGenda are modelled, these processes will be analysed. In this case I will understand where UltraGenda can be of importance of the healthcare process. This will help me in explaining with the use of Essomenic what UltraGenda is and what its advantages are in the healthcare process.

- *Step 8: Discuss the models by conducting interviews – the actual research*

  The next step is to discuss the models with practitioners who understand and are familiar with the problems around scheduling in healthcare. I will gather their thoughts about implementing technology without the use of Essomenic models and implementing technology with Essomenic models.

- *Step 9: Analyse data*

  In this step I will analyse the data gathered form the interviews.

- *Step 10: Give recommendations*

  After analysing the data, I will give recommendations about the analysed data, which will help me in given a deliberated answer on the research question.

4.2 Method of data gathering

This section of the methodology chapter describes and justifies how the data was gathered. As highlighted by (Creswell & Miller, 2000; Yin, 2004) a clear description of the data collection protocol is an important mechanism for creating 'credibility' in qualitative research. Stepwise research makes qualitative research scientific. According to Boeije (2009) qualitative research processes permits the researcher to "reinterpret the information while preserving the participants meaning" (Boeije, 2009; p.14).

4.2.1 Interviews

According to Yin (2011) the success and reliability of a research is created in the preparation and the evaluation of the (interview) data. This research uses semi-structured face to face interviews in order to gain further insight from the respondents (Yin, 2011). Whilst undertaking focus groups was a consideration, in this particular case, the research required individual responses to enhance the breadth of data gathered. Focus group data is fraud with 'group think' where people might agree with the most salient group member, when in reality their own opinions are not heard (Chioncel, Veen, Wildemeersch, & Jarvis, 2003). The cohort in this research – clinicians and managers – are also difficult to organise in groups. Hence, face to face interviewing was more appropriate.

4.2.1.1 Sampling method

The population that is interviewed for the purpose of this research are clinicians and managers in Queensland Health. A pool of potentially eligible interviewees was established by convenience and snowball sampling. According to Yin (2011) snowball sampling, whereby previous participant refers the researcher to more participants is a useful technique, because this allows the researcher to target and access a diverse sample group of participants who could answer the research questions. In doing so, following Yin's advice, at the conclusion of each interview I asked the participant for new referrals. All potentially participants got a recruitment email with information about this research (Appendix B). Participants were selected in regards to their knowledge and experience about the subject and their ability to reflect and provide detailed information (Whiting, 2008). Twelve change managers and clinicians were asked to do an interview, nine of them responded and agreed with participating in an interview.

4.2.1.2 Interview method

The research participant was informed about the purpose of the thesis, data collection, and the voluntary nature of participation in the interview. They then received the participant information sheet (Appendix C) and consent letter (Appendix D) outlining the purpose of the study, ensuring their confidentiality and anonymity. Also see ethical consideration in Appendix E.

At the introduction of the interview, I explained the goal of my research and the structure of the interview. Interviewees were asked to select a number between zero and twenty. Those who chose an even number were first offered an explanation of UltraGenda software *without* the visualisation technique 'Essomenic', before UltraGenda was explained *with* the aid of Essomenic. Those who chose an odd number first received the explanation of UltraGenda *with* Essomenic, and then the explanation *without* it. See Appendix F for the (even version) presentation used in the interviews.

The interview contained of three distinct parts. First, I asked the questions: "Could you tell me something about your experience with implementing a new technology or other aid in healthcare?" I was particularly seeking examples of barriers and facilitators to implementation of a technology software. This line of questioning also prepared the interviewee for the next step.

Second, I used the two different ways of explaining UltraGenda, according to the randomisation exercise. I gave a short tutorial on the use of UltraGenda *without* and *with* the use of Essomenic. I then asked the interviewees which mode of explanation they preferred: with or without, and why. This gave me deeper insights into the utilisation of visualisation techniques and likely levels of adoption of new software. The randomised order of explanation methods of the software assured that sequence of explaining had no influence on the outcome.

Third, I asked the participants to think back to the example they mentioned in the first part of the interview and specifically focus on their previous experience. The question was if the participant thought that visualisation would have helped them with understanding, adopting and implementing technology when they had to implement it in the past. I then asked if they had any additional comments, issues or suggestions that they want to raise. I thank them for their time.

All interviews were transcribed verbatim to create text data for analysis. After the interview was transcribed, a respondent validation was carried out, by sending the interview transcript to the interviewees to validate responses and provide further clarification if needed. In addition, in order to gather all important and complete information, field notes were made during the interview. These included notes on the observations during the interview. Some observations included describing the reactions of interviewees. Their faces showed their level of understanding and in some cases delight with the visualisation technique.

The interviews were conducted at a location preferred by the respondent. In this research it was either at their workplace, which is in most cases the hospital, or at their homes. The duration of the interviews is approximately 40 minutes.

4.3 Method of data analysis

Typically in qualitative research, once the data has been collected, transcribed and read through, the transcripts are coded (Creswell, 2003). After transcribing the interview, I reread the transcripts. To analyse line by line the transcripts of the interview in order to identify initial codes within the data the method of constant comparison of Corbin & Strauss' (1990) was used. This was accomplished through open coding by underlining the words and writing a phrase of three words that represented a short summary of each thought, opinion or view inside the text (Saldaña, 2015). Also see the Appendix G for an example of the coding. Defining these phrases was first done on paper, and added to excel later. Codes with a similar meaning were linked to the same category.

The interview consisted of three parts. First, I asked the interviewees to describe their experiences with managing change. Second, I presented two methods of explanation: one with the use of Essomenic, one without the use of Essomenic and I asked which mode of explanation was preferred and why. Third, I asked if using visualisation techniques would have assisted them in their example given to the first question. In analysing this data, I kept these three parts separately.

From the categories that fit together, I formed themes. These themes were linked to theory, using the quotes of the research participants. This three phase coding is illustrated in Figure 7. Text data was analysed using thematic analysis.

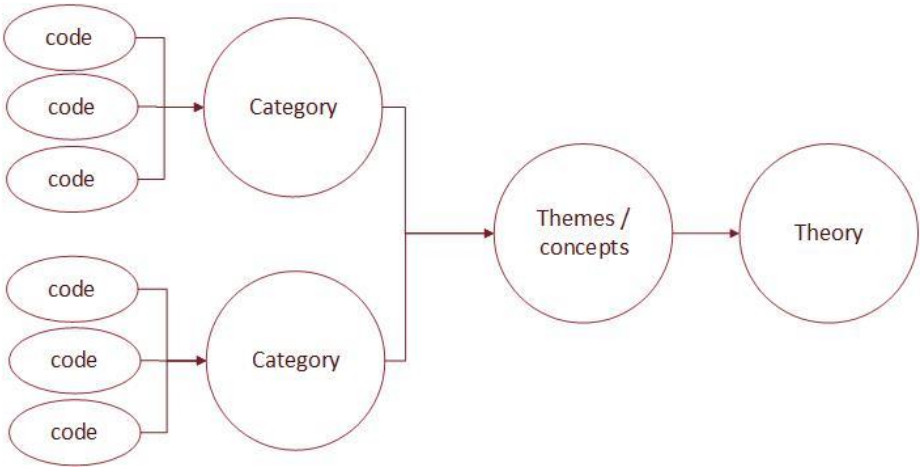


Figure 7: Three phase coding

4.3.1 Validity and transferability

Validity is an assessment to determine whether the findings of the research accurately represent what they supposed to be about (Saunders et al., 2009). In qualitative research, there is more of a focus on validity to determine whether the account provided by the researcher and the participants is accurate, can be trusted and is credible. To achieve validity in this research, first the models I created in Essomenic were verified with specialists inside the CSC and clinical specialists from outside CSC. Second, the interview questions where developed and discussed before the actual interviews, to ensure the right questions were asked in order to gather the right information. Third, to validate the responses, a summary of the interviews were sent back to the respondents in order to verify their original opinions. In addition to the validation techniques it is well known that face validity in qualitative research is always high.

In terms of reliability, qualitative research is by nature unreliable and as such reliability has limited meaning. In this research, reliability is somewhat strengthened by transcribing the interviews verbatim, including the pauses and overlap, giving a true picture of the data. In addition there was high degree of inter-coder agreement. I shared some of the transcripts with my supervisors and colleagues, and we had similar findings.

As opposed to quantitative research, qualitative research does not seek truth and generalisability. Generalisation is a word that should be reserved for survey questionnaires only (Silverman, 2013). The claims we can make from qualitative data are 'extrapolated' rather than generalised and, therefore, research may be *transferable* to other contexts, but cannot be generalised

4.3.2 Limitations of the methodology

Some limitations are present in this research. First, the research environment is a controlled company setting. UltraGenda is a software developed by a company who is prejudiced about this technology. Nevertheless, this limitation is minimised by discussing the models with several people inside and outside the company CSC. Models in Essomenic were discussed in order to get the correct patient journey of the endoscopy procedure and knee replacement process (Appendices G-J).
Other limitations include the different hospital settings, different contexts and different points in time. Nevertheless, I embraced the different settings to gain a wider understanding and the interview were conducted within a limited timeframe – over a period of two weeks - so that these were not heavily influenced by temporal differences.

Conducting the interview has also some limitations. The number of interviews, how the interview is conducted, and the questions posed all have influence on the outcome of the questioning. Nevertheless, these are common limitations of qualitative research and the depth of the data gained by doing interviews in this research outweighs the limitations of the small number of participants. In addition, as stated generalisations are not sought, but rather, a deeper understanding was the aim of this research. Regular reflections on own influences on the data gathering process assisted with ensuring minimised bias.

4.3.3 Bias

In order to minimise researcher bias, the research process and any conclusions were discussed, evaluated and confirmed during regular meetings with my supervisors. A reflective process allowed me to test my own biases by thinking deeply about the research results. Researcher bias was also minimised by checking if the models, and conclusions in the data analysis are correct and valid according to specialists.

4.4 Summary

This research methodology is underpinned by pragmatism and interpretivism. This chapter outlined the research protocol using scenarios created by Essomenic, on a topic of implementation of UltraGenda. Nine interviewees were presented with two methods: one that used Essomenic to visualise the way the new technology, UltraGenda would work in practice, and one where UltraGenda was explained without visual aids. Text data was analysed using thematic analysis. Some limitations exist, but are characteristic of any qualitative research.

The next chapter will discuss the findings.

Chapter 5: Findings

5 Findings

This chapter reports the findings gathered from the interviews. A total of nine healthcare managers and practitioners were interviewed for this research. In their voice, section 5.1 describes the difficulties with implementing new technologies from participants' experiences. Section 5.2 discusses the preferences of two different methods of explaining a new technology to the organisation's staff. Section 5.3 explains the findings that visualisation techniques are deemed to be of great assistance and preferred when implementing a new technology.

5.1 Experienced difficulties in implementation

As previously reported, successful implementation of new technologies or softwares in healthcare organisations is difficult (Berg, 2001). Some of the difficulties experienced by the research participants concerned issues such as: lack of staff involvement, lack of understanding and insufficient training and lack of time. Each of these aspects are discussed below.

5.1.1 Lack of staff involvement

The perceived problem of lack of staff involvement might be twofold: due to a lack of engagement of staff by managers in the decision making processes, or due to a lack of involvement by staff because they are reluctant towards enacting changes.

Most participants advocated the lack of engagement. One participant noticed that some staff members simply do not want be engaged:

> *"…[implementation] impacts everybody and it was a program that involved everybody from first right up. So that was, that is a challenge to engage that bulk of people [staff] who don't want to be engaged." (Participant 6)*

However, the process of engagement is frequently not much focussed on the involvement of stakeholders, i.e. staff. Implementing new processes or technologies are often simply imposed by managers without considering the actual implementers (Konrad, 2006). A lack of engagement of stakeholders in the early implementation process can lead to stakeholders rejecting results that vary from their expectations. Likewise, failure to include salient stakeholders have similar results (Craig, 2010). This is also stated by one of the participants who said:

> *"But still people [staff] felt that the decision was already made. They were not part of the decision making. And frankly the features were never used in the way that they could have been used." (Participant 1)*

Notwithstanding the lack of engagement, some participants recognised that engagement, especially emotional engagement, is crucial in the implementation process:

> *"So it was really about engaging them [staff] as stakeholders, managing the stakeholder expectation and stepping them through the project in terms of milestone. So what we did was draft up a communication plan about the sorts of things that were going to happen and give that to people to say this is what you can expect." (Participant 3)*

> *"You need kind a bit of an emotional engagement then. So if we don't do this we could harm the patient. So that's another way of engaging people to you know fix and correct and engage." (Participant 6)*

Literature suggested that the human factor of implementation is underdeveloped (Berg, 2001; Fitzgerald et al., 2016; Jackson, 2001). Thus, it is no surprise that the findings in this research confirm this. As we already know, research evidence alone will not result in changing practice, though the understanding of the reasons behind why people commit and execute changes at individual levels could lead to more successful implementation (Fitzgerald et al., 2016). The research of Fitzgerald et al. (2016) resulted in the Participatory Action Research Translation and Implementation (PARTI) framework, which is based on the Quality Improvement Framework (QIF) (Meyers et al., 2012). Compared to other models, the PARTI framework focusses on individual responses when new practices will be implemented. The first two phases (of four phases) of the PARTI model focusses on the preparation of people and the preparation of the environment. Hence, early engagement of stakeholders in the implementation process is essential, as was argued by a participant:

> *"Like, 'We all have to move on. Here it is'. And even though the company had to come in and do a lot of training etc., training alone is not enough to get people on board to use it." (Participant 1)*

Henceforward, providing education and training to learn the new technology alone is not enough for a successful implementation (Glasgow et al., 2003). Staff need to see what the importance of the technology is and engage with the staff from the beginning.

In addition, staff are often not involved in the decision making process of implementing a new technology. This might be due to resistance to change, as is noted by one participant, who stated:

"They could not see the point of why do you need to have that monitoring. They felt it was monitoring of them rather than of their practice. So they took it quite personally."(Participant 1)

Another participant commented on the lack of involvement as a result of decreed changes:

The thing is because our general manager decided we were going with it so they had to. (Participant 9)

Decreed change, or top down determined changes to policy and practice, classically does not involve staff, i.e. practitioners, from the start. In the health environment, decreed change is common practice and unpopular, which hampers implementation processes. Yet, some participants mentioned that the environment is vital for implementing new aids:

"Your environment is a big factor in change management."(Participant 6)

Existing research recognises the critical role of user involvement played by achieving successful implementation (Glasgow et al., 2003; Green, 2001). According to Berg (2001), including potential users in the project group is not enough. In general, staff, i.e. users, are poor in understanding and explaining the specifications of a technology. They are also poor at visualising which certain configuration of the technology they need, or which part of the technology would work best in a particular situation. This will be discussed in the next section. Developing such judgement skills takes time. In order to reduce this length of time, users need to be taken on board early in the implementation process (Berg, 2001). Hence, it can be implied that involvement of staff is a key factor for successful implementation.

5.1.2 Lack of understanding

As stated, software or other technologies are sometimes difficult to understand by healthcare professionals. The main reason is that they do not speak the same language as the software developers. Especially people who tend to be computer illiterate and/or technophobic have difficulties in understanding new technologies. This is a particular problem in healthcare. As one participant stated:

"There are people who are computer illiterate." (Participant 8)

Another one said:

"The difficulties were a lot of health professionals and nurses are not computer savvy. So using the technology even if it's just a computer because the majority of the evidence that we had to keep and collect is electronic and some people can't

use computers. So that was one challenge for some people. Then in young nurses that's not a challenge, in old nurses that is a challenge." (Participant 6)

Another commented on the resistance to change in general, and said:

We've done it this way for so long. Why do we need to change? (Participant 4)

The understanding is not made easier when the instruction, education and training is too specific, too technical. Some participants stated that within their own experiences:

"There are always difficulties of trying to understand the mechanism of the program, in other words what the program does, how easy it is to use…… Probably the interface, that it is a different interface, different controls and different terminologies." (Participant 5)

Another participant said:

"It was complex wording and there was two hundred plus criteria. And they [staff] couldn't understand the complex wording of the criteria. Then we had to break it down into just simple [sentences] and put in day to day things that they did around those words. (Participant 6)

Beer and Eisenstat (2000) argued that organisations would lack strategic consensus and clarity about goals (Beer & Eisenstat, 2000). Noble (1999) stated that if staff poorly understands the broader scope and goals of the organisation, they are not able to work sufficiently in order to reach a different organisational level with a new strategy (Noble, 1999). In addition, the user friendliness of the new technology is a significant issue in healthcare (Liu et al, 2000). Therefore, a clear understanding of the aim of the implementation and understanding of new technology is essential. Visualisation techniques, such as Essomenic, may assist in giving a better understanding of the innovation and could visually show what the goal of the implementation is. The next section will discuss the lack of proper education in more detail.

5.1.3 Insufficient training

In addition to the lack of understanding in implementing a new technology, participants mentioned the issues of poor training and little reflection on the implementation process. Previous research indicates that an insufficient level of education results in a failure to completely understand how a technology is used and how it impacts the process of implementation (Markus & Tanis, 2000).

Educational preparation is often poor. Explanations about why an innovation needs to be implemented is regularly neglected and education about the usage of new technologies is often minimal. A lack of education and understanding will result in poor use of the technology. If medical workers do not understand and remember how to use the new technology properly, these staff members will most likely forget some (important) steps, or will take shortcuts in using the technology. One of the participants noted:

> *"Someone on the staff maybe would educate them [new staff] the way they have been doing it. And you know it gets lost after a while in translation, people take shortcuts and forget what they need to do." (Participant 7)*

Every staff member has their own, and sometimes incorrect way, of using a technology. Teaching new staff the wrong method of using technologies may result in real problems. Using visualising techniques as part of the education will assist in getting a better understanding and higher uptake of the new software (Curry et al., 2011; Curry et al., 2014). Therefore, reflection of tasks is an essential part of the implementation process.

As mentioned before, not every user is computer savvy and users have a different level of education. This means that staff with different levels of education need to be approached in different ways. One of the participants said:

> *"The expectation of different levels [of education] is different for the requirement to achieve the standard [knowledge]. So you had to be aware of your audience [the staff] and what they would do." (Participant 6)*

Implementation may be restricted by a low level of technical education among the staff (Liu, Ning, & Jajodia, 2001) and a lack of technical support (McAlearney, Schweikhart, & Medow, 2004). Patient journey modelling (PJM) can assist in giving an understanding of the practical situations and tasks, because of the visualisation of the patient journey. It will teach staff step by step how, in this case, UltraGenda, works. Staff can see where they fit in the whole process, which makes it more relevant to them. Therefore, it is important to adapt the training to the level of education of the staff. Patient journey modelling, such as Essomenic, can assist in giving this education and shows visually the role and the tasks of the user.

Whilst the users of technology have issues with adopting the new technology, a great deal depends on the training provided by the software provider. One participant said:

> *".. often it [the implementation of a new software] comes down to the software provider, how well the training is. A lot of time it's a poor training. They don't offer good training. So you have to work it out yourself. Often times the manuals are very complex and time-consuming to go through, and I think the majority of the time we never use this software to its fullest potential, because we don't know what there and how to use it correctly." (Participant 5)*

The technical training provided by the software company is dependent on the team that implemented the technology. A participant said that they make sure that the staff understand the technology:

> *"We had to make sure people had an understanding of what they had to do and that they actually had to change and do something different." (Participant 3).*

If the staff understands why and what they must do to fulfil a task correctly, they can reflect on this and on how to improve their skills. Hence, reflection of their work will decrease the number of mistakes. As discussed by Fitzgerald et al. (2016) reflection is an essential phase in the implementation process. The fourth stage of the Fitzgerald et al. (2016) PARTI model is about reflection and assessing the new state. This stage includes a reflection on what has been done and on the lessons learnt. In addition, leader champion evaluates which problems have appeared and identifies whether these need addressing by returning to the first stage, preparation of people (Fitzgerald et al., 2016). The visualisation models can assist in this reflection phase.

Once it was clear that the change was going to be implemented, it was essential to feel supported. One participant said:

> *"When it was first implemented they came around there was a phone number on the computer, which you could call for help on the line but initially they came just physically around. Which was right, because people felt supportive." (Participant 8)*

Hence, providing proper training is significant for the understanding and uptake of new technologies. Using these visualisation techniques give the users a better understanding of the importance of the implementation. This requires good educational preparation. Therefore, a visualisation technique may be of use when educating staff members. It will give a more understandable way of visualising the technology in practice. Thus, good training using visualisation techniques is essential.

5.1.4 Lack of time

The participants also mentioned the lack of time to learn about the innovations as an issue, as evidenced by the following quotes:

> *"Often it was about the workload. They [the staff] just felt that they had enough to do clinically…. They didn't really have the time to do this extra stuff." (Participant 4)*

Another participant commented:

> *"They [the staff] didn't agree about the timeframe because it was often very quick that they had to do things." (Participant 3)*

Another participant said:

> *"My experience with any new technology change in Queensland Health has always been very poor. We are not shown [how the technology works] or you can go to a group lesson and learn stuff as they take it through. There's not a one-on-one ability to get tailored information unless you can fit in with the time slots that they say during your working hours you miss out on seeing a group presentation." (Participant 6)*

Therefore time and timing are considerations when implementing a new technology. Lack of time is identified as one of the main barriers for implementing evidence-based results into practice (Bradshaw, 2010). It will be difficult to implement an innovation successfully if the time to understand '*why*' and '*how*' to use this particular innovation is too short.

In addition to timing, the lack of opportunities and time to practice the use of technology is a problem (Alpay & Russell, 2002). It is often the case that staff must learn how to operate with a new technology in a short period of time. Implementing new technologies is difficult as it depends on the available time and skills of the staff members. Visualisation can assist with speeding up the process as it will visualise how to use the technology.

Thus far, this chapter has focused on experiences of participants when implementing new software into their day to day practice. A lack of staff involvement, lack of appropriate training and education and lack of time were all considered barriers to successful implementation.

The next section displays the findings of Part 2 of the interviews, which presented the two methods for introducing and explaining the new software UltraGenda: One method without the use of visualisation techniques and one with the use of visualisation techniques.

5.2 Explaining UltraGenda with two different methods

This section elaborates on the preferences of the participants of one of the methods over the other: explaining the software UltraGenda, without or with the use of Essomenic. All the participants unanimously preferred the explanation with the use of Essomenic. The participants indicated that they had a better understanding of the software after the explanation with Essomenic. In this section, I evidence the reasons for their preference for using patient journey modelling, such as Essomenic, which included: easier to convince the need for change, explanation of the why, and that it is a visual and stepwise approach. Further I explain why it could be useful as education technique, the understanding of the why and how it can improve the communication between stakeholders.

5.2.1 Visualisation of new working process

In order to fulfil the process in its entirety, one must complete steps in the correct order. It is important to understand each step and how it works within the process before moving onto the next step. When staff understand each step and its purpose, this will decrease the number of mistakes, allowing the healthcare process to improve its efficiency. The following quotes provide evidence for this:

> *"I am visual. So I like the flowchart aspect and I what I really liked was that I can have a full understanding of the patient's journey. The other one [explaining software with PowerPoint] I didn't understand; it was just a process. You were teaching me how to do something to get a patient appointment but I had no background or understanding of why I was doing all of those things or I would be doing all of those things." (Participant 6)*

> *"Because I see exactly what's going and have a look at the other screen so I'm actually get a better idea chapter by chapter and seeing the process from top to bottom and not having so many questions in the back of my head." (Participant 2)*

> *"It is very simple to see, you know who [staff and patient] is going to be involved, if there is a document generated, what actually has to happen. So I like the idea of that. It looks very straight forward to me." (Participant 3)*

Using a visualisation technique will assist staff in a better and quicker understanding of the technology and change. Explaining the software by visualising the process steps, will support with a quicker uptake. Without visualisation, staff are less likely to use the software by themselves. It is much harder reading a manual rather than have a visual of the process and see how the software or technology works. The latter, explanation with use of Essomenic, was clearly preferred by all the

participants and required less ongoing support from the software company. One of the interviewees argued:

> *"Just because, for the first one could I do it again if you left me alone? … I actually couldn't do it again. I would need you still to be here. With the second explanation I think I would have a resource where I could possibly do it again." (Participant 6)*

This quote indicates that visualisation may assist with changing behaviour as it links 'the *how*' and 'the *why*'. As discussed in the literature chapter, a theory driven implementation framework has a higher chance of being successful when direct links are established between the intervention and behaviour change (Lapointe & Rivard, 2005; Piderit, 2000). Visualisation will achieve this. Thus, the participants could see a real benefit using Essomenic for the implementation of UltraGenda software.

5.2.2 Showing relationships between healthcare workers, patients and technology.

Essomenic shows additional dimensions that other modelling approaches ignore. These include patient needs, evidence-based clinical practice and complex multiple-path process flows. In addition, Essomenic is highly graphical and visual, making it easy for both clinical and non-clinical staff to understand. Essomenic shows the interactions with staff and technologies, during the patient's healthcare pathway. Essomenic helps people to understand their systems in such what that changes are easily implemented (Curry, 2008). In addition, in Essomenic, step by step is mapped out on *how* to use the new software is and clearly displays *who* is involved with a particular process step, and *how* this affects the patient. Showing these relationships is essential to understand the entire process. One respondents commented:

> *"I find that relationship of the steps in their relevant screen is much better to portray the information." (Participant 7)*

Another had a much better understanding of the sequence of events resulting in a desired outcome when using Essomenic. She stated:

> *"You need to know why you have to change your practice and you need to know why you're doing it. Somebody just come along and say do this now and not give you a reason why because then you'll going to get revolve in the system. So, people need to know why you're doing it, why the changes happening and the outcomes are a bit outcomes for the patients." (Participant 4)*

Using visualisation techniques supports with gaining a better understanding of the scheduling software as it shows a more understandable way of what the benefits of the new software

UltraGenda are and how to use it. According to Rapert et al. (2002) a lack of clear common understanding is a major barrier in implementation process (Rapert, Velliquette, & Garretson, 2002). Essomenic provides an end-to-end view of the system of care as experienced by the patient and can assist in giving a common understanding between healthcare workers and software developers in the healthcare and implementation process. Hence, using Essomenic would be helpful to bridge this barrier.

Using visualisation techniques assists in showing where the patient, staff and technologies fits into the patient journey. The following are some comments participants made in regards to patient journey modelling:

> *"My assumption is that Essomenic will help people see entire picture where they fit in but more importantly where the patient fits in." (Participant 1)*

> *"So what I like is the way you can see where the interactions happen when you got the staff and patients together for the patient. So the patient or whoever is the user can look at it and go oh this is an opportunity to have these people either talking together or whatever." (Participant 3)*

> *"It actually takes the focus away of the boss wants it or the nurse wants or the company wants you to have it. It actually can tell the story why it could be more important for the patient. And that is a motivating factor for most because it de-personalizes things from what people want who are working on it; the centricity around the clinician to the centricity of the patient." (Participant 1)*

According to Curry (2008) patient journey modelling, such as Essomenic, shows the complex stakeholder interactions and clinical streams that occur within healthcare. Using PJM also results also in more comprehensive, robust and specific models that will decrease process variability and increase patient safety (Curry, 2008). In addition, models contribute in building consensus among (particularly difficult to convince medical) staff and assist in the planning of interventions and improvements (Camann, 2001). Hence, PJM, such as Essomenic, will help in giving insight in the interactions of patients, carers and technology and will put the centricity around the patient.

According to Nilsen's (2012) theoretical categorisation of implementations, the use of technology to implement an innovation would fall under the 'process theory'. Essomenic uses a stepwise approach that tells the patient journey. Besides, Essomenic explains the process steps in using the technology, UltraGenda. It tells the staff step by step how to use the software. Hence, using Essomenic gives a clear view on how to use UltraGenda and where it is involved in the healthcare process.

5.2.3 Visualisation as an educational technique

As stated above, visualisation techniques are useful to educate the new software. In addition, it is also useful as an orientation technique or simply a reminder of how the software can be used to serve the patients best interest. Most participants confirmed this, evidenced by the following quotes:

> *"Well I think it's going to be useful for when you are teaching the admin staff to be able to use this piece of software, for them to be able to look at it to go; you know like it is very simple to see, you know who is going to be involved, is there a document generated, what actually has to happen. So I like the idea of that. It looks very straight forward to me." (Participant 3)*

> *"You get consistency because everyone will be shown the same way. I like that fact that where you put your little people, who is involved in which step that's really good as well." (Participant 7)*

> *"For me, I learn particularly and don't usually use journey boards but I think it's a great way and I would pick up a system a lot quicker if I had a journey board…." (Participant 2)*

> *".. if we had those visual pictures sort of up on the wall or whatever it gave you each step, I think the learning would've been quicker." (Participant 9)*

Novice learners, or new staff members, can become quickly overwhelmed by too many details or windows of a software program (Naps et al., 2002). Using PJM, such as Essomenic, to explain how a technology works, will assist in giving an easier and more understandable explanation of how a technology works.

One of the main advantages of process mapping tools for the use in cooperative learning is their adaptability to a specific content. Using pictures and certain types of relations provided in clear abstract concepts can assist with the focus the staffs' discourse on relevant aspects without undue constraint (Fischer, Bruhn, Gräsel, & Mandl, 2002). Content specific visualisation encourages the staffs' focus on the task-relevant content and increases the quality of the processes of collaborative knowledge construction (Fischer et al., 2002). Therefore, visualisation techniques, such as Essomenic will be useful for the initial and ongoing education of complex software.

The advantages and disadvantages of visualisation have been researched in different contexts. For example, Murre et al. (2013) surveyed 28000 participants between 11 to 80 years of age. This research investigated if human memory has preference for either verbal memory or visuospatial

memory. This research shows that the visuospatial memory is dominant (>60%) in both the short and the long term memory of all the research participants, indicating the advantages of visualisation (Murre, Janssen, Rouw, & Meeter, 2013). Further to this research, visualisation is said to enable new perspectives, because pictures have been shown to inspire creativeness and imagination of people (Whyte, Ewenstein, Hales, & Tidd, 2008). According to Tversky (2011 the human's input channel capacity is larger when visual competences are used (Tversky, 2011). Visualisation supports solving complex problems by condensing information (Vessey, 1991). In addition, different studies have shown that visual representations are superior to verbal sequential representations in different knowledge tasks (Bauer & Johnson-Laird, 1993; Burkhard, 2004; Glenberg & Langston, 1992; Larkin & Simon, 1987). Using visual techniques is effective for the transfer of knowledge. As described in the literature chapter, visualisation techniques has many advantages, which are presenting new perspectives by discovering trends abnormalities and unexpended connections, motivate and engage people, providing a greater understanding and interpreting of complex data and situation (Cook et al., 2007; Wong et al., 2006). Because visualisation techniques have so many benefits, it would be very useful for the implementation process of a new innovation. Thus it is no real surprise, that, in this research, all participants preferred visualisation over verbal and written explanations. Hence, Essomenic as an educational technique seems most effective.

5.2.4 Visualisation techniques to aid convincingness

As the participants mentioned, staff generally do not like change. However, using visualisation technology such as Essomenic, could be a valuable technique to convince staff to adopt new practices. One respondent reflected:

> *"So if you go from the premise that nobody likes change then would this be more convincing? Probably. It would probably be more convincing." (Participant 1)*

Another participant mentioned:

> *"It's easier to visualise it [change] and you can actual see the process rather than talk about it in very various words. And people learn better from visual rather than by explanation or by PowerPoint." (Participant 8)*

Another participant said:

> *"And so if you deliver something that shows patient centred care, and how they fit into that journey, that's where you'll convince people." (Participant 9)*

Using the visualisation technique explains the reasons why and where change results in efficiency (Curry, 2008). By the way of using a story board, people can relate to the new processes, and therefore visualisation techniques will be more convincing. The next section briefly discusses the third part of the interviews which was about how visualisation would have assisted implementation of technology in the participants' own context, as mentioned in Part 1 of the interview.

5.3 Interviewees' example and preferred method

This section elaborates on the third part of the interview, which was the reflection back to the example mentioned in the first part of the interview. It assesses if the participants thought that visualisation would have helped with the implementation of the software they were responsible for (as mentioned in Part 1).

One participants mentioned that he was happy with the implementation strategy as it was carried out:

> *"Well it [the implementation process was very well packaged. They [software developers] did do a good sort of introduction programme. They did have a good manual, both online and in hard copy manual. So that was handy, and they did have good support in the early stages. If we had a problem we could just ring and they were there and log in and help us or explain it." (Participant 5)*

However, most of the research participants stated that they preferred to use Essomenic in explaining the new technology they had to implement. Their arguments were the same as described in section 5.2. Hence, most participants said it would improve the implementation process. It would be easier to explain what the staff need to do, what their roles are and why. It is easier to see which steps need to be taken to fulfil the implementation process correctly. One participant mentioned:

> *"Had we had something like this [patient journey model] a manual where you would then prepare the whole journey of the machine because it doesn't have to be a person the journey of the machine and map out what the machine was used for and what it could do, what kind of licenses or what kind of software, what kind of policies and procedures would support it, etc. The whole journey board of the machine – it would have probably become really clear that implementation was going to fail." (Participant 1)*

Another participant said:

> *"[I would use Essomenic] because you can see it's really the thing that I had to do was about people. And you can see which people are going to be involved in that process. You know sometimes it's just going to be just one person, sometimes it's going to be a group of people and I think that's important to be able to show."(Participant 3)*

As discussed in the literature chapter, including the ideas and opinions of stakeholders results in a higher chance of success in the implementation and maintenance phase. As success of the implementation of an innovation is influenced by the emotional engagement of the stakeholders during the implementation process (Lapointe & Rivard, 2005; Piderit, 2000). Using Essomenic in explaining the software, helps the participants in understanding what the software is. Such patient journey model showed where UltraGenda interacts in the process, and why it would be helpful for the staff to use it. A step by step story telling approach would most likely convince them in purchasing the software and assisting in convincing and explaining the software to the staff members. Using the whole patient journey process would be helpful as an introduction to the software. The staff members could see where they interact and at what point the software interacts in the patient journey. Therefore, PJM, such as Essomenic, will support in giving the staff members the feeling that they are part of the process.

5.3.1 Summary

In summary, implementation of new software into practice is difficult. Reason for this is that no standardised way for implementing software into practice exists that suits everyone. One way is to use patient journey modelling as a visualisation technique. It counters difficulties experienced by participants in the past, such as lack of engagement, poor training and the perceived lack of time to change practices.

When presenting two methods of explanation to the participants, one without the use of Essomenic and one with the use of Essomenic, in a randomised order, this research indicates there is an overwhelming preference for the use of Essomenic, as visualisation is a strong motivator for changing current practice. Essomenic or patient journey modelling (PJM) is patient centric and the story boards created are relevant to the users, more easily convincing them to adopt changes. Therefore it can be said that visualisation is an effective implementation technique that motivates most.

Chapter 6: Discussion and conclusion

6 Discussion and conclusion

This chapter discusses the main study findings, which serve as a basis for answering the main research question. Thereafter, the implications for research and implication for practice of the most important or remarkable findings are discussed. Next, this chapter elaborates on the strengths and limitations of this research. Last, several recommendations for future research are provided.

6.1 Conclusion

Upon embarking on this research journey, the research questions were around the most effective way of convincing people to adopt a new technology. In this vein, the research question developed into: ***How can Patient Journey Modelling (PJM) assist in the implementation of new technologies in healthcare organisations?***

The sub research questions are described in Table 3 including the answers to these questions.

Table 3: Research questions and outcomes

Research questions	Answer?
What is implementation research and what are the issues around implementation?	- The gap between research and practice is well documented - Implementation process has been haphazard, slow and unpredictable - It takes on average 17 years for fully implementation - Various models and frameworks are developed to bridge this gap, such as process models
What is PJM? - **What is visualisation** - **What is Essomenic? How does it work?** - **What is UltraGenda? How does it work?**	- **PJM** is Patient Journey Modelling - **Visualisation** is an iterative process that combines the strengths of technologies and humans. - Within **Essomenic**, from a patient centric perspective, the patient's movements through the healthcare organisation are modelled from a patient centric perspective. These patient journey models can provide problem insights that would otherwise not be noted. - **UltraGenda** is an enterprise scheduling solution which enables hospitals and outpatient clinics to manage the scheduling process across entire hospitals and hospitals departments.
How can UltraGenda be modelled within Essomenic?	- Modelling 2 scenarios, with and without UltraGenda of the patient journeys of Endoscopy and Knee replacement journey
What are the difficulties experienced by change managers and healthcare workers?	- **Lack of staff involvement/lack of engagement**: Due to a lack of engagement of staff by managers in the decision making processes, or due to a lack of involvement by staff because they are reluctant towards enacting changes. - **Lack of understanding:** Software developers and healthcare professionals do not speak the same language - **Insufficient training** and little reflection: Implementation may be restricted by a low level of technical education among the staff and a lack of technical support - **Lack of time:** It will be difficult to implement an innovation successfully

	if the time to understand '*why'* and '*how'* to use this particular innovation is too short.
Which method is preferred in introducing new software (UltraGenda) to staff, with or without the use of Essomenic?	- All participants preferred the method with using Essomenic above the method without
Why is this method preferred?	- **Visualisation of new working process**: Explaining the software by visualising the process steps, will support with a quicker uptake. Without visualisation, staff are less likely to use the software by themselves. - **Showing relationships between healthcare workers, patients and technology**: Staff can see where they fit in the process and why change is needed. - **Visualisation as an educational technique:** it will assist in giving an easier and more understandable explanation of how a technology works for all level of educations. - **Visualisation techniques to aid convincingness:** Using the visualisation technique explains the reasons why and where change results in efficiency. By the way of using a story board, people can relate to the new processes

Thus the objective of this research is how patient journey modelling, such as Essomenic, can assist in the implementation process of new technologies. To investigate this, first the implementation science literature was critically assessed to get more insight in the issues within implementation research, in particular in the area of process theory. One of the most consistent findings in research of health services is the gap between research and practice. Although research evidence shows that an intervention is effective, little is known about how research to practice occurs. There is a plethora of implementation process frameworks, but human behaviours in the implementation process is largely overlooked in these process theories. This thesis advocates for a better understanding of human behaviour when implementing new technologies.

Therefore, in this research the patient journey modelling technique 'Essomenic' was tested on a new scheduling software called 'UltraGenda'. A total of nine interviews with change managers and clinicians were conducted, using scenarios to get a deeper understanding about human reactions to implementing new technologies using visualisation techniques. The results were astounding: an overwhelming appreciation of using visualisation techniques to help convince people to adopt new practices.

As shown in Table 3 the experienced problems around implementation of new technologies without visual aids include: the lack of involvement and engagement, lack of understanding of the new technology, insufficient training, little reflection and the lack of time for implementing and learning

the new technology. These findings correspond with the issues found in existing literature as described in Chapter 2.

Thus, using Essomenic in the implementation process can assist in decreasing these problems. So, one way of involving people more in the process of implementation is to address convincingness to be involved and engaged. Patient journey modelling allows people to imagine, from a story board, how the new software will work in the future, keeping the patient central to the processes. This research confirms the hunch that visualisation on a story board is extremely powerful to convince people to adopt the change, and as such is likely to increase uptake of new ways of working. Therefore, PJM can assist in bridging the research to practice gap.

This research proves that using a patient journey modelling technique can lead to significant improvements in the engagement of stakeholders and improved understanding of complex IT concepts. Thus, Essomenic, patient journey modelling, is a suitable approach to aid the implementation of new technological interventions and demonstrate the functionality and improvements that UltraGenda may lead to. In addition, the patient journey models will be of high value as educational tools for the implementation of new technologies. Due to the potential these modelling tools have, it could result in improving the efficiency and effectiveness of care provision significantly.

As stated before, visualisation is a good education tool. What is novel is the use of technology (Essomenic) to implement new technology. In healthcare, where a large amount of stakeholders are not technology savvy, the visualisation technology needs to be relevant, clear and explanatory. Essomenic is that.

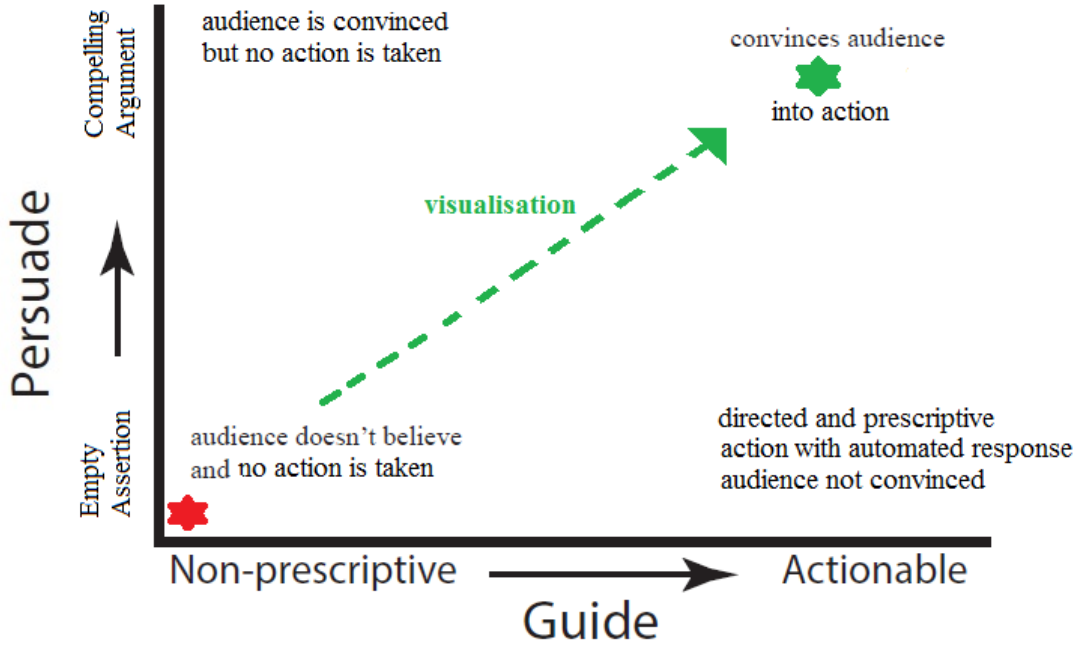


Figure 8: Overcoming the research to practice gap adapted from(Gleicher, 2012)

This thesis shows that visualisation can bridge the research to practice gap. As shown in Figure 8, an actionable guide makes a compelling argument. This means that in the gap between theory and practice, theory represents the compelling argument and practice represents the action. Therefore visual persuasion assists with convincing stakeholders to adapt, adopt and implement a new technology. Hence, visualisation will assist to move along this green line in order and reach the green asterisk.

Thus, stakeholder involvement and (emotional) engagement is essential for the implementation of new technologies. In the section 6.2, implications for theory, stakeholder engagement and their tipping points are discussed in more detail. In addition, the combination of Essomenic and the process model PARTI is argued. Section 6.3 will give more insight in why Essomenic can assist as an education technique for the implementation of new technology.

6.2 Implications for theory

This section discusses the implications for theory of this research. As mentioned in chapter 2, a gap exists between research and practice. This research aimed to provide evidence that patient journey modelling can assist with the introduction, development and embedding of technological solutions in order to bridge this gap. First, I discuss stakeholder identification and engagement, before turning to the tipping point. Second, I discuss how an implementation framework which could assist in the implementation process of a new technology.

To reduce the theory to practice gap, the human factor, largely ignored by other researchers, is of utmost importance (Fitzgerald et al., 2016). This is fundamental because, as this research indicates, making things visual creates a level of relevance for people to want to be involved with adopting new practices.

This research also evidences that patient centrality is essential. We can assume that most healthcare workers want to make a difference to the lives of their patients and when they visualise where their role fits in with the entire process, it is easier for them to see relevance to the changes required.

Stakeholder salience is equally significant. Having the right people doing the right job is essential for successful implementation. As such stakeholder identification is extremely important. Making the whole process visual, keeping the patient central, actually clearly outlines who should be involved at what stage of the implementation process. Making it explicit who the determinant stakeholder (or change champions) can be. So, this will be discussed in the next section.

6.2.1 Stakeholder identification and engagement

Stakeholder salience or assigning definitive stakeholders, is an essential factor for successful implementation (Mitchell et al., 1997). As pointed out in the interviews, lack of involvement and engagement of stakeholders is a large problem in the implementation process, and as result there will be a higher chance of a failed implementation (Berg, 2001). Using visualisation will assist in involving staff and getting people on board. Patient journey modelling shows who is involved in which part of the process. Visualisation creates a dialog between the stakeholders, end-users, and it feels for them you understand their concerns (Sanders & Simons, 2009). The staff are more likely to accept and participate in innovations because they feel they have a choice and matter in the process. They want to be needed for the process and want to feel important (Mur-Veeman, Eijkelberg, & Spreeuwenberg, 2001).

Involvement of stakeholders in the planning stage of the implementation process and discussing the benefits and drawbacks innovation and implementation, will help in identifying potential problems and concerns (Guldbrandsson, 2008). Visualisation can integrate different perspectives of the stakeholders, because it can ensure an environment of equality and decrease the dominance of certain stakeholders (DiMicco, Pandolfo, & Bender, 2004; Whyte et al., 2008). In addition, patient journey modelling puts the patient central, rather than the clinician. Hence, visualisation techniques, such as Essomenic, can be an essential technique to identify and engage the different stakeholders.

6.2.2 Tipping Point

Rogers (2010) developed Diffusion of Innovation Adoption Curve that gives the percentages of any population that make up each adopter category. Each category of adopters acts as an influencer and reference group for the next category. These five categories of adopters, which can be translated to an organisational setting, are as follows (see Figure 9):

- Innovators: About 2.5 % of the population, which is the first part of the organisation to adopt a particular innovation.
- Early adopters: The next 13.5% of the population is categorised by opinion leadership and a high degree of respect from peer organisations.
- Early majority: The next category is approximately 34% of the population, this part of the organisation wants to adopt new ideas just before the average of the organisation.
- Late majority: The fourth category is also 34% of the population, this group will adopt innovations, which is often a result of economic necessity and peer pressure.
- Laggards: The remaining 16% of the organisational system, have lengthy innovation decision processes and adoption occurs a long time after initial awareness of new ideas.

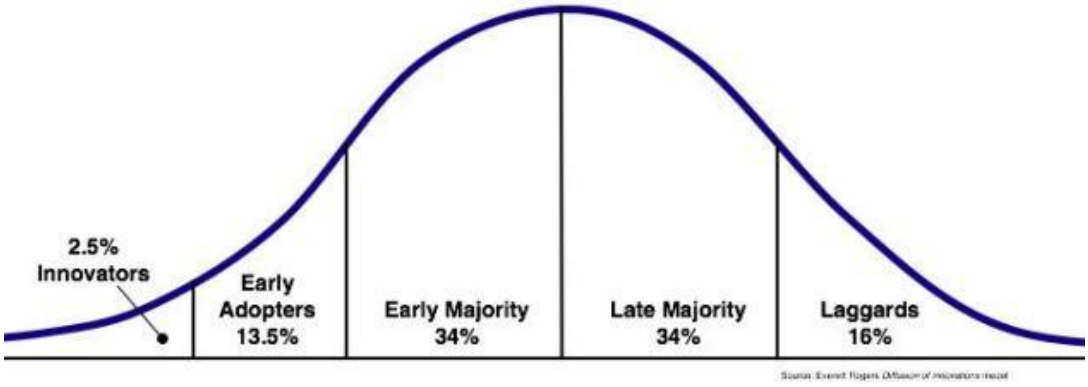


Figure 9: Diffusion of innovation adaption curve (Rogers, 2010)

Identifying change champions and stakeholders with the highest salience is an essential part of the implementation process (Fitzgerald et al., 2016). These persons need to be part of the whole implementation process, in this way they can support and enthuse other staff, resulting in an increased chance of a successful implementation in the long-term (Glaser & Backer, 1980). According to Maloney's 16% rule, the first 16% of the stakeholders are easy to convince to adopt an innovation. Once this 16% is reached, the strategy in convincing stakeholders needs to be changed in a strategy that focuses on social proof (Maloney, 2010). This particular point is called the tipping point as shown in Figure 10 below.

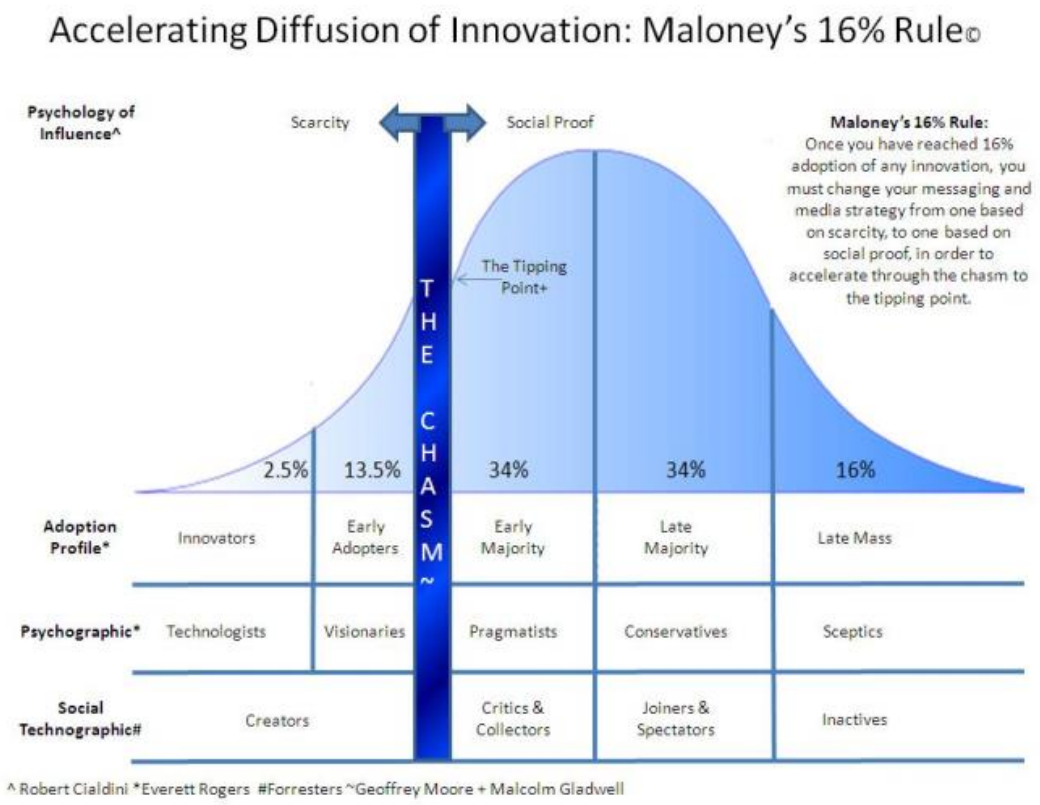


Figure 10: Maloney's 16% rule (Maloney, 2010)

Visualisation techniques, such as Essomenic, can assist in convincing these group of stakeholders, the early majority. As mentioned in the findings chapter, the participants were more convinced in implementing a new technology by the use of patient journey modelling, Essomenic. The majority of the participants thought that visualisation would have helped with the implementation of the software they were responsible for. Thus, visualisation may shift the tipping point. The combination of an implementation framework with the focus on the human factor and visualisation techniques, such as Essomenic, would be an appropriate combination for the implementation of new technologies.

6.2.3 Implementation framework

As mentioned before, implementation research aims to overcome the research-to-practice gap through the scientific study of processes used in the implementation of interventions and the consideration of contextual factors that affect these processes. Process models could help in bridging this gap. As discussed in the literature chapter, visualisation techniques in combination with theoretical process models can be applied in different situations, to increase the understanding of implementation frameworks in general (Michie et al., 2008) and the implementation of new technologies. As discovered in the findings chapter, emotional engagement is essential for the implementation of new technologies. One of the process models is the PARTI framework, which

takes the human factor into account. This framework could help in assisting with the implementation of an innovation. It is my premise that, by combining the PARTI framework and visualisation techniques such as Essomenic, the end result will have a higher chance of successful implementation of an innovation.

Nilsen (2015) has done great work in categorising existing models and arguing for a theoretical underpinning of implementation techniques. Whilst this was happening, a group of researchers in Australia have developed an extension to the Meyers (2012) Quality Improvement Framework (QIF) (Meyers et al., 2012). These researchers have conducted a systematic review of all models used in healthcare management. One of the main findings was the gap in the current implementation frameworks, because the previously developed frameworks have deficiencies in the area of individual and social behaviour, actions of participators, operationalisation and reflection on the frameworks. Research evidence alone will not result in changing practice, however the understanding of the reasons behind why people commit and execute changes at individual levels could lead to more successful implementation (Fitzgerald et al., 2016). Compared to other models, the PARTI model focusses on individual responses when new practices will be implemented. According to Fitzgerald et al (2016) the human factor of translation research into practice needs to be considered. The PARTI model consists of a four stages process, as shown in Figure 11.

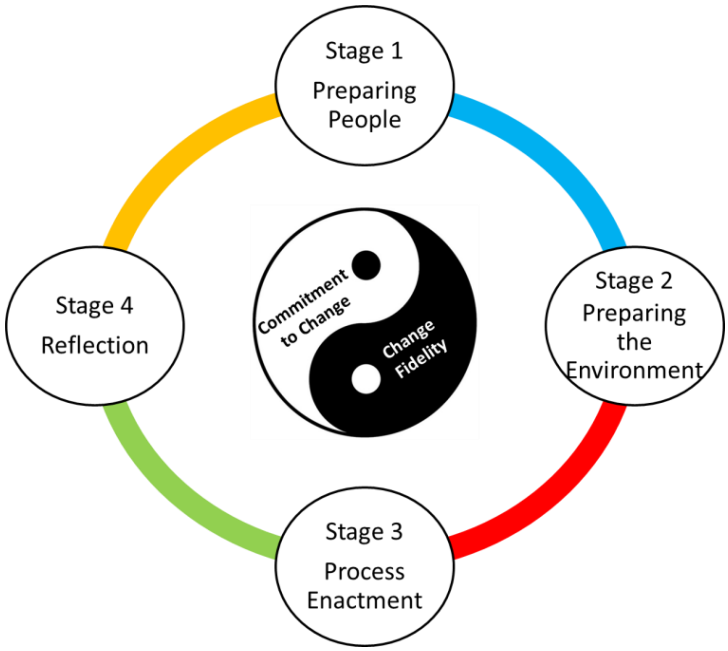


Figure 11: PARTI framework (Fitzgerald et al., 2016)

All stages are connected in an infinite circle, which indicates that the model of change is continual. Each stage contains of a set of questions to stimulate constructive reflection from individual, group and organisational membership mind-set. As represented in this figure, Yin and Yang, commitment to change and change fidelity respectively, is central to each stage. Hence, these interactions between

the positive and negative influences create a harmonious environment in which the change occurs, is approved, implemented and evaluated (Fitzgerald et al., 2016).

In Table 4 all stages of the PARTI framework are elaborated. Besides, it shows what the added value of each stage is.

Table 4: PARTI and Essomenic

	PARTI	Essomenic
Stage 1: Preparing people	• stakeholder salience • champion identification • needs assessment • resource assessment	• Asks the stakeholders to reflect on the current state, in order to determine the future state. • Builds social capital by increasing social ties between the change actors • shows role of each of the stakeholders
Stage 2: Preparing the environment	• social interaction and exchange environment • stakeholder tipping points • inspection reflections • understanding current state • developing stakeholder goal congruence • establishment of an implementation team	• shows which departments are involved • builds greater understanding of roles in and between departments • shows the documents and software needed in the processes • requires changes to departmental and corporate policy and procedures
Stage 3: Process enactment	• monitoring • supportive feedback mechanisms	• process steps reduction • process improvement • stepwise explanation software
Stage 4: Reflection	• reflection • identifies if problems still exist and return to stage 1 is needed • prioritising • assessing the new state of affairs	• assists in reflection process • ensures fidelity is measured and 'value add' can be argued

Considering this PARTI framework, Essomenic will be a useful technique in all stages of this framework. The first stage is the preparation of people, which is, according to Fitzgerald et al. (2016) the most important and time consuming phase. In order to improve the time of this process, Essomenic can assist in the preparation of the staff.

Next, I will explain where Essomenic could be helpful in four stages of the PARTI framework.

Stage 1: Preparation of people

Essomenic can assist in this first stage by modelling the whole process end to end. For this modelling to occur the key personnel need to come together to provide the information for the models. By doing this, an environment of cooperation is established. Staff find out their roles and how these intersect with other persons' roles, sometimes across departments. This creates a form of social capital, where each person obtains a better understanding of the system by considering their own role within it and that of others. This process also allows people to talk to one another, whereas they might not have done this previously. Repetitive processes, inconsistencies and waste are often discovered during this process. When change champions discover where there is an opportunity for improvement they tend to also 'own' the responsibility for making the changes. In addition, this visualisation technique is even more powerful because it elucidate the processes from the patient point of view. This first stage often overlaps with the second stage which looks closer at the environment for change.

Stage 2: - Preparing the Environment

In addition to getting staff on board, the organisational environment needs to be ready. Executive sponsorship needs to be obtained and/or ensured. Existing policies and procedures are reviewed at departmental and organisational levels, and change process is facilitated in terms of (human) resource management. In this stage stakeholder tipping points are also analysed. In addition, stakeholders are encouraged to undertake regular introspection periods in this stage to ensure that actual actions are in line with the approved goals. PJM, such as Essomenic, can help perform the introspection, because it can easily designate where stakeholders encounter barriers in the process.

Stage 3: Process enactment (i.e. Doing it)

Process improvements are undertaken in this stage. Essomenic can assist in modelling the current and new state or, create a blue-sky state. The change agents choose which parts they want to address first. It is good to get some runs on the board and address the things that are easy to do and virtually without risk. However, a few larger projects can also start that may be a bit harder to do, and are more risky. Incremental changes and larger changes usually happen at the same time. By

visualising what is needed to be more efficient and effective, process steps reductions become visual. Not only the number of processes can decrease, also the number of staff needed or cost can be reduced and be shown in Essomenic.

Stage 4– Reflection and assessing the new state.

The last stage is the evaluation and reflection stage. Visualisation techniques can help in answering these reflecting questions. Healthcare professionals and software developers can see in the patient journey where difficulties exist in implementing the innovation. PJM, such as Essomenic, can assist in identifying whether problems with the implementation still exist and if there is a need being addressed by returning to stage one. In addition, using these patient journeys can help the staff answering the introspective questions. Further, Essomenic can assist with fidelity, to show that the chosen process of change was used in the best way and achieved the outcomes that were intended.

Thus far I have argued that there is a need to look deeper towards existing process theory and visualisation modelling to expand implementation research.

6.3 Implications for policy and practice

This research shows that visualisation techniques, such as Essomenic, can be effective techniques for the implementation of innovations. It creates a common language between software developers and healthcare professionals. Through involving all these stakeholders during the end to end implementation process, there will be a higher chance of successful implementation. Every stakeholder will feel involved and can see where they fit in the process. This section describes the implications for practice. First, it describes a better way to approach people; the why, how and what. Next, it will discuss how PJM, such as Essomenic, can be useful as educational technique and create a common language.

6.3.1 Why, how, what?

Approaching technologies from a different point of view assists in convincing stakeholders to implement the new technology. Whilst, often, prescribed change is explained in the order of: what is to be changed, how the change will occur an why the change is needed, this research shows that by placing stakeholders at the centre of the change process, the order of explanation needs to be reversed: *why* the change needs to occur, *how* it might occur and *what* is needed for it to occur. This change in order helps convince the change is imperative. It is all about the explanations of ‘the why’, then ‘the how’ and ‘the what’, as shown in Figure 12.

Figure 12: The approach of why, how, what

Essomenic helps in understanding *why* it is important to implement a new technology first, involving people to think about the why and convincing getting people on board. Then Essomenic visualises the *how,* for people to think deeply about what needs to occur, and how this new practice might affect them in terms of *what* needs to change. Thus, visualising the process with Essomenic helps to discover 'the *why'*.

Participants in the interview noticed that they could see why this new technology was important to implement. Because of visualising these examples, it was easier for the participants to understand where, why and how this software could support in the healthcare pathway. They could relate to the examples and see where the support could improve the healthcare process. The patient journey model showed that the number of the process steps was decreased and where waiting times in the process exited. In addition, the patient journey model showed how to use this software. Using a stepwise approach of explaining this software resulted in a better understanding of the software.

6.3.2 Education

In addition to using this visualisation technique as part of the implementation process, it could also be beneficial in assisting as education material. This section describes why this visualisation technique fits as an appropriate teaching technique.

With the introduction of a new method or technology, usually only oral or written information is provided. However, offering only information, education or practical training is insufficient. According to research (Azocar, Cuffel, Goldman, & McCarter, 2003; Davis, Thomson, Oxman, & Haynes, 1995; Fixsen, Naoom, Blase, & Friedman, 2005) providing only one of these types of support in introducing a new innovation is rarely successful. Information, education or training by itself does

not necessarily lead to a change in behaviour of people (Ager & O'May, 2001; Bero et al., 1998; Denton, Vaughn, & Fletcher, 2003). The chances of successful implementation of an innovation is decreased by insufficient equipment, inadequate distribution of materials, poorly trained or disinterested staff, lack of support and lack of evaluation (Rohrbach, Grana, Sussman, & Valente, 2006). As one of the respondents said, using this visual technique as part of the training to learn the software is very helpful and creates confidence in using this software by herself.

As already discussed in the findings chapter, staff will teach themselves their own way of doing things. If they teach it to others, they probably will teach their way of doing tasks although it is not always the correct way. Using the models as a learning technique would be very helpful as a manual to support and teach new staff members how to use the new technology in the correct way.

According to Bero et al. (1998) educational materials (distribution of recommendations for clinical care, including clinical practice guidelines, audio-visual materials, and electronic publications) and didactic educational meetings (such as lectures) have little effect on the behavioural change among healthcare professionals. However, interactive educational meetings, e.g. participation of healthcare providers in workshops that include discussion or practice results in consistently effective behavioural change (Bero et al., 1998). Hence, providing training whereby these patient journey models are included and offered support enhances a higher uptake of this new technology. According to Lluch (2011) it is more likely that the more user-friendly, flexible and intuitive the technology is, the less training is required. A shared vision and support at different levels (policy level, management, colleagues and technical support), is likely to result in lower barriers for uptake (Lluch, 2011). Essomenic or patient journey modelling could achieve this.

6.3.3 Common language

In addition to educational benefits, using visualisation techniques assists in achieving a better understanding of the roles and visions of different stakeholders. This is discussed in this section.

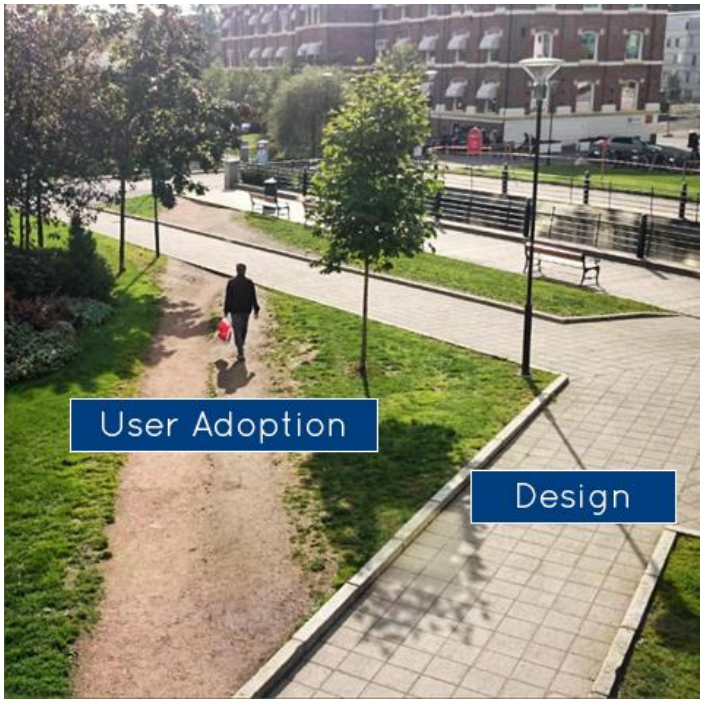


Figure 13: Perspective of view ((Westbrook, 2015))

Figure 13 is a clear example of visual explaining the difference between how a technology is designed to be working versus how it is actually used in practice. Visualising the process will discover these issues and could assist in solving or improving them. In addition, visualising the process will create a common language between software developers and healthcare providers which will improve the healthcare process. Software developers and healthcare professionals wear 'different glasses', which makes it more difficult to understand the view of the other person. However, visualising the patient journey will create a better understanding for the software developers what the total patient journey will look like and that their software will only interact with certain processes in the care process. Next, visualisation techniques will show them for whom they need to make the software understandable. Visualisations can reveal misunderstandings of different stakeholders in the healthcare process (Aikio, Jounila, & Jokela, 2005).

Research shows that ineffective communication results in unsuccessful projects, e.g. unsuccessful implementation of the innovation (Van Achterberg, Schoonhoven, & Grol, 2008). However, using Essomenic creates a common language and will increase the communication between the different stakeholders.

As already stated in the findings chapter, staff will learn their own way of using new software and will take shortcuts. This happens especially when staff do not get proper education or do not understand what they are doing in the big scheme of things.

Visualising the total process and the process steps about how to use the software, gives the staff a better understanding and a quicker uptake of using the new software, resulting in decreasing the number of process steps (as shown in Figure 14). Additionally, decreasing the number of process steps will most likely result in error reduction.

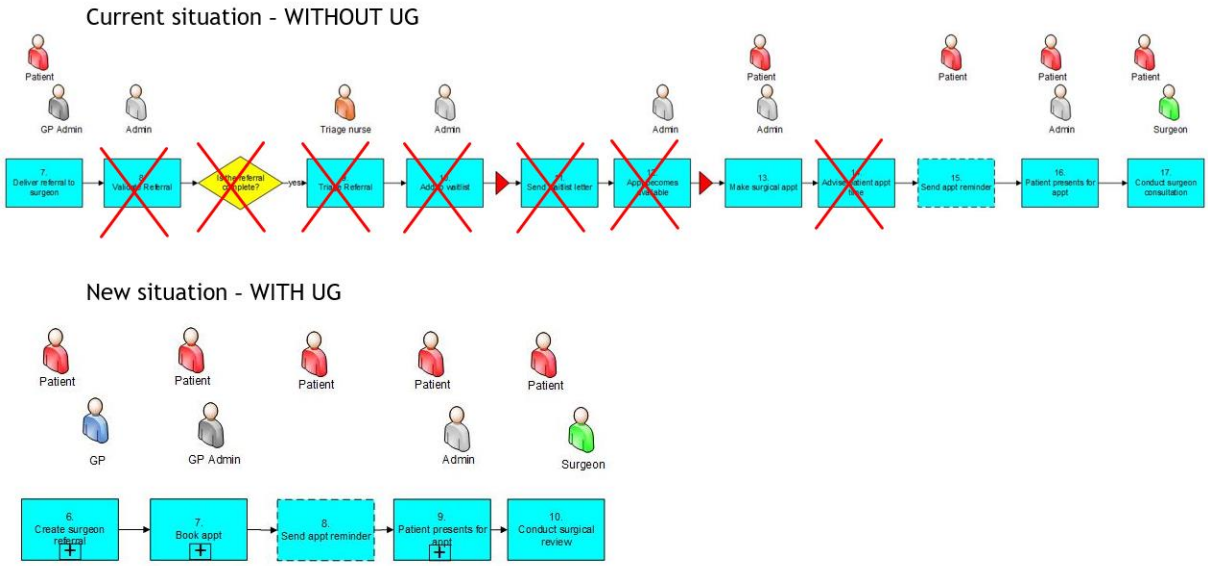


Figure 14: Improvement through implementation of UltraGenda

As shown in Figure 14, this part of the process is decreased by 6 steps. In addition to the decrease in the amount of actions, less staff members will also be necessary. This will results in a decrease in time and costs. Thus, Essomenic can serve as a platform for dialog. It is an aid to visualise the current state and create future management of state. In addition, it could improve the language between healthcare practitioners and software developers.

6.4 Limitations

In addition to the methodological limitations discussed in Chapter 4, this research is limited to the use of two specific softwares: Essomenic and UltraGenda. I needed to obtain deep knowledge about working both softwares before I could undertake the interviews. The level of knowledge gained in a relatively short period of time had the potential to affect the ability to teach the participants two different methods. However, intensive training on the two softwares, at the respective companies was undertaken by me and my confidence of knowing the software is relatively high, minimising the effects on the outcomes of the research.

Due to the nature of the university course and overseas stay, time itself is a limitation of the research. The outcomes may have been affected by the time constraints under which this research was carried out. Nevertheless, all the interviews were undertaken within a short timeframe, as early as possible as the researcher was aware that much of the work in qualitative research is *after* collection of data. Further, the methodological decision was made to only focus the interviews on a small part of the overall patient journey, potentially limiting the outcome. Nevertheless, by shortening the method of introducing and explaining the software, the research outcome was not affected.

6.5 Further research

The research conclusions collected in this thesis provide future research opportunities:

As discussed in this research, visualisation techniques, such as Essomenic, could assist in reducing the gap the between theory and practice in implementation research. Although much is written about implementation frameworks, thus far no research is done in combining visualisation techniques and implementation frameworks. Hence, future research is proposed to develop and investigate the combination of the PARTI framework and Essomenic in assisting to bridge this research-practice gap, as both focusses on the human factor.

Interviews in this research were conducted with clinicians and healthcare managers. They were asked to give the preference for the method, with or without Essomenic, to use for their staff. However, what the opinion is of these staff members is unknown. Further research could be considered to investigate if staff members needs to be approached in a different way and if they prefer this way of approach for introducing and implementing new technologies.

In addition, it is unknown if different stakeholders should be provided with different versions of visualisation. Further research could investigate if change managers should have a more abstract visualisation and the staff members have a more detailed visualisation of the patient journey and software, UltraGenda.

6.6 Summary

This thesis set out to look deeper into the theory to practice gap in order to reduce this gap. A critical review of implementation research showed a lack of focus on human interaction when implementing practice change. It is my premise that visualisation of intended change will help with implementing change and as such early engagement with stakeholders, careful planning and preparation of people and environment is imperative for successful implementation.

This research showed that social interaction, i.e. group exercises to map the patient journey, as part of the preparation phase of implementation process will assist with getting stakeholders on board and more likely to adopt the new practices. Visualisation of current practices and identifying the issues in a group helps with the preparation of people and of their environment. Therefore, in order to reduce the theory to practice gap, process theory in combination with visualisation techniques is a useful way forward.

7 References

Aarons, G. A., Hurlburt, M., & Horwitz, S. M. (2011). Advancing a conceptual model of evidence-based practice implementation in public service sectors. *Administration and Policy in Mental Health and Mental Health Services Research, 38*(1), 4-23.

Ager, A., & O'May, F. (2001). Issues in the definition and implementation of "best practice" for staff delivery of interventions for challenging behaviour. *Journal of Intellectual and Developmental Disability, 26*(3), 243-256.

Aikio, K., Jounila, I., & Jokela, T. (2005). *Developing techniques for visualising scenarios.* Paper presented at the 11th International conference on human-computer interaction, Las Vegas, Nevada, USA.

Alpay, L., & Russell, A. (2002). Information technology training in primary care: the nurses' voice. *Computers Informatics Nursing, 20*(4), 136-142.

Azocar, F., Cuffel, B., Goldman, W., & McCarter, L. (2003). The impact of evidence-based guideline dissemination for the assessment and treatment of major depression in a managed behavioral health care organization. *The journal of behavioral health services & research, 30*(1), 109-118.

Bauer, M. I., & Johnson-Laird, P. N. (1993). How diagrams can improve reasoning. *Psychological science, 4*(6), 372-378.

Beer, M., & Eisenstat, R. A. (2000). The silent killers of strategy implementation and learning. *MIT Sloan Management Review, 41*(4), 29.

Benbasat, I., Goldstein, D. K., & Mead, M. (1987). The case research strategy in studies of information systems. *MIS quarterly*, 369-386.

Berg, M. (2001). Implementing information systems in health care organizations: myths and challenges. *International journal of medical informatics, 64*(2), 143-156.

Bero, L. A., Grilli, R., Grimshaw, J. M., Harvey, E., Oxman, A. D., & Thomson, M. (1998). Closing the gap between research and practice: an overview of systematic reviews of interventions to promote the implementation of research findings. *British Medical Journal, 317*(7156), 465-469.

Bradshaw, A. (2010). Is the ward sister role still relevant to the quality of patient care? A critical examination of the ward sister role past and present. *Journal of clinical nursing, 19*(23-24), 3555-3563.

Bristow, A., & Sauders, M. (2015). Heighten your own Awareness of Research Philosophy: the development of a reflexive tool for use with students.

Bryson, J. M. (2004). What to do when stakeholders matter: stakeholder identification and analysis techniques. *Public management review, 6*(1), 21-53.

Burkhard, R. A. (2004). *Learning from architects: the difference between knowledge visualization and information visualization.* Paper presented at the Information Visualisation, 2004. IV 2004. Proceedings. Eighth International Conference on.

Camann, M. A. (2001). Outcomes of care: the use of conceptual models to" see the forest and the trees" in planning outcomes studies. *Topics in health information management, 22*(2), 10-14.

Chioncel, N. E., Veen, R. G. W. V. D., Wildemeersch, D., & Jarvis, P. (2003). The validity and reliability of focus groups as a research method in adult education. *International Journal of Lifelong Education, 22*(5), 495-517.

Cochrane, L. J., Olson, C. A., Murray, S., Dupuis, M., Tooman, T., & Hayes, S. (2007). Gaps between knowing and doing: understanding and assessing the barriers to optimal health care. *Journal of continuing education in the health professions, 27*(2), 94-102.

Cook, K., Earnshaw, R., & Stasko, J. (2007). Discovering the unexpected. *IEEE (Institute of Electrical and Electronics Engineers)*.

Creswell, J. W. (2003). Research design. *Qualitative, quantitative and mixed methods approaches*.

Creswell, J. W., & Miller, D. L. (2000). Determining validity in qualitative inquiry. *Theory into practice, 39*(3), 124-130.

Curry, J. M. (2008). *A Meta-methodology for the Design and Modeling of Patient Journeys.* University of Western Sydney.

Curry, J. M., Fitzgerald, J. A., & Eljiz, K. (2011). *Patient Journey Modelling: Using students as a vehicle for the diffusion of innovation*. Paper presented at the Australian National Health Informatics Conference, Brisbane, Australia.

Curry, J. M., Fitzgerald, J. A., Prodan, A., Dadich, A., & Sloan, T. (2014). Combining patient journey modelling and visual multi-agent computer simulation: A framework to improving knowledge translation in a healthcare environment. *Investing in E-Health: People, Knowledge and Technology for a Healthy Future*, 25-31.

Curry, J. M., & Prodan, A. (2013). *Using visual tools to improve clinical engagement and group understanding of complex IT concepts.* Paper presented at the MedInfo.

Damschroder, L. J., & Hagedorn, H. J. (2011). A guiding framework and approach for implementation research in substance use disorders treatment. *Psychology of Addictive Behaviors, 25*(2), 194.

Davis, D. A., Thomson, M. A., Oxman, A. D., & Haynes, R. B. (1995). Changing physician performance: a systematic review of the effect of continuing medical education strategies. *Jama, 274*(9), 700-705.

Denton, C. A., Vaughn, S., & Fletcher, J. M. (2003). Bringing research-based practice in reading intervention to scale. *Learning Disabilities Research & Practice, 18*(3), 201-211.

DiMicco, J. M., Pandolfo, A., & Bender, W. (2004). *Influencing group participation with a shared display.* Paper presented at the Proceedings of the 2004 ACM conference on Computer supported cooperative work.

Eccles, M. P., Foy, R., Sales, A., Wensing, M., & Mittman, B. (2012). Implementation Science six years on—our evolving scope and common reasons for rejection without review. *Implement Sci, 7*, 71.

Eccles, M. P., & Mittman, B. S. (2006). Welcome to implementation science. *Implement Sci, 1*(1), 1-3.

Ellen, M. E., Léon, G., Bouchard, G., Lavis, J. N., Ouimet, M., & Grimshaw, J. M. (2013). What supports do health system organizations have in place to facilitate evidence-informed decision-making? A qualitative study. *Implementation Science, 8*(1), 1.

Ellinger, A. D., Watkins, K. E., & Marsick, V. J. (2005). Case study research methods. *Research in organizations: Foundations and methods of inquiry*, 327-350.

Fischer, F., Bruhn, J., Gräsel, C., & Mandl, H. (2002). Fostering collaborative knowledge construction with visualization tools. *Learning and Instruction, 12*(2), 213-232.

Fitzgerald, A., Ogrin, R., Hayes, K., Curry, J., Eljis, K., & Radford, K. (2016). Balancing Yin and Yang: the development of a framework using Participatory Action Research for the Translation and Implementation (PARTI) of new practices.

Fixsen, D. L., Naoom, S. F., Blase, K. A., & Friedman, R. M. (2005). Implementation research: a synthesis of the literature.

Flyvbjerg, B. (2006). Five misunderstandings about case-study research. *Qualitative inquiry, 12*(2), 219-245.

Glaser, E., & Backer, T. E. (1980). Durability of innovations: How goal attainment scaling programs fare over time. *Community Mental Health Journal, 16*(2), 130-143.

Glasgow, R., Lichtenstein, E., & Marcus, A. (2003). Why don't we see more translation of health promotion research to practice? Rethinking the efficacy-to-effectiveness transition. *American Journal of Public Health, 93*(8), 1261-1267.

Glasgow, R., Vinson, C., Chambers, D., Khoury, M., Kaplan, R., & Hunter, C. (2012). National Institutes of Health Approaches to Dissemination and Implementation Science: Current and Future Directions. *American Journal of Public Health, 102*(7), 1274.

Gleicher, M. (2012). *Why ask why?: considering motivation in visualization evaluation*. Paper presented at the Proceedings of the 2012 BELIV Workshop: Beyond Time and Errors - Novel Evaluation Methods for Visualization, Seattle, Washington, USA.

Glenberg, A., & Langston, W. (1992). Comprehension of illustrated text: Pictures help to build mental models. *Journal of memory and language, 31*(2), 129-151.

Goggin, M. L. (1990). *Implementation theory and practice: Toward a third generation*: Scott Foresman & Co.
Green, L. (2001). From research to "best practices" in other settings and populations. *American journal of health behavior, 25*(3), 165-178.
Green, L., Ottoson, J., Garcia, C., & Hiatt, R. (2009). Diffusion theory and knowledge dissemination, utilization, and integration in public health. *Annual review of public health, 30*, 151.
Greenhalgh, T., Robert, G., Macfarlane, F., Bate, P., & Kyriakidou, O. (2004). Diffusion of innovations in service organizations: systematic review and recommendations. *Milbank Quarterly, 82*(4), 581-629.
Grol, R., & Grimshaw, J. (2003). From best evidence to best practice: effective implementation of change in patients' care. *The lancet, 362*(9391), 1225-1230.
Guba, E. G., & Lincoln, Y. S. (1994). Competing paradigms in qualitative research. *Handbook of qualitative research, 2*(163-194), 105.
Guldbrandsson, K. (2008). From news to everyday use, the difficult art of implementation. *Swedish national institute of public health*.
Jackson, S. (2001). Successfully implementing total quality management tools within healthcare: what are the key actions? *International Journal of Health Care Quality Assurance, 14*(4), 157-163.
Konrad, A. M. (2006). Engaging employees through high-involvement work practices. *Ivey Business Journal, 26*, 11-14.
Kuo, T., Gase, L. N., & Inkelas, M. (2015). Dissemination, Implementation, and Improvement Science Research in Population Health: Opportunities for Public Health and CTSAs. *Clinical and Translational Science, 8*(6), 807-813.
Lapointe, L., & Rivard, S. (2005). A multilevel model of resistance to information technology implementation. *MIS quarterly*, 461-491.
Larkin, J. H., & Simon, H. A. (1987). Why a diagram is (sometimes) worth ten thousand words. *Cognitive science, 11*(1), 65-100.
Liu, P., Ning, P., & Jajodia, S. (2001). Avoiding loss of fairness owing to failures in fair data exchange systems. *Decision Support Systems, 31*(3), 337-350.
Lluch, M. (2011). Healthcare professionals' organisational barriers to health information technologies—A literature review. *International journal of medical informatics, 80*(12), 849-862.
Maloney, C. (2010). The Secret to Accelerating Diffusion of Innovation: The 16% Rule Explained. Retrieved from http://innovateordie.com.au/2010/05/10/the-secret-to-accelerating-diffusion-of-innovation-the-16-rule-explained/
Markus, M. L., & Tanis, C. (2000). The enterprise systems experience-from adoption to success. *Framing the domains of IT research: Glimpsing the future through the past, 173*, 207-173.
May, C., & Finch, T. (2009). Implementing, embedding, and integrating practices: an outline of normalization process theory. *Sociology, 43*(3), 535-554.
McAlearney, A. S., Schweikhart, S. B., & Medow, M. A. (2004). Doctors' experience with handheld computers in clinical practice: qualitative study. *Bmj, 328*(7449), 1162.
Meyers, D. C., Durlak, J. A., & Wandersman, A. (2012). The quality implementation framework: A synthesis of critical steps in the implementation process. *American journal of community psychology, 50*(3-4), 462-480.
Michie, S., Johnston, M., Francis, J., Hardeman, W., & Eccles, M. (2008). From theory to intervention: mapping theoretically derived behavioural determinants to behaviour change techniques. *Applied psychology, 57*(4), 660-680.
Michie, S., van Stralen, M. M., & West, R. (2011). The behaviour change wheel: a new method for characterising and designing behaviour change interventions. *Implementation Science, 6*(1), 1.

Mitchell, R. K., Agle, B. R., & Wood, D. J. (1997). Toward a theory of stakeholder identification and salience: Defining the principle of who and what really counts. *Academy of management review, 22*(4), 853-886.

Morris, Z., Wooding, S., & Grant, J. (2011). The answer is 17 years, what is the question: understanding time lags in translational research. *Journal of the Royal Society of Medicine, 104*(12), 510-520.

Mur-Veeman, I., Eijkelberg, I., & Spreeuwenberg, C. (2001). How to manage the implementation of shared care-A discussion of the role of power, culture and structure in the development of shared care arrangements. *Journal of management in medicine, 15*(2), 142-155.

Murre, J., Janssen, S., Rouw, R., & Meeter, M. (2013). The rise and fall of immediate and delayed memory for verbal and visuospatial information from late childhood to late adulthood. *Acta psychologica, 142*(1), 96-107.

Naps, T., Rößling, G., Almstrum, V., Dann, W., Fleischer, R., Hundhausen, C., . . . Rodger, S. (2002). *Exploring the role of visualization and engagement in computer science education.* Paper presented at the ACM Sigcse Bulletin.

Neuman, W. L., & Wiegand, B. (2000). *Criminal justice research methods: Qualitative and quantitative approaches*: Allyn and Bacon Boston.

Nilsen, P. (2015). Making sense of implementation theories, models and frameworks. *Implementation Science, 10*(1), 53.

Noble, C. H. (1999). The eclectic roots of strategy implementation research. *Journal of Business Research, 45*(2), 119-134.

Pandi-Perumal, S. R., Akhter, S., Zizi, F., Jean, G., Ramasubramanian, C., Freeman, R. E., & Narasimhan, M. (2015). Project Stakeholder Management in the Clinical Research Environment: How to Do it Right. *Frontiers in psychiatry, 6*.

Parry, G. J., Carson-Stevens, A., Luff, D. F., McPherson, M. E., & Goldmann, D. A. (2013). Recommendations for Evaluation of Health Care Improvement Initiatives. *Academic Pediatrics, 13*(6), S23-S30.

Peters, D. H., Adam, T., Alonge, O., Agyepong, I. A., & Tran, N. (2014). Republished research: Implementation research: what it is and how to do it Implementation research is a growing but not well understood field of health research that can contribute to more effective public health and clinical policies and programmes. This article provides a broad definition of implementation research and outlines key principles for how to do it. *British journal of sports medicine, 48*(8), 731-736.

Piderit, S. K. (2000). Rethinking resistance and recognizing ambivalence: A multidimensional view of attitudes toward an organizational change. *Academy of management review, 25*(4), 783-794.

Rapert, M. I., Velliquette, A., & Garretson, J. A. (2002). The strategic implementation process: evoking strategic consensus through communication. *Journal of Business Research, 55*(4), 301-310.

Ratner, C. (2008). Cultural psychology and qualitative methodology: Scientific and political considerations. *Culture & Psychology, 14*(3), 259-288.

Rogers, E. M. (2010). *Diffusion of innovations*: Simon and Schuster.

Rohrbach, L. A., Grana, R., Sussman, S., & Valente, T. W. (2006). TYPE II translation transporting prevention interventions from research to real-world settings. *Evaluation & the Health Professions, 29*(3), 302-333.

Rubenstein, L. V., & Pugh, J. (2006). Strategies for promoting organizational and practice change by advancing implementation research. *Journal of General Internal Medicine, 21*(S2), S58-S64.

Rycroft-Malone, J., Seers, K., Crichton, N., Chandler, J., Hawkes, C. M., Allen, C., . . . Strunin, L. (2012). A pragmatic cluster randomised trial evaluating three implementation interventions. *Implement Sci, 7*(1), 80.

Saldaña, J. (2015). *The coding manual for qualitative researchers*: Sage.

Sanders, L., & Simons, G. (2009). A social vision for value co-creation in design. *Open Source Business Resource*(December 2009).

Saunders, M., Lewis, P., & Thornhill, A. (2009). *Research Methods for Business Students* (5th ed.).

Silverman, D. (2013). *Doing qualitative research: A practical handbook*: SAGE Publications Limited.
Tabak, R. G., Khoong, E. C., Chambers, D. A., & Brownson, R. C. (2012). Bridging research and practice: models for dissemination and implementation research. *American journal of preventive medicine, 43*(3), 337-350.
Thomas, J. J., & Cook, K. A. (2006). A visual analytics agenda. *Computer Graphics and Applications, IEEE, 26*(1), 10-13.
Tversky, B. (2011). Visualizing thought. *Topics in Cognitive Science, 3*(3), 499-535.
Van Achterberg, T., Schoonhoven, L., & Grol, R. (2008). Nursing implementation science: how evidence-based nursing requires evidence-based implementation. *Journal of nursing scholarship, 40*(4), 302-310.
Vessey, I. (1991). Cognitive Fit: A Theory-Based Analysis of the Graphs Versus Tables Literature*. *Decision Sciences, 22*(2), 219-240.
Wang Baldonado, M. Q., Woodruff, A., & Kuchinsky, A. (2000). *Guidelines for using multiple views in information visualization.* Paper presented at the Proceedings of the working conference on Advanced visual interfaces.
Webb, C. (1992). The use of the first person in academic writing: objectivity, language and gatekeeping. *Journal of Advanced Nursing, 17*(6), 747-752.
Wensing, M. (2015). Implementation science in healthcare: an introduction and perspective. *Zeitschrift für Evidenz, Fortbildung und Qualität im Gesundheitswesen*.
Whiting, L. S. (2008). Semi-structured interviews: guidance for novice researchers. *Nursing Standard, 22*(23), 35-40.
Whyte, J., Ewenstein, B., Hales, M., & Tidd, J. (2008). Visualizing knowledge in project-based work. *Long Range Planning, 41*(1), 74-92.
Wong, P. C., Rose, S. J., Chin, G. J., Frincke, D. A., May, R., Posse, C., . . . Thomas, J. (2006). "Walking the path: A new journey to explore and discover through visual analytics. *Information Visualization*.
Yin, R. K. (2004). *The case study anthology*: Sage.
Yin, R. K. (2009). How to do better case studies. *The SAGE handbook of applied social research methods, 2*, 254-282.
Yin, R. K. (2011). *Qualitative Research from Start to Finish*: Sage.

Appendix A: Search strategy

A comprehensive literature review and context description was undertaken as part of background research. For this literature review different databases were used, like the University Library, Scopus, Pubmed and Google Scholar. Furthermore, scientific books were used. Also, different experts were contacted to exchange opinions and share information. For the literature review, the date of publishing is used to determine whether an article is relevant for this research. Articles published between 1990 till 2016 will be considered for inclusion. Other inclusion criterion was language (only English and Dutch). In addition, articles were sorted on relevance in the database.

To generate combinations of the search terms and in order to prevent exclusion based on different spelling, operators like AND, OR and an asterisk are used. Based on the used search terms a set of articles will be found. The titles and abstracts will be read to determine whether an article is relevant for this research. If so, the whole article will be read, otherwise the article will be discarded. If useful information is described in an article and referenced to another article, that other article will also be read to get deeper insight in the information.

The used terms can be found in table below.

Table 5: Search terms

	Terms
1	Implementation
2	Implement*
3	Research AND practice AND gap
4	Innovation AND healthcare AND problems
5	2 AND 3
6	2 AND 4
7	2 AND 3 AND 4
8	2 AND 3 OR 4
9	Stakeholder analysis
10	Stakeholder identification
11	Stakeholder engagement
12	8 AND 9 AND 10
13	Visualization OR visualisation
14	Visual* techniques
15	Visual analytics
16	13 AND 14 OR 15
17	16 and benefits

Appendix B: Recruitment email

Dear ...

Re: Using a technology to implement another technology: What are the benefits in using Essomenic in order to implement a new technology in healthcare? (GU Ref No: 2016/147)

We are researchers at the Griffith Business School, who are interested in understanding exactly what triggers people to adopt new technology in the workplace. As you have been identified within your network as a manager with more than 5 years experience with implementing new interventions into organisations, we would very much like to interview you and seek your thoughts about a novel visualisation technology and its benefits. The interview will take around 30-45 minutes and we will be able to come to your place of choice.

The interview will be audiotaped and transcribed and the information gathered will be kept strictly confidential with no individual identifiable by anyone other than the researchers, who will use this information only for research purposes. Furthermore, access to the data collected will be restricted to the researcher with the data file containing the information collected being stored away and not accessible to anyone other than the researchers.

Attached is the detailed information sheet and the consent form.

We are looking forward hearing from you!

If you have any questions or wish to obtain further information regarding this study please feel free to contact Anneke Fitzgerald by phone (07 55527043) or email (anneke.fitzgerald@griffith.edu.au).

Regards

Appendix C: Participant information sheet

Using a technology to implement another technology: What are the benefits in using Essomenic in order to implement a new technology in healthcare?
GU Ref No: 2016/147

INFORMATION SHEET

Who is conducting the research

CHIEF INVESTIGATOR
Professor Anneke Fitzgerald
Griffith Business School
anneke.fitzgerald@griffith.edu.au

ASSOCIATE INVESTIGATOR
Dr Katrina Radford
Griffith Business School
k.radford@griffith.edu.au

Why is the research being conducted?

This research is designed to examine the usefulness of visualisation technology, as a tool to introduce new technologies.

What you will be asked to do

You will be asked to participate in an interview with the researcher. This interview is expected to last 30-45 minutes. You will be presented with two scenarios. One scenario where a new technology is being explained verbally with some visual clues, and one scenario where a new intervention is being shown with the aid of computerised visualisation technology. After the presentations we will ask you some questions about the scenarios.

The basis by which participants will be selected or screened

If you are a change manager who has more than 5 years experience with implementing new interventions into organisations than you are invited to participate in this project.

The expected benefits of the research

While there are no direct benefits to you personally by participating, this is an important piece of research. This is because understanding what triggers people to change will ensure organisations are better positioned to understand how to implement new changes more successfully. This will potentially avoid unsuccessful change attempts in the future.

Risks to you

The risks involved in participating in this research are no greater than that arising from daily living.

Your confidentiality

Any information gathered will be kept strictly confidential with no individual identifiable by anyone other than the researchers, who will use this information only for research purposes. Furthermore, access to the data collected will be restricted to the researcher with the data file containing the information collected being stored away and not accessible to anyone other than the researchers.

As required by Griffith University all research data (audio recordings, transcriptions, observational/field notes and analysis) will be retained in a locked cabinet and/or password protected electronic file at Griffith University for a period of five years before being destroyed.

Your participation is voluntary

Participation is entirely voluntary: you are not obliged to be involved and - if you do participate and feel uncomfortable with any aspect of the study - you can withdraw at any time without giving any reason and without any consequences.

Questions / further information

If you have any questions or wish to obtain further information regarding this study please feel free to contact Anneke Fitzgerald by phone (07 55527043) or email (anneke.fitzgerald@griffith.edu.au).

The ethical conduct of this research

Griffith University conducts research in accordance with the National Statement on Ethical Conduct in Human Research. If potential participants have any concerns or complaints about the ethical conduct of the research project they should contact the Manager, Research Ethics on 3735 4375 or research-ethics@griffith.edu.au Ethical approval has been obtained for this study.

Participants can access a summary of findings by emailing Anneke Fitzgerald or by indicating their interest on the consent form.

Privacy Statement

Please note that the conduct of this research involves the collection and analysis of data. Any information collected is considered to be confidential and will not be disclosed to anyone else without your expressed consent, except to meet any government, legal or regulatory authority requirements. Your anonymity will be protected at all times. If you have any questions about this privacy statement, you may consult the university's privacy plan at https://www.griffith.edu.au/about-griffith/plans-publications/griffith-university-privacy-plan or telephone +61 7 3735 4375.

Appendix D: Consent form

Using a technology to implement another technology: What are the benefits in using Essomenic in order to implement a new technology in healthcare?

CONSENT FORM

Researcher: Angelique Olde Meierink
0490213168
a.h.r.oldemeierink@student.utwente.nl

By signing below, I confirm that I have noted that:

- I have had any questions answered to my satisfaction;
- I understand that there will be no direct benefit to me from my participation in this research;
- I understand that my participation in this research is voluntary;
- I understand that if I have any additional questions I can contact the researcher;
- I understand that I am free to withdraw at any time, without explanation or penalty;
- I agree to be interviewed for the purposes of the student research named above;
- I agree that the interview may be audio recorded; and
- I agree to participate in the project.

☐ I agree to participate in the project.

Name	
Signature	
Date	

Appendix E: Ethics clearance

Full Research Ethics Clearance 2016/147

1 message

rims@griffith.edu.au <rims@griffith.edu.au> 21 March 2016 at 09:01
To: k.radford@griffith.edu.au, anneke.fitzgerald@griffith.edu.au
Cc: research-ethics@griffith.edu.au, k.madison@griffith.edu.au

GRIFFITH UNIVERSITY HUMAN RESEARCH ETHICS REVIEW

Dear Prof Anneke Fitzgerald

I write further to the additional information provided in relation to the provisional approval granted to your application for ethical clearance for your project "Implementation of technology" (GU Ref No: 2016/147).

This is to confirm that this response has addressed the comments and concerns of the HREC.

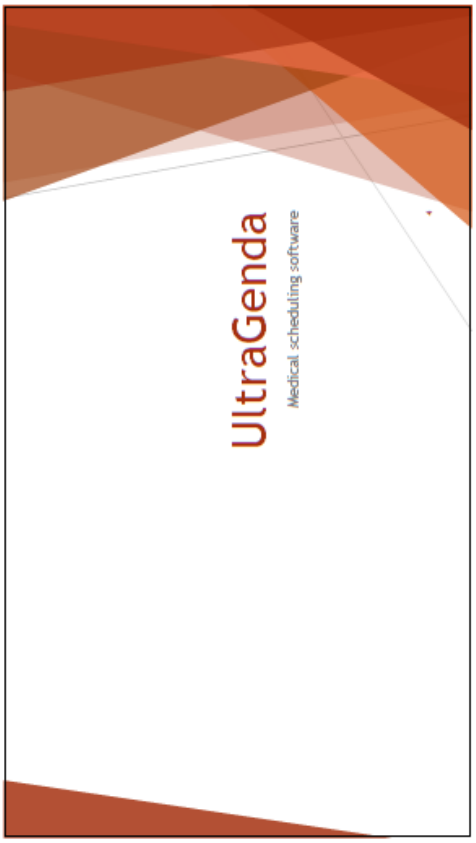
The ethics reviewers resolved to grant your application a clearance status of "Fully Approved".

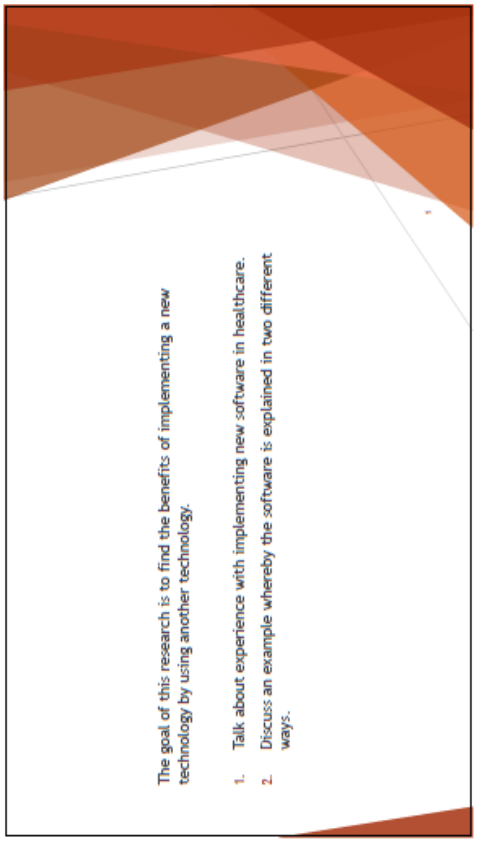
Consequently, you are authorised to immediately commence this research on this basis.

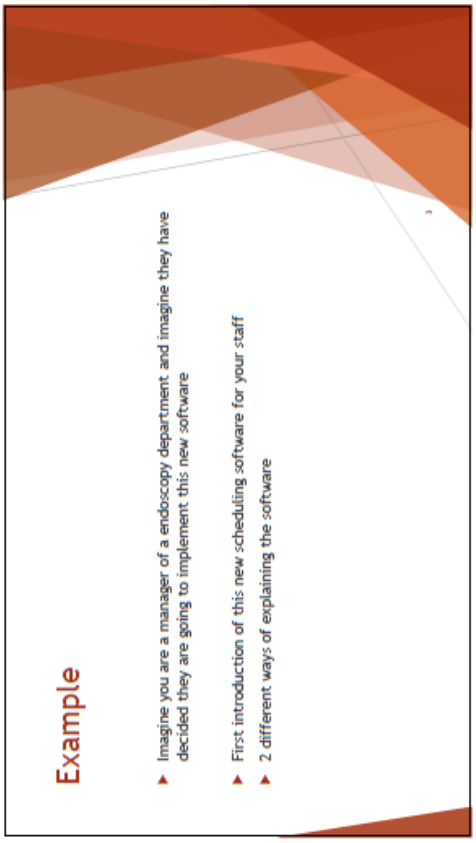
Regards

Kim Madison
Policy Officer, Human Research Ethics and Integrity
Office for Research
Bray Centre, Nathan Campus
Griffith University
ph: +61 (0)7 373 58043
fax: +61 (07) 373 57994
email: k.madison@griffith.edu.au

Appendix F: Example (even version) presentation interview

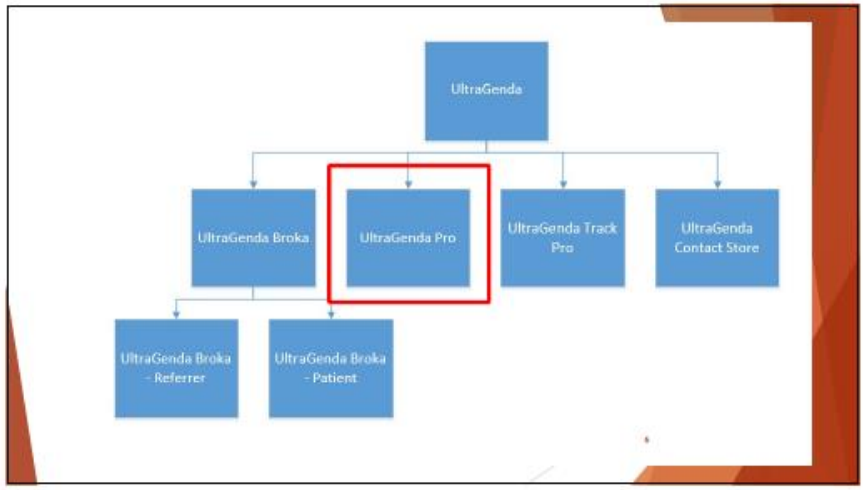




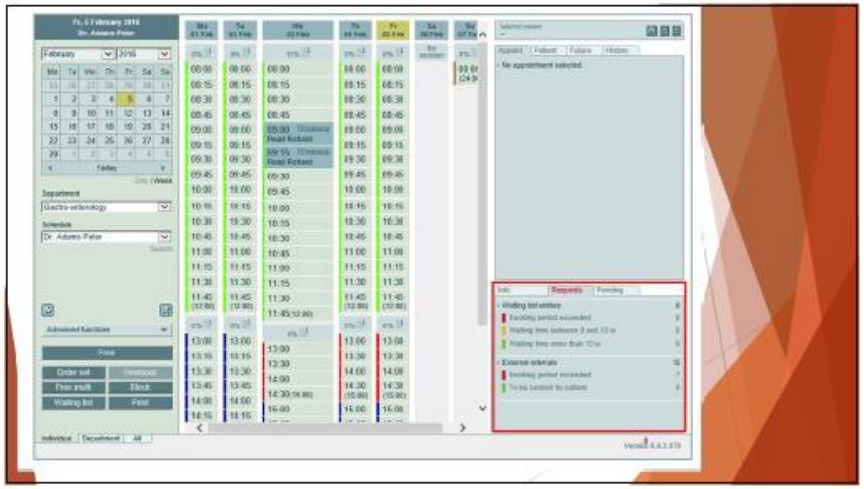


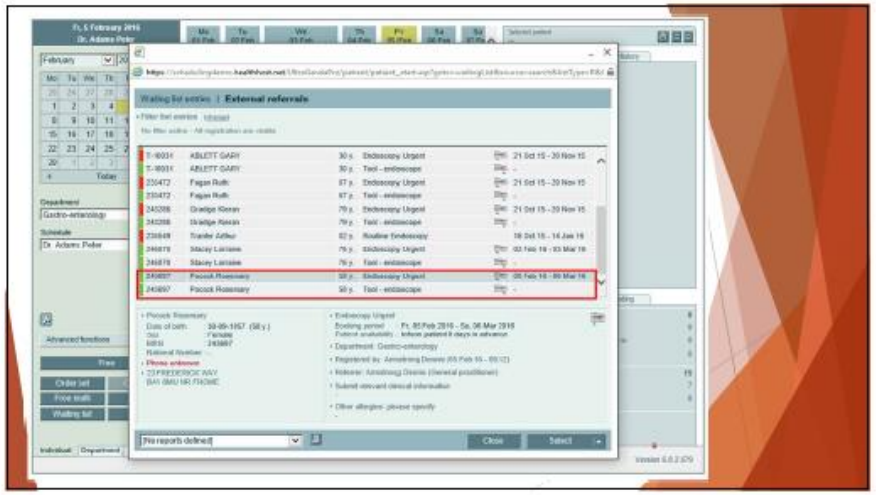
UltraGenda

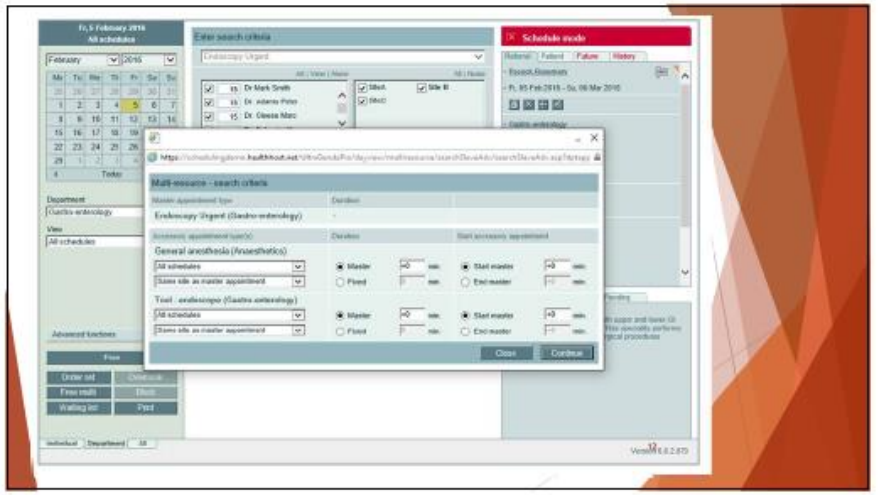
- New scheduling solution for healthcare
- Offers hospitals and healthcare organisations generic tools:
  - to manage the scheduling process
  - improve service for patients
  - and reduce inefficiencies

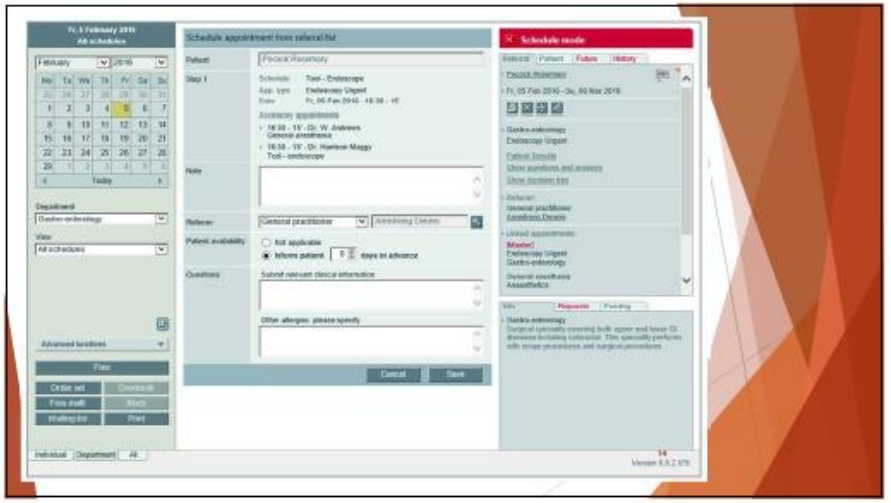


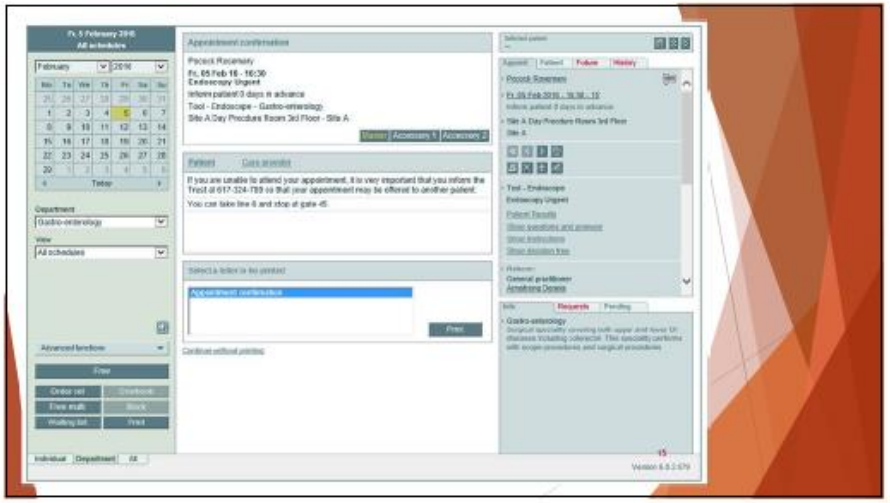
Method 1





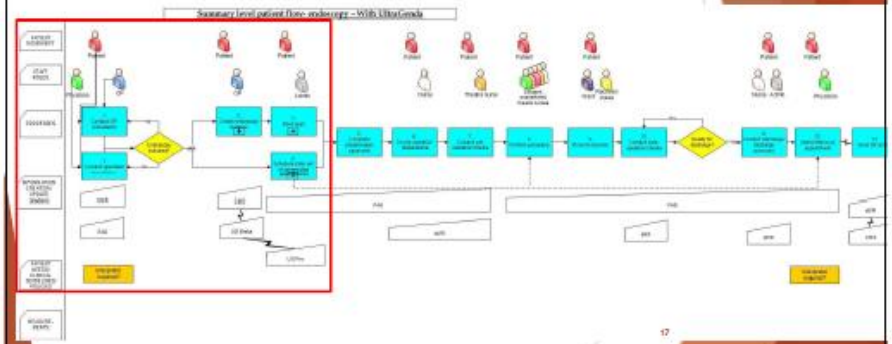


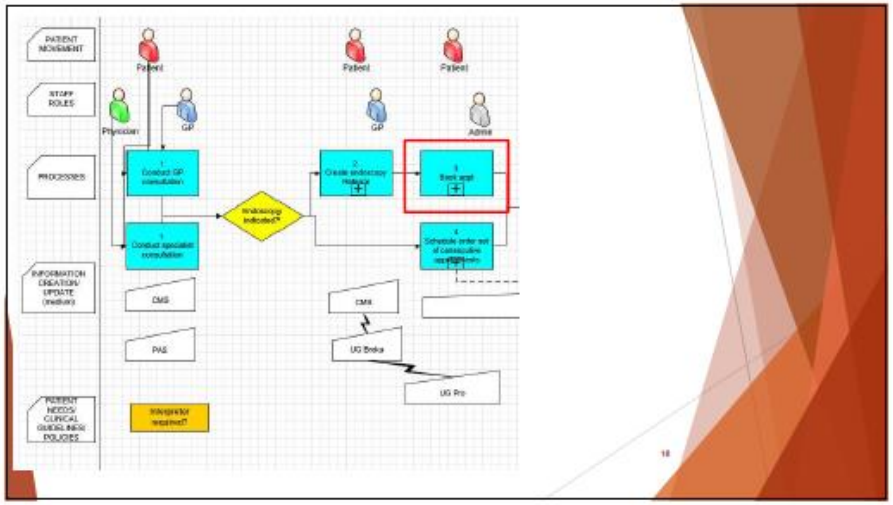


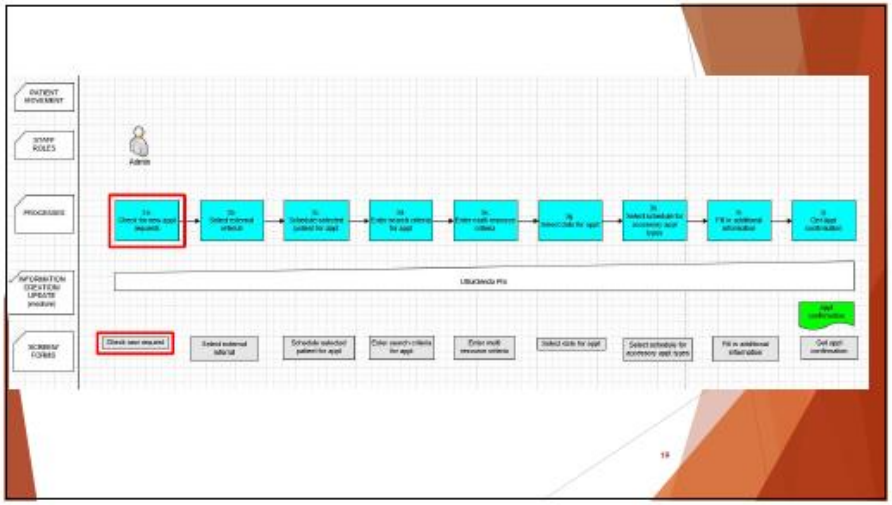


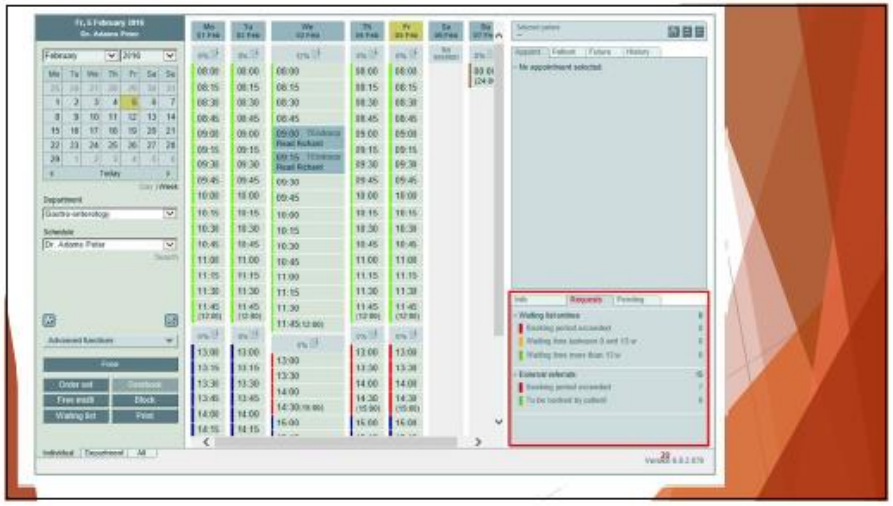
Method 2

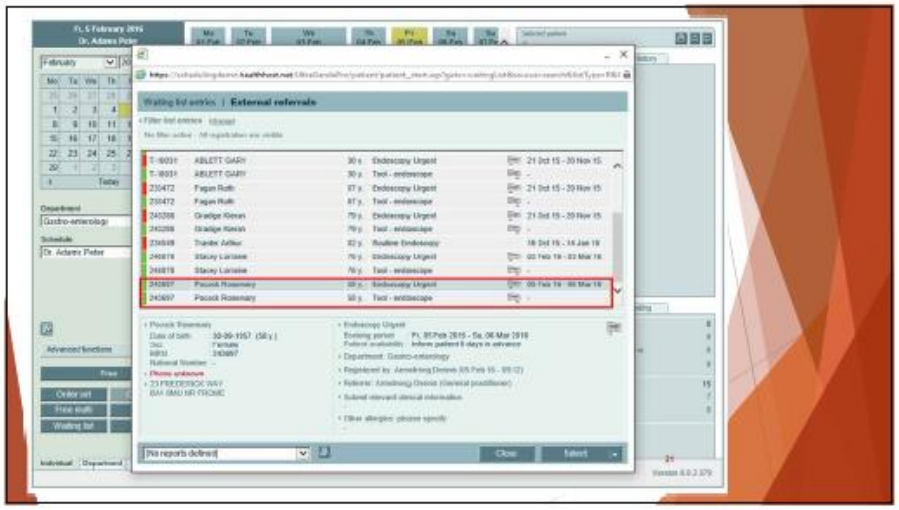
Process with UltraGenda

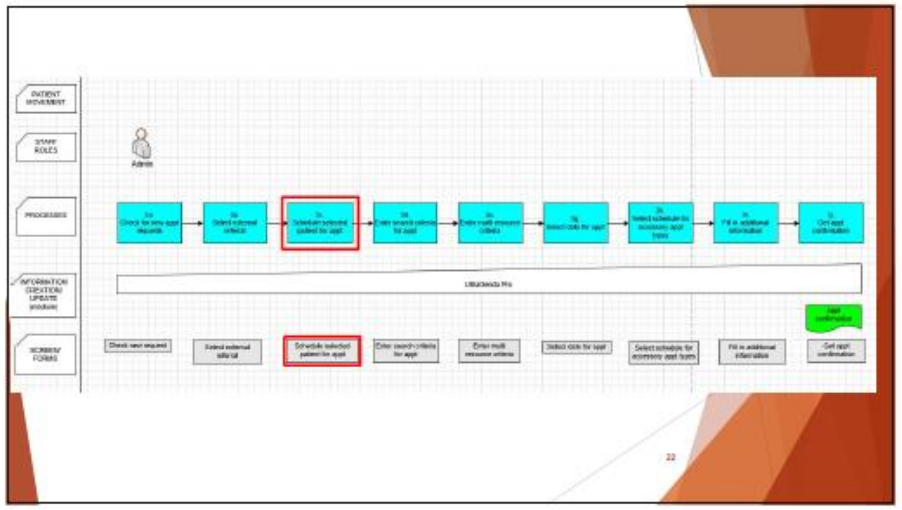


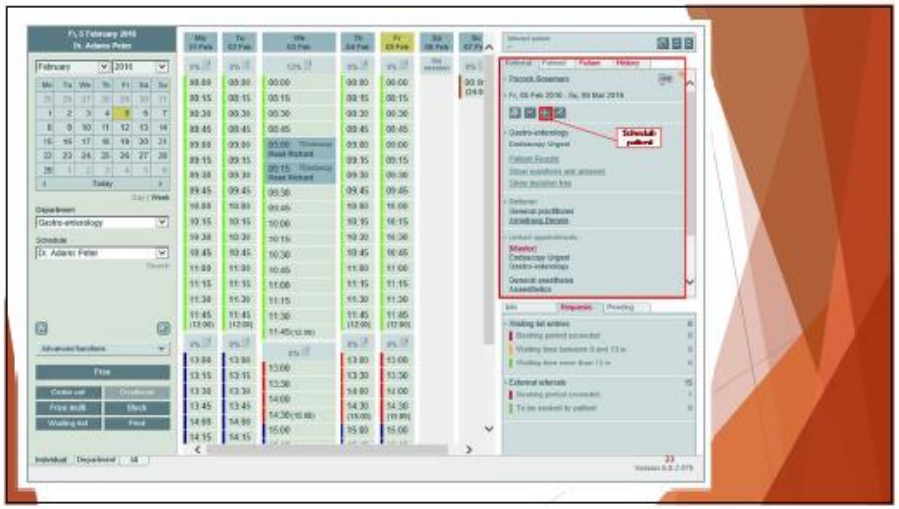


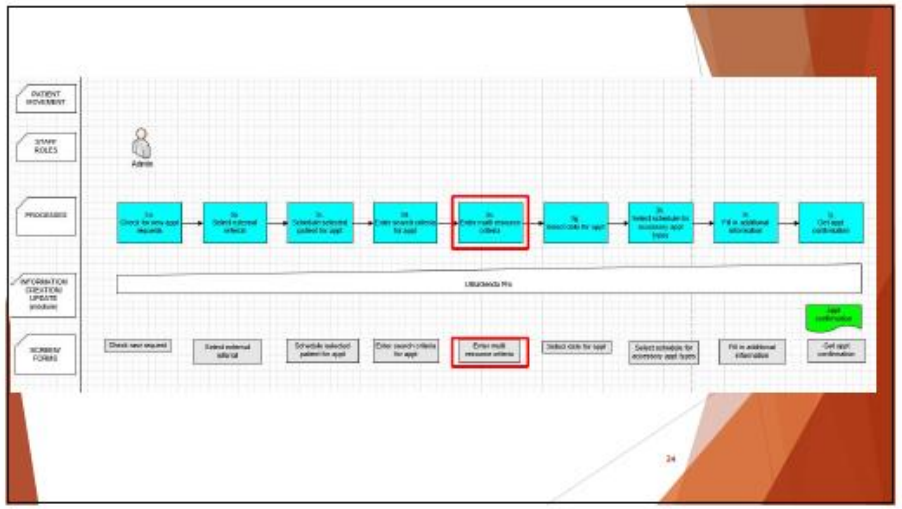


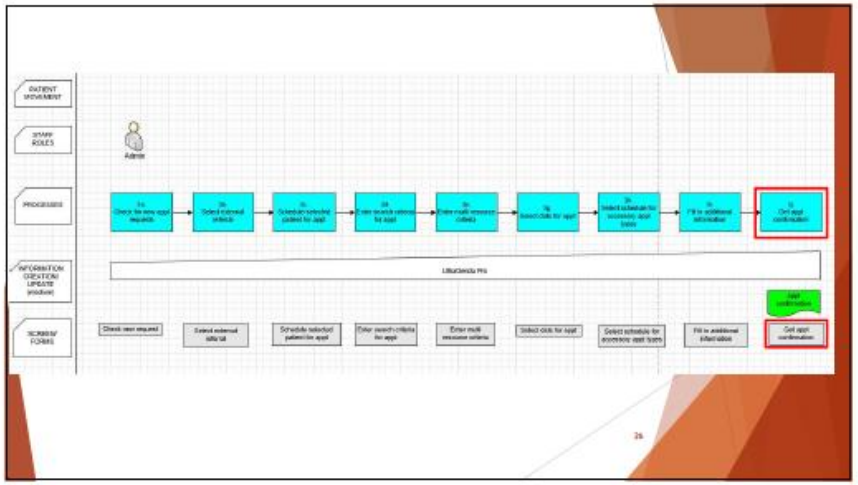



Waiting list entries | External referrals
Close
Select


PATIENT MOVEMENT
STAFF ROLES
PROCESSES
INFORMATION (DESKTOP) UPDATE window
SCREEN/ FORMS
Admin
Check new request
Select external referral
Schedule selected patient for appt
Enter search criteria for appt
Enter multi resource criteria
Select slots for appt
Select schedule for accessory appt types
Fill in additional information
Get appt confirmation
Appt confirmation
22


Schedule patient
23


PATIENT MOVEMENT
STAFF ROLES
PROCESSES
INFORMATION (DESKTOP) UPDATE window
SCREEN/ FORMS
Admin
Check new request
Select external referral
Schedule selected patient for appt
Enter search criteria for appt
Enter multi resource criteria
Select slots for appt
Select schedule for accessory appt types
Fill in additional information
Get appt confirmation
Appt confirmation
24



Questions

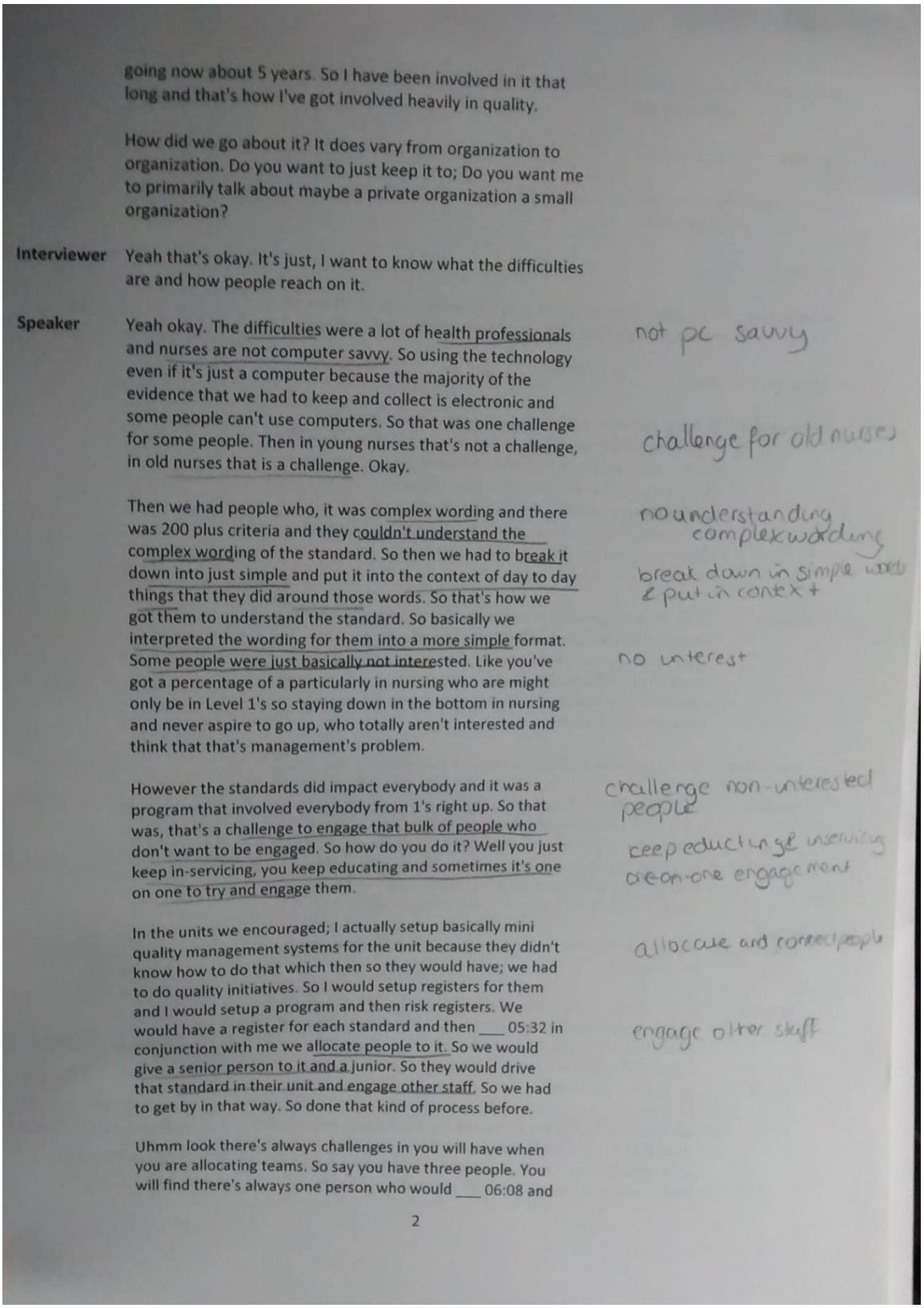
- What do you think about this explanation of UltraGenda?
- How would you rate this explanation?

Questions

- Which explanation of UltraGenda do you prefer? Why?
- What are the limitations, barriers and enablers?
- How would you rate each explanation on a scale from 0 to 10?

- Coming back to the example you mentioned in the beginning of this interview would you rather aim to use the first explanation to implement this software of the second with Essomenic?

Appendix G: Example coding



going now about 5 years. So I have been involved in it that long and that's how I've got involved heavily in quality.

How did we go about it? It does vary from organization to organization. Do you want to just keep it to; Do you want me to primarily talk about maybe a private organization a small organization?

Interviewer Yeah that's okay. It's just, I want to know what the difficulties are and how people reach on it.

Speaker Yeah okay. The difficulties were a lot of health professionals and nurses are not computer savvy. So using the technology even if it's just a computer because the majority of the evidence that we had to keep and collect is electronic and some people can't use computers. So that was one challenge for some people. Then in young nurses that's not a challenge, in old nurses that is a challenge. Okay.

Then we had people who, it was complex wording and there was 200 plus criteria and they couldn't understand the complex wording of the standard. So then we had to break it down into just simple and put it into the context of day to day things that they did around those words. So that's how we got them to understand the standard. So basically we interpreted the wording for them into a more simple format. Some people were just basically not interested. Like you've got a percentage of a particularly in nursing who are might only be in Level 1's so staying down in the bottom in nursing and never aspire to go up, who totally aren't interested and think that that's management's problem.

However the standards did impact everybody and it was a program that involved everybody from 1's right up. So that was, that's a challenge to engage that bulk of people who don't want to be engaged. So how do you do it? Well you just keep in-servicing, you keep educating and sometimes it's one on one to try and engage them.

In the units we encouraged; I actually setup basically mini quality management systems for the unit because they didn't know how to do that which then so they would have; we had to do quality initiatives. So I would setup registers for them and I would setup a program and then risk registers. We would have a register for each standard and then ___ 05:32 in conjunction with me we allocate people to it. So we would give a senior person to it and a junior. So they would drive that standard in their unit and engage other staff. So we had to get by in that way. So done that kind of process before.

Uhmm look there's always challenges in you will have when you are allocating teams. So say you have three people. You will find there's always one person who would ___ 06:08 and

2

not pc savvy

challenge for old nurses

no understanding complex wording

break down in simple words & put in context

no interest

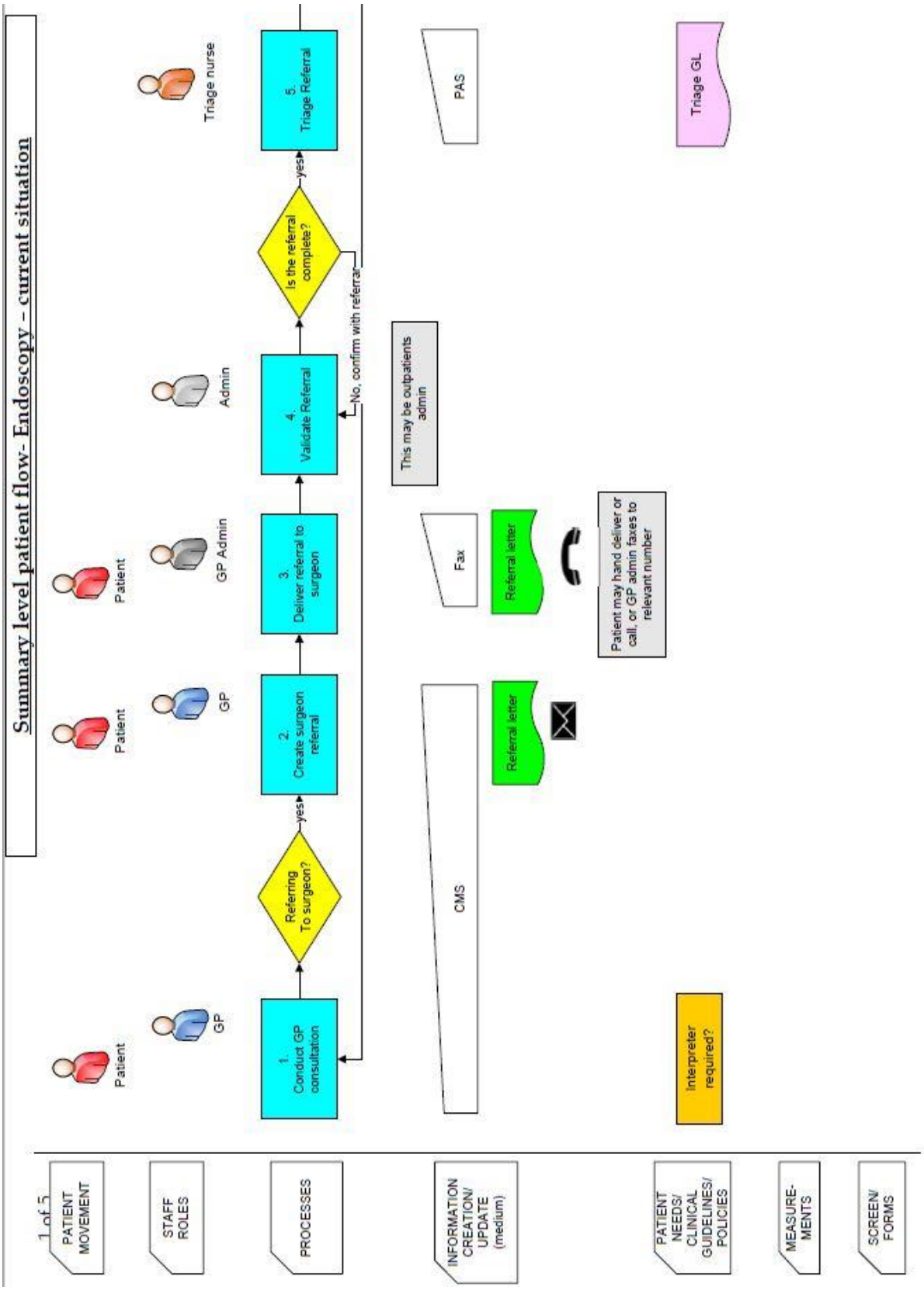
challenge non-interested people

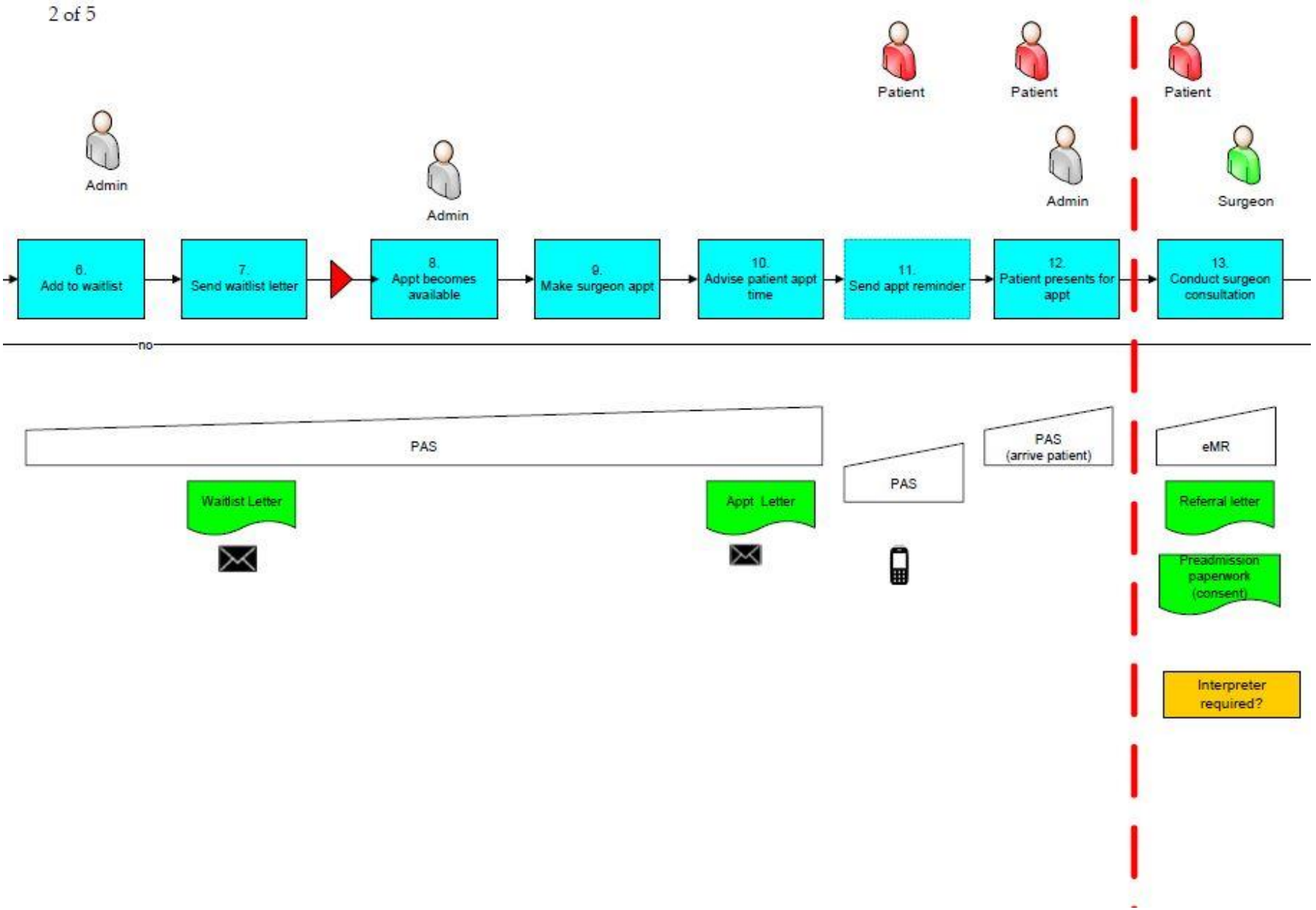
keep educating & servicing one-on-one engagement

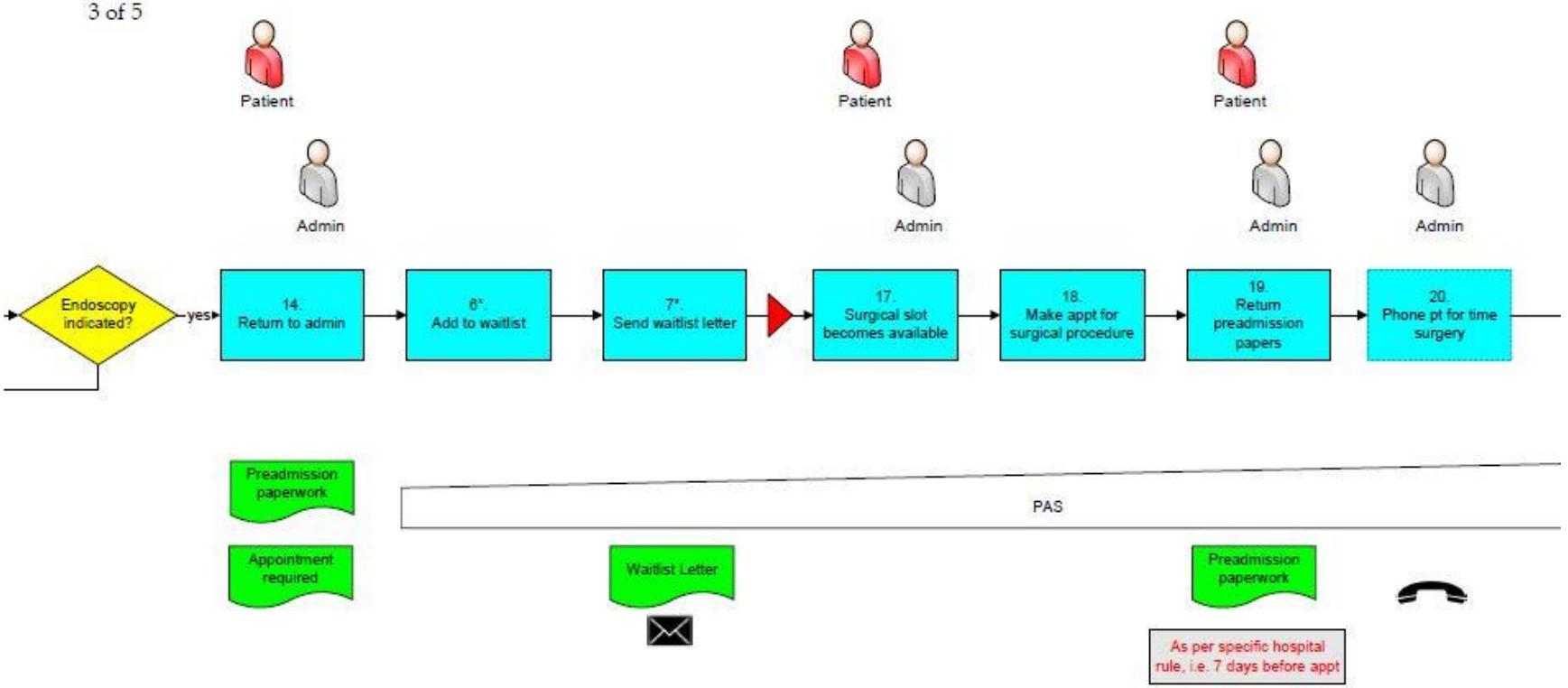
allocate and connect people

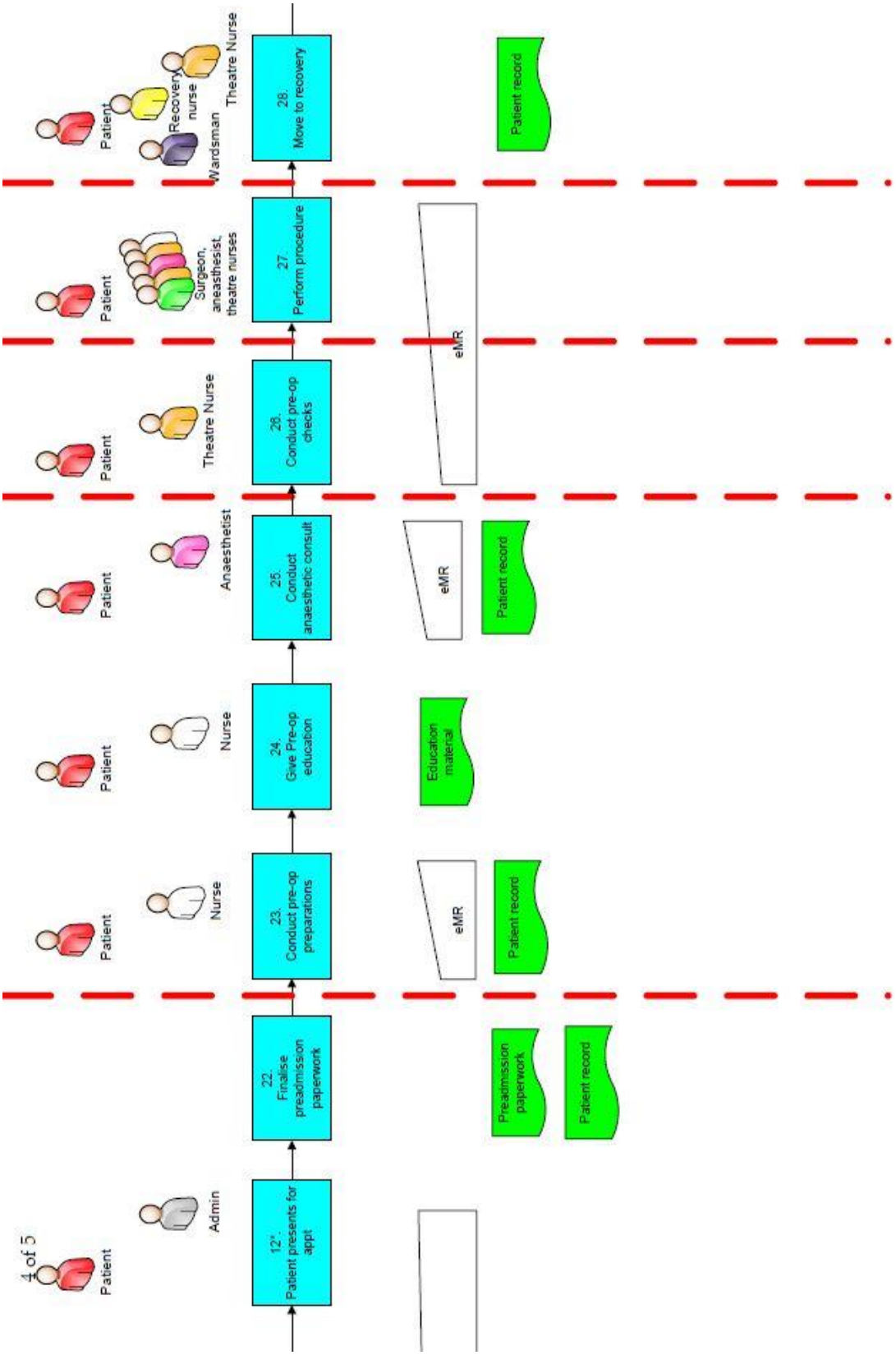
engage other staff

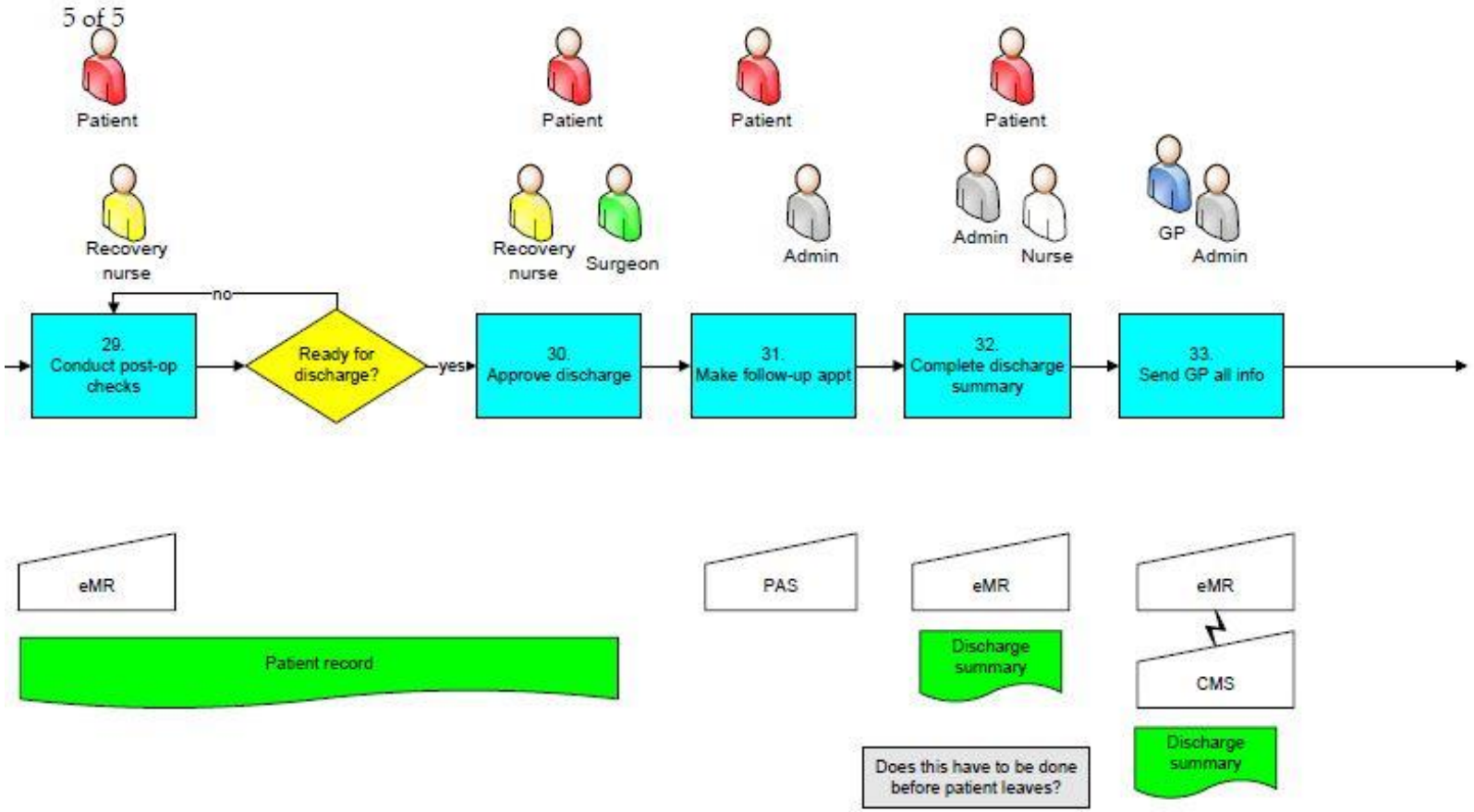
Appendix H: Model Endoscopy current situation



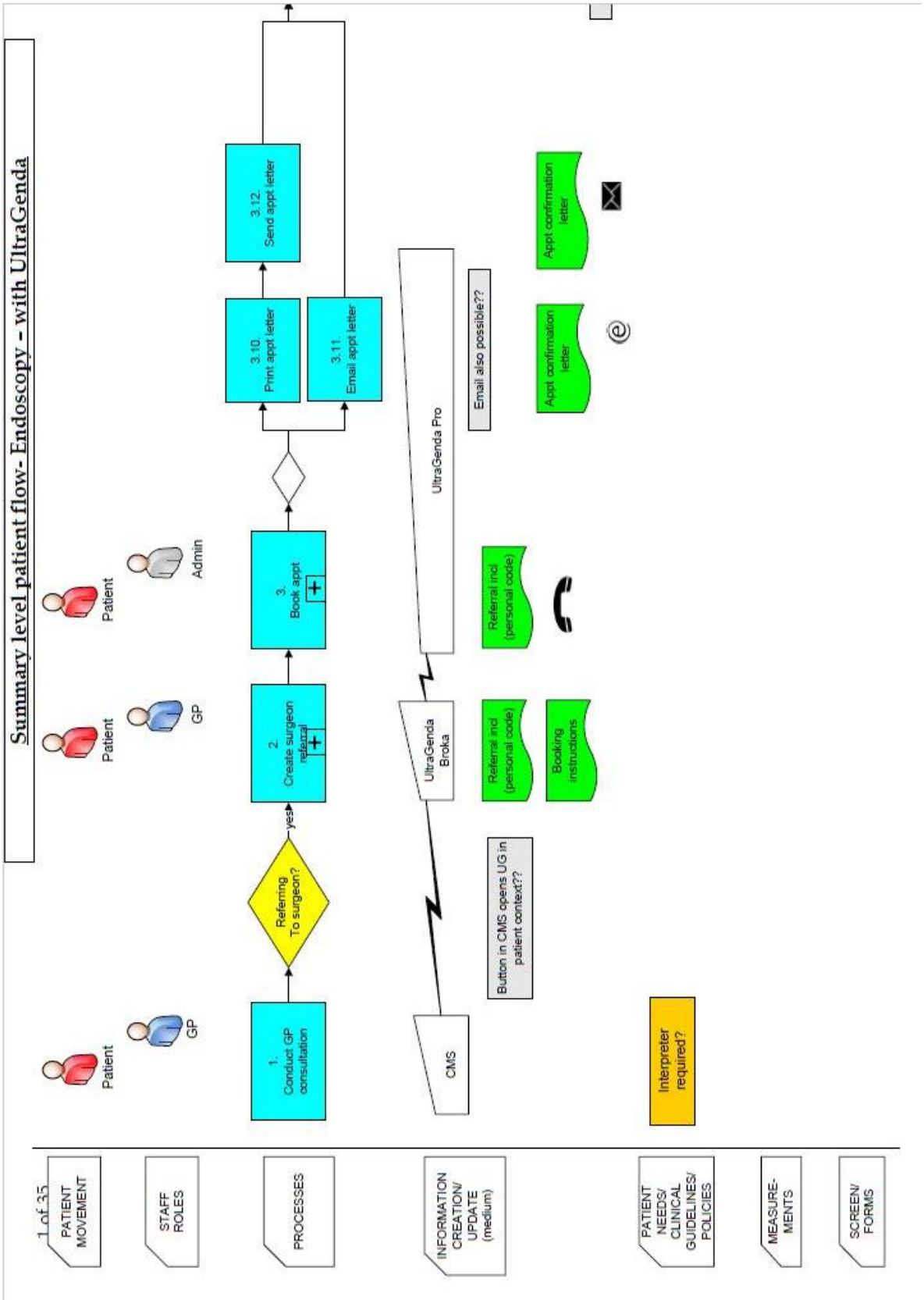

Patient
Patient
Patient
Admin
Admin
Admin
Surgeon
6.
Add to waitlist
7.
Send waitlist letter
8.
Appt becomes available
9.
Make surgeon appt
10.
Advise patient appt time
11.
Send appt reminder
12.
Patient presents for appt
13.
Conduct surgeon consultation
no
PAS
PAS
PAS
(arrive patient)
eMR
Waitlist Letter
Appt Letter
Referral letter
Preadmission paperwork (consent)
Interpreter required?

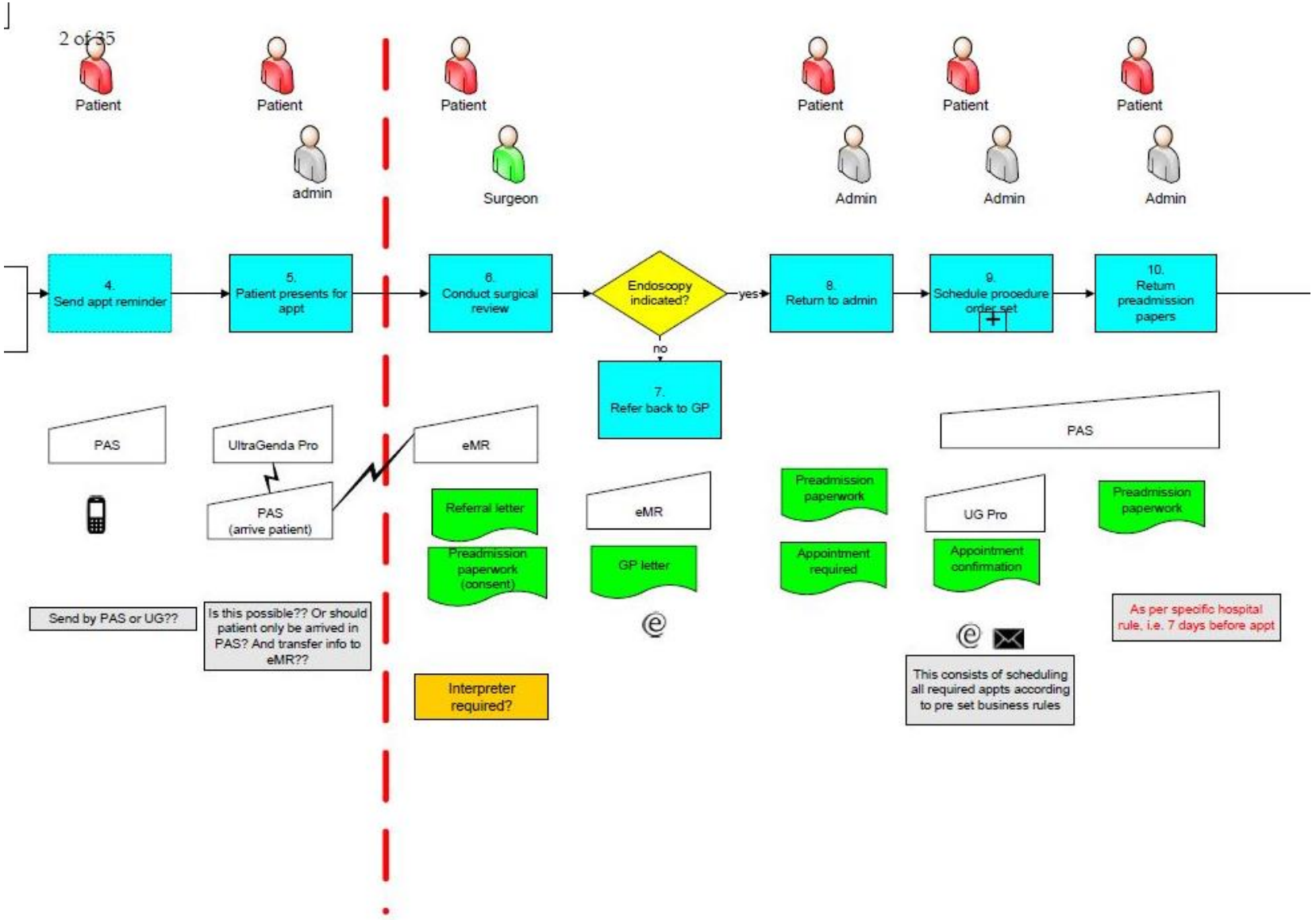

Patient
Patient
Patient
Admin
Admin
Admin
Admin
Endoscopy indicated?
yes
14. Return to admin
6*. Add to waitlist
7*. Send waitlist letter
17. Surgical slot becomes available
18. Make appt for surgical procedure
19. Return preadmission papers
20. Phone pt for time surgery
Preadmission paperwork
Appointment required
PAS
Waitlist Letter
Preadmission paperwork
As per specific hospital rule, i.e. 7 days before appt

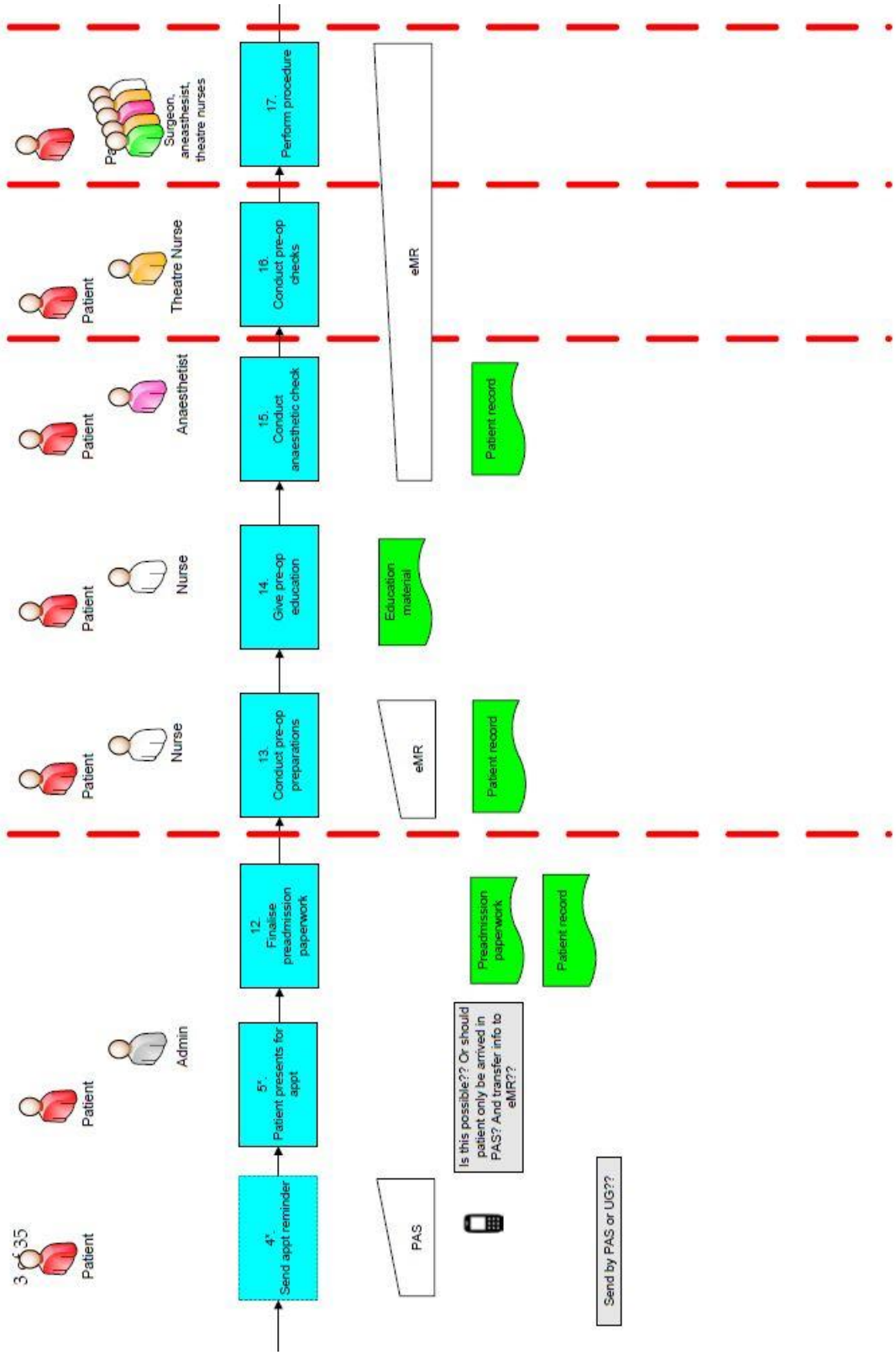

4 of 5
Patient
Admin
12'. Patient presents for appt
22. Finalise preadmission paperwork
Preadmission paperwork
Patient record
Patient
Nurse
23. Conduct pre-op preparations
eMR
Patient record
Patient
Nurse
24. Give Pre-op education
Education material
Patient
Anaesthetist
25. Conduct anaesthetic consult
eMR
Patient record
Patient
Theatre Nurse
26. Conduct pre-op checks
eMR
Patient
Surgeon, anaesthesist, theatre nurses
27. Perform procedure
Patient
Wardsman
Recovery nurse
Theatre Nurse
28. Move to recovery
Patient record

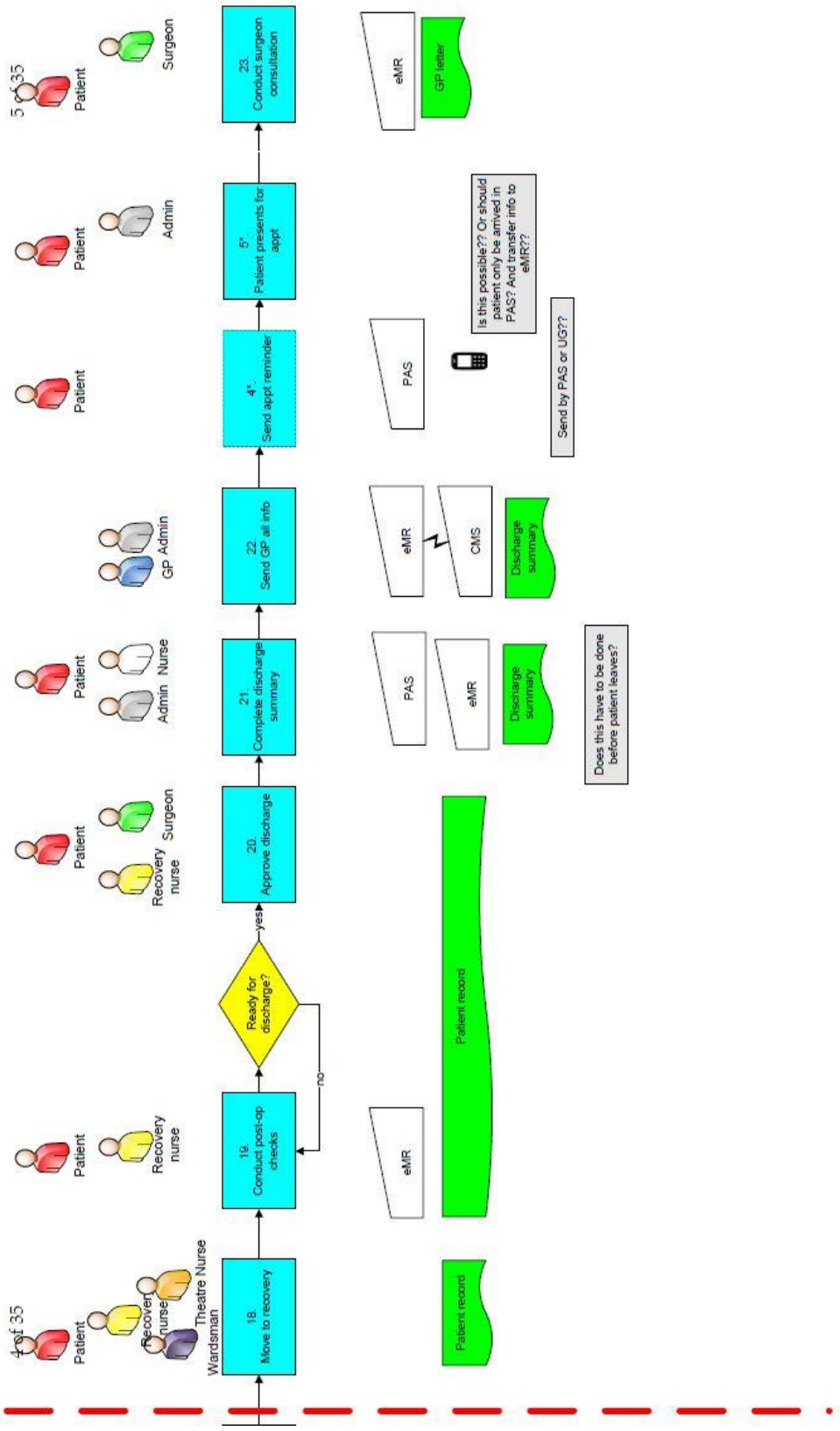

Patient
Patient
Patient
Patient
Recovery nurse
Recovery nurse
Surgeon
Admin
Admin
Nurse
GP
Admin
no
29. Conduct post-op checks
Ready for discharge?
yes
30. Approve discharge
31. Make follow-up appt
32. Complete discharge summary
33. Send GP all info
eMR
Patient record
PAS
eMR
Discharge summary
Does this have to be done before patient leaves?
eMR
CMS
Discharge summary

Appendix I: Model Endoscopy new situation, with UltraGenda

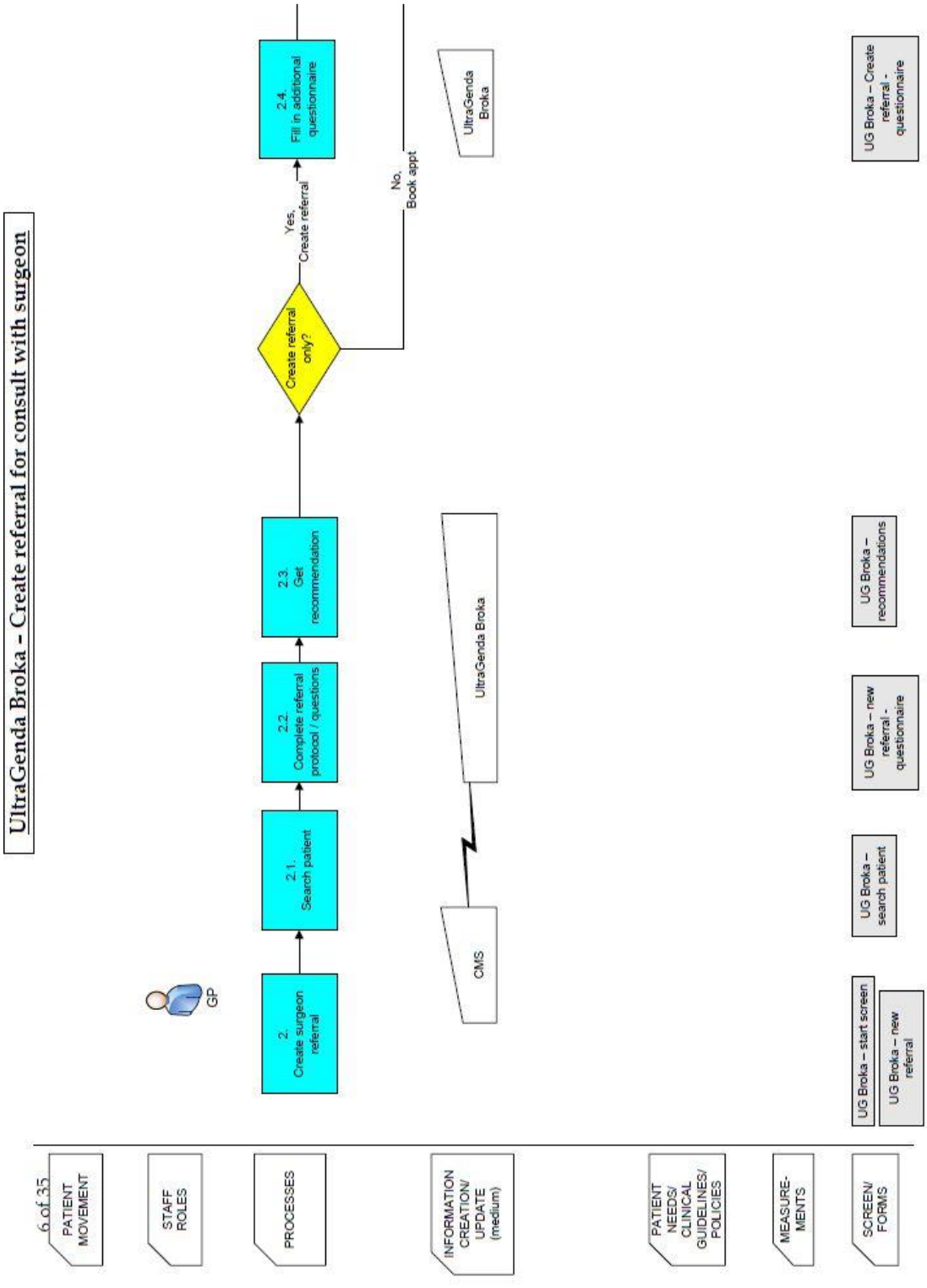


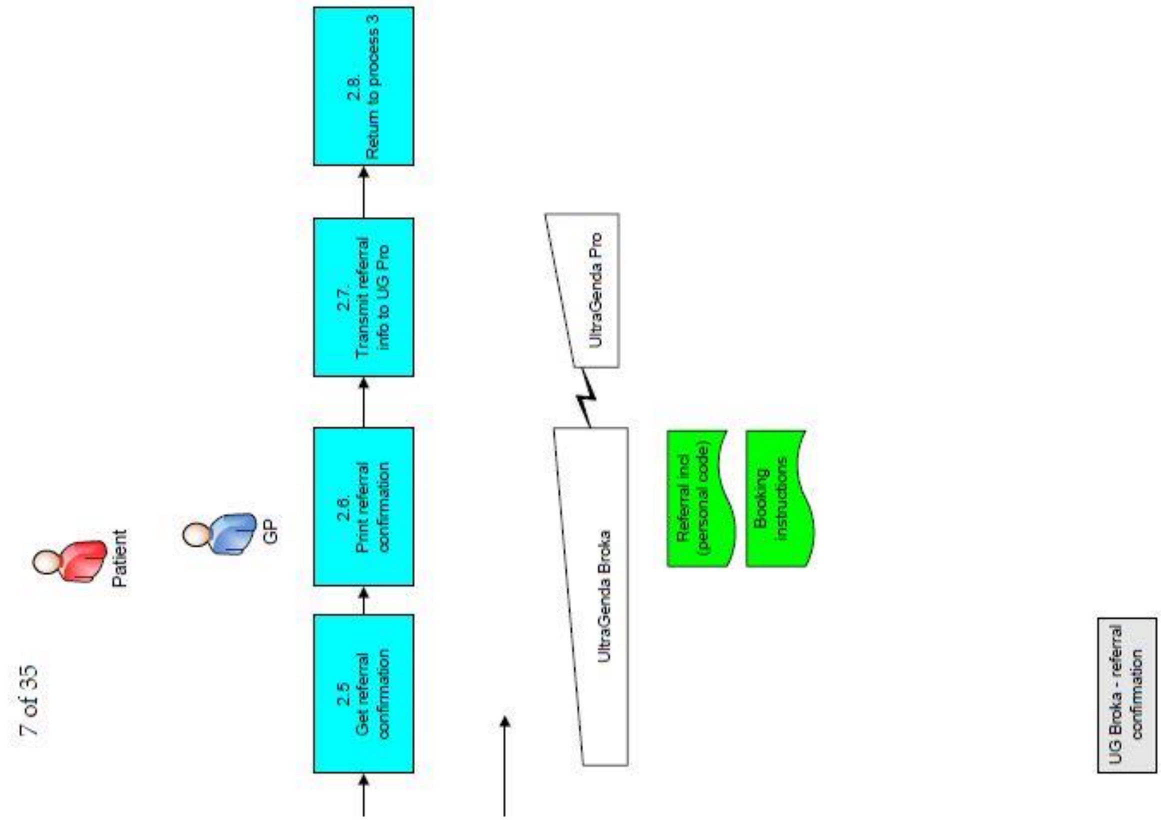

Patient
Patient
Patient
Patient
Patient
Patient
admin
Surgeon
Admin
Admin
Admin
4. Send appt reminder
5. Patient presents for appt
6. Conduct surgical review
Endoscopy indicated?
yes
8. Return to admin
9. Schedule procedure order set
10. Return preadmission papers
no
7. Refer back to GP
PAS
UltraGenda Pro
eMR
PAS
PAS (arrive patient)
Referral letter
Preadmission paperwork (consent)
eMR
GP letter
Preadmission paperwork
Appointment required
UG Pro
Appointment confirmation
Preadmission paperwork
Send by PAS or UG??
Is this possible?? Or should patient only be arrived in PAS? And transfer info to eMR??
Interpreter required?
This consists of scheduling all required appts according to pre set business rules
As per specific hospital rule, i.e. 7 days before appt


3 of 35
Patient
Patient
Admin
4*
Send appt reminder
5*
Patient presents for appt
12.
Finalise preadmission paperwork
13.
Conduct pre-op preparations
14.
Give pre-op education
15.
Conduct anaesthetic check
16.
Conduct pre-op checks
17.
Perform procedure
Patient
Nurse
Patient
Nurse
Patient
Anaesthetist
Patient
Theatre Nurse
Surgeon, anaesthesist, theatre nurses
PAS
Is this possible?? Or should patient only be arrived in PAS? And transfer info to eMR??
Preadmission paperwork
Patient record
eMR
Patient record
Education material
eMR
Patient record
Send by PAS or UG??


4 of 35
Patient
Recovery nurse
Theatre Nurse
Wardsman
18. Move to recovery
Patient record
Patient
Recovery nurse
19. Conduct post-op checks
eMR
Ready for discharge?
no
yes
Patient
Recovery nurse
Surgeon
20. Approve discharge
Patient record
Patient
Admin
Nurse
21. Complete discharge summary
PAS
eMR
Discharge summary
Does this have to be done before patient leaves?
Patient
GP Admin
22. Send GP all info
eMR
CMS
Discharge summary
Patient
4*. Send appt reminder
PAS
Is this possible?? Or should patient only be arrived in PAS? And transfer info to eMR??
Send by PAS or UG??
Patient
Admin
5*. Patient presents for appt
5 of 35
Patient
Surgeon
23. Conduct surgeon consultation
eMR
GP letter

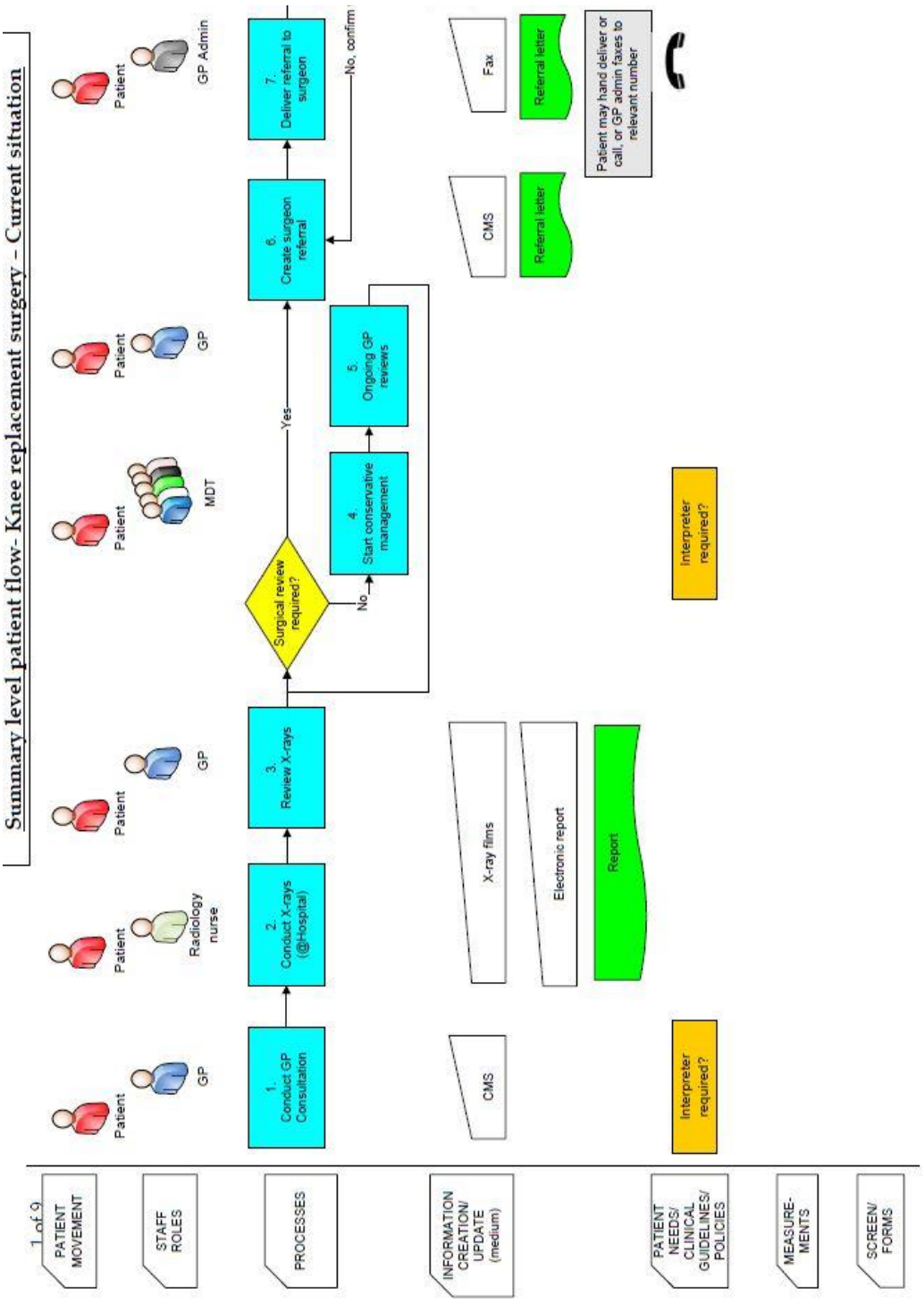
Appendix I.1: Create endoscopy referral in UG Broka

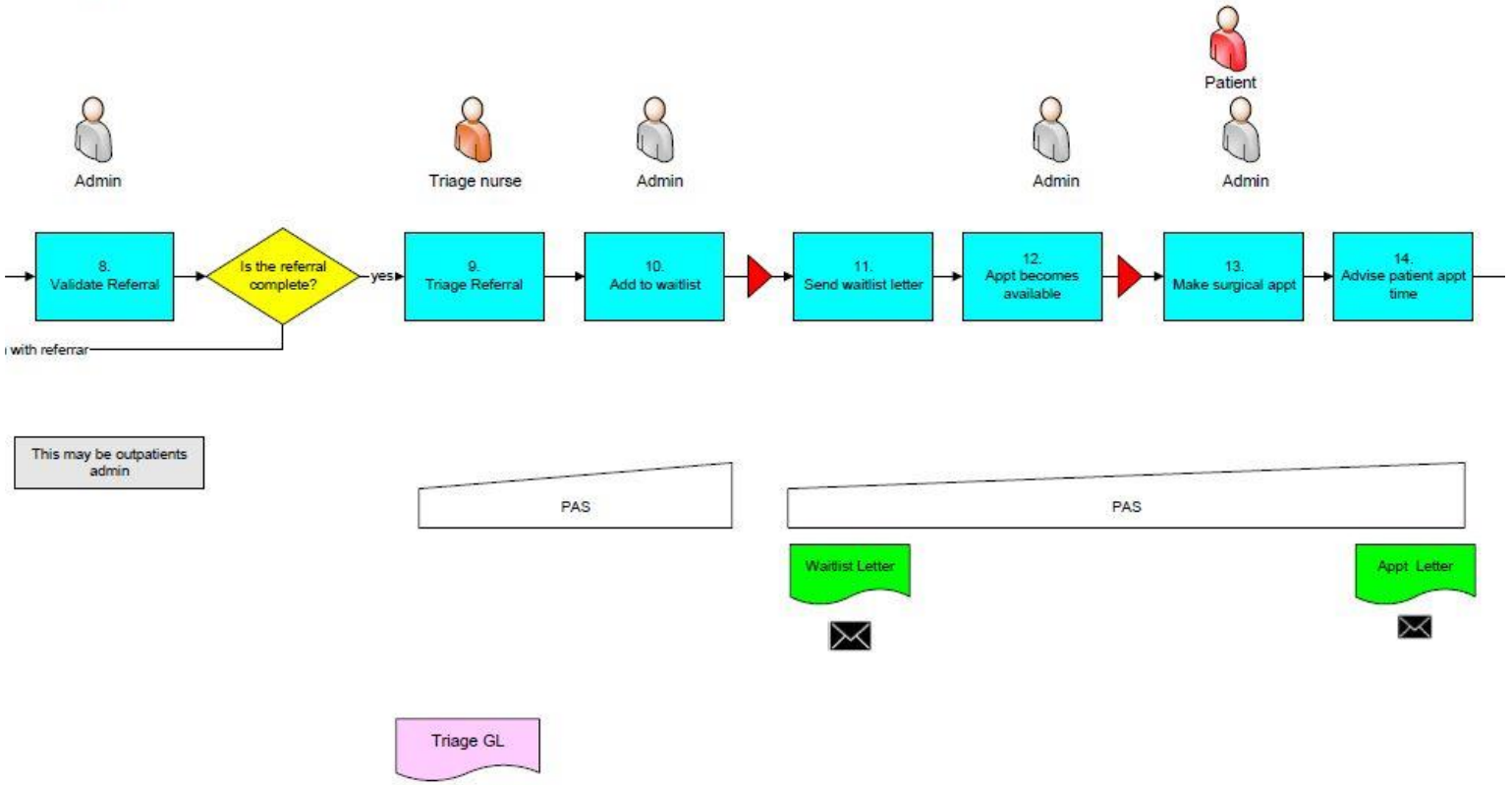


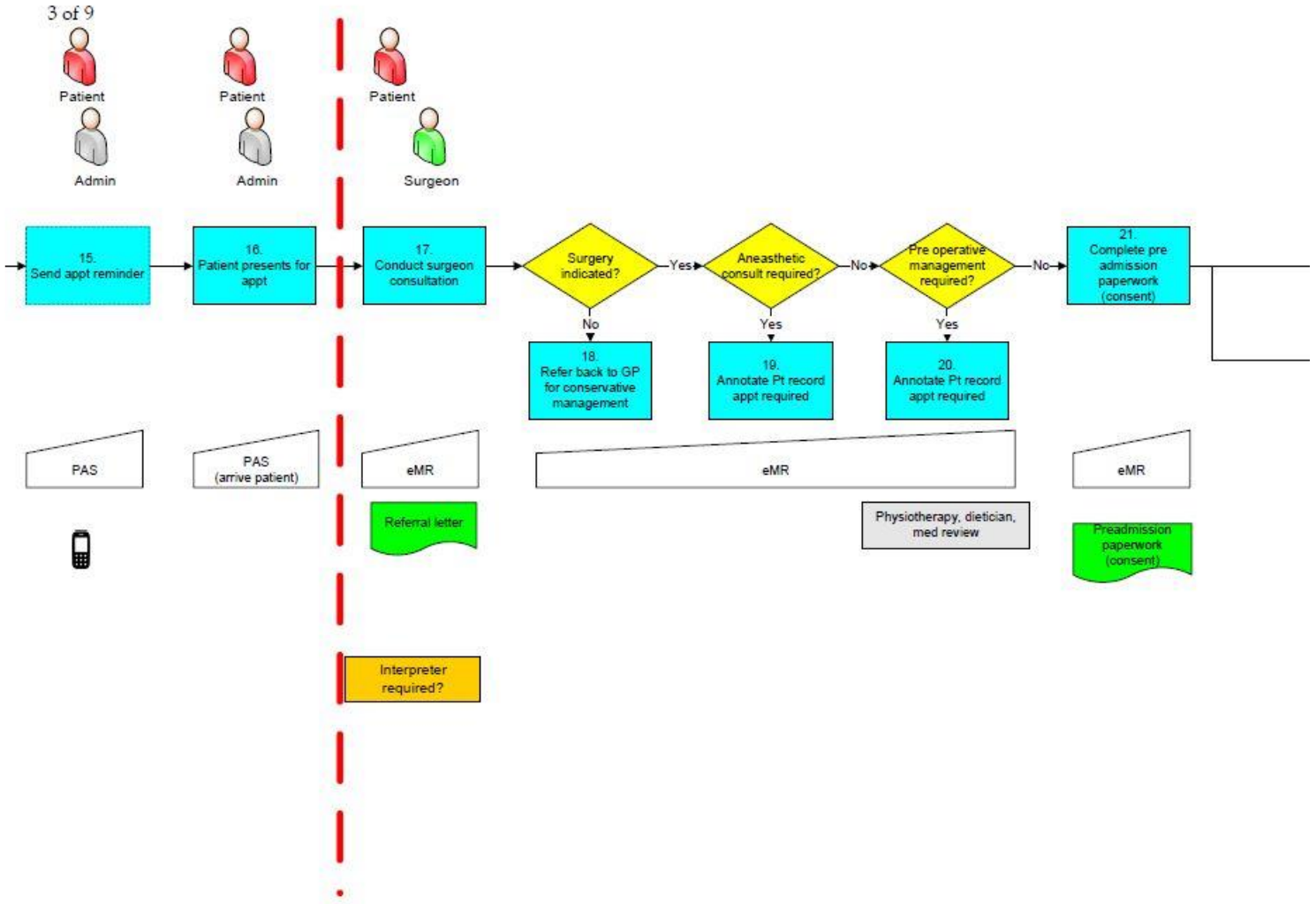


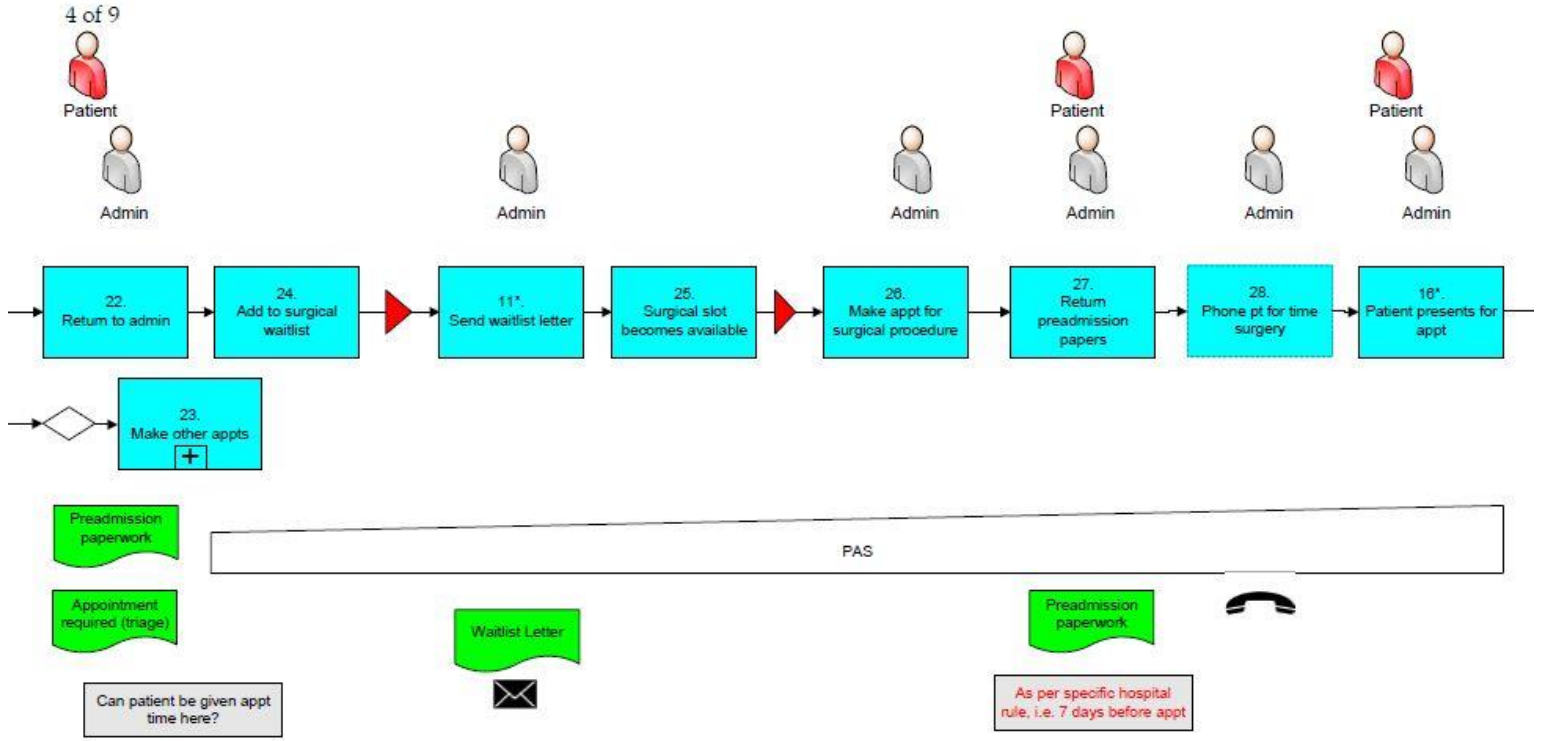
7 of 35
Patient
GP
2.5
Get referral confirmation
2.6.
Print referral confirmation
2.7.
Transmit referral info to UG Pro
2.8.
Return to process 3
UltraGenda Broka
UltraGenda Pro
Referral incl (personal code)
Booking instructions
UG Broka - referral confirmation

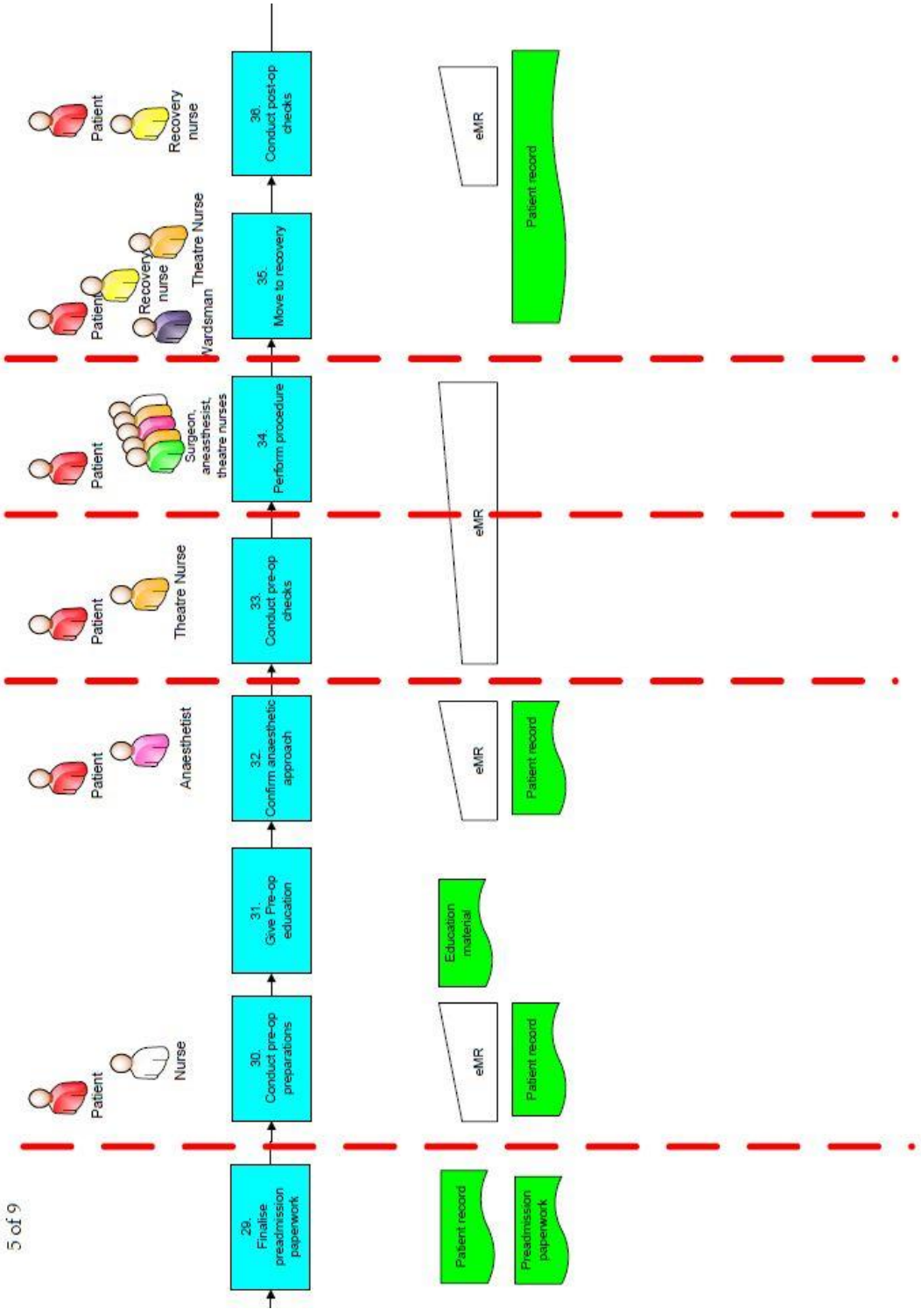
Appendix J: Model Knee replacement current situation

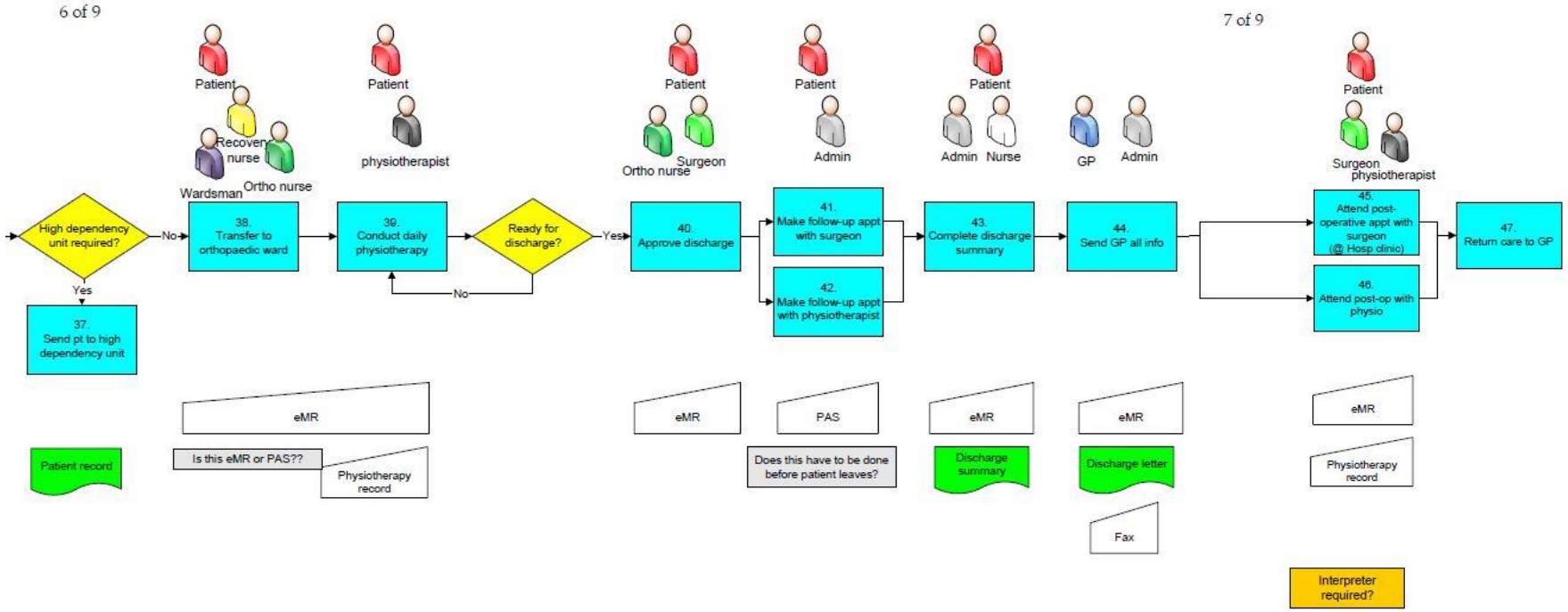



Patient
Admin
Triage nurse
Admin
Admin
Admin
8.
Validate Referral
Is the referral complete?
yes
with referrar
9.
Triage Referral
10.
Add to waitlist
11.
Send waitlist letter
12.
Appt becomes available
13.
Make surgical appt
14.
Advise patient appt time
This may be outpatients admin
PAS
PAS
Waitlist Letter
Appt Letter
Triage GL

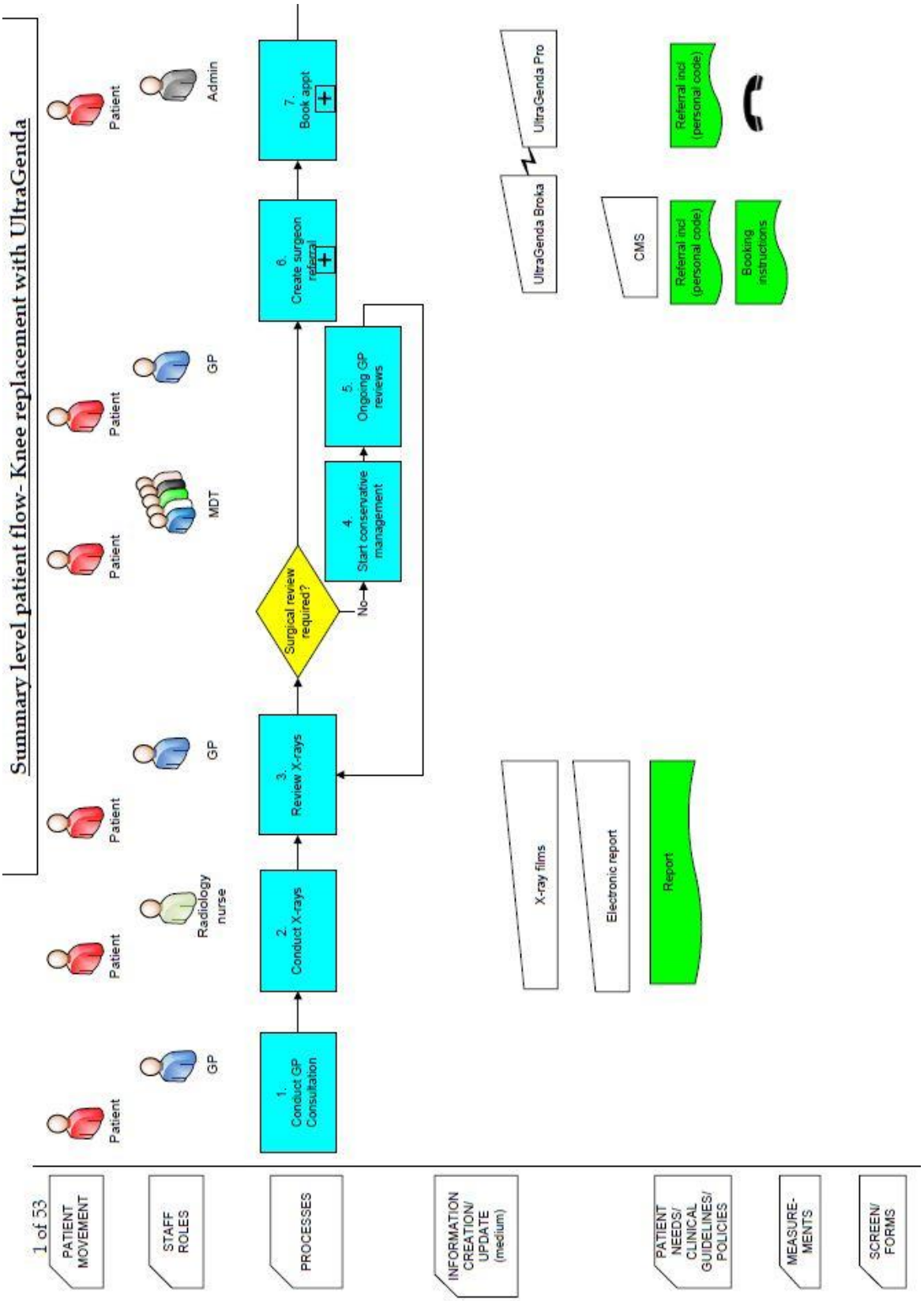

3 of 9
Patient
Admin
Patient
Admin
Patient
Surgeon
15. Send appt reminder
16. Patient presents for appt
17. Conduct surgeon consultation
Surgery indicated?
Yes
Aneasthetic consult required?
No
Pre operative management required?
No
21. Complete pre admission paperwork (consent)
No
18. Refer back to GP for conservative management
Yes
19. Annotate Pt record appt required
Yes
20. Annotate Pt record appt required
PAS
PAS (arrive patient)
eMR
eMR
eMR
Referral letter
Physiotherapy, dietician, med review
Preadmission paperwork (consent)
Interpreter required?

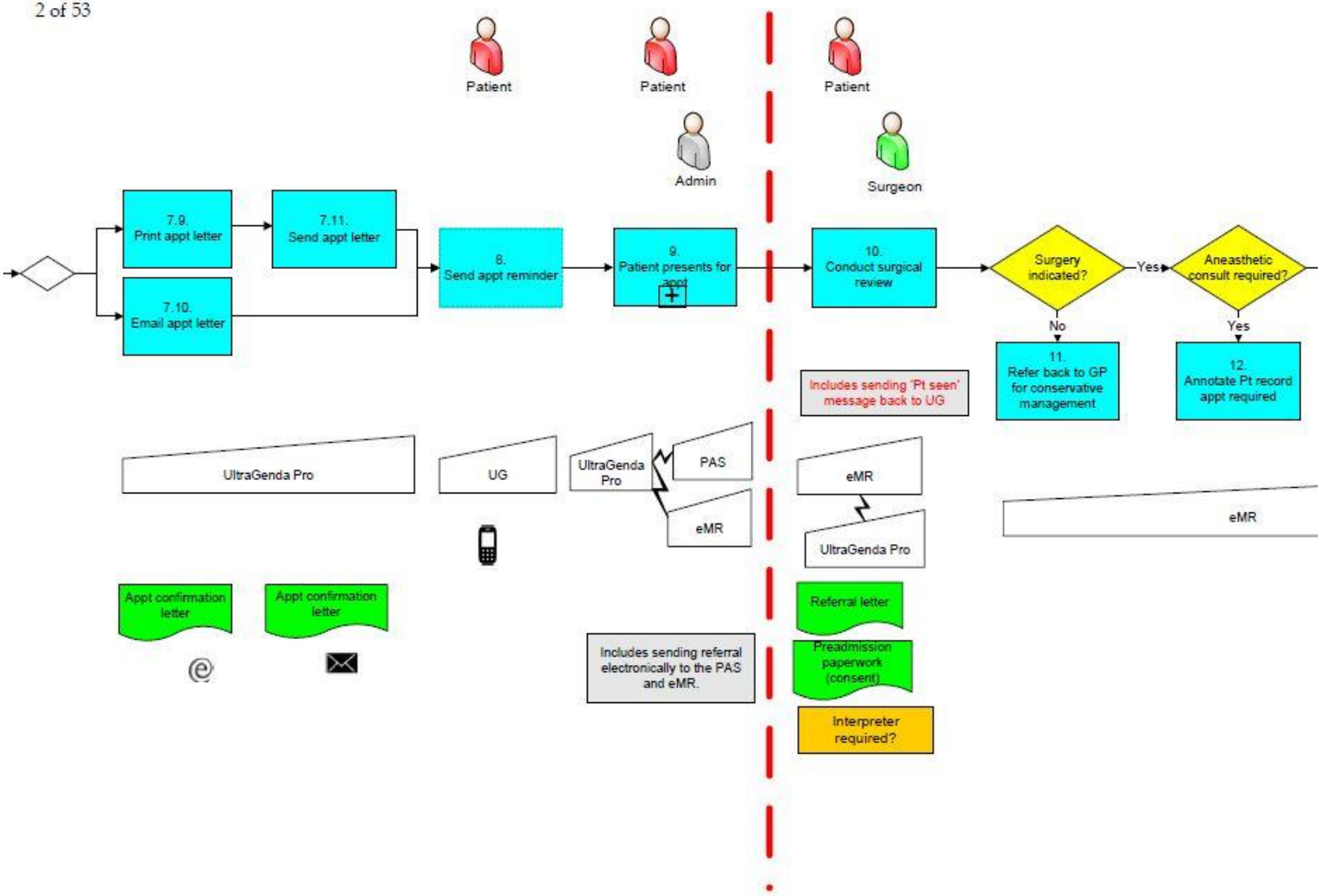

Patient
Admin
Admin
Admin
Patient
Admin
Admin
Patient
Admin
22.
Return to admin
24.
Add to surgical waitlist
11*.
Send waitlist letter
25.
Surgical slot becomes available
26.
Make appt for surgical procedure
27.
Return preadmission papers
28.
Phone pt for time surgery
16*.
Patient presents for appt
23.
Make other appts
Preadmission paperwork
PAS
Appointment required (triage)
Waitlist Letter
Preadmission paperwork
Can patient be given appt time here?
As per specific hospital rule, i.e. 7 days before appt

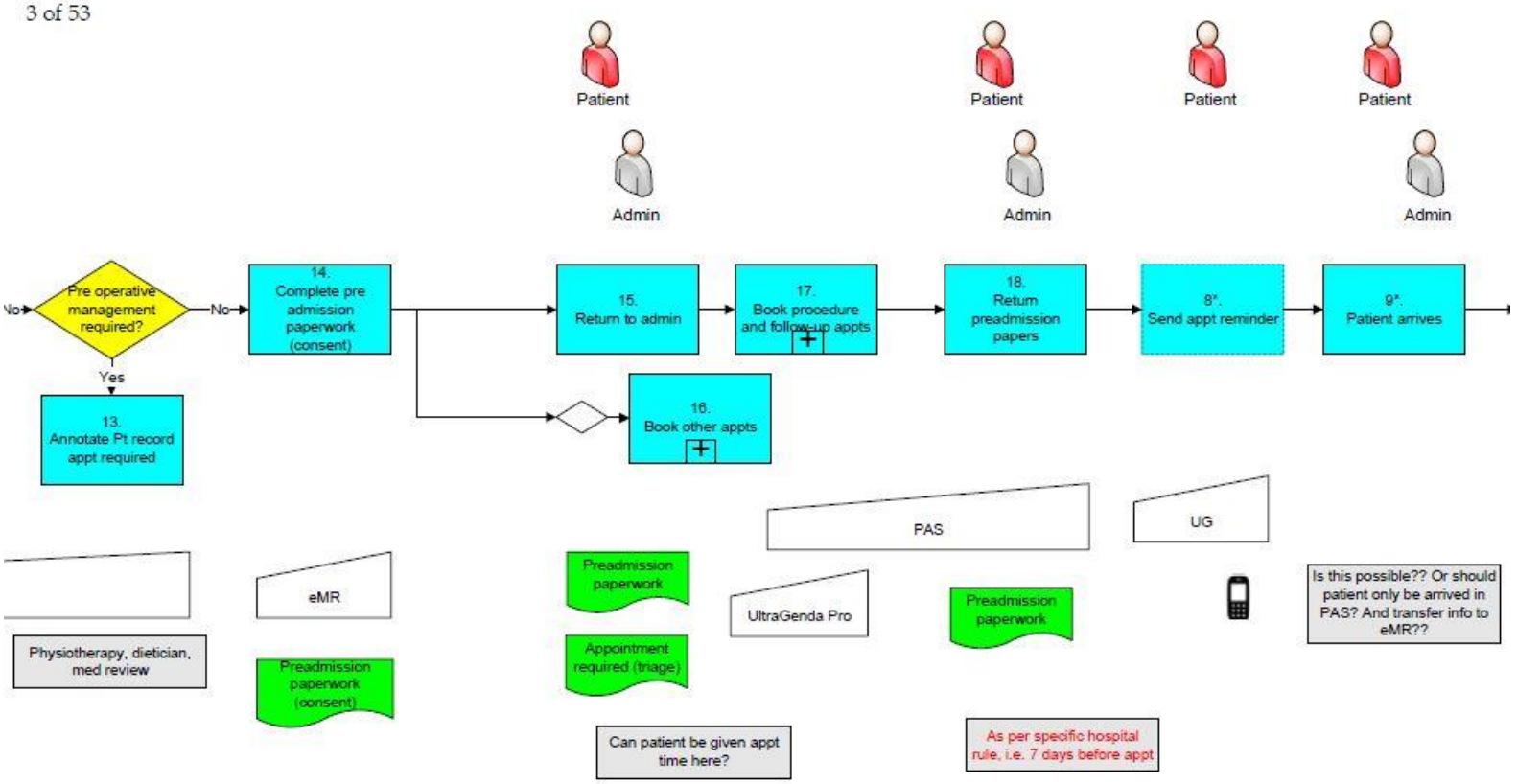

5 of 9
29. Finalise preadmission paperwork
30. Conduct pre-op preparations
31. Give Pre-op education
32. Confirm anaesthetic approach
33. Conduct pre-op checks
34. Perform procedure
35. Move to recovery
36. Conduct post-op checks
Patient
Nurse
Anaesthetist
Theatre Nurse
Surgeon, anaesthesist, theatre nurses
Wardsman
Recovery nurse
eMR
Patient record
Education material
Preadmission paperwork

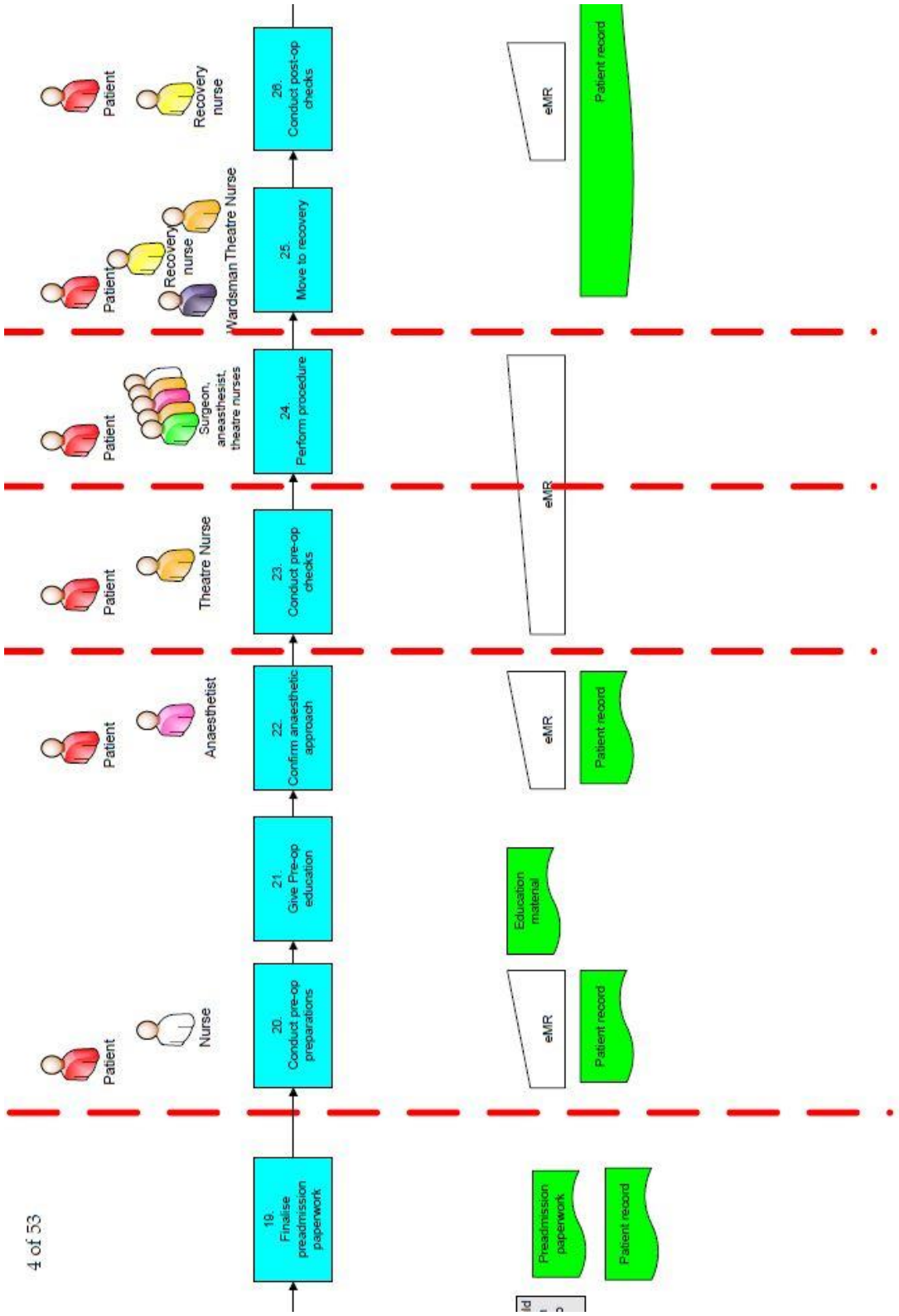

6 of 9
7 of 9
Patient
Recovery nurse
Wardsman
Ortho nurse
physiotherapist
Ortho nurse
Surgeon
Admin
Admin
Nurse
GP
Admin
Surgeon
physiotherapist
High dependency unit required?
No
Yes
37. Send pt to high dependency unit
38. Transfer to orthopaedic ward
39. Conduct daily physiotherapy
Ready for discharge?
No
Yes
40. Approve discharge
41. Make follow-up appt with surgeon
42. Make follow-up appt with physiotherapist
43. Complete discharge summary
44. Send GP all info
45. Attend post-operative appt with surgeon (@ Hosp clinic)
46. Attend post-op with physio
47. Return care to GP
Patient record
eMR
Is this eMR or PAS??
Physiotherapy record
eMR
PAS
Does this have to be done before patient leaves?
eMR
Discharge summary
eMR
Discharge letter
Fax
eMR
Physiotherapy record
Interpreter required?

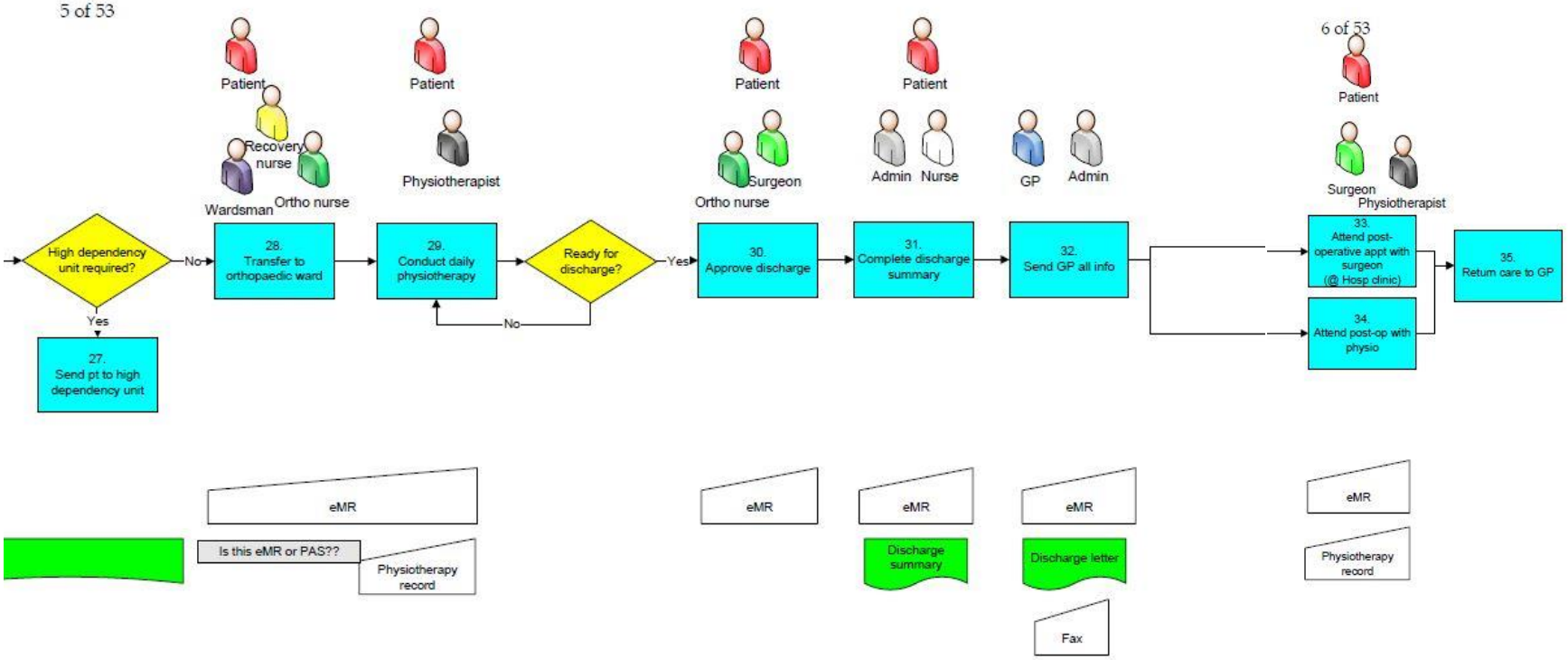
Appendix K: Model Knee replacement new situation, with UltraGenda




Patient
Patient
Patient
Admin
Surgeon
7.9.
Print appt letter
7.11.
Send appt letter
7.10.
Email appt letter
8.
Send appt reminder
9.
Patient presents for appt
10.
Conduct surgical review
Surgery indicated?
Yes
Aneasthetic consult required?
No
Yes
11.
Refer back to GP for conservative management
12.
Annotate Pt record appt required
Includes sending 'Pt seen' message back to UG
UltraGenda Pro
UG
UltraGenda Pro
PAS
eMR
eMR
UltraGenda Pro
eMR
Appt confirmation letter
Appt confirmation letter
Referral letter
Includes sending referral electronically to the PAS and eMR.
Preadmission paperwork (consent)
Interpreter required?


Patient
Patient
Patient
Patient
Admin
Admin
Admin
Pre operative management required?
No
Yes
14. Complete pre admission paperwork (consent)
15. Return to admin
17. Book procedure and follow-up appts
18. Return preadmission papers
8*. Send appt reminder
9*. Patient arrives
13. Annotate Pt record appt required
16. Book other appts
PAS
UG
eMR
Preadmission paperwork
UltraGenda Pro
Preadmission paperwork
Physiotherapy, dietician, med review
Preadmission paperwork (consent)
Appointment required (triage)
Is this possible?? Or should patient only be arrived in PAS? And transfer info to eMR??
Can patient be given appt time here?
As per specific hospital rule, i.e. 7 days before appt


4 of 53
Patient
Nurse
18. Finalise preadmission paperwork
20. Conduct pre-op preparations
21. Give Pre-op education
22. Confirm anaesthetic approach
Anaesthetist
23. Conduct pre-op checks
Theatre Nurse
24. Perform procedure
Surgeon, anaesthesist, theatre nurses
25. Move to recovery
Recovery nurse
Wardsman
Theatre Nurse
26. Conduct post-op checks
Recovery nurse
Preadmission paperwork
Patient record
eMR
Patient record
Education material
eMR
Patient record
eMR
eMR
Patient record


Patient
Recovery nurse
Wardsman
Ortho nurse
Patient
Physiotherapist
Patient
Surgeon
Ortho nurse
Patient
Admin
Nurse
GP
Admin
6 of 53
Patient
Surgeon
Physiotherapist
High dependency unit required?
No
Yes
27. Send pt to high dependency unit
28. Transfer to orthopaedic ward
29. Conduct daily physiotherapy
Ready for discharge?
No
Yes
30. Approve discharge
31. Complete discharge summary
32. Send GP all info
33. Attend post-operative appt with surgeon (@ Hosp clinic)
34. Attend post-op with physio
35. Return care to GP
eMR
Is this eMR or PAS??
Physiotherapy record
eMR
eMR
Discharge summary
eMR
Discharge letter
Fax
eMR
Physiotherapy record