Process Improvement in a Physiotherapy Outpatient Setting

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A Dissertation submitted to the University of Dublin, in partial fulfilment of the requirements for the Degree of Masters in Science in Health Informatics

Declaration

I declare that the work described in this dissertation is, except where otherwise stated, entirely my own work, and has not been submitted as an exercise for a degree at this or any other university.

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Marie Byrne

9th August 2013

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Summary

The requirement to do more with less in the current healthcare environment has led healthcare professionals to look at the potential opportunities provided by process improvement methodologies. In the main, these methodologies have their origins in the manufacturing industry and provide an alternative way to look at healthcare, away from profession or disease specific initiatives and toward the processes of the patient journey. Rather than doing more with less process improvement can lead to the elimination of unnecessary processes and measurable improvements in quality.

The question this research wished to answer was how processes could be improved in a physiotherapy outpatients setting. The first phase of answering this question involved carrying out a literature review to determine current prevalent process improvement methodologies in use in healthcare and how processes have been improved at other sites through the application of such methodologies. The literature also outlined some potential benefits and perceived challenges. From the literature the researcher determined that a process improvement methodology based on the principles of Lean Thinking was appropriate for use in the case under study. In conjunction with the literature review baseline data was collected by the researcher. Next the process improvement methodology was applied in the physiotherapy outpatient department. This was done in three stages: process mapping through observation, interviews with key physiotherapy informants and a staff focus group. These three stages pinpointed which parts of the process should be improved and how, the potential benefits these improvements could have on the quality of the patient journey and some possible challenges.

While the scope of this research was not to implement the suggested process improvements some of the suggested improvements have been

progressed and others are planned. Those progressed have had a significant impact on the baseline data whereby no patient waited for an orthopaedic or rheumatology appointment for the three months following clarification of the booking policy **(I[1])**[1] (figures 5.2 to 5.4). A possible future process map and key repositories are also presented based on the improvements suggested (figure 5.7 and 5.8). As can be seen, figure 5.8 shows the potential for a dramatic reduction in the reliance on paper. This has already begun with the elimination of the printing of 5,500 front sheets each year (section 5.4.1).

The literature emphasises the need to begin by reviewing processes, and to use data to determine the focus of improvement, and to highlight if any change is indeed an improvement. The literature also recommends that processes are improved in so far as possible before the introduction of health information technology (IT) to avoid automation of outdated processes. At the same time, the role of IT in simplifying and standardising processes and ultimately in sustaining improvement is also acknowledged. This research demonstrated that the staff who participated clearly acknowledged the role IT has in this regard. Highlighting the benefits realised elsewhere and the baseline data had a noticeable impact on staff engagement. Challenges outlined in the literature and through the interviews are important to be aware of to allow for change management strategies to be put in place.

The literature also highlights, that while there are case studies outlining various methodologies, the tools and methodologies used are sometimes not clearly stated and some authors have called for more rigorous study design. The terminology used to describe Lean Thinking interventions also varies as some organisations have adapted Lean Thinking principles to their local context.

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[1] **I[1,2,3]** etc. refer to the suggested improvements/point in the workflow outlined in Chapter 5.

In conclusion, the use of process improvement and information technology in physiotherapy has not been cited extensively. However, numerous case studies are available elsewhere in healthcare. This research demonstrates that a process improvement methodology based on Lean Thinking principles can be applied in a physiotherapy outpatient setting to determine how processes could be improved. Data collection and staff engagement at all stages have been and will continue to be crucial.

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Abbreviations

AHP	Allied Health Professional
AHRQ	Agency for Healthcare Research and Quality
ARCHI	Australian Resource Centre for Healthcare Innovations
ASQ	American Society for Quality
DoH&C	Department of Health & Children
DNA	Did Not Attend
ED	Emergency Department
EHR	Electronic Health Record
EMR	Electronic Medical Record
EPR	Electronic Patient Record
HIMSS	Healthcare Information and Management Systems Society
HIQA	Health Information and Quality Authority
HSE	Health Service Executive
IHI	Institute for Healthcare Improvement
MeSH	Medical Subject Headings
NCP	National Clinical Programmes
PAS	Patient Administration System
SOAP	Subjective, Objective, Analysis, Plan
TQM	Total Quality Management
VAS	Visual Analogue Scale
VMMC	Virginia Mason Medical Centre

Glossary of Terms

Bottleneck

Part of the system where patient flow is obstructed, causing waits and delays e.g. waiting for an appointment

Capacity

Resources available to do the work

Demand

All the referrals/requests coming in from all sources

Flow

The progressive, uninterrupted movement of products, information and people through a sequence of processes

Functional bottleneck

Service that has to cope with demand from several sources e.g. physiotherapy, radiology, pathology

Hand-offs

The number of times work is passed from one person to another person

Kaizen Event

An improvement tool that brings together employees to examine a problem, propose solutions, and implement changes. Kaizen events usually take place over several days

Map of Medicine

The Map of Medicine supports the optimisation of care by providing access to a web-based visual representation of evidence-based patient care journeys covering 28 medical specialties and 390 pathways and clinical decision support at the point of care

New slot

An appointment slot in the outpatient booking module on the PAS which is specifically for a new patient appointment

PhysioTools

Software used to produce personalised exercise hand-outs

Return slot

An appointment slot in the outpatient booking module on the PAS which is specifically for a return patient appointment

Triage

The practice of sorting patients into categories of priority for treatment

CHAPTER 1

INTRODUCTION

1.1 Study Context

This dissertation describes research carried out in the physiotherapy outpatients department of a large acute teaching hospital. The research investigated how processes could be improved in the study setting. The research also explored the potential benefits and perceived challenges of any suggested improvements.

The overall aim of any process improvement in the department under study was improvement to the patient's journey and staff morale. The focus for this study was the orthopaedic and rheumatology patients referred to the department. Focussing on this cohort of patients would give a comprehensive outline of the patient journey through the department as they go through the complete range of processes. The physiotherapists who treat this cohort are also based solely in the main outpatients department. Patients from other specialties such as oncology, cardiology, neurology, women's health and plastics are also managed as outpatients but are treated by physiotherapists who are also based on the acute wards. Some of these specialities would not follow the full extent of the processes e.g. oncology patients would not go through the triaging process as they do not go on to a waiting list as they are booked directly into an outpatient appointment on discharge from their inpatient stay.

The department under study sees over 2,000 new orthopaedic and rheumatology patients per annum. There are 5.5 physiotherapists and 2 clerical staff serving these patients. Of note, the clerical staff complement has reduced from 3 in 2010 due to the Irish Health Service Executive (HSE) early redundancy scheme at the end of 2010.

In theory, there appears to be sufficient physiotherapy capacity to prevent a waiting list but there continues to be several weeks of waiting for patients.

The view of the clerical staff is that they are unable to book patients into appointments in a timely manner due to lack of time. The clerical staff do spend a significant amount of their working day making and receiving calls from patients while many calls to the department are unanswered – see baseline data in section 4.2.

The current workflow through the department is heavily dependent on paper and a few separate information systems. The workflow can be broadly divided into the following sections; referral management, waiting list management, clinical documentation and discharge and/or onward referral.

All referrals, assessments, outcome measures and treatment plans are paper based. The patient is reassessed each time they are referred as accessing physiotherapy notes for previous attendances is difficult due to reduced clerical capacity to retrieve them. There are manual processes for referral and waiting list management. Referrals outward to the community and other hospitals are paper-based via the general postal service. This results in delays in referral onwards to community physiotherapy. An internal audit carried out in 2010 showed an average delay from referral to date stamp in the community of 6 days but in some cases up to 8.5 days. This is before the patient goes on the community physiotherapy waiting list.

Due to all clinical documentation including outcome measures and protocols being paper based there is a lack of easily accessible information. This makes it difficult and time consuming to determine if (1) physiotherapists are using outcome measures consistently, (2) if patient outcomes are sufficient, (3) to carry out research and audit and so determine where improvements are required clinically.

There are three main information systems in use; (1) the Cerner EPR (Electronic Patient Record) which is used only for referrals to the outpatient physiotherapy service and to look up test results and imaging, (2) the PAS (Patient Administration System) for all patient appointment bookings and registration of patient attendance and (3) PhysioTools which is a software

application used to generate paper based exercise programmes for patients to carry out at home. Microsoft Excel is used for referral and waiting list management. There is also some information saved in electronic format, patient correspondence (to consultants), protocols, outcome measures and relevant articles and presentations.

The following section gives an overview of key steps where information is collected and accessed during a patient attendance in the outpatient physiotherapy department under study. For further background on the physiotherapy outpatient setting see Appendix A.

In the outpatient physiotherapy setting (following consent from the patient for treatment) the patient receives an initial assessment from an individual physiotherapist. All information from this initial assessment is recorded on a standardised assessment for, which includes a body chart. Clinical information for follow-up appointments is recorded in the form of a SOAP note (Subjective, Objective, Assessment and Plan). The standardised assessments and SOAP notes are paper-based.

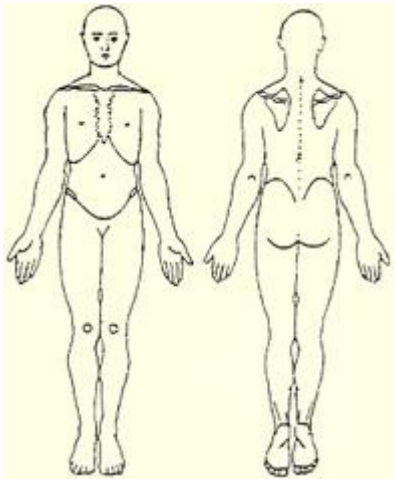

Figure 1.1 Body chart anterior and posterior view

(Reproduced from Whitman, J., Flynn, T., Wainner R and Magle J., 2002. *Orthopaedic Manual Physical Therapy Management of the Lumbar Spine, Pelvis, and Hip Region*. Fort Collins, CO: Manipulations, Inc.)

At the initial visit the presenting complaint is recorded on a body chart. Figure 1.1 above is a standard view of a body chart. Physiotherapists use

symbols to describe the location of symptoms, nature of any pain (sharp, ache), the frequency of the pain (intermittent, constant) and whether the pain radiates. The notations used are not currently standardised among the physiotherapists in the department under study.

Assessment of red flags is a key part of the physiotherapist's examination to alert the physiotherapist to the possibility of a more serious underlying condition. While most patients will have musculoskeletal conditions as an explanation of their symptoms, a small number will have a more serious condition such as malignancy. These patients need to be identified and referred urgently to a medical specialist. Going through the list of red flags systematically greatly reduces risk. An example of a red flag in a patient with low back pain would be a change in bladder habit e.g. incontinence.

The physiotherapists should use an outcome measure at the initial assessment and intermittently thereafter to determine patient progress. Many of these outcome measures are self-reported questionnaires. However, due to time constraints and difficulties with analysing the resulting data they are not used consistently.

Advice and education are a very important part of the physiotherapist's role, and the patient will be given further educational material such as an exercise sheet or information on their condition. These exercise sheets are pre-printed or generated from PhysioTools. When treatment is complete the patient is discharged back to the referring consultant and previously a discharge summary was written to the consultant outlining the treatment undertaken and the progress to date. This discharge summary was not in a standardised format. Due to a shortage of clerical staff discharge letters are no longer written.

Physiotherapists refer to the evidence base for the most relevant outcome measures, clinical pathways and the latest evidence. This occurs outside patient treatment times due to time constraints and issues with access to

this information. This information is accessed on the department's shared drive or via the internet.

Management reports are available from the information inputted on the PAS and are downloaded monthly e.g. DNAs (Did Not Attends), cancellations and number of new and return patients. However, other metrics such as waiting time (required by the Health Service Executive (HSE)) continue to be determined through inefficient manual processes. Manual collation of numbers waiting and waiting times is necessary as the referral comes through the EPR (date stamped on EPR) and the booking occurs separately in the PAS and there is currently no link between date of referral and date of appointment to allow for calculation of waiting time.

In summary, there are a number of issues:

- Reduction in clerical capacity
- Dependency on paper
- Disparate IT systems
- Some of the reports required locally and nationally generated manually
- Delays in patient referrals reaching the community services
- Lack of standardisation in use of notations on the body chart
- Lack of easy access to information to review previous attendances, analyse outcomes and carry out research and audit
- Discharge letters not sent to the referrer to complete patient journey

1.1.1 National Context

At a national level there are some key initiatives that are driving the need to improve the processes of the patient journey and how data is collected and reported along that journey. Three of these are outlined below; (1) the requirement for physiotherapy departments to submit data to the HSE each month, (2) the work of the National Clinical Programmes (NCP) and (3) the

Health Information and Quality Authority (HIQA) publication the "National standards for Safer, Better, Healthcare". It remains to be seen if the work around "money follows the patient" (Department of Health & Children (DoH&C), 2013) will include the money following the input provided by physiotherapists but the drive from the HSE is certainly to keep waiting lists low and the work of the NCP and HIQA is focussed on improving the quality of the patient journey.

1.1.1.1 HSE CompStat

Each month physiotherapy departments nationally, submit a report of clinical activity (including the number of patients seen, waiting times and numbers waiting) to CompStat (formerly HealthStat[2]). This is the public health services performance dashboard and is published online by the HSE. HealthStat was devised to provide 'reliable, timely and comprehensive information about how our services are delivered to those who use them' (HSE, 2011). CompStat compares the monthly performance of twenty nine public hospitals. Actual performance is then compared with a target of the average of the top three best performing hospitals. The aim is to have no patient waiting for outpatient physiotherapy for more than 6 weeks. It is therefore, imperative that the data submitted is collected accurately.

1.1.1.2 HSE National Clinical Programmes (NCP)

The objectives of the NCPs are to improve quality, improve patient care and access and ensure value for money. The new clinical director of the NCP has outlined that patient flow should be embedded in all NCPs and that all programmes have a dependency on data to understand demand/capacity issues and to measure patient outcomes. All NCP programmes are developing clinical decision making support tools such as guidelines, algorithms, referral templates, data sets, bundles and models of care (HSE NCP). Physiotherapists are involved in all programmes either as therapy

[2]http://www.hse.ie/eng/staff/Healthstat/about/

leads or support to the therapy lead and the work of all programmes impacts the care provided by physiotherapists.

1.1.1.3 Health Information and Quality Authority Standards[3]

The Health Information and Quality Authority (HIQA) published the 'National Standards for Safer Better Healthcare' in June 2012. The standards focus on patient-centred, effective, safe and reliable services and outline how accurate and timely information is key to driving improvements in patient care. The department under study will be accredited according to these standards.

1.2 Research Questions

This research will attempt to answer the following questions:

Main Question (MQ):

- How can processes be improved in a physiotherapy outpatient setting?

Sub questions (SQs):

- What process improvement methodology is appropriate to apply in the physiotherapy outpatient setting? (SQ1)
- Which processes should be improved? (SQ2)
- How should processes be improved? (SQ3)
- What are the potential benefits of any suggested improvements? (SQ4)
- What are the perceived challenges of any suggested improvements? (SQ5)

[3]http://www.hiqa.ie/standards/health/safer-better-healthcare

1.3 Motivation for the Research

The main motivation for this research is to add to the limited body of research in this area. Despite the vast and ever expanding body of literature on process improvement and electronic records, physiotherapy specific literature makes up a very small percentage. Use of a specific process improvement methodology will allow for the structured identification of possible improvements, where paper could be reduced, inefficiencies could be eliminated and information technology could add value.

Some of the issues with the current processes that the researcher was aware of before commencing the research are summarised at the end of section 1.1, all are motivators for the research.

Local motivation factors include the announcement that the proposed new children's hospital will be based on the site. This is significant as it will involve the knocking down of the physiotherapy building within 12 months. It would be advantageous to move to a new location with inefficiencies ironed out and new ways of working standardised in so far as possible.

In addition, one of the eight areas of focus of the organisation's corporate strategy is paperless systems and to move to a higher level on the HIMSS (Healthcare Information and Management Systems Society) European EHR Adoption Model[4].

1.4 Overview of the Research

A literature review was carried out to gain a clear understanding of process improvement methodologies prevalent in healthcare and the tools commonly used. Process improvement based on the principles of Lean Thinking was selected by the researcher as the best fit for the case under study. This methodology was then applied in three stages of process mapping through observation, semi-structured interviews with key physiotherapy informants and a staff focus group. This methodology

[4] http://www.himssanalytics.eu/emr.asp

assisted in identifying how processes could be improved in the department. The use of data and staff engagement were noted as key building blocks.

1.5 Overview of the Dissertation

This chapter presented the background to the research, the research questions, motivation for the research and an outline of the dissertation.

Chapter 2 presents the literature review. The literature review addresses the area of process improvement, methods and tools used in healthcare, case studies in healthcare, process improvement and information technology, process improvement and information technology in physiotherapy.

Chapter 3 presents the research methodology. The literature review and collection of baseline data was followed by the application of the process improvement methodology; process mapping, interviews with key informants and the focus group.

Chapter 4 presents the quantitative data from the process mapping stage (stage 1) outlining how the data was collected and the time spent in observation. The process maps are presented in this chapter. This chapter also presents the qualitative data from the interviews, and focus group (stages 2 and 3).

Chapter 5 presents an analysis of the data in chapter 4 and a discussion of the findings and how the research questions have been answered.

Chapter 6 presents the study limitations, recommendations for future work and the conclusion.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

This chapter gives an overview of process improvement in healthcare. Prevalent improvement methodologies are outlined along with an introduction to the importance of measurement and some tools used. The importance of data to highlight priorities for improvement and to determine if any change results in improvement is illustrated.

Some case studies and benefits realised are outlined followed by a summary of information technology (IT) used to drive improvement in the physiotherapy setting. Some challenges to improvement are then highlighted and the importance of staff engagement and change management to assist in overcoming these challenges is emphasised.

Of relevance to this research is the emphasis in the literature on the importance of reviewing processes, involving staff and using data to determine the focus of improvement and to highlight if any change is indeed an improvement. The case studies also give ideas for improvement and the benefits realised. Regarding the introduction of IT for process improvement the literature acknowledges the role of IT in the simplification, standardisation and ultimately in sustainability of improvement (Hughes, 2008; Bell, 2013).

Information technology in healthcare is viewed by many as a way to reduce costs, improve quality and safety and optimize operational efficiencies (Institute of Medicine (IOM), 1999). However, others call for these claims to be further substantiated (Himmelstein, Wright and Woodlander, 2009; Black, et al., 2011).

It is acknowledged that many of the processes in healthcare can be inefficient and complicated. Therefore, the introduction of IT without first improving processes could result in doing the same inefficient, complicated

activities electronically. The allocation of current limited resources to IT without first tackling inefficient healthcare processes will be unlikely to generate benefits. Therefore, the need to simplify and eliminate wasteful activities in hospital processes should be a prerequisite to implementing any IT system. In fact, Trinity Health, a large U.S. multi-hospital healthcare organisation, attributes much of its successful implementation of an organisation-wide Electronic Health Record (EHR) to carrying out process improvement initiatives prior to implementation (Brokel and Harrison, 2009).

Before looking at "process" we need to look at "quality" in health care. Quality is a complex concept. The IOM identified six specific aims for improvement in its report "Crossing the Quality Chasm", 2001 (IOM, 2001; Berwick, 2002). The six aims are depicted in Figure 2.1.

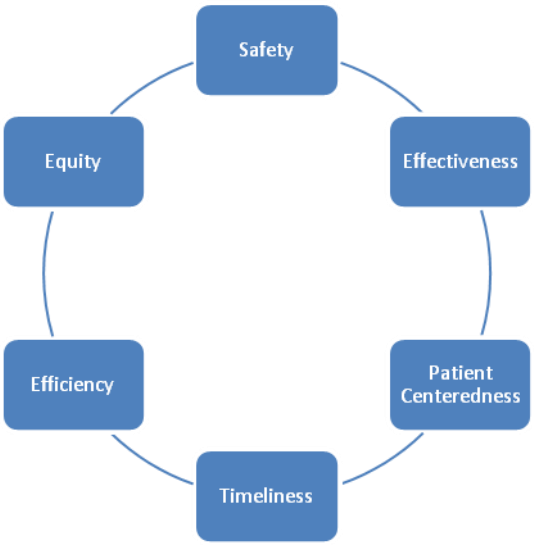

Figure 2.1 Six aims for improvement outlined by the IOM

(Institute of Medicine, 2001. *Crossing the Quality Chasm: A New Health System for the 21st Century.*Washington, DC: National Academies Press)

More than 40 years ago, Donabedian (1966) proposed measuring the quality of health care by the observation of structure, process, and outcome. Structure measures assess the accessibility, availability, and quality of resources; having the right things. Process measures assess the delivery of health care by all providers; doing the right things right.

Outcome measures indicate the final result of health; having the right things happen.

Process improvement, particularly in the name of quality, has been around for a long time. Back in 1950 W. Edwards Deming spoke to Japanese business leaders, outlining a roadmap for total quality management (TQM). Deming outlined how most quality issues are caused by process, policy and procedure issues rather than by people. A more recent advocate of process improvement, Spear (2011) a senior fellow at the Institute for Healthcare Improvement (IHI) concurs outlining that inadequately designed and operated systems of care delivery are the cause of many quality issues.

Batalden (2006) also emphasises that poorly designed systems lend themselves to inefficiency and poor quality.

"Every system is perfectly designed to get the results that it gets"

Paul Batalden, 2006, p. 32

The IOM report (1999) "To Err Is Human" also outlined how the majority of errors in healthcare are the result of faulty systems and processes, not individuals. This report also suggests that IT must play a central role in the redesign of healthcare if a substantial improvement in quality is to be achieved.

2.1.1 Literature Search Strategy

An initial requirement in the research process is a review of relevant literature (Creswell, 2009). Some of the MeSH terms that were used for this literature review included process improvement AND physiotherapy, quality improvement AND physiotherapy, Lean Thinking AND physiotherapy, electronic patient record AND physiotherapy, electronic documentation AND physiotherapy, information technology AND physiotherapy, computer use AND physiotherapy, process improvement AND healthcare and Lean Thinking AND healthcare. For each search using "physiotherapy" a duplicate search was also conducted using "physical therapy" as both titles are used interchangeably.

The literature was searched using the electronic database Pubmed initially followed by, ProQuest Nursing and Allied Health Source database, the BMJ group database and others that specific journal articles led the researcher to such as Science Direct, SpringerLink, Wiley Library, JSTOR and Academic Search Complete.

While there is a sufficient number of articles and grey literature published on the topics of process improvement in healthcare and Lean Thinking in healthcare no articles were found that described process improvement methodologies in physiotherapy. A general search was carried out to seek out presentations or other source material related to the topic of physiotherapy and process improvement with limited success. Therefore, the reader will note there is reference made to health service reports and blogs in the literature review (section 2.8).

The references of all key articles found in the initial stages were reviewed for further relevant articles and specific leads pursued (snowballing). Alerts were set up from the databases outlined above.

The search strategy for the literature review was a challenge. There was limited literature on the subject of process improvement in physiotherapy/physical therapy. The quality improvement literature is extensive. Lean Thinking principles have been adapted to local contexts and are applied in many settings under various guises, for example, VMPS (Virginia Mason Production System), BICS (Bolton Improving Care System) and Redesigning Care Programme in Australia.

This chapter will now introduce process improvement in health care, prevalent methodologies, measurement and tools, outline some interesting case studies and finally take a brief look at some challenges to process improvement.

2.2 Process Improvement in Healthcare

Many countries have national healthcare quality improvement agencies which are highlighting the importance of using process improvement

methodologies; the Institute of Healthcare Improvement (IHI) in the US, the NHS Institute for Innovation in the UK, the Dutch Institute for Healthcare Improvement (CBO) and the Australian Council for Safety and Quality in Healthcare (Locock, 2003 (a)).

2.2.1 What is Process Improvement in Healthcare?

In healthcare, a process is a set of steps, each of which must be accomplished properly in the proper sequence at the proper time to create value for the customer (patient and/or staff). So invariably in order to look at improving what the organization does, the focus must be on reviewing and improving the process (Batalden, 2006; Victorian government report on streaming care, 2008; Holden, 2011). Batalden (2006) outlines that trying to change things without first understanding how things are working won't lead to sustainable change.

The activities that make up a process are not equal. Some activities add value to a process and other activities fail to add value. Therefore, one way to think about process improvement is to think in terms of reducing non-value added activities. To understand the concepts of value-added and non-value added processes (waste) it is important to look in more detail at process improvement based on the principles of Lean Thinking. This will be discussed further in section 2.3.1.

Once it is understood what processes exist in a healthcare environment options for improvement of processes can be explored. This definition of improvement

"An improvement is anything that brings about a measurable benefit against a stated aim"

(NHS Institute for Innovation and Improvement Leaders Guide 1.1, 2005, p.40)

emphasises the importance of defining aims prior to making any changes and of using measurement to determine if a change is indeed an

improvement. Measurement to define priorities and determine if a change is an improvement will be explored further in section 2.4.

An important aspect of improving processes is that it is not about cutting people. It's about cutting waste and inefficiency so people can carry out their work more efficiently (Ben-Tovim, et al., 2008). Process improvement gives staff clear ways of working and so allows them greater job satisfaction as they are able to get on with their job without process distractions. It also aims to ensure patients get faster and more predictable treatment (Australian Resource Centre for Healthcare Innovations (ARCHI))[5].

Some suggestions for improvement in healthcare include:

- Eliminating duplication and redundant processes
- Reducing time taken to complete tasks
- The introduction of information technology

(NHS Institute for Innovation, 2007; Bolton Improving Care System (BICS), 2007; Campbell, 2009; Page, 2010).

Simplification and standardisation are key to sustainability of any improvement (Ben-Tovim, et al., 2008). Once the most simple, effective and efficient way of undertaking a process has been developed it can become standard work. Spear (2005) also highlights the importance of reducing ambiguity and work arounds by standardising processes and the time taken to carry out each step in the process. McGrath, et al. (2008) also highlight that standard processes are robust, less prone to error and are easy to teach to new staff. However, Mazzocato, et al. (2012) caution against over standardisation as staff can begin to find their work monotonous.

[5] http://www.archi.net.au/

In section 2.6 some case studies outline further examples but first we will look at levers for process improvement followed by the process improvement methodologies and tools prevalent in health care.

2.2.2 Levers for Process Improvement in Healthcare

The main lever for process improvement in health care should always be the patient as the customer. The Agency for Healthcare Research and Quality (AHRQ)[6] highlights that rising demands in healthcare, increasing costs, workforce shortages and the requirement for quality outcomes have all led healthcare organisations to look for opportunities through process improvement.

According to NHS Institute for Innovation (2005) and Fillingham (2008) the main levers for process improvement are:

- To improve the journey for the patient leading to better outcomes and experiences for patients
- To increase staff morale
- To improve overall performance in terms of efficiency, quality and safety
- To improve the flow of information
- To reduce waiting lists
- To avoid mistakes
- To develop a business case
- To understand the culture we work in

The IHI also emphasises patient-centred care as a key lever for process improvement and other authors outline how the patient as the customer must remain as the central focus and that the patient's experience should be improved at every opportunity (Philips and Hughes, 2008).

[6]http://www.ahrq.gov/qual/toolkit/toolkit3.htm

In Virginia Mason Medical Centre (VMMC), Kaplan (Albright, 2008) outlines that the board challenged staff to take a closer look at their processes to make sure everything they did was for the benefit of the patient. Mazzocato, et al. (2012) outline a similar directive from the hospital board at Lindgren's children's hospital in Sweden for the initiation of process improvement.

Other levers include:

- A crisis (the Emergency Department in the newspaper due to long waits), The need to transform the organisation
- A general desire to improve processes
- A need to demonstrate improved operational or financial results
- A need to exploit strategic events such as an information technology implementation, integration of care and building a new facility

(Fine, Golden, Hannam, and Morra, 2009; The Philips Healthcare white paper, 2009).

Overall the requirement to do more with less highlights an opportunity to step back and determine if process steps actually need to be done at all (Locock, 2003 (b)).

2.3 Methodologies in Process Improvement in Healthcare

As outlined, quality issues are generally a result of system or process failures. Like any other business, healthcare requires a framework built upon best practices in process improvement and innovation (Bell, 2006; Hughes, 2008).

In recent years healthcare organisations are turning to quality improvement methodologies with origins in the manufacturing world such as Lean Thinking, Six Sigma, Business Process Re-engineering, Theory of Constraints, Queuing and TQM (total quality management)/CQI (continuous quality improvement) (Albright, 2008; Murray, 2009). Healthcare, like manufacturing, is a complex system with multiple processes that must be

aligned to deliver optimal services of high quality at reasonable cost. Another methodology outlined in the literature which does not have its origins in manufacturing is the IHI's Plan-Do-Study-Act (PDSA) cycle.

The use of methodologies and tools for process improvement in healthcare has expanded in recent years and some can be quite complex to understand and apply. However, fundamental concepts can be applied to improve processes and a basic understanding of methodologies and tools is a starting point for any process improvement project. According to Locock (2003 (b)) much of it is common sense and accessible to all.

In healthcare, models are not always clearly outlined and in fact healthcare settings often pull on a range of methodologies and apply them in a piecemeal fashion (Powell, Rushmer and Davies, 2009).

However, all of the process improvement methodologies outlined involve mapping out the current workflow, establishing baseline data (how long process takes, cost), validating that the workflow accurately reflects the existing processes, applying improvement techniques and use of improvement tools, implementing change and driving continuous improvement (ARCHI, NHS Institute for Innovation, 2005).

There follows an outline of the three methodologies most commonly used in healthcare. There are others in the literature and the reader is referred to the work of Murray (2009) and the Powell, Rushmer and Davies (2009) NHS confederation report for further review.

2.3.1 Lean Thinking

Lean thinking, as the name implies is a mind-set. Macleod, Bell, Dean and Baker (2008) suggest that Lean Thinking is becoming a critical tool for healthcare. Lean Thinking was developed by Toyota in the 1950s and its application in healthcare began in the early 2000s (Young and McClean, 2009). Lean Thinking in healthcare is largely based on the work of Deming at the IHI. It emphasises streamlining processes and standardisation to provide what the internal (staff) and external (patient) customer wants with

minimal waste (Dickson, et al., 2009). This methodology uses a range of tools to identify blockages in process flow and then looks at removing unnecessary steps in the process. It is a different way of looking at healthcare, moving away from the work of specific clinicians or body systems towards processes (Ben-Tovim, et al., 2008).

There are five principles of Lean Thinking (see figure 2.2) (Ben-Tovim, Dougherty, O'Connell and McGrath, 2008; Campbell, 2009):

- Identifying value. This involves identifying anything that adds value to the customer
- Mapping the value stream. This involves mapping the complete set of process steps
- Making value flow. This involves eliminating non-value added activities and simplifying and standardising the remaining steps that do add value. This also involves the elimination of batching and queuing. Ultimately for the patient this means giving them just what they need when they need it without waiting
- Establishing pull. This allows for work to be pulled to the next step (rather than pushed, for example, on to a waiting list)
- Seeking perfection. This requires continuous improvement and the sustaining of any improvements made

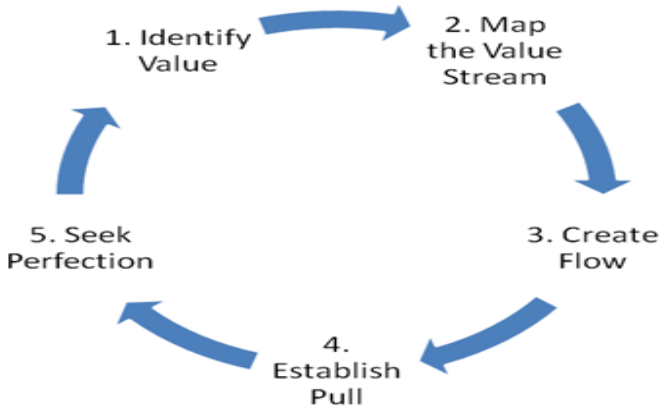

Figure 2.2 Principles of Lean Thinking

(Lean Enterprise Institute, *Principles of Lean* Available at: http://www.lean.org/whatslean/principles.cfm)

To identify non-value added activities Lean Thinking assigns non-value added activities (waste) into seven categories:

1. Overproduction – incompatible IT systems or dual paper and IT-based systems can lead to duplication of data entry

2. Waiting – time spent where resources are idle or time spent waiting for a service

3. Transportation – moving resources (paper or staff or equipment) from one location to another which introduces delay and inefficiency

4. Nonessential activity – performing an activity that makes no contribution to the service provided to the customer

5. Inventory – holding resources until they can be used

6. Variation – changes or deviations from the expected outcome or the expected standard

7. Defects – errors produced during the process

The idea in Lean Thinking is to squeeze non value activities out of a process (Mazzocato, et al., 2012). Fine, Golden, Hannam and Morra (2009) give examples of waste as test results that are never read, staff walking miles daily and repeating tests as forms of waste. Fillingham (2008) adds staff searching for equipment, staff recording information many times and staff not having important information to hand when needed.

In summary, Lean Thinking views any non-value added activity as waste, focuses on process and the tools used are all related to visualising where there is waste. Value is always defined from the customer's viewpoint (patients and staff in healthcare). Data is key to the identification and prioritisation of improvement initiatives (see section 2.4) and staff involvement is crucial for success and sustainability. Lean Thinking as a methodology is often selected where an organisation values a visual improvement along with positive changes in speed and efficiency (ARCHI).

A review of projects using Lean Thinking by Hughes (2008) reported that health care organizations improved patient safety and the quality of health care by systematically defining the problem; setting goals, removing workarounds and clarifying responsibilities. Team members in the improvement projects developed action plans that improved, simplified, and redesigned work processes. In contrast to this Holden (2011) found in his review of Lean Thinking in emergency departments studies did not report on patient safety outcomes or on quality aspects. Research on Lean Thinking is limited with studies lacking clear research designs, limited metrics, a variation in terminology/definitions, tools and methods used and there is a knowledge gap regarding how and why Lean Thinking may work in healthcare making it difficult to determine which aspects work best (Young and McClean, 2009; Mazzocato, et al., 2012). In 2010, Mazzocato, et al., outlined that 33 articles they reviewed all reported positive results suggesting a bias towards reporting of successful implementations. In summary, there is scope for methodological development (Young and McClean, 2008). Further challenges are outlined in section 2.5.

2.3.2 Six Sigma

Six Sigma is the newest of the methodologies prevalent in healthcare. It originated in Motorola in the mid-1980s and has been used in manufacturing since then but in healthcare only in the last 15 years.

Six Sigma uses a five-phased structured approach and is a very rigorous statistical measurement methodology. The five-phased approach is known as the define, measure, analyse, improve, and control (DMAIC) approach. Statistical tools, for example, statistical process control charts, are used to identify variation in processes. Six Sigma recognises that variability can prevent the delivery of a consistent quality service (Eitel, et al., 2010). This

method requires statistical expertise and reliable data collection and usually requires intensive technical training (ARCHI[7]; NHS[8]; IHI[9]).

Albright (2008) highlights that Lean Thinking and Six Sigma share some similarities. However, Six Sigma is a problem-solving methodology focused primarily on reducing process variation while lean focuses more on improving process flow. Lean Thinking also allows for more holistic decisions to be made about opportunities for process improvement with the emphasis on involvement of staff and observation of the workflow in situ whereas Six Sigma tends to look at disembodied facts and statistics. Six Sigma as a methodology is often selected where an organisation values analytics and precision (ARCHI).

2.3.3 Plan-Do-Study-Act (PDSA)

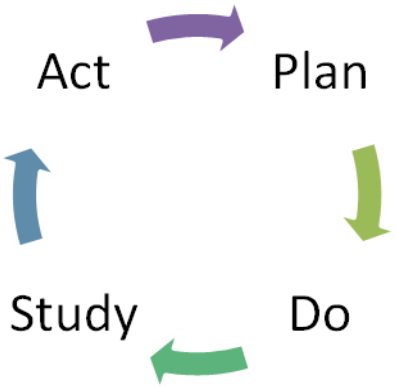

Figure 2.3 PDSA cycle

(Langley, G.J., Moen, R., Nolan, K.M., Nolan, T.W., Norman, C.L. and Provost, L.P., 2009. *The Improvement Guide: A Practical Approach to Enhancing Organizational Performance.* 2nd ed. San Francisco: Jossey-Bass)

The Plan-Do-Study-Act (PDSA) cycle depicted in figure 2.3 above has been widely used by the IHI for rapid improvement in healthcare. One of the unique features of this model is the cyclical nature of assessing change

[7] http://www.archi.net.au/

[8] http://www.institute.nhs.uk/

[9] http://www.ihi.org/Pages/default.aspx

through small and frequent PDSA cycles before changes are made system wide. In this way this methodology turns ideas into action and connects action to learning (Varkey, Reller and Reser, 2007).

Langley, et al. (2009) propose a model for improvement which poses three questions before using the PDSA cycles: (1) what are we trying to accomplish? (Aim) (2) how will we know that a change is an improvement? (Measures) (3) what change can we make that will result in improvement? (Change). The PDSA cycle starts by determining the problem, what changes can be made, a plan, who should be involved and what should be measured to understand the impact. The change is implemented and data and information are collected. Results from the implementation study are assessed and interpreted by reviewing key measurements that indicate success or failure. Finally, action is taken on the results by implementing the change or beginning the process again. PDSA cycles allow low risk tests of change based on proposals of frontline staff and so encourages staff engagement. As outlined by Powell, Rushmer and Davies (2009) there is only limited evidence in the peer-reviewed literature of changes in outcomes from this approach.

The next section outlines the importance of data and measurement in process improvement.

2.4 Measurement in Process Improvement in Healthcare

The literature outlines some of the measures used to monitor the impact of any process improvement initiative. These include counting the number of steps in the process, the time to carry out each step in the process, the waiting time at each step, the total cycle time, throughput, capacity and demand, the number of errors, staff numbers involved and customer satisfaction.

One of the universal principles for a sustained approach to improving a process is to measure the process. Data helps to identify problems, prioritise problems and determine if improvement has occurred (Chyna,

2002). In Lean Thinking terms data can "push" improvement by identifying problems and "pull" improvement by identifying opportunities (Victorian Government report on using data for quality improvement, 2008). Once the process is measured there is an opportunity to get control over it. McGrath, et al. (2008) highlight that data must be used to determine if a change is an improvement and so any solution can become more evidence based. Some authors also emphasise that data used for measurement needs to be simple, clearly visible and available in real time (McGrath, et al., 2008; Eitel, et al., 2010).

The establishment of a baseline position for measuring and communicating the improvements can also be an exciting and motivating factor for teams (Fillingham 2008; NHS Institute for Innovation, 2005; ARCHI). However, Holden (2011) in his review of Lean Thinking in 15 EDs (Emergency Departments) points out that pre and post metrics were often not measured and no numeric data was given to support the reported improvements.

A weakness in the literature on improvement methods is that there is minimal discussion on the costs of implementation and while many initiatives state a reduction in cost through increased efficiency as one of their objectives there is a lack of evidence to suggest reductions have occurred (Powell, Rushmer and Davies, 2009). However, it is acknowledged that measuring and analysing cost savings from these initiatives presents complex challenges (Brennan, Sampson and Deverill, 2005).

2.5 Tools used to Understand and Improve Processes

This section outlines some of the tools used in process improvement. Some tools are used to collect data on processes in order to visual where issues are occurring, for example a process map; others are used to further explore problems to examine their cause and effect, for example a fishbone diagram; and others work with numbers to monitor progress.

"If you can't describe what you're doing as a process, you don't know what you're doing,"

The father of the quality revolution, W. Edwards Deming 1900-1993

2.5.1 Process Mapping

Process Maps are a visual representation of the steps that make up a process and are a key first step when using process improvement methodologies. They can describe process steps, timing, and frequencies at the highest level and work downward. High level process maps give an overview of the process. Lower level maps help analyse the process in greater detail and can assist in highlighting priority areas for improvement (ARCHI; IHI, 2004; NHS, 2005). Of note, attention to detail in the lower level maps is important to determine how best to integrate healthcare IT into workflow (Crandall, et al., 2007). Attention to detail at bottlenecks is also important (NHS Scotland Quality Improvement Hub, 2008). It is important to define the beginning and end (the scope). As process mapping is a key step in process improvement it is outlined here in more detail than the other tools. Figure 2.4 below outlines a high-level process map for an ischaemic heart disease patient. The diamonds in the map are decision points where the patient journey can take one of two paths depending on the decision-making process.

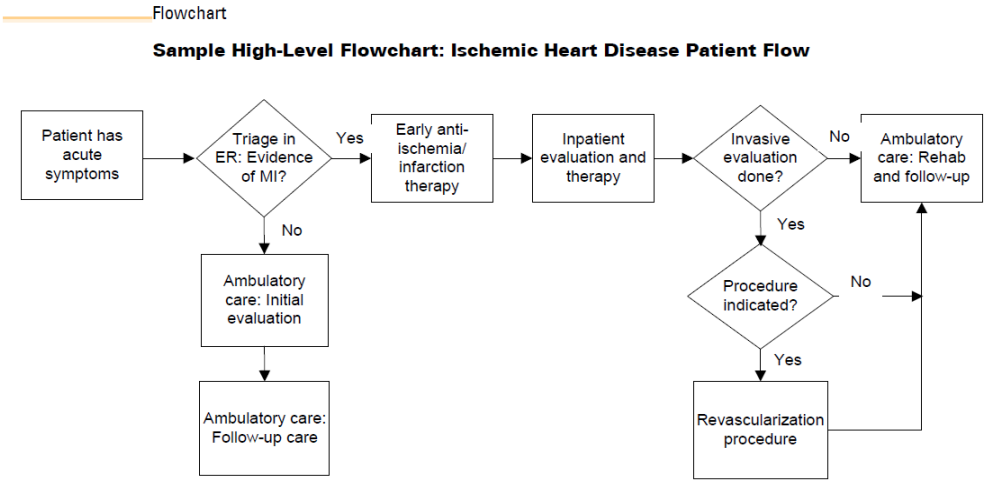

Figure 2.4 High-level flowchart for ischaemic heart disease patient

(Institute for Healthcare Improvement (IHI), *Process Improvement Tools, Flowcharts*, 2004. [pdf] http://nnphi.org/CMSuploads/Flowcharts%20Guide.pdf)

There is little guidance in the literature regarding the most effective type of process map to use (Colligan, Anderson, Potts and Berman, 2010). Patient orientated approaches to process mapping put the patient at the centre and remind staff of why process improvement is needed. This method may be preferable to more clinician orientated workflow with each clinician depicted in parallel "doing" things to the patient. Ozkaynak, et al. (2013) outline how clinician orientated workflow, unlike patient orientated, can lose sight of the cooperative work that prevails in healthcare and that a more patient orientated approach can help characterise the gap between clinical and non-clinical practices and inform the IT that can bridge the gap. However, it should be emphasised that a review of clinical workflow and integration of any process improvement (including IT) into such workflow is crucial to get buy-in from staff (Kawamoto, Houlihan, Balas and Lobach, 2005; Bowens, Frye and Jones, 2010). Therefore, in many cases more than one type of map may be appropriate.

Process mapping is used to depict the flow of steps within a process. In order to map a process the activities need to be understood, what triggers

these activities (inputs), who is involved, the sequential steps, and the outputs associated with the steps (Fine, Golden, Hannam and Morra, 2009).

Where possible, it is also recommended that time consumed at each step or at some key steps is documented (Holden, 2011). The Victorian Government report on Process Mapping (2007) recommends keeping process maps simple by not using complex symbols and shapes that are not easily understood.

Once completed the process map can be used to answer certain critical questions:

1. Can we eliminate or reduce certain activities?

2. Can we complete the process in less time by changing the process?

3. Can we improve how we meet customer requirements by changing the process?

The importance of process mapping by on the ground observation is emphasised by Bell (2006). This is a Lean Thinking concept of "Gemba" or "going where the action is".

Summarised below are some of the benefits of process mapping

- Once workflow is mapped opportunities for improvement can be identified
- Mapping assists in the understanding of all the processes involved in the patient journey. Sometimes staff are seeing the complete patient journey for the first time and this increases their understanding of the journey and its complexity. Mapping makes all stages visible to all involved and engages staff in owning any problems that emerge. In short, mapping can generate permission to change from all involved (Victorian Government report on Process Mapping, 2007; Ben-Tovim, Dougherty, O'Connell, and McGrath, 2008; Eitel, et al., 2010).

- Mapping promotes collaboration and improved communication between staff members. It provides an opportunity to bring people together and boosts team morale. Mapping has also been shown to really assist in understanding capacity and demand problems (NHS, 2005).

In Lean Thinking process maps called value stream maps can be used to take process mapping a step further by establishing the steps but also outlining which steps do and don't add value (waste).

2.5.2 Focus Groups and Interviews

Focus groups and interviews are common methods of gaining qualitative data to guide improvement initiatives. They can provide valuable input in terms of diagnosing any issues and gaining an understanding of the perspectives of various stakeholders in a short amount of time. They are also useful for identifying and exploring challenges (Victorian Government report on using data for quality improvement, 2008).

Focus groups are important for ideas generation. One of the key elements of any improvement work is getting staff views on what could be improved (section 2.9). Appropriate representation of stakeholders is also an important consideration and Bell (2012) recommends IT department involvement (section 2.7). It is important to be clear about goals, roles and what will happen, to stick to the start and finish time and allow each person present to have their views heard. If there are dominant people in the group, a method whereby each person has an opportunity to write down/express their views is preferable. The NHS Leaders Guide on "Working with Groups" gives some useful ideas on how to conduct these groups. Once all ideas are outlined by participants ideas can be prioritised (NHS, 2005).

Interviews are used to garner more in-depth information from a limited number of experts. These experts can give their valuable insight and recommend solutions. Interviews tend to be more objective as those interviewed do not have any affiliation with the organisation and can lead to

more frank discussions whereas the larger number in a focus group can limit or bias discussion. The interviewees can help direct towards similar work or other experts. Interviews are commonly guided by a script and can be face to face or on the telephone (NHS, 2005; Victorian Government report on using data for quality improvement, 2008).

2.5.3 Fishbone Diagrams

Ishikawa, Fishbone, or Cause and Effect Diagrams visually represent the causes of a problem/effect and help determine the ultimate source of the problem (IHI; NHS).

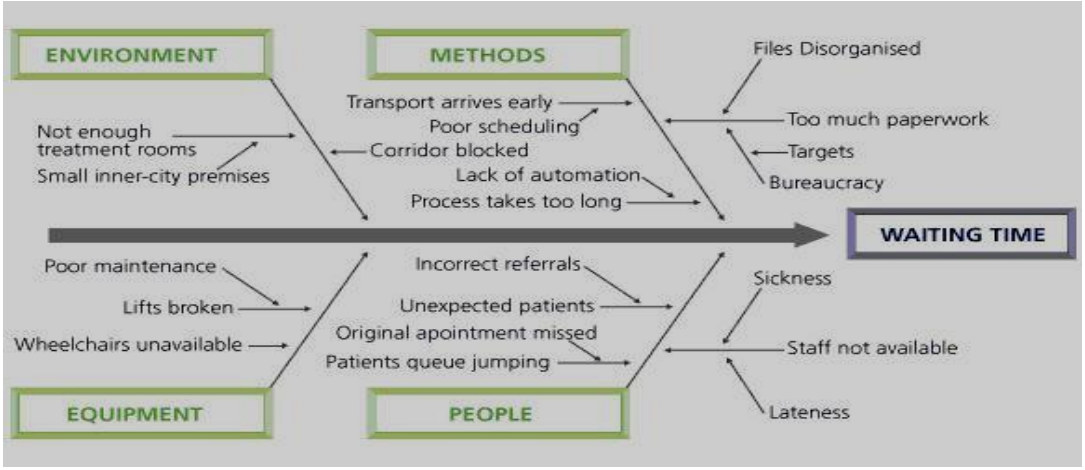

Figure 2.5 Fishbone diagram

(NHS Institute for Innovation and Improvement Quality and Service Improvement Tools)

http://www.institute.nhs.uk/quality_and_service_improvement_tools/quality_and_service_improvement_tools/cause_and_effect.html)

This tool invented by Ishikawa is called a "fishbone" diagram because of its appearance. The cause-and-effect diagram can be used for further analysis to determine why a particular problem/effect occurs. Once a problem/effect is identified as a priority for improvement all causes are listed by the team. The causes can then be listed in order of priority as a focus for improvement work. In Figure 2.5 the causes are broken down in 4 sections; environment, methods, equipment and people. Causes in terms of methods outlined include lack of automation, too much paperwork and the process taking too long.

2.5.4 Data Check Sheets

Data check sheets, or recording tables are used to collect observational data which can be analysed to identify opportunities for improvement. They are usually used to collect data repeatedly at the same location or by the same person (ASQ, 2004; Victorian Government report on using data for quality improvement, 2008). Figure 2.6 below shows a check sheet used to collect data on telephone interruptions. The tick marks were added as data was collected over several weeks. These interrupt the staff workflow and an analysis would determine if they are valued added or non-value added.

Telephone Interruptions

Reason	Day					
	Mon	Tues	Wed	Thurs	Fri	Total
Wrong number	𝍸	||	|	𝍸	𝍸||	20
Info request	||	||	||	||	||	10
Boss	𝍸	||	𝍸||	|	||||	19
Total	12	6	10	8	13	49

Figure 2.6 Check Sheet

(To collect data on telephone interruptions from the American Society for Quality (ASQ) http://asq.org/learn-about-quality/data-collection-analysis-tools/overview/check-sheet.html)

2.5.5 Statistical Control Chart

The control chart is a type of statistical process control tool. Process performance is plotted over time against upper (UCL) and lower control limits (LCL). This chart helps to readily identify process variations over time. Control charts are used both during and after process improvement implementations. Variations evidenced on a control chart can highlight a focus for process improvement and once improvements have been implemented control charts can be used to ensure that processes are maintained within pre-determined control limits (Varkey, Reller and Resar, 2007).

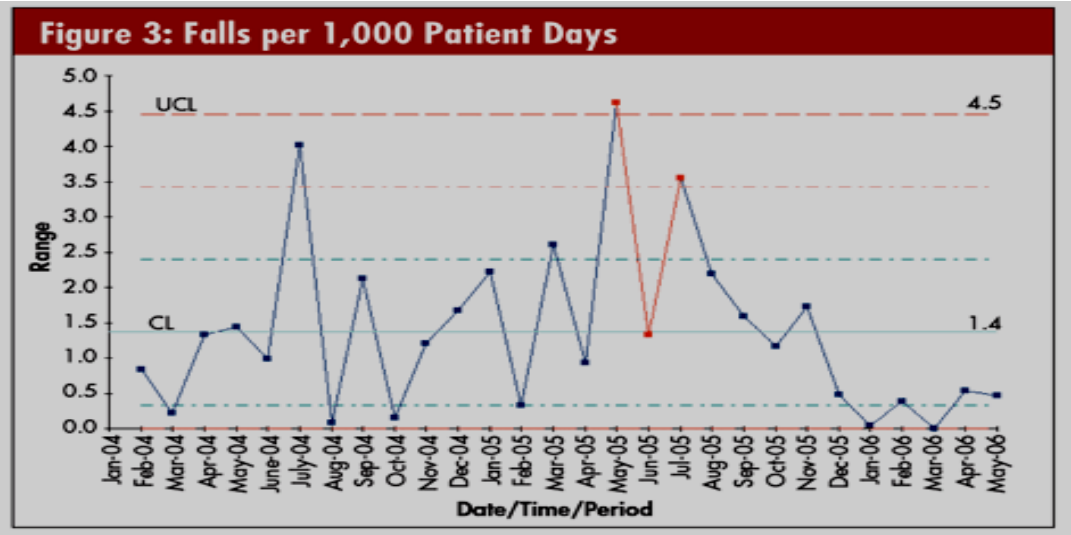

Figure 2.7 Control chart

(Control chart of falls per 1,000 patient days from Quality Digest http://www.qualitydigest.com/june08/articles/03_article.shtml)

Figure 2.7 outlines the number of falls per 1,000 patient days. The UCL is set at 4.5 and if the control chart shows a peek above this UCL further investigation is carried out and the necessary improvements implemented.

2.5.6 Summary

To achieve the best results in process improvement the literature recommends the following strategies (Locock, 2003 (b); Hughes 2008; Holden, 2011):

- Draw a process map to understand the process flow
- Document the time consumed at each or key steps
- Use check sheets if observing the process to collect repetitive data
- Analyse the process map and identify which problems to focus on
- Develop a cause-effect diagram if the cause of problems is not easily identified
- Prioritise improvement opportunities

- Following the introduction of a process improvement initiative a control chart can be used to ensure that the process is staying within process control limits

Some improvement opportunities will be easily identified once the process map is drawn and can be implemented immediately. This is often referred to as "Just do it!" in Lean Thinking.

2.6 Case Studies

Some healthcare organisations are using process improvement methodologies to target improvements in a wide range of departments both clinical and administrative: laboratories, emergency departments, wards and stock are the areas most commonly targeted. Improvements in emergency departments are frequently cited in the literature (Dickson, et al., 2009; Mazzocato, et al., 2010; Holden, 2011). Process improvement methodologies are also applied to achieve improvements in such areas as diagnostics, patient records, operating rooms, outpatient services, pharmacy, quality assurance, IT and accounts. Middleton, et al. (2009) outlines clearly the reduced workload, time spent and cost of improving processes through the introduction of IT in a radiotherapy department. Many of these sites use process improvement methodologies based on the principles of Lean Thinking.

From a review of improvement work by thousands of clinical teams across the UK in 2004, the NHS Institute for Innovation (2005) outlined the 10 improvements with the highest impact and benefit. They outline that the work to match capacity and demand and reduce variation particularly at bottlenecks has led to some of the most exciting improvements in healthcare processes. The 10 high impact improvements are outlined below.

1. Day surgery being the norm
2. Improving flow through access to diagnostic tests
3. Managing variation in patient discharge thereby reducing length of stay

4. Managing variation in the patient admission process
5. Avoiding unnecessary follow-ups and ensuring any follow-ups occur in the right care setting
6. Care bundle packages to increase reliability of performing therapeutic interventions
7. A systematic approach to care for people with long term conditions
8. Improve access by reducing the number of queues
9. Optimise patient flow through service bottlenecks using process templates
10. Redesign extended roles in line with efficient pathways

However, success depends on what is done correctly at the outset of any improvement effort. Identifying opportunities through process mapping and measures to be used are essential pre-requisites for the delivery of benefit (Fillingham, 2008).

Some specific case studies of process improvement now follow. The majority have used a methodology based on the principles of Lean Thinking and they were chosen as they are leaders in the field and/or have introduced process improvements that could be applicable to the study setting.

Gary Kaplan (Kenney, 2011), CEO of Virginia Mason Medical Centre (VMMC) in the USA, emphasises that at VMMC "Lean" is not just an improvement system; it is a culture. VMMC was the first health centre to integrate the Toyota Manufacturing (Lean) philosophy back in 2000 (Holden, 2011; Kenney, 2011; Mazzocato, et al., 2012). Process improvements include a patient alert system, nurses using computers on wheels (COWs) for change of shift handovers to take them away from the nurses' station and be more visible to patients which also reduced the number of steps they took daily by up to 90%. They also introduced contemporaneous documentation and order entry by portable wireless computer and computer access in all

outpatient rooms. All of these improvements were achieved through the introduction of IT.

The VMMC outline benefits of improvements in terms of reduced costs, decreased time to report test results and a decrease in the amount of walking for staff. Now patients get to spend more time with healthcare providers, patients have less delays, more timely results and treatments, staff have less duplication and when best practices are introduced they become the standard (Womack, et al., 2005; Kaplan and Patterson 2008; Kenney, 2011).

Intermountain healthcare is recognised internationally as a pioneer in both quality improvement and health information technology. Intermountain uses a system called HELP2 which provides clinical decision support to clinicians through automated clinical tools, gives a longitudinal view of patient records and collects aggregate data for use in quality improvement. While similar paper-based tools (protocols, infection control tools, guidelines and summary worksheets) have been used at other organisations, the use of more than a few of these tools has been shown to require information technology (Intermountain briefing report, 2013; Thompson, Classen and Haug, 2007).

At the Flinders Medical Centre in Australia (Ben-Tovim, et al., 2008) the redesign of care (as it is known there) using Lean Thinking began in 2003. They concentrated on improving the processes for the Emergency Department (ED) and medical and surgical patients, standardisation of work and sustainability of improvements. By rearranging the order in which patients were seen during ward rounds patients ready for discharge were seen first and this meant discharge summaries were completed more efficiently and the authors reported that over 80% were completed within 24hours. The Australian experience also highlights the importance of suitable IT systems as a key enabler of process improvement.

Thedacare in the USA, the nation's "most wired" hospital[10], also uses Lean Thinking principles. Improvements ensured all patients were visited by the multidisciplinary team (MDT) on admission and a care plan devised which was documented in the electronic medical record (EMR) so that it could be accessed by all providers and orders could be generated. They had reduced errors, length of stay and greatly improved customer satisfaction (Womack et al., 2005; Thoussaint, 2007)[11].

Bolton Improving Care System (BICS), which is a Lean Thinking approach has been implemented throughout Bolton hospital. This led to a reduction in the steps for routine bloods from 309 to 57 steps (70%) and fewer staff were required to carry out these tasks and there was a 90% reduction in the time taken (Jones and Mitchell, 2006).

In Canada, Lean Thinking began in 2005 within 5 hospitals initially. They reported reduced ED wait times, reduced length of stay, improved operating room usage, increased radiology procedures per time period and better infection control measures as a result (Fine, Golden, Hannam and Morra, 2009).

In Sweden, Lean Thinking led to the introduction of a data board in a paediatric ED which was used to highlight if the flow of patients was slowing down with patient names turning red if target timeframes were surpassed (Mazzocato, et al., 2012).

Some primary care practices in California are adopting touchscreen tablets, kiosks or patient portals that automate the registration process which results in shorter waiting times, a reduction in errors and lower staff costs (Rhoads and Drazen, 2009). At Vanguard urologic institute in Houston a self-service patient check-in kiosk has enabled patients to enter their personal health information and consent to treatment (Webster, 2011).

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[10]http://www.thedacare.org/News%20and%20Events/Company%20News/ThedaCare%20Again%20Ranks%20Among%20Most%20Wired.aspx

[11] http://www.innovations.ahrq.gov/content.aspx?id=3355

This initiative has reduced the number of errors and lost charts and provides an opportunity to assess the patient experience. Patients at Vanguard wait an average of 2.44 minutes only (the national average wait being 21.3 minutes (ASQ)).

"It lessens the work that I wouldn't consider high value and the patients can do it better. I think job satisfaction is higher when you are doing more interesting work"

Kevin Slawin, MD, Vanguard Urologic Institute p. 2

In a review of Lean Thinking in EDs Holden (2011) looked at 15 EDs in the USA, Australia and Canada. Improvements included reduced length of stay and proportion of patients leaving the EDs without being seen, fast tracking of patients of low complexity, eliminating or combining steps in the process and registration conducted using mobile workstations.

However, despite the benefits outlined, a survey carried out in 2009 by the American Society for Quality (ASQ, 2009) highlighted that only 4% of U.S. hospitals reported full deployment of Lean. However, 53% of the hospitals did outline some level of Lean. Some challenges to the deployment of process improvement will be outlined further in section 2.6.

A discussion of process improvement through the introduction of information technology now follows in section 2.5. It is important at this point to note that the application of a process improvement methodology such as, Lean Thinking without introducing IT, as seen in some of the case studies above, demonstrates the value that can be added by changes to process alone.

2.7 Process Improvement based on the introduction of Information Technology

As outlined in the introduction, the IOM (1999) suggests that IT must play a central role in the redesign of healthcare to achieve substantial improvements in quality. IT is an enabler and allows for the automation of routine tasks which in turn, gives providers more time to spend with

patients. The connectivity provided by IT allows for better communication among providers. Decision support assists providers with the analysis of ever-growing amounts of information and ensures the right information is delivered to the right people at the right time and in the right format which aids decision making (IOM, 1999; NHS Institute for Innovation, 2007; Victorian government report on streaming care, 2008). In this way, health IT such as electronic records, digital technology for x-rays, mobile technology, telecare, access to Map of Medicine can be extremely powerful tools for improvement (NHS Institute for Innovation, 2007; Victorian government report on streaming care, 2008). Bates (2002) states that IT and high-quality healthcare are closely linked and that excellent clinical outcomes at some healthcare organisations have been achieved in part due to their information systems.

As outlined previously (section 2.4) measurement is a key component of improvement. Data for improvement, generated from information systems is often more accessible, timely, accurate and reliable than that created manually. Finally, data mining allows providers to carry out statistical analysis to determine outcomes of care, if processes need to be improved and to carry out more extensive research (Hynes, et al., 2004).

In the context of process improvement Hughes (2008) advises that IT should be used cautiously. IT exists to add value to a business, so that a business in turn can add value to the customer. Bell (2006) outlines that IT can be used effectively to simplify processes and add value, but if it is used badly it can ingrain the very waste that should be eliminated. Automation for automation sake is poor practice. Computers are amplifiers and if inefficiencies are not first removed, the addition of IT will just lead to the system becoming more inefficient faster (Diamond and Shirky, 2008). Trinity Health and others outlined in the case studies above (2.6) have demonstrated that process improvement prior to implementation of IT can provide a solid foundation for IT implementation rather than simply

modelling existing, possibly problematic processes (Brokel and Harrison, 2009).

Bell and Orzen (2011) recommend that IT staff are active participants in process improvement activities. Business and IT sections must integrate and keep focused on delivering value to the customer. The authors acknowledge that there can be misalignment between the business processes and IT; IT can be seen as inflexible and resistant to change and continuous improvement by the business side. Bell (2012) highlights the need for guidance on how business and IT can integrate and suggests this guidance may be found in the principles of Lean Thinking.

Bell (2013) tells us that the key to creating effective IT systems is engaging employees in the simplification and standardisation of business processes before investing in information systems. Bell (2006) indicates that previously IT was often seen as waste to be removed rather than a tool to help achieve improvement. Now IT is seen as a requirement for sustainable improvement and he outlines that it is no longer possible to exclude IT from the Lean Thinking approach. IT can make it difficult to revert to old ways of working so can assist with sustainability of improvements (NHS, 2007).

Some examples of process improvements through the introduction of IT were highlighted in section 2.6. There follows an outline of process improvements based on the introduction of IT in physiotherapy.

2.8 Process Improvement and the introduction of Information Technology for Physiotherapists

Physiotherapy specific literature makes up a very small percentage of the growing body of literature on process improvement and health information technology.

In Lean terminology physiotherapy can be seen as a functional bottleneck as often physiotherapy is the last point in the patient journey and due to waiting lists the flow stops and the patient waits. In a lean process the patient would not have to wait but instead would be "pulled" from the

referring service to see a physiotherapist directly (NHS Institute for Innovation, 2005; NHS Scottish Quality Improvement Hub, 2008).

In the UK the Department of Health commissioned service improvement in Allied Health Professional (AHP) services in 2011, the aim of which was to enhance quality and productivity through better outcomes and experience for patients and carers. One of the main learning points from this initiative was the importance of AHPs (Allied Health Professional) taking sufficient time to first understand clearly the processes of the business they work in and the importance of using data. In Barnet physiotherapy community services wait times and Did Not Attends (DNAs) were reduced and a new referral process was implemented. This was achieved through a demand and capacity analysis, development of clear protocols and the use of evidence based clinical outcome measures (Department of Health, 2011).

In Flinders Medical Centre in Australia, a similar initiative based on Lean Thinking principles resulted in a reduction in waiting times and DNA rates in two AHP services, physiotherapy and podiatry (Kitch, Crane, Ben-Tovim and Daebeler, 2007).

The literature outlines how quality improvements can be achieved by reviewing processes and introducing information technology in physiotherapy, for example, by use of structured forms to improve data accuracy and allow for the right information to be in the right place at the right time, screening for contra-indications to treatments, improved communication with the multidisciplinary team and improved research capabilities (Barry, Jones and Grimmer, 2006; Vreeman, Taggard, Rhine and Worrell, 2006; Buyl and Nyssen 2009). Shields, et al. (1994) found that electronic documentation took 30% less time than paper documentation. However, Vreeman, Taggard, Rhine and Worrell (2006) point out that apart from the analysis by Shields, et al. (1994) few studies provide any quantitative assessment of the impact of electronic recording in physiotherapy.

Despite the benefits there have been limited examples of process improvement through the introduction of IT in physiotherapy. In fact, Vreeman, Taggard, Rhine and Worrell (2006) state that a 2004 review in the USA showed only 26.4% of healthcare providers with EHR functionality had implemented any components for AHPs and there were no plans to do so in the future.

Through informal correspondence with physiotherapy managers the researcher determined that there has been limited progress in the area of process improvement based on the introduction of IT for physiotherapy in acute hospitals in Ireland. Private hospitals in Ireland have made some progress but there are still some outstanding issues such as duplication of data entry into paper charts. Private practice physiotherapy services have made most progress in this area but they are single service, stand-alone systems with no necessity for the integration that would be required in an acute hospital. These practices are at somewhat of a disadvantage in not having access to on-line scan or x-ray results. However, some have managed to achieve an integrated body chart, incorporated VAS (Visual Analogue Scales) and % improvement scales into their electronic notes. Physiotherapists can enter physiotherapy discharge status and are using PCs and tablets.

Some physiotherapists overseas have made significant progress. Nitin Chhoda is a physiotherapist in the USA and an early adopter of EMRs. Chhoda (2012) outlines the benefits of EMRs which he believes should allow clinicians to spend much less time on paper work and much more time with patients. Chhoda (2012) also outlines a new innovation in physiotherapy management that he calls self-intake technology. This is similar to the initiative outlined previously in Vanguard urologic institute and allows

patients to carry out pre-visit registration saving time at a first attendance[12].

Choose and Book is in use by some physiotherapy services in the UK since 2008. The GP and patient can review waiting lists in their local area on line and choose which location to refer to. Patients can leave their GP or consultant knowing their referral has gone directly to their location of choice which increases patient satisfaction. Physiotherapists can then triage referrals on line and contact the patient with an appointment. The benefits in terms of referral response times, improved communication, improved access and reduction in time spent storing and retrieving referrals is well established (Choose and Book, 2013).

Richardson (2011) outlines in his book how computerised clinical decision support can be leveraged within physiotherapy electronic records to set up computerised alerts and reminders to physiotherapists and their patients, integrate clinical practice guidelines, condition-specific order sets, and documentation templates and can give context and person specific diagnostic support to the physiotherapist. The author suggests benefits in terms of improved quality and productivity and patient outcomes, and highlights that there is clear evidence that the use of evidence based clinical decision rules allow physiotherapists to make decisions that are safer and more efficient. One example outlined is the Virginia Mason low back screening process which originated in the VMMC spinal clinic (Bisognano and Kenney, 2012).

Work by Swinkels, et al. (2007) outlines that electronic clinical databases for physiotherapy are in place in a few countries and are being used for research, quality improvement and performance management. Clinical outcome measures and numbers of patients was the main data collected.

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[12]http://www.prweb.com/releases/PT-management/physical-therapy-software/prweb10162237.htm

Many physiotherapy-specific challenges that have been cited include the need for a body chart to allow for profession specific notations to be documented (see figure 1.1) and access to laptop PCs or tablets to allow for documentation at the point of care, both of which would match the current workflow of physiotherapists in the out-patient setting (Buyl and Nyssen, 2009; Unertl, Weinger, Johnson and Lorenzi, 2009).

Chapman (2010) demonstrated how the challenge of the body chart could be resolved through his work with SystmOne UK and a digital pen. The initial implementation of SystmOne added 40 minutes to the time taken for the physiotherapist to complete one patient's notes. Using the digital pen reduced this time dramatically and increased consultation time with patients by 15 per cent. More time spent with patients meant a reduction in the number of attendances for each patient as more could be achieved in a single appointment. Chapman's (2010) work demonstrated overall productivity gains of 35 per cent as a direct result of using the digital pen[13].

Further challenges are explored in the next section.

2.9 Challenges to Process Improvement

The characteristics of healthcare have been extensively outlined in the literature as a challenge to any change initiative. These characteristics include complexity, multiple standards of care, multiple stakeholders, intra-professional boundaries, reluctance to engage and varying standards of infrastructure.

With specific reference to process improvement, some authors outlined further challenges: (Fine, Golden, Hannam and Morra, 2009; Powell, Rushmer and Davies, 2009; Dixon-Woods, McNicol and Martin, 2012)

(1) staff concerns about jobs

(2) staff believing that the initiative is the current flavour of the month

[13]http://www.ubisys.co.uk/news/detail/digital-pen-and-paper-increases-productivity-of-physiotherapists-by-35

(3) the difficulty with sustainability of some initiatives

(4) convincing staff of the need for change

(5) convincing staff that the solution is viable

(6) ability to access and continuously collect and monitor data preferably through easily usable IT systems

(7) preventing unintended consequences at another point in the care system

Fillingham (2008) highlights the difficulties with overcoming cultural barriers and John Toussaint of Thedacare suggests the importance of being open and honest about such cultural problems in any organisation[14].

The importance of leadership as a success factor, and also as a challenge if not clearly present and visible, is highlighted extensively in the literature (Chyna, 2002; Fillingham, 2008; O'Connell, et al., 2008; ASQ, 2009; Bowens, Frye and Jones, 2010).

Similar challenges to the introduction of health information technology have been identified by some authors; lack of leadership, funding, buy-in from staff, training or loss of expert personnel have also been cited in the literature (Lapointe and Rivard, 2006; Vreeman, Taggard, Rhine and Worrell, 2006; Buyl and Nyssen, 2009; Lluch, 2011; Rozenblum, et al., 2011).

Fillingham (2008) suggests it is important to recognise the existence of challenges and develop strategies to overcome them. With regard to staff engagement Fine, Golden, Hannam and Morra (2009) put emphasis on addressing "what's in it for me?" for all staff involved. Staff involvement can shift employees from merely carrying out the steps in a process to looking

[14] http://www.lean.org/common/display/?o=1578

for ways to improve and feel empowered to suggest and implement change (Scott, et al., 2011; Spear, 2005). `

When we acknowledge the link between structure (including staff roles and responsibilities), process and outcomes the critical importance of engaging with staff; those who are at the frontlines and will be impacted by any change initiative cannot be overlooked (Berwick, 1992). Batalden (2006) outlines how the greatest power for change lies at the front lines.

Virginia Mason Medical Centre (VMMC) believes that the key to accomplishing the perfect patient journey is understanding that the staff who do the work know what the problems are and have the best awareness of process improvement opportunities (Kenney, 2011). Other authors concur with the idea of learning about possibilities for improvement through problem solving with staff rather than telling staff what to do (Berwick, 2002; Ben-Tovim, Dougherty, O'Connell and McGrath, 2008; Brokel and Harrison, 2009; Mazzocato, et al., 2010; Holden, 2011).

However, while some studies in his review outline the positive effects of involving staff Holden (2011) suggests that this positive effect may be due to the Hawthorne effect, the phenomenon that change efforts bring about positive effects in staff merely because more interest is paid to staff. Brokel and Harrison (2009) also suggest that the release of clinical staff to participate in process improvement can be a challenge and therefore, involvement of clinicians should be done in a manner that meets their needs (McGrath, et al., 2008).

The use of data to convince staff of the need for change and to demonstrate that a change is indeed an improvement is reiterated at this point (see section 2.2.1.4).

In summary the critical importance of frontline staff involvement, data collection and easily usable IT systems and leadership is emphasised (Batalden, 2006; Ben-Tovim, Dougherty, O'Connell and McGrath, 2008; O'Connell, et al., 2008; Dickson, et al., 2009; Holden, 2011).

The importance of referring to the organisational change literature in more depth prior to implementation of any process improvement is highlighted. A brief overview of change management for process improvement is outlined in the next section.

2.10 Change Management

"All improvement requires change but not all change is an improvement"

Don Berwick, IHI; 1996, p. 619

The link between improvement and change is indisputable as outlined by Berwick (1996). Fillingham (2008) in the NHS outlines how process improvement is as much about an understanding of culture and beliefs as it is about techniques and tools. Crandall, et al. (2007) suggests change management for implementation of IT in healthcare is one part technology and two parts work processes and culture. Lorenzi (2000) takes this further suggesting an 80/20 split between culture and IT implementation. Kaplan of the VMMC recommends a clear commitment to change and very open communication about expectations of any process improvement (Kenney, 2011). However, even with strong and committed leadership, some people within the organization may be hesitant to participate in quality improvement efforts because previous attempts to create change were hindered by system factors; a lack of organization-wide commitment, poor relationships, and/or ineffective communication (Eitel, et al., 2010). The impact of these challenges was found to reduce if the organization embraced the need for change.

The importance of identifying potential benefits and perceived challenges cannot be overemphasised. These are important aspects of the change management process as is the involvement of key stakeholders at each step as outlined in the previous section. As emphasised by the Change Management Framework of the Canada Infoway (2011), if stakeholders are not engaged and cannot see potential benefits, change is less likely to be successful. Therefore, any process improvement technique should have an

associated benefit for the key stakeholders; the patients and staff (Buyl and Nyssen, 2009). However, it is acknowledged that sustaining change is a continuous challenge but once processes are simplified and standardised IT can assist hugely in the quest for sustainability (Bell, 2006; Brokel and Harrison, 2009). IT systems, if designed and implemented appropriately can make it difficult if not impossible to revert to old ways of working (NHS, 2007).

The Australian literature on Lean Thinking suggests the 8 steps for change devised by Kotter in the 1990s offers a framework for the change management process (Philips and Hughes, 2008).

2.11 Conclusion

Healthcare is embracing methodologies from manufacturing to improve processes. Key areas of focus to date have been emergency departments, laboratories, the admission and discharge processes through hospitals and waiting times and numbers waiting for outpatient clinics. Some suggestions for improvement are highlighted in the literature which are very relevant to physiotherapy and include reduction in duplication of processes, elimination of redundant processes, avoiding unnecessary follow-ups to improve throughput, improving flow of patients and reducing unnecessary staff motion. Once processes are simplified and as near to perfection as they can be these processes should become standard work. There are some examples of process improvement based on the introduction of IT while the emphasis is on improving the processes and flow in the first instance. Information Technology has a huge role to play in standardisation and sustainability of any process improvement.

Improvement requires some essential elements for success: fostering a culture of change, involving key stakeholders, leadership commitment, standardising care processes, appropriate use of information technology and allocating sufficient resources.

Physiotherapists have not been extensively involved in process improvement and/or the introduction of IT to date so an awareness of the various approaches and an acknowledgement of the key challenges and success factors is very much a first step.

Through this literature review and the case studies outlined therein, the researcher identified process improvement methodology and tools based on the principles of Lean Thinking are appropriate for use in the physiotherapy outpatient setting. Lean Thinking principles are simple, yet powerful. The focus is on the process rather than specific problems and the customer is always at the centre. Staff engagement is crucial. Data to highlight where processes could be improved and if a change is indeed an improvement is a key factor. This data needs to be meaningful to all and not involve complex statistical analysis. The next chapter outlines the methodology used in this research in further detail.

CHAPTER 3

RESEARCH METHODOLOGY

3.1 Introduction

This chapter outlines the methodology used to assist in answering the research questions.

Main Question (MQ):

- How can processes be improved in a physiotherapy outpatients setting?

Sub questions:

- What process improvement methodology is appropriate to apply in the physiotherapy outpatient setting? (SQ1)
- Which processes should be improved? (SQ2)
- How should processes be improved? (SQ3)
- What are the potential benefits of any suggested improvements? (SQ4)
- What are the perceived challenges of any suggested improvements? (SQ5)

A mixed methods exploratory case study design was employed. Baseline quantitative data was collected and a literature review carried out. Through the literature review the researcher identified a process improvement methodology and tools based on the principles of Lean Thinking as an appropriate methodology for use in the physiotherapy outpatient setting.

Following baseline data collection and the literature review, the three stages of applying the process improvement methodology took place: process mapping, semi-structured interviews and a focus group. Further quantitative data was collected at the process mapping stage. This process improvement methodology and the tools chosen closely resemble those

used by the redesigning care programme in Australia (Ben-Tovim, et al., 2008; Victorian Government Department on streaming care, 2008).

As outlined previously (section 2.5.6) the first step is to map the process. Next the map should be analysed and improvement ideas prioritised. Before starting and during the observation stage data is collected to assist prioritisation and to determine after implementation if a change is indeed an improvement. Keeping the patient at the centre and the engagement of staff is crucial. Armed with this knowledge the first stage of applying the process improvement methodology was to map the process of the patient journey while involving staff in the clarification and validation of the process maps. Following this mapping, potential process improvements and associated benefits and challenges were garnered from the literature, interviews and the focus group. While the scope of this research did not involve the implementation all improvements some initial changes have been made and the impact on the baseline data and other measures will be closely monitored going forward.

3.2 Background

The location of this research study was the physiotherapy outpatient department of a large acute teaching hospital. The department is not located in the main hospital outpatients department and is at the very edge of the campus.

The focus for this study was the orthopaedic and rheumatology patients referred to the service as they make up the highest percentage (71%) of referrals that go through the complete range of processes and so they were a useful sample (see further explanation of local context in section 1.1).

3.3 Study design

The approach to this research was that of a case study concentrating on the specific case of the physiotherapy outpatients department of a large acute teaching hospital but it is hoped that the process improvement methodology identified and results of applying this methodology can be leveraged for use

by other departments, physiotherapy and other allied health professional settings.

3.4 Methodology

A literature review was completed to identify (1) an appropriate process improvement methodology for the study setting (SQ1) (2) process improvements carried out elsewhere (SQ3) (3) potential benefits (SQ4) and (4) perceived challenges (SQ5). Referring back to the research questions, the literature review assisted with answering the questions on the most appropriate process improvement methodology, how processes were improved elsewhere and the resulting benefits and challenges. It also gave the researcher some improvement ideas that could be applied in the setting.

As outlined in section 2.3.1 Lean Thinking as a methodology is often selected where an organisation values a visual improvement along with positive changes in efficiency. Referring back to the issues identified by the researcher (section 1.1) before commencing this research, the principles of Lean Thinking were deemed the best fit for the department under study. Section 1.1 identified waste from use of paper and disparate IT systems, lack of standardisation for some processes and the need for improved efficiency due to reduced clerical capacity.

Baseline data was collected. This data was used to assist in determining which processes should be improved (SQ2) and will be used to determine if any future change is an improvement. The baseline data gives an indication of the department throughput; number of notes filed and retrieved, phone usage and costs and is outlined in section 4.2.

As outlined in section 1.1.1 the waiting times and throughout data is requested by the HSE each month. Waiting does not add value to the patient experience and can lead to conditions moving from an acute to a chronic phase and inability to work. Patients want to have access to a service without a delay, not when the system determines this for them

(Campbell, 2009; Murray, 2009). Patients also want to have access to any appliances they require; this is not always possible due to non-pay budget constraints, a budget which is also used for the purchase of paper and printing components. Unanswered phone calls from patients are not providing a patient-centred service.

Application of the process improvement methodology addressed sub-questions SQ2, SQ3, SQ4 and SQ5 (to a lesser extent) and was made up of three distinct stages:

3.4.1 Stage 1: Process mapping

As outlined in section 2.5.6 the first step towards improvement should always be to map the process. Referring to figure 2.2, this stage is in line with the Lean Thinking principles of all steps adding value for the customer (patients and staff), mapping, creating flow and establishing pull.

Mapping allows all staff involved in the patient journey to visualise the complete journey and can clearly highlight which processes need to be improved (SQ2). Steps may not add value and timing of steps can assist staff to realise the time taken to complete steps some of which may not add value. Therefore, the processes were documented at a high level and in detail through observation of all processes. The scope of the process mapping and observation was the complete patient journey through the physiotherapy outpatients department from the patient's referral to the service to discharge and/or onward referral. Many studies focus on the patient journey from the point of arrival for a service (Dickson, et al., 2009). However, the researcher was also interested in a more detailed review of the processes involved in the period from referral to actual appointment to determine what if any value was added. The observation was carried out by the researcher and included measuring the time taken to carry out some key steps in the process, for example; to retrieve and file physiotherapy paper notes and to access relevant patient information. Time was measured with a stopwatch mobile phone app. In parallel to the

process mapping, information flow in terms of documents and data generated and information accessed was also documented.

Ten participants made up of 8 physiotherapy and 2 clerical staff were recruited for observation. Participants were drawn from the staff of the physiotherapy department and were a convenience sample dependent on which staff members were available and willing to volunteer at the time the study was taking place. Consent was received from all participants. There are three grades of physiotherapy staff working in the outpatients department and one clinical specialist, two seniors and five staff grade physiotherapists were recruited. The staff grade physiotherapists rotate through the hospital to a different area every four months and this happened midway through the observation stage. Therefore, staff at each grade and staff grades with different levels of experience in the area were observed.

An initial pilot of data collection took place in early January 2013 to finalise the data collection sheet and determine the best way to randomise the observations. Following this it was decided that observing the complete patient journey from referral to discharge in sequence was not realistic as the process steps occur at different times and some processes were a bit adhoc. Therefore, this approach would not be an efficient use of the researcher's time and would not yield sufficient data.

For patient interactions such as patient registration, booking of appointments and the patient being alone in a cubicle while the physiotherapist accesses relevant information the researcher decided to observe a maximum of one patient every 15 minutes. Other steps that took place during the observation were documented and timed as they occurred.

A total of 7.49 hours observation was carried out on various days (Monday to Friday) and at various times. Various days and times ensured documentation of a representative process map of both busy and quiet periods and ensured an even distribution of staff were observed.

The researcher was positioned at a desk in the reception area to allow visibility of the clerical staff while blending in in so far as possible. The researcher would have a presence at the reception area in any case and did not announce every time she was carrying out the observations. This was an attempt to reduce performance bias.

Throughout the observation, the researcher recorded notes on observations and anything that required clarification.

To acquire further detail on some of the process steps it was sometimes necessary for the researcher to request clarification at the time from the observed staff member.

The process map was documented in Microsoft Visio after each observation session. Standard process map symbols were used as these are easily understood and currently used at the site under study. Value stream maps were not used as the researcher did not wish to make any assumptions at the observation stage about which steps did or did not add value as determined by the customer (patients and staff).

In between observations, a reflection session and iterative construction of process maps was used to highlight gaps in knowledge about the processes and guide subsequent observations. The level of detail outlined in the process maps was determined by what was observed during the observation sessions and what clarifications were gained within the timeframe of the study. It is acknowledged that some gaps remain which were highlighted to some extent through the interviews and focus group. Timings of steps and reflections on the observations were recorded in Microsoft Excel after each observation session. Descriptive statistical analysis was carried out on these timings and mean times documented on the Visio process maps. Following observation and documentation of the process maps in Visio the maps were validated by those observed. This added credibility to this stage of the study (Wallace and Savitz, 2008). The resultant process maps are presented in section 4.3.

3.4.2 Stage 2: Semi-structured interviews

As outlined in section 2.5.2 interviews and focus groups are ways of gathering qualitative data to aid process improvement initiatives.

Referring to figure 2.2, this stage is in line with the Lean Thinking principles of all steps adding value for the customer (patients and staff), creating flow and establishing pull.

Three semi-structured interviews with key physiotherapy informants who have implemented process improvements and/or health information technology were undertaken. The interviewees assisted with answering the research questions as they reviewed the process maps in the study setting, outlined where improvements could be made (SQ2), gave clear suggestions as to what those improvements would look like (SQ3) and their potential benefits (SQ4) and finally they gave some advice about challenges and how to manage them (SQ5).

Five experts were originally identified through the literature and word of mouth and were asked for their voluntary participation. Four agreed to participate but one subsequently had to withdraw for personal reasons. All three were physiotherapists, one has a diploma in Lean healthcare, and the other two participants have implemented process improvements through the introduction of IT; one in an Irish private practice and the other at a UK-based acute /community trust.

Once consent had been received from participants they were e-mailed some background information on the department under study, some of the baseline data and the detailed process maps. This information was sent a minimum of 3 weeks prior to interview to allow the participants sufficient time to review the detailed maps. Interviews were by telephone and took approximately one hour (total time spent interviewing was just over 3 hours) and written notes were taken by the researcher during the interview.

Interviews were conducted as per the protocol outlined in Appendix B.

The interviewee was encouraged to talk about the process maps and the questions were not necessarily asked in sequence but before ending the interview the researcher asked if the interviewee wished to add anything to each of the questions as outlined in the protocol by going through each question systematically. Each set of individual interview notes were sent to the interviewees for validation. While the conversation of the interviews did not flow from one question to the next the researcher's notes were organised according to the questions outlined in the protocol. Similar comments and ideas emerged from these interviews and it was felt that further interviews were unlikely to yield additional insights.

3.4.3 Stage 3: Focus group

A focus group with key stakeholders was carried out. Eight participants were involved in the focus group which included physiotherapists (n=5), clerical staff (n=1) and IT staff (n=2). Participants were a convenience sample dependent on which staff members were available and willing to volunteer at the time. Eleven people expressed an interest in participating but due to work demands 2 IT staff and 1 clerical staff member had to withdraw. The final group was made up of one clerical staff member, two IT staff, three physiotherapists from the out-patient area and two physiotherapists who previously worked in the area and have a keen interest in IT and/or quality improvement.

The focus group assisted with answering the research questions as staff reviewed some of the baseline data and the process maps with timings and identified which processes could be improved (SQ2) and how (SQ3). Following this they prioritised the improvements and outlined what they felt the benefits of each improvement could be (SQ4).

The focus group took place from 11:30 a.m. as this time was most convenient for participants and had the least impact on patient contact time. The venue was on the site of study but in a location very much

separate from the physiotherapy outpatients department where staff would have space to give their full participation with no interruptions.

At the focus group the process maps from stage 1 were displayed on A1 size posters at four stations. The documents, data and information accessed tables and the outline of repositories were also displayed in a separate area of the room on A1 size posters for participants to refer to.

The session began with a brief introduction to the purpose of the focus group, an outline of findings from the literature and the goals of any suggested improvements. Participants were encouraged to add to the goals throughout the session or to remove any they did not agree with. The goals were displayed throughout the focus group and reiterated again prior to the regroup and discussion session. There was agreement to maintain them as they were.

Goals:

- Improve patient journey and the importance of keeping the patient at the centre
- Boost staff morale
- Reduce non-value added activities, for example, waiting, duplication and movement
- Reduce non-clinical steps for the physiotherapists
- Improve ease of access to information – both when the patient is present (patients with multiple attendances) and to review service outcomes and carry out research

Referring to figure 2.2, these goals are in line with the Lean Thinking principles of adding value for the customer (patients and staff), creating flow and establishing pull.

From the department's "comment cards" process; of note, patients have very few complaints but access to the service and waiting times are commented on. Therefore value from the patient's viewpoint is access to

the service when they need it and not when their problem is chronic, to have their queries answered and to have the therapist spend time with them and explain their condition.

Some of the baseline data was also presented (see section 4.2).

Following collection of consent forms from all participants they were divided into groups of two and asked to review the process maps to identify where improvements could be made. Each group of two had 12 minutes to review each station. Each group of two had at least one member currently working in the physiotherapy outpatients department. Each group had a flip chart and a specific colour pen on which they documented their ideas for process improvement. After 12 minutes the groups rotated clockwise to the next station, reviewed what the previous group had documented, ticked the ideas they agreed with and added to this list. This method of group work is one of the suggested activities outlined in the NHS leaders' guides (2005) section "Working with groups".

When each pair had visited each station the full group took a break for lunch. Following lunch the full group came together to discuss the ideas presented and to outline potential benefits and perceived challenges of any suggestions. The focus group took 2.5 hours in total. In all 19 items were listed as improvement opportunities. The number of ticks allowed clear visibility of the opportunities highlighted most frequently.

Notes from the focus group were transcribed into a table by the researcher, listing each item against any benefits and challenges outlined at the focus group and were distributed to each participant by e-mail. Participants were asked to state whether they agree/not agree that each item should be explored and to prioritise the items for which they said "yes", giving 1 to their highest priority. All responses were amalgamated into a master priority list and an average score was assigned to each item (total assigned to item/number of responses to the item). If average scores were equal for

two items the item that received the higher number of "Yes" responses was given the higher priority.

3.5 Participants and recruitment methods

All participants were asked to sign a consent form (Appendix C) before participating. The same consent form was used for all three stages. For semi-structured interviews (stage 2) consent forms were sent by e-mail and confirmation of agreement to participate was received by e-mail.

Participants in each stage of this research study were given a [stage specific] information sheet a minimum of two weeks in advance of the study stage outlining the purpose of the study and requesting their voluntary participation (Appendix D). Each information sheet includes a statement "Your participation is voluntary and you are free to withdraw at any time without providing a reason". One participant who had agreed previously to participate in a semi-structured interview had to withdraw for personal reasons.

3.6 Ethics application

Ethics was sought from the ethics committee at the acute hospital site and was deemed unnecessary. An application to the Trinity College Dublin (TCD), School of Computer Science and Statistics Research Ethics Committee was then submitted and approval received following one requested change. This study conformed to the conditions of the ethical approval obtained (Appendix E).

3.7 Conclusion

This chapter has detailed the design of the research study and its implementation. The methodology outlined assisted in answering the research questions as described in the text.

The Mixed Methods approach (Creswell, 2009) used, allowing for the collection of both quantitative and qualitative data and also data from a variety of sources increased the validity of the data and findings.

The results of all three stages are presented in the following chapter. While the scope of this research did not involve the implementation of all improvements some initial changes have been made and the impact on the baseline data and other measures will be closely monitored going forward (section 5.4).

CHAPTER 4

RESULTS

4.1 Introduction

This chapter presents the quantitative and qualitative data collected by the researcher. Baseline data and the process maps including a brief narrative of each map are presented initially. Thereafter, data from the semi-structured interviews and focus group are presented.

As outlined in chapter 3 data from all three stages of applying the process improvement methodology; process mapping, semi-structured interviews and the focus group was reviewed and validated by participants which added to its validity given that one researcher carried out each stage independently.

Throughout this chapter numbers $I^{1},^{2},^{3}$ etc. refer to the suggested improvements and/or the point in the process map to which the suggested improvement applies, as identified in this research. These numbered suggested improvements are listed in table 5.1 in section 5.3.2. They are ordered in the table starting with the suggestions whose implementation is complete or further advanced. This is an attempt to add clarity for the reader regarding which suggested improvement/point in the process the researcher is referring to.

4.2 Baseline data

As outlined in Chapter 3, as part of this study baseline data was collected. The baseline data gives an indication of department throughput, numbers waiting and time to wait, unanswered calls and estimated paper and storage costs and is outlined in the tables and text below. As outlined by Ben-Tovim, et al. (2008) data is an important part of any process improvement initiative and the measures used need to be important to patients, the organisation and the health service in general. The data chosen impacts all three aspects with the patient at the centre.

Table 4.1 illustrates the number of referrals, number of new and return patients seen and the waiting time and number of patients waiting per month for each of the two specialties under study. The DNA for both specialties is also outlined.

4.2.1 Throughput

Table 4.1 Throughput (average per month in 2012)

	Orthopaedic	**Rheumatology**
Referrals	170	46
New patients seen	140	27
Return patients seen	422	104
New to Return ratio	1 : 3	1 : 4
Number of patients on the waiting list	46	38
Waiting time for patients	6 weeks	5 weeks
Did Not Attend (DNA) rate	9%	7%

As illustrated in table 4.2 the clerical staff retrieve the physiotherapy notes and make up and file away the notes of patients attending for the first time (new patients) each day. The physiotherapists file away the notes of all patients returning for a second or subsequent appointment (return patients). See process map 4.11 in the next section for timings on this section of the process.

4.2.2 Retrieval and filing of physiotherapy notes

Table 4.2 Physiotherapy notes retrieval and filing (average per month)

Number of physiotherapy notes clerical staff retrieve monthly	526
Number of physiotherapy notes physiotherapy staff file monthly	526
Number of physiotherapy notes clerical staff file monthly	167
Number of new sets of physiotherapy notes made up by the clerical staff monthly	167

Table 4.3 illustrates the high volume of calls that the clerical staff have to deal with and highlights that 20% of calls are unanswered **(I^3)**. Calls to the department are mainly from patients to (1) cancel their appointment (2) to book an appointment (3) to determine where they are on the waiting list and (4) how long they will wait.

4.2.3 Phone calls

Table 4.3 Phone calls (average per month in 2012)

Number of calls in and out of the physiotherapy outpatient's main reception	2760
Average time per call	63 seconds
% of calls that were unanswered	20.46%

4.2.4 Costs of paper and storage

- Each set of physiotherapy notes has an average of 8 pages. This includes the referral, a front sheet, a pre-printed assessment sheet, a database and blank sheets for SOAP notes (see figure 4.3).
- This paper along with printing components costs an average of €2,220 per annum.
- Appointment cards cost an average of €145 per annum.
- Text messaging has no on-going cost (Ref. IT department)
- Active physiotherapy notes are stored in a shelving unit with a tambour door. Each set of physiotherapy notes has its own cardboard file which is recycled so there is a negligible cost involved.
- Physiotherapy notes that have been discharged are filed in the current and then old archive. Notes are destroyed after 8 years and the filing cabinets are recycled so there is a negligible cost involved.

Source of baseline data:

- Phone usage data is automatically generated
- Numbers of new and return patients is a monthly report generated by the IT department based on data inputted to the PAS at the point of patient registration
- Paper costs; actual price comes from the SAP requisitioning system and the overall cost was manually calculated
- Number of referrals is counted manually
- Waiting numbers and times are counted manually

4.3 Process Maps

The methodology used for the observation and process mapping stage is outlined previously in section 3.4.1. The researcher believes that documentation of the processes through observation by the researcher rather than staff outlining the processes was an accurate representation. As outlined by Unertl, Weinger and Johnson (2006), staff may have difficulty in

providing a complete description of their processes because they are immersed in the work. Use of a single researcher also eliminated intra observer bias. As outlined previously by Crandall, et al. (2007) attention to detail in the lower level maps is important to determine how to improve existing processes and how best to integrate healthcare IT into processes.

The outputs of the observation stage are depicted in the process maps on the following pages. Overall the process maps clearly indicate that this is a very busy department with very complex processes producing a high volume of documents and data which are accessed from a variety of repositories (see figure 4.3 and tables 4.4, 4.5 and 4.6). When the maps were documented some opportunities for improvement were visible to the researcher; the need to simplify, standardise and make better use of existing IT systems.

The process maps presented are those based on the observations that the researcher carried out. As outlined in sections 4.4 and 4.5 some clarifications were sought on steps in the process maps, both during the semi-structured interviews and at the focus group, but the researcher did not adjust the maps accordingly but did take note of all clarifications requested (see section 4.5).

During the observation and process mapping stage some opportunities for improvement emerged and it was agreed that these changes should be carried out (Just do it! in Lean Thinking which might be more akin to action learning than a case study). These opportunities included the need to clarify the policy of booking new patients into return patient slots for all staff **(I^1)** and standardisation of the notations for the body chart diagram **(I^2).** These changes are not reflected in the initial background information or the process maps as the researcher thought it best to clearly demonstrate the starting point of the study.

The process maps are now outlined. Figure 4.1 outlines the high level process map broken down into the key blocks that make up the patient

journey from referral to discharge. The separation into blocks emerged naturally with the iterative construction of the process maps between each observation session. Blocks A-D are detailed in figures 4.4 through 4.10.

Figure 4.2 is an overview of key repositories of patient information. Figures 4.4 to 4.10 are lower level process maps of the blocks outlined in the high level map (4.1). Figure 4.11 outlines the process for filing and retrieval of physiotherapy notes and figure 4.12 clinical documentation and information access during the patient attendance. Tables 4.4, 4.5 and 4.6 outline documents and data created and information accessed. Each is described in the following sections. More detail on each of the notations outlined on the process maps is available in Appendix F.

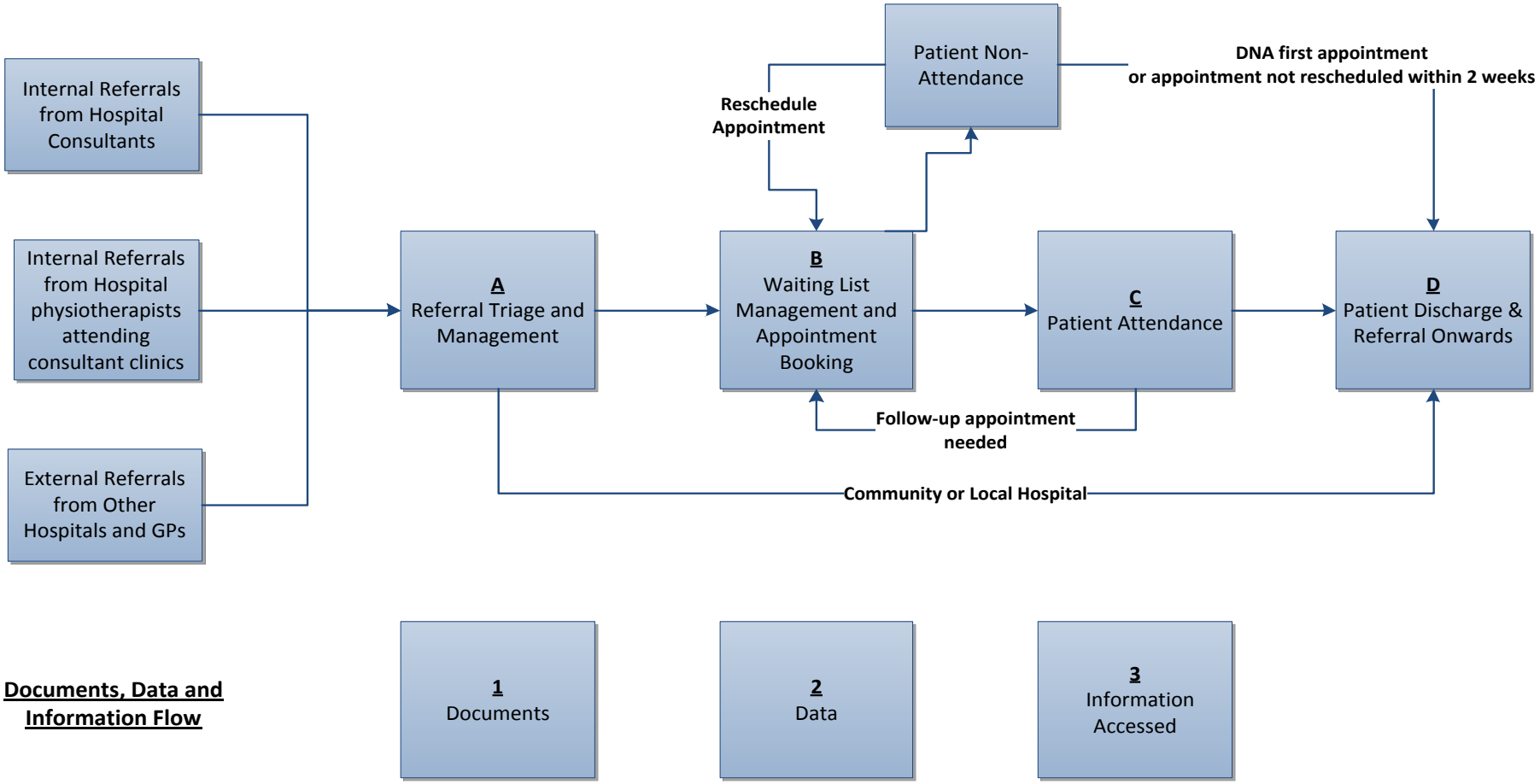

Figure 4.1 High level process map

As illustrated in Figures 4.2 and 4.3 information is stored in a number of locations many of which do not join up together leading to multiple points of data entry (some of which are paper-based and some electronic) and storage and much duplication. Access to the IT systems is limited by the number of computers available and accessing any information involves movement of staff and/or paper.

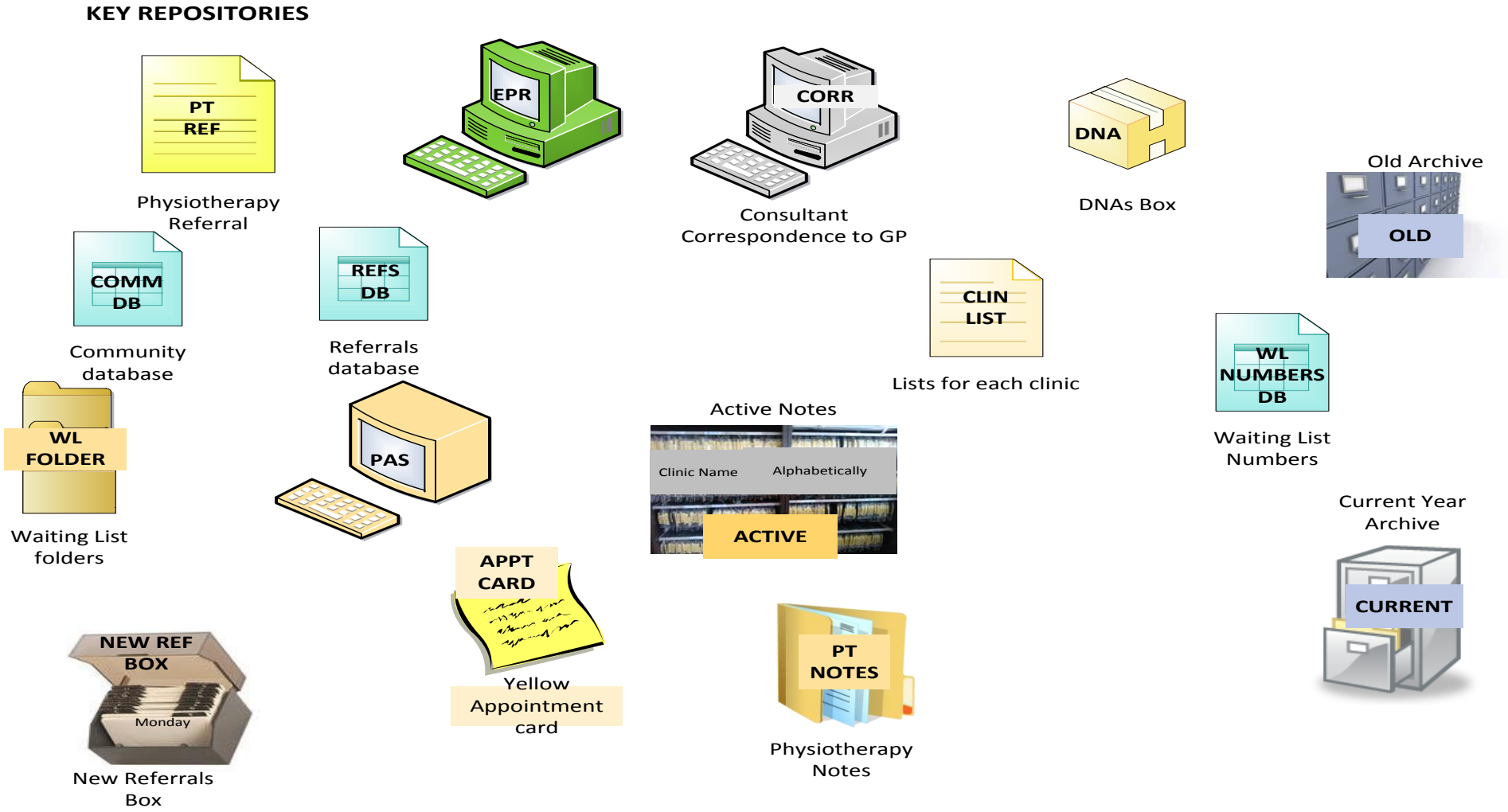

Figure 4.2 Key Data Repositories

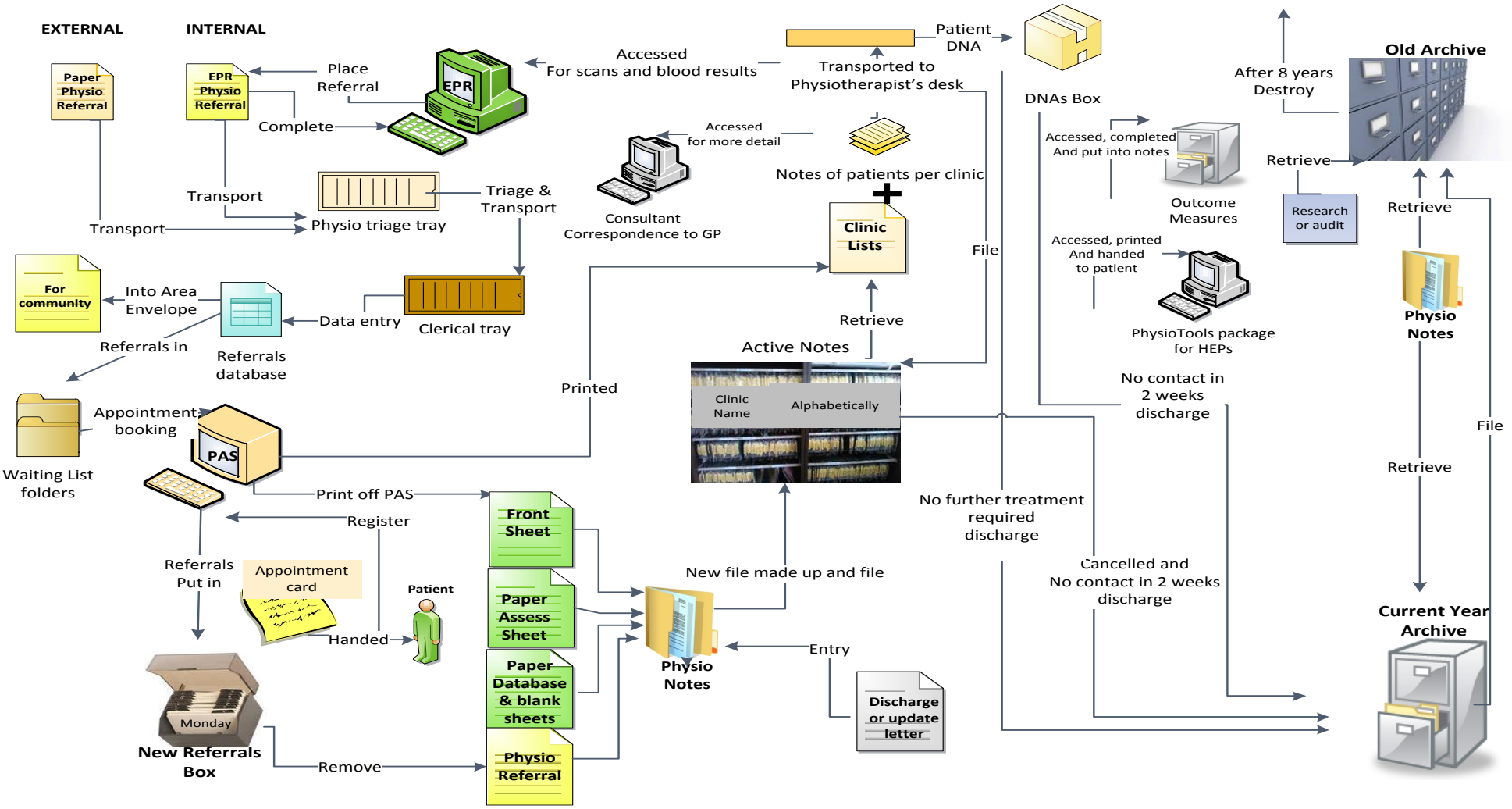

Figure 4.3 Data storage and access

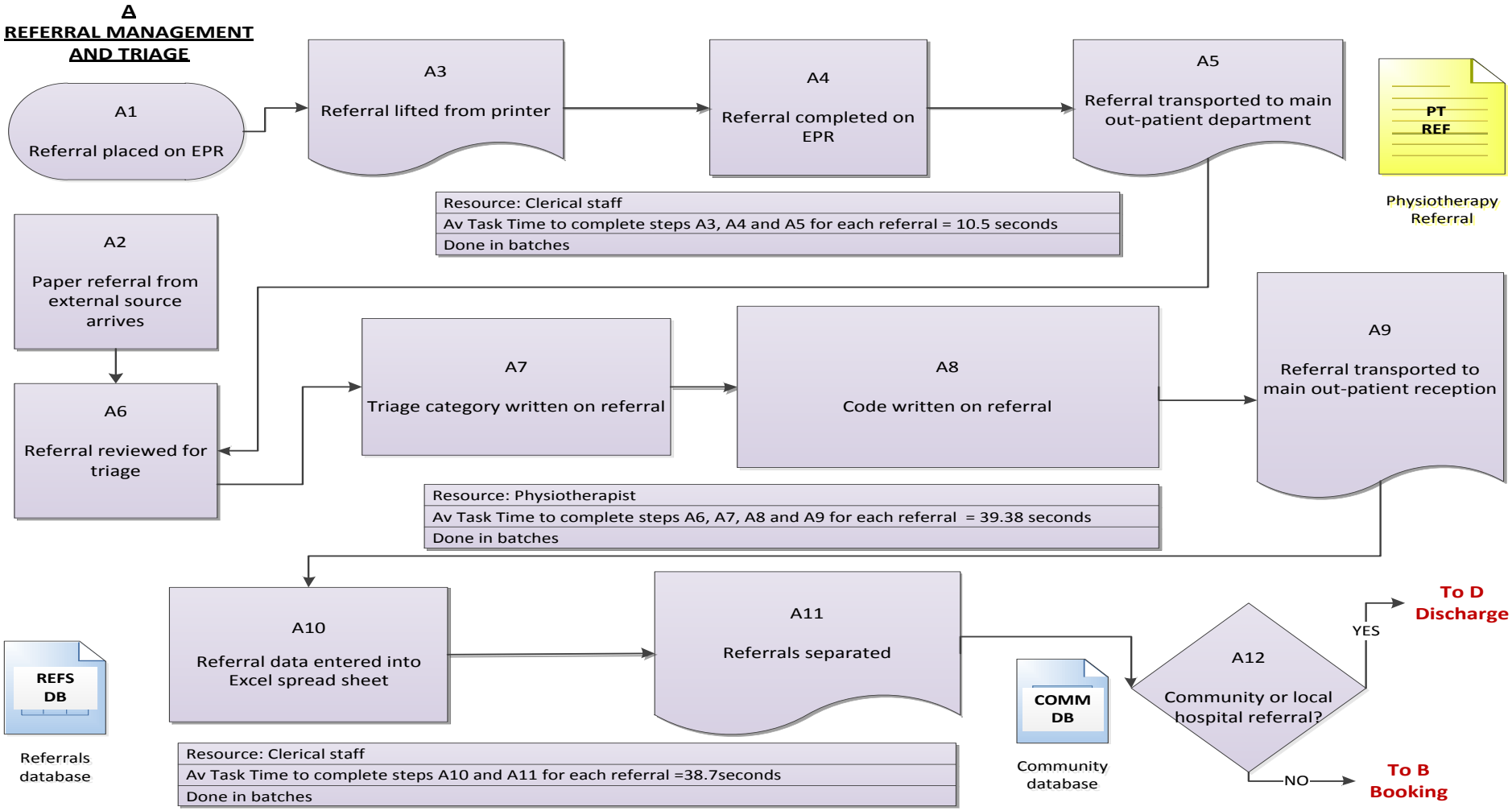

Figure 4.4 Referral Management and Triage

The process for referral management and triage **(I^4)** was mapped in detail. As outlined in section 2.5 it is important to map in detail at any bottlenecks. This stage is an obvious bottleneck in the patient journey as referrals arrive and patients wait for an appointment. As illustrated in Figure 4.4 referral management and triage involves 9 steps, takes a mean of 88.6 seconds per referral (n=35) and entails a lot of walking about for staff and movement of paper from one place to another. The 9 steps in the process are purely to determine the patient's priority and to decide a physiotherapy diagnostic code. This process takes up to 16 minutes (for orthopaedic and rheumatology referrals only) of staff time each day and adds little value to the patient journey apart from ensuring that those patients who are in urgent need of physiotherapy are seen first. Referrals are triaged daily in batches which causes a delay between receipt of each individual referral and the referral going on to the waiting list and the patient actually receiving an appointment. However, the researcher acknowledges that due to the significant amount of movement, carrying out this process on each individual referral would actually add to the time taken to complete the steps. An example illustrates this clearly and highlights the amount of time wasted on movement of staff and referrals. The mean time it took one of the clerical staff to complete steps A2, A3 and A4 for 5 referrals was 20.71 seconds per referral whereas this mean time reduced to 8.3 seconds per referral for a batch of 30 referrals.

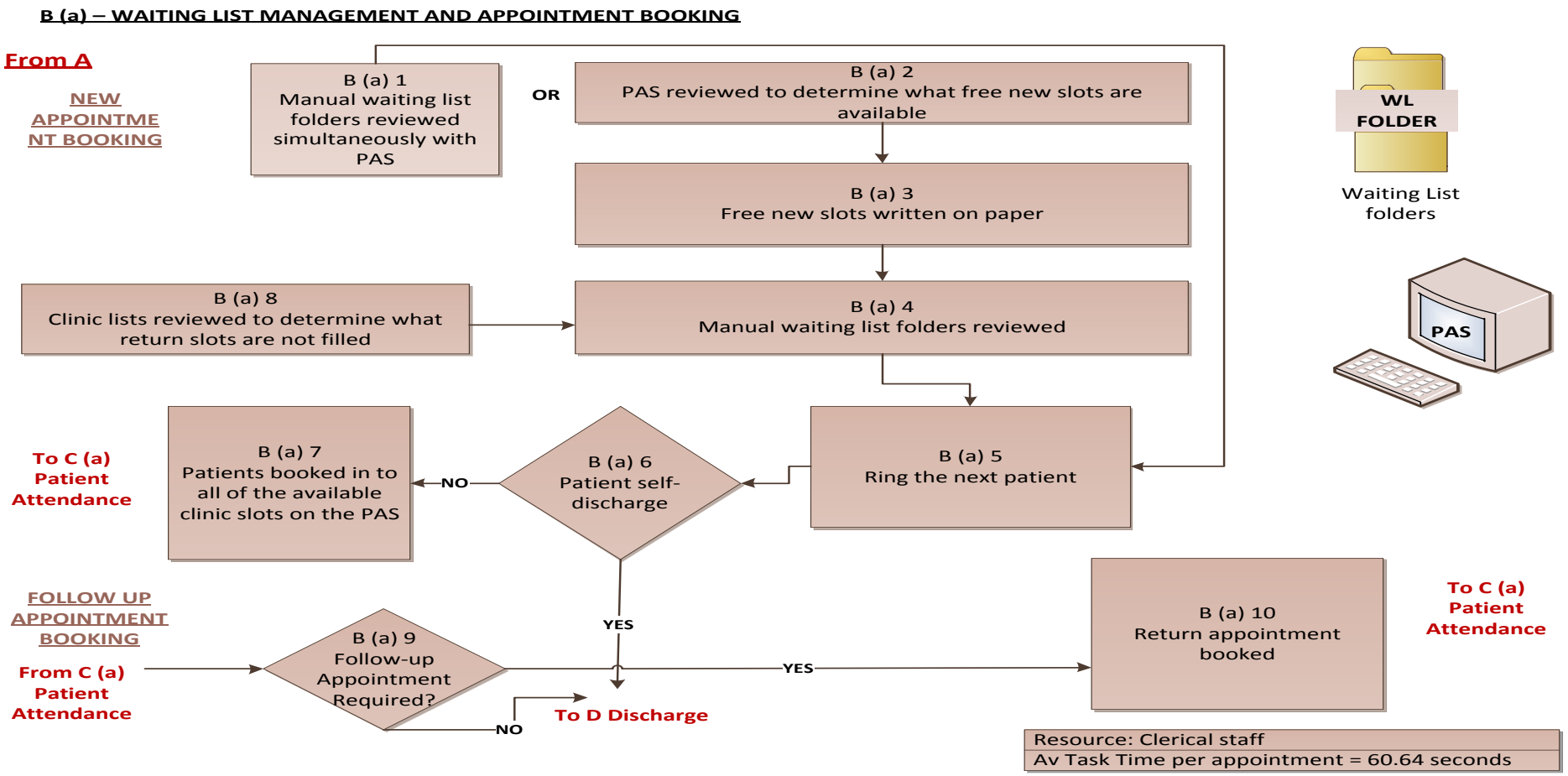

Figure 4.5 Waiting list Management and Appointment Booking

The process map for waiting list management and appointment booking (figure 4.5) shows a waiting list folder (WL folder). This is where all paper referrals are stored. This manual folder exists despite most referrals (internal consultant referrals make up 95%) already being on the EPR system. This process follows on from figure 4.4 triage. As outlined previously in table 4.1 (section 4.2) the timeframe from referral received to appointment booking can be up to 6 weeks.

With regard to taking patients off this manual waiting list and ringing them to book an appointment it is not clear who is responsible for this; all clerical staff or one or if done on all or specific days? During the observation the researcher noted that both clerical staff took on this duty while carrying out multiple other tasks with multiple interruptions. As seen in the process map there were two ways that the two clerical staff carried out this process one of which appears more efficient than the other (B (a) 1 directly to B (a) 5) **(I^{12})**.

Staff did not seem to be clear on the expectation that all new slots were to be filled 3 weeks in advance or what the guidelines are for booking new patients into return slots (if they are vacant). The booking policy states all new slots in the clinic templates should be filled 3 weeks in advance. It is not in the booking policy but clerical staff understand that return slots can only be filled with new patients 1 day in advance so they do this following printing of clinic lists which leads to the patients getting an appointment at very short notice. On the other hand, the physiotherapists said they are happy for new patients to be booked into return slots 3 days in advance. As the understanding of expectations and clarification on the policy was required a decision was made to meet with staff and seek agreement on the policy (Just do it!) **(I^{1})**.

Clerical staff also said they could ring 20 patients and manage to make only 4 appointments and the question must be asked if this is an efficient use of their time or if an alternative time or method for making appointments needs to be considered. The time taken to book new appointments was not

recorded as there were so many variations in understanding of the booking policy and the process for booking that time did not allow for this to be fully assessed and timed.

There was significant variation in the time taken to book a return appointment; ranging from 28.7 to 124.9 seconds (mean 60.64 seconds SD+/- 35.38 seconds) per patient (n=15). There were some reasons noted for this variation including interruptions from other staff and interruptions from phone calls. While the stopwatch was stopped while interruptions were dealt with the staff member was obviously distracted on returning to finish the booking.

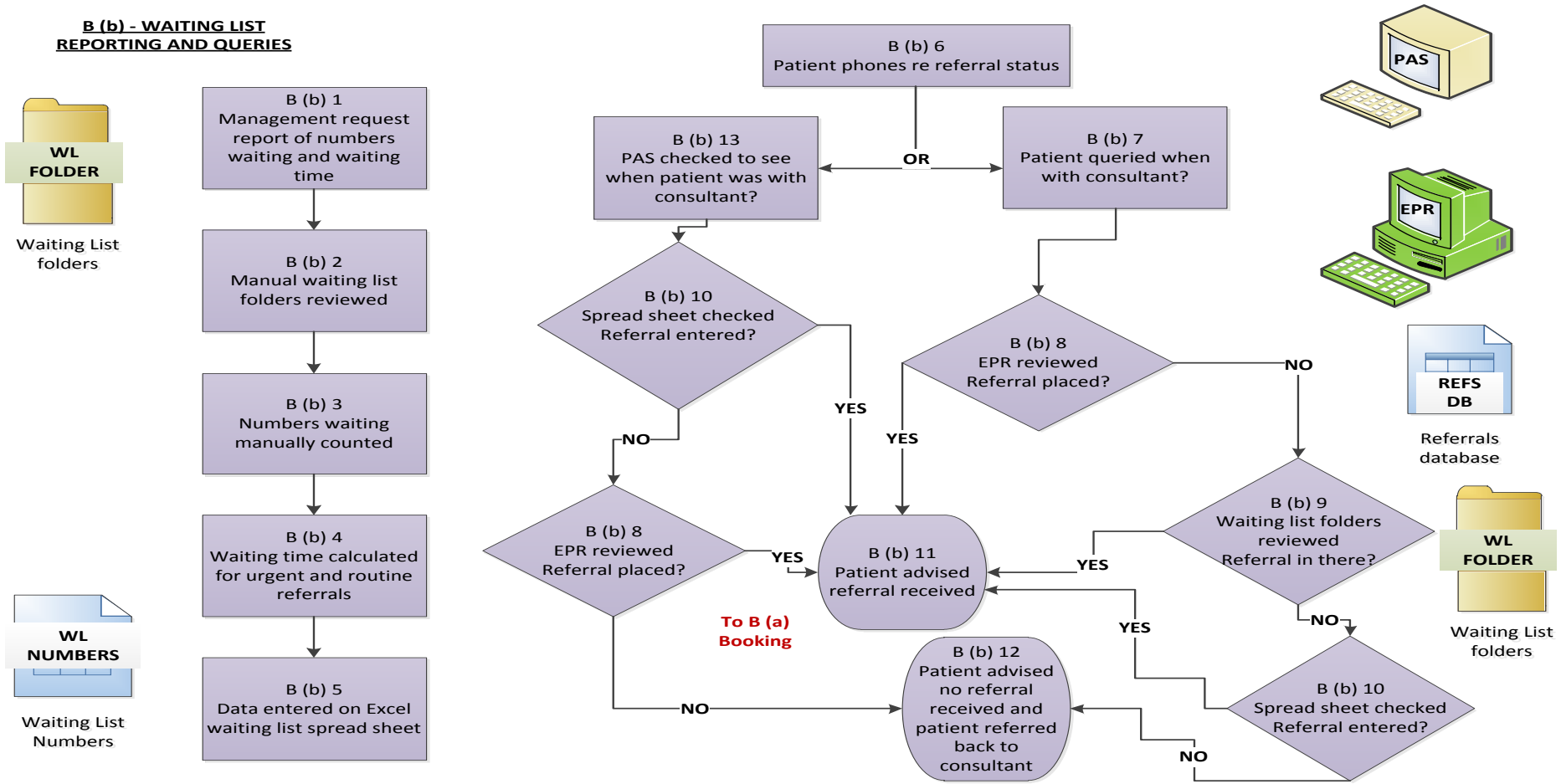

Figure 4.6 Waiting List Reporting and Queries

Figure 4.6 illustrates the process followed for calculation of numbers waiting and waiting time. This process is completely manual.

An observation from this process map is to query why the manual process of data collection occurs given that all of the data is inputted in to the PAS? As explained in section 1.1 the referral is date stamped on the EPR system and the appointment then booked on the PAS and these two systems do not link up. As will be seen in the next sections (4.4 and 4.5) the question as to why waiting list data cannot be calculated automatically was asked by some participants at the focus group and by two of the interviewees **(I^{5})**.

Figure 4.6 also illustrates that the process for answering a patient query is not standardised and involves the checking of multiple systems storing similar information **(I^{13})**.

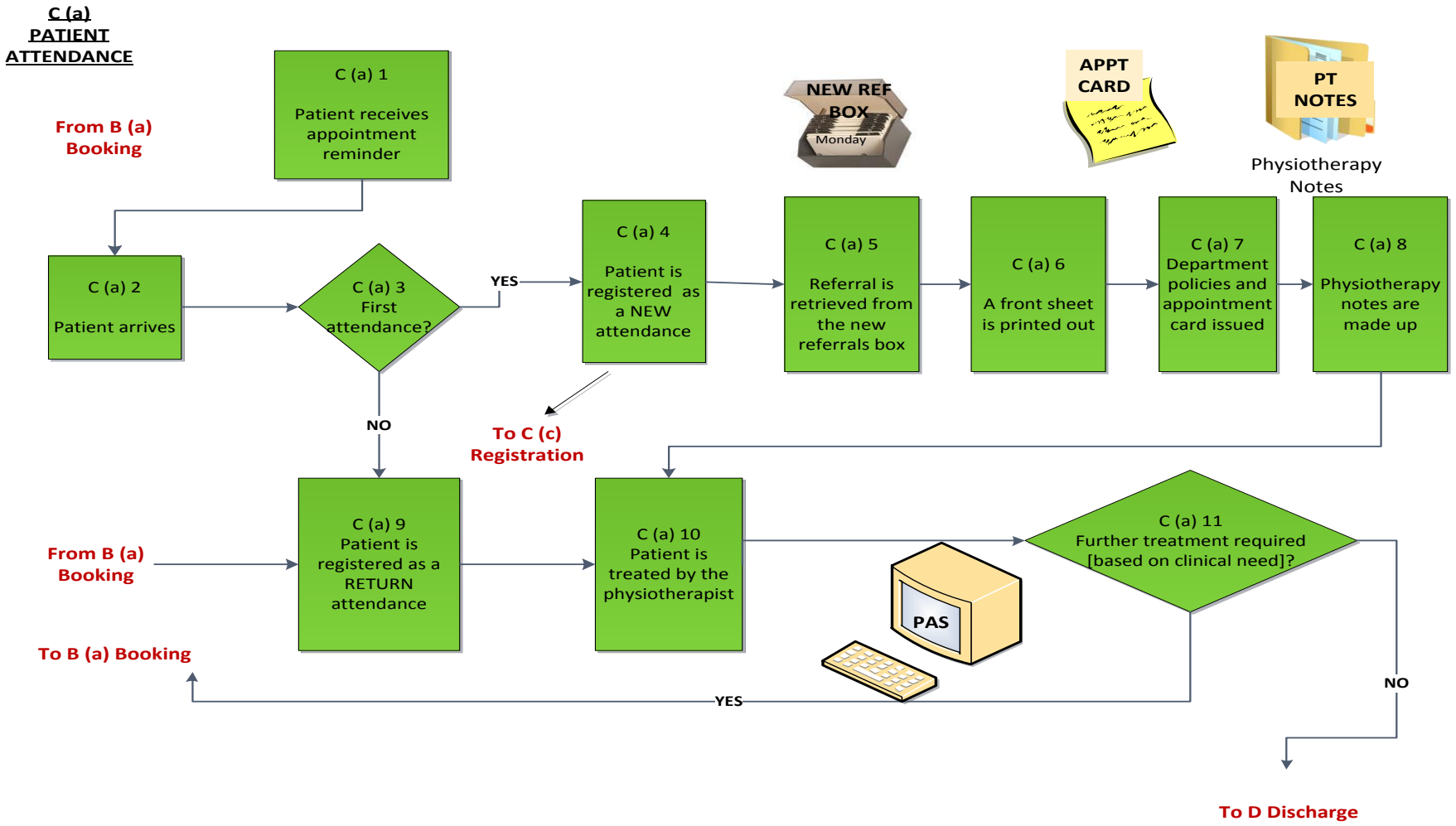

Figure 4.7 Patient Attendance

The process that occurs when the patient attends the department for a new or return appointment is outlined in figure 4.7. Information gathered and accessed by the physiotherapist at step C (a) 10 is illustrated further in figure 4.12. Similar to the triage process outlined in figure 4.4 there is much movement and gathering of pieces of paper for a new patient attendance **(I^{11})**. The physiotherapy notes are not made up in advance of a new patient attendance to avoid time wasting in the case of non-attendance. However, as can be seen some of the steps, for example, registration at C (a) 4 (new) and C (a) 9 (return) do not add value to the patient's journey while this step does allow for automatic calculation of numbers attending. Step C (a) 6, leads to the printing of a front sheet and it is unclear what this is actually used for (Table 4.4) **(I^{6}).**

Registration is mapped in more detail in figure 4.8. The researcher acknowledges that there is more than one step in each box and would like to state that this section of the process map was represented diagrammatically purely to demonstrate the time taken to complete patient registration of a new and return patient. The mean time taken to register a new patient was 62.36 seconds (SD +/- 23.23 seconds) with an extra 41.52 seconds (SD +/- 12.32 seconds) on average to gather up the pieces of paper needed to make up the physiotherapy notes (n=7).

The mean time taken to register a return patient **(I^{10})** was 12.6 seconds (SD +/- 16.47 seconds) (n=13). Therefore, a significant amount of time is taken to register patients and as stated above this adds no value to the patient as it purely acknowledges their arrival but it does allow for automatic calculation of the number of attendances. Of note, if a patient arrived without their yellow appointment card for a return appointment this caused delays in the registration process as there are important details such as the clinic code, consultant's name and physiotherapist's name written on the yellow card and these details are required by the clerical staff to register the patient **(I^{7})**. One example clearly illustrates this where the patient had no yellow card, was unclear who their consultant or physiotherapist were

leading to the registration taking 56.4 seconds to complete. The physiotherapist/consultant details are currently not in the text message reminder sent to patients (step C (a) 1).

During patient attendance clerical staff are engaged in multiple simultaneous tasks which can lead to many interruptions. As seen in the study by Chand, et al. (2009), any external disruption while registering a patient lengthened the registration time. A consistent example of this was interruption by phone calls, whereby the registration process was interrupted and the phone call answered and then put on hold while the registration process was completed.

C (c) REGISTRATION

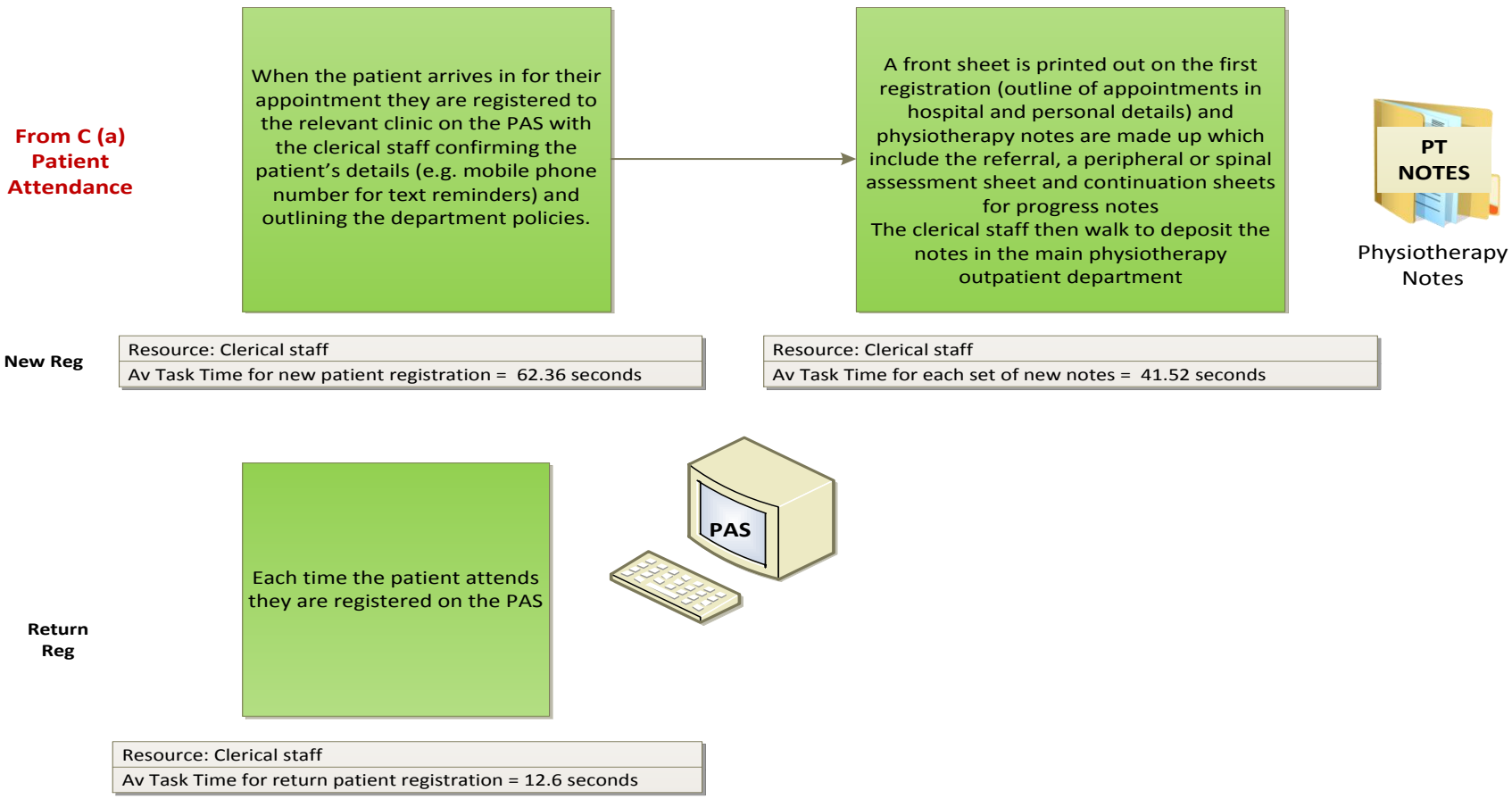

Figure 4.8 Registration

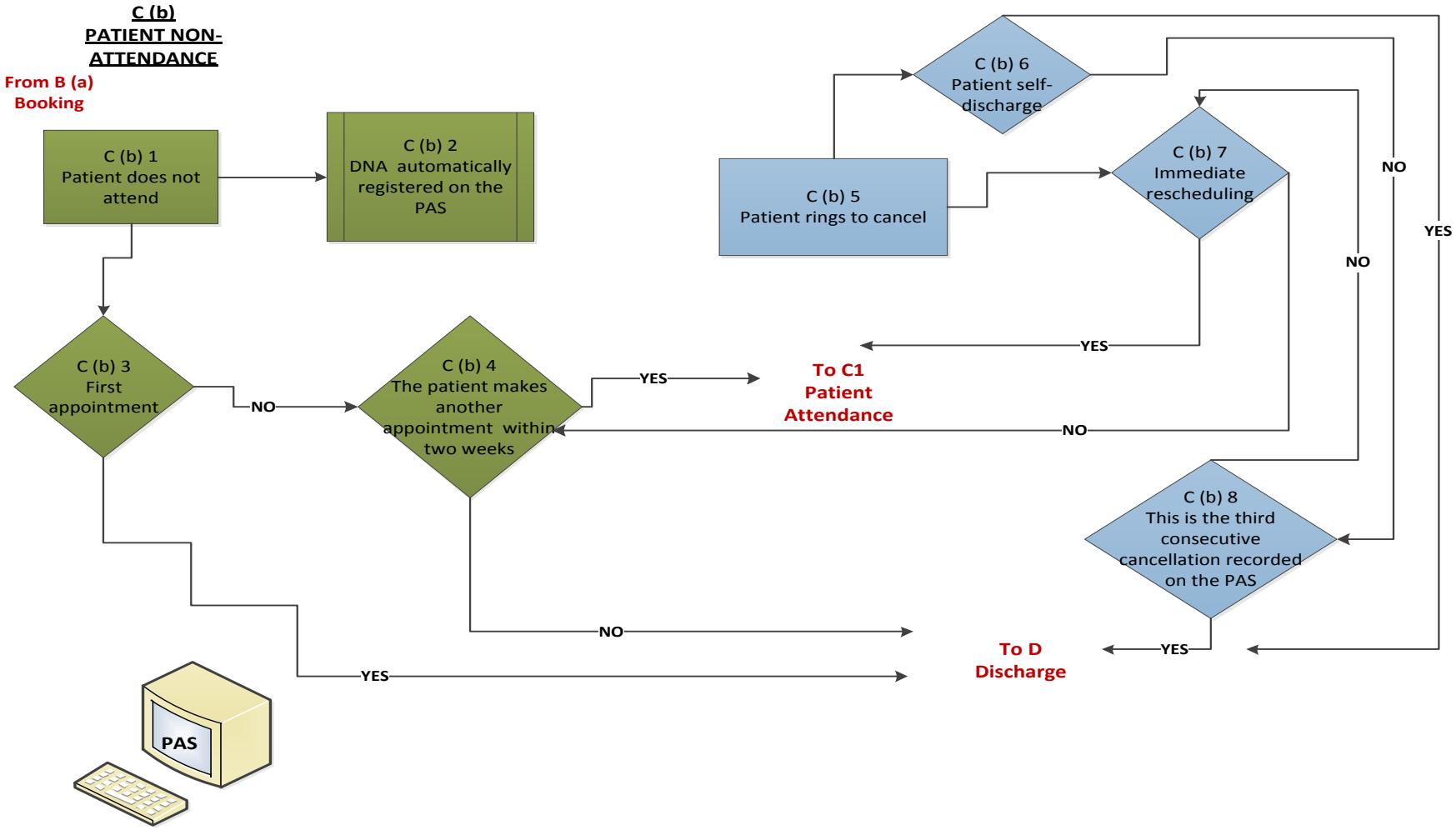

Figure 4.9 Patient Non-Attendance

Figure 4.9 illustrates the process for non-attendance. Overall the patient non-attendance block of the process seems to work well with the department receiving automatic reports from the IT department on the number of cancellations and DNAs on a monthly basis and actions taken to try to improve the rates. Of note, when it comes to retrieving the notes of patients who have cancelled and not made subsequent appointments the process involves the physiotherapist going through all of his/her active notes and subsequently removing the notes of these patients; a manual process (see step E7 in figure 4.11) **(I^{11})**.

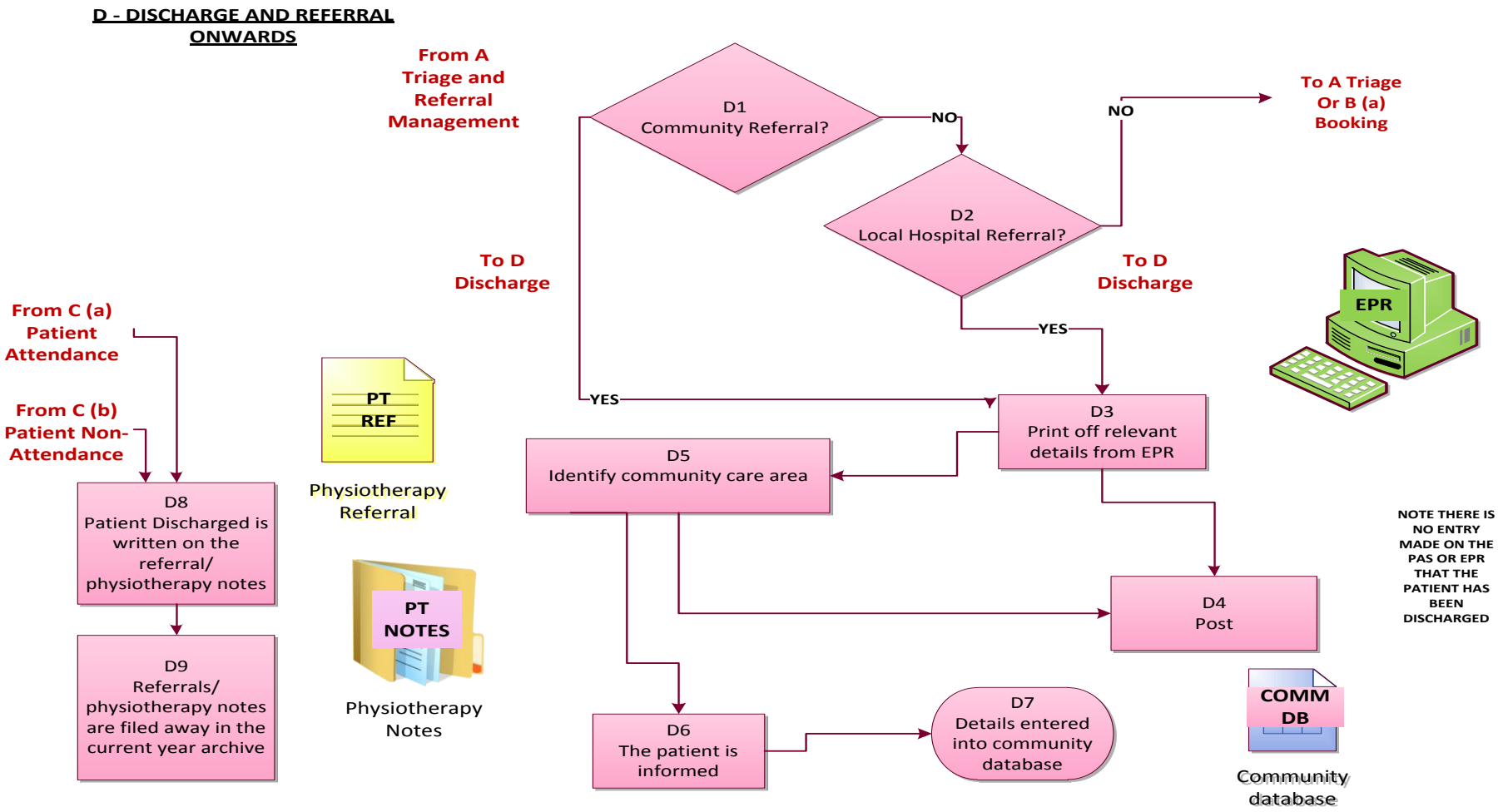

Figure 4.10 Discharge

Figure 4.10 illustrates the process carried out when the patient is to be discharged from physiotherapy. The patient may be referred to their local hospital or community care area at the point of triage. This is a paper-based process **(I^{9})**. The patient is informed that they have been referred to their community care area but not if referred to their local hospital so there is no standard process. There is no entry made on the EPR or PAS that the patient has been discharged. This is only written on the physiotherapy referral/notes which are stored in the physiotherapy department and not accessed by others. An entry on the PAS or EPR would allow internal referrers to see that the patient has completed their physiotherapy **(I^{11})**.

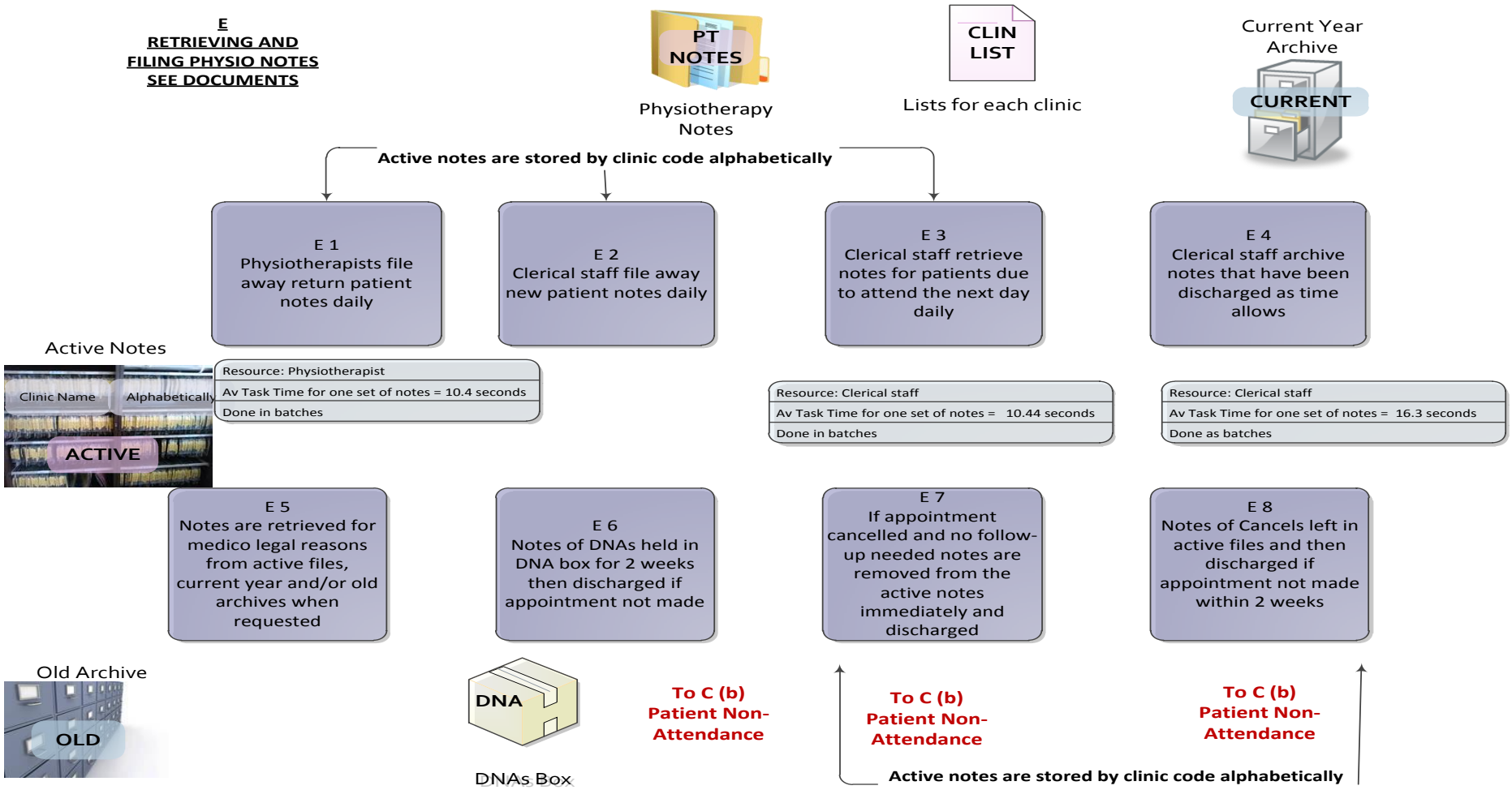

Figure 4.11 Retrieval and Filing of Physiotherapy Notes

As outlined in Figure 4.11 a significant amount of time is spent by both the clerical and physiotherapy staff on the retrieval and filing of notes on a daily basis **(I^{11})**. Each set of notes takes approximately 10 seconds to retrieve (n= 18) and 10 seconds (n = 21) to file away. Archiving notes takes over 16 seconds per set of notes (n = 12).

In figure 4.12 we see that a significant amount of time is taken up accessing information during the patient attendance; more than 99 seconds (n = 7) of the physiotherapist's time each visit is taken up searching for information to assist the decision-making process or give to the patient to aid recovery; exercise sheets, outcome measures, x-ray and scan results and other correspondence (see table 4.6 for further details) **(I^{11})**. During the time the physiotherapist accesses this information the patient waits alone in the cubicle. While it is acknowledged that all steps in this process add value to the patient in terms of treatment planning and goal setting, information could be more easily and efficiently accessed.

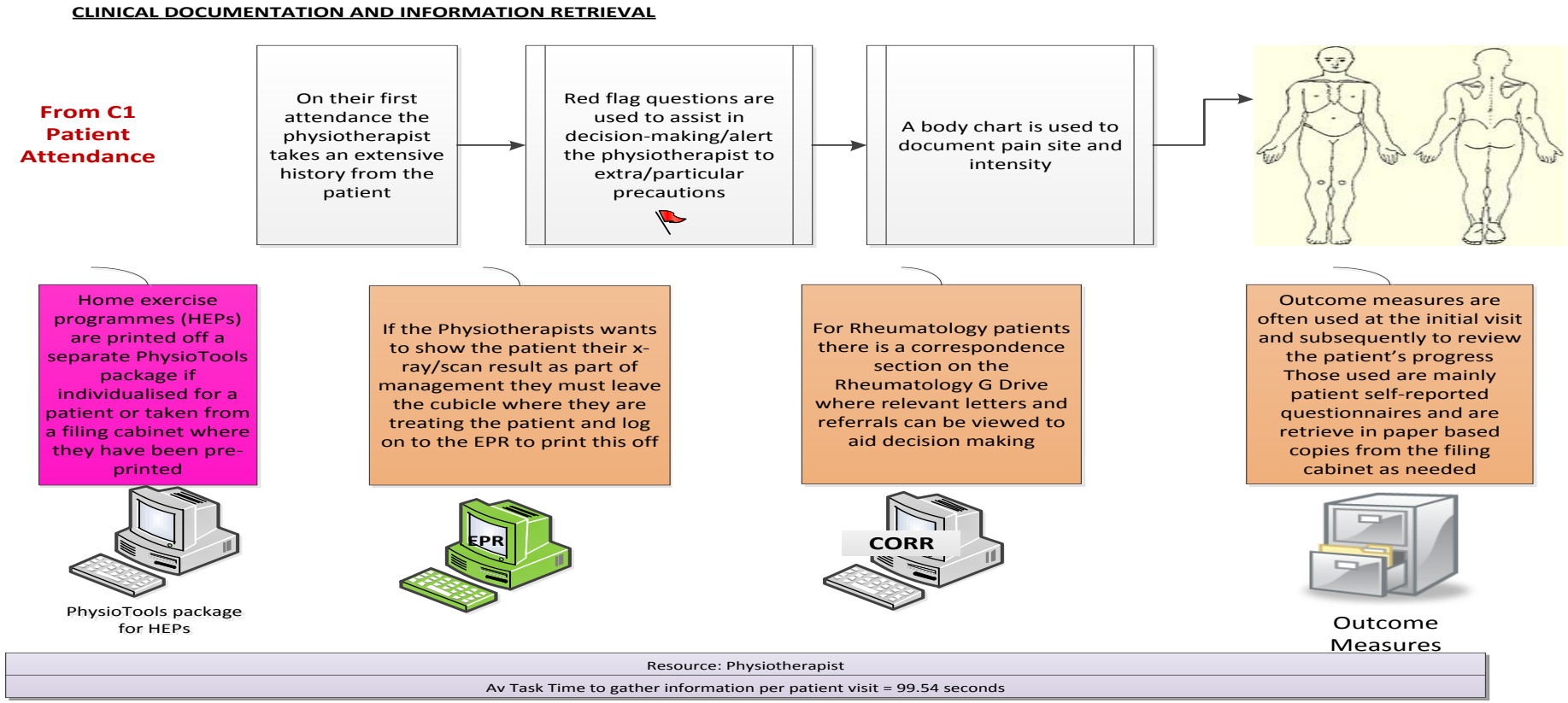

Figure 4.12 Clinical Documentation and Information Access

The following tables outline the documents and data created and information accessed by the clerical and physiotherapy staff during the patient's journey.

Table 4.4 Documents created

Document	Daily work list	Physiotherapy Referral	Yellow Appointment Card	Front sheet	Physiotherapy Notes including file made up to hold them	Discharge Letters	Report to referrer
Type	Paper	EPR	Cardboard	Paper	Paper File is cardboard	Paper	E-mail for Rheumatology patients (internal referrals) Paper to all referrers Telephone calls to all referrers (?data)
When accessed?	Daily print from PAS for next day	Lifted from printer on referral Reviewed by physiotherapist	Every attendance	On first attendance	Each time patient attends	Not routinely done Completed once on discharge Written by physiotherapist and posted internally to medical records chart room for filing	As needed
Where stored?	Paper is discarded once the clinic date has passed	In standard folders until appointment booked In "new patients" box when appointment booked until patient arrives in In physiotherapy notes	With patient	In the front of the physiotherapy notes	In notes storage area as long as patient continues to attend In filing cabinets on discharge for 8 years Notes holders are recycled	Original filed in medical chart Copy filed in physiotherapy notes	Copy of letters kept in physiotherapy notes Note made of phone call E-mails kept separately

Document	Daily work list	Physiotherapy Referral	Yellow Appointment Card	Front sheet	Physiotherapy Notes including file made up to hold them	Discharge Letters	Report to referrer
What used for?	For each physio to know which patients (whether new or return) are arriving on a given day. The physiotherapists document any DNAs or Cancels on the paper worklist?	Details on referral used to decide clinical priority (triage) Details from referral transcribed into Excel spread sheet	Appointment Time Clinic Code Physiotherapist's name All written on it	Unclear	All clinical documentation relating to the patient Retrieved for research, audit and medico legal purposes	To update referrer on patient's status on discharge from physiotherapy No discharge letters sent since Nov 2012 due to reduced clerical capacity	To highlight concerns to referrer To give update

Table 4.5 Data created

Data created	Waiting List Excel Spread Sheet - database of patients waiting	Waiting List Excel Spread Sheet - of numbers waiting and time waiting	Reports from the PAS Number of new, return, DNAs and cancels New and returns per consultant/specialty	Excel spread sheet outlining all community referrals
Type	Excel	Excel	On-line report run by the IMS department	Excel
When accessed?	All referrals manually transcribed into database Accessed if patient rings department	Numbers counted manually and inserted monthly	Monthly	Monthly
Where stored?	On department drive	On department drive	On department drive	On department drive
What used for?	To profile patients attending To confirm referral received and possible length of wait for patients phoning the department If referral sent on to community or local hospital this is recorded here	To give number of referrals and numbers in each category of wait to HSE	New and returns needed for HSE CompStat New, returns, DNAs and cancels needed at corporate level Used for annual reports, service plans, business cases	Knowledge of referrals sent out and demand for community services To show patient seen in most appropriate setting

Table 4.6 Information Accessed

Information Accessed	Home exercise programmes (HEPs)	X-ray/scan result	Further correspondence relating to the patient	Outcome measures	The Evidence Base or clinical guidelines
Type	Paper	EPR Report and image	Scanned letters or letters saved electronically	Paper or soft copy	Paper or soft copy
When accessed?	While the patient is attending	Prior to or while the patient is attending	While the patient is attending	While the patient is attending	In between the first and second patient attendances
Where stored?	Pre-printed or in most cases individualised and printed from a PhysioTools package	EPR	EPR and specialty drive	Paper based in filing cabinet or electronic on department drive	On-line or paper based in filing cabinet
What used for?	To give to patient to carry out independent exercise	To aid decision making and treatment planning	To aid decision making and treatment planning	To aid goal setting and determine progress	To aid decision making and treatment planning

4.4 Semi-structured interviews

As previously outlined in section 3.4.2 three semi-structured interviews of key physiotherapy informants who have implemented process improvements and/or health information technology were undertaken. The interviewees reviewed the detailed process maps, outlined where improvements could be made, gave clear suggestions as to what those improvements would look like and their potential benefits and finally they gave some advice about possible challenges and how to manage them.

The three experts interviewed confirmed that they were familiar with process maps. All found the diagrams and notations very clear. The overview/high level workflow and the documents, data and information accessed tables were found to be very useful.

Prior to outlining the process improvements suggested at the interviews an overview of opinions expressed by the interviewees on the process maps and methodology used is presented.

It was suggested that the diagrams could be used to explain the workflow to others who do not work in the department under study. They could also be used in another area or across disciplines as a good starting point for similar work.

With regard to the methodology used to map the workflow i.e. observation and validation with staff observed; it was suggested by one of the interviewees that staff could have been asked to input directly into the workflow. This is known as a "Kaizen event" in Lean terminology and would usually involve freeing staff up for 3-5 days to map the process. However, it was acknowledged that this would be hard to do while maintaining a service. It was also suggested that ideally the patient's viewpoint should be included.

All clarifications that were sought related to the department's activity and definitions; the definition of a new patient, the number of new and return

patients seen by each therapist daily, the monthly demand and an understanding of possible reasons that there is a waiting list.

4.4.1 Suggested Improvements arising from interviews

There follows an outline of suggestions for improvement which emerged from the interviews. These are grouped in the blocks (A-D) outlined in the high level process map (see figure 4.1).

There was an emphasis on using the functionality in existing systems to their fullest extent and in particular the use of simple IT methods of communication such as text messaging and e-mail.

A – Triage and Referral management (Figure 4.4)

In general, comments were that there is too much movement of paper and people and too many "hand-offs". There is duplication of work when transcribing patient details from the printed referrals to the Excel spread sheet as all details are already contained in the electronic referral. There could also be a clinical risk in transcribing data from the referral to the Excel file. The risk of storing all of the referral and waiting list data on a general drive in Excel was also highlighted. It was queried if this was safe and secure, how many staff had access and could the file be accidentally deleted? It was also stated that an Excel file could become corrupt over time, with many changes being made leading to loss of data. Other issues with Excel and having several individuals accessing and updating a file is that there is no way of knowing who updated which parts and there is no audit trail; this is after all patient data.

Suggested Improvements:

- Upgrading the current EPR to allow for everything to be done on one system **(Not Possible)**.
- Clerical staff triaging by giving clerical staff clear guidelines on how to triage. This would eliminate the movement of paper and people and reduce the time taken for this part of the workflow even if this

continued to be done on paper. However, ideally triaging should be done electronically **(I^4)**.

- The accuracy of coding at this point in the workflow was queried and it was suggested that this should be done at a later point, ideally discharge. To make improvements to patient outcomes it is important to look back at the input each patient was given. If coding were to happen at discharge the input for each of the discharge codes could be reviewed and this could be used to determine changes required to service provision or to improve outcomes **(I^{14})**.
- Use of formulae in the Excel file to assist with calculation of waiting times (see B (b) below).

B (a) – Appointment Booking (Figure 4.5)

The booking of appointments needs to be standardised to ensure efficiency in the process and so reduce unnecessary waiting for patients. A lot of time is wasted phoning patients with appointments and in many cases staff do not received an adequate response.

Suggested Improvements:

- The appointment booking process should be standardised **(I^{12})**.
- Clarification of the booking policy regarding booking new patients into return slot **(I^1)**.
- Sending an appointment by text and giving the patient an option of Yes/No to accept should be explored. This still gives the patients the option to look for an alternative yet eliminates the need for the clerical staff to do so much ringing **(Not Possible)**.
- A short waiters list – of patients who are happy to be contacted at short notice for those last minute appointments [next day appointments] could be explored **(I^{15}).**

B (b) – Waiting list data (Figure 4.6)

This involves too much manual counting and too much paper. It was queried why this process is manual when all of the information needed to calculate waiting times gathered in the Excel referrals spread sheet and so a formulae could be used to assist. It was also queried why if the bookings are carried out in the PAS why this information couldn't be drawn down from there? The researcher explained that the referrals are generated in the EPR (and date stamped with the date of referral) but there is no connection between the EPR and the PAS that would allow for date of referral (EPR) to date appointment booked (PAS) to be calculated.

Suggested Improvements:

- Waiting list data should be generated electronically. This would increase the reliability and accuracy of the data. An electronic system works off an algorithm therefore; there is consistency with calculation **(I^4)**.

C (a) – Patient attendance (Figure 4.7)

Suggested Improvements:

- Use a self-registration booth **(I^{10})**.
- Electronic documentation would get rid of make-up of notes **(I^{11})**.
- Self-appointment making booth for return appointments **(I^{16})**.
- Return appointments could be confirmed by text one day in advance as the current 5 days is too long **(I^8)**. The patient should have the option of replying to this text. The reply can be set up to go to the department's e-mail and be checked each morning. Text speak can be used if characters limited. All texts could be embedded in each individual patient's record.
- Text messaging for mass cancellation of appointment, for example if a clinician is sick **(Not possible)**.

- Stop using appointment cards as patients receive a text message **(I^{8})**.
- Draw a body chart diagram and scan it in to the EPR to attach to the patient record **(I^{11})**.
- Take photos for certain evaluations to engage patients and as a motivator for patients. A photo taken with a mobile phone which can be uploaded and attached to the patient's record on the system has huge advantages **(I^{17})**.
- Using the camera in a tablet or laptop would be very helpful. The photo could then be uploaded to the patient's record **(I^{17})**.
- Simple outcome measures could be embedded into the patient's record. This is motivating for the patient and helps the physiotherapist to review progress **(I^{18})**.

D – Discharge and onward referral (Figure 4.10)

Suggested Improvements:

- Clarity around what services are actually available in the HSE is a challenge. There should be one national database of services. It is acknowledged that this is a wider issue for the health services than the department under study **(I^{19})**.
- Have an agreement with referrers that a discharge summary is only sent if requested **(I^{20})**.
- Links with hospitals and other agencies could be by secure e-mail communication (taking into account data protection issues) **(I^{9})**.

4.4.2 Potential Benefits as identified by interviews

The interviewees were then asked to identify the potential benefits of their suggested process improvements. The benefits are not broken down by block in the process map (as in many cases they apply across the continuum of the process map) but rather how they relate back to the

quality aims outlined by the IOM (2001) and those outlined by the HIQA standards (2012) whereby the patient is at the centre and the care provided is safe, timely, effective, efficient and equitable with IT and information enabling improvements.

- Overall the benefits of electronic recording were identified as enormous.
- The electronic record gives a much better holistic view of patients.
- The ability to look back and see the records of patients who consistently attend assists greatly. If the usual "recipe" doesn't work for these patients this may be a good indicator that the patient needs to be referred onwards.
- Mass cancellation by text saving significant admin time
- Reduce hand-offs between staff
- Reduce duplication of effort
- Clarity of process, roles and responsibilities
- Reduce risk of data loss and errors of data entry
- Savings on postage – one interviewee said she used to buy 100 stamps per month now she wouldn't use 100 stamps in 4 months
- Savings on purchase of appointment cards - purchased 10,000 cards about 2.5 years ago and hasn't used very many of them
- Making the most of functionality and systems already available reduces cost
- Stats can be available as needed
- Improve accuracy and safety of data

4.4.3 Perceived Challenges as identified by interviews

During the interviews very few challenges were highlighted and in fact the two interviewees who have undertaken implementation of IT projects were very positive about this change but did stress the importance of change management and staff buy-in. The main exception to this was the challenge

in determining what services are actually available in the HSE. As outlined above this impacts more than the department under study.

Two challenges that were specifically mentioned were finding the correct solutions to electronic triage and documentation and the possibility of asking staff to take on non-traditional roles such as the suggestion that clerical staff could triage.

Some key success factors that were highlighted were:

- Staff buy-in
- A phased approach making small changes
- Clarity on benefits
- Selecting a clinical champion who is "aware of the mood on the ground"
- The necessity to carry out a stakeholder analysis which should include patients and referrers

Administration staff may be threatened by any changes so again stressing the importance of change management. It is important to state the positives to those who feel threatened; improved throughput of patients, ensuring the patient is at the centre and reducing/eliminating risks in the process (for patient and staff).

Finally it is important to understand that there will always be an element of discord and that sometimes it's important to just keep focussed.

4.5 Focus Group

Before presenting the results of the focus group the researcher would like to outline again the overall goals, of any process improvement, that were agreed at the focus group. As outlined in section 3.4.3 these goals were presented as a starting point by the researcher at the beginning of the focus group and participants were encouraged to add/remove any they didn't agree with. No changes were made.

Goals:

- Improve the patient journey and the importance of keeping the patient at the centre
- Boost staff morale
- Reduce non-value added activities, for example, waiting, duplication and movement
- Reduce non-clinical steps for the physiotherapists
- Improve ease of access to information – both when the patient is present (to review previous notes) and to review outcomes and carry out research

The methodology used for the focus group is outlined in section 3.4.3.

Nineteen improvements were suggested which the participants subsequently prioritised. The top 10 items are outlined in table 4.7 on the following page.

Table 4.7 Top Ten Suggested improvements identified at the focus group

Suggested improvements identified at the focus group
1. Automatic printing of the "Front sheet" from the PAS for new patients should stop as the information contained therein is not used for anything **(I^{6})**
2. Clerical staff to give physiotherapy notes directly to new patients and ask the patient to give them to the physiotherapist to avoid excessive walking **(I^{21})**
3. Edit the text message for each clinic (on OPRS) to ensure the essential details required by the clerical staff at registration are on the text **(I^{8})**
4. Triaging of referrals on the PAS **(I^{4})**
5. Standardisation of the process of actually ringing the patients and booking their appointments on the PAS **(I^{12})**
6. Filtering of patient calls by extending the functionality used on the current phone system **(I^{3})**
7. Using the PAS for triage would allow for direct booking of appointments from the waiting list **(I^{4})**
8. Electronic clinical documentation on the EPR **(I^{11})**
9. If a patient rings looking for an appointment and no physiotherapy referral has been received in the physiotherapy department but the patient has obviously had a recent appointment with the consultant (this can be seen on the PAS) generate a physiotherapy referral and offer the patient an appointment **(I^{13})**
10. Electronic community/local referral **(I^{9})**

As outlined in table 4.7 there was an emphasis on (1) simplifying (2) reducing steps staff need to take and (3) steps in the process that don't add value to the customer (4) standardising processes and (5) more extensive use of the current IT systems.

During the focus group an unexpected energy among the staff involved was observed, with much discussion and teasing out of ideas. Of interest, it was not specifically the IT staff that suggested the possibilities of more extensive use of existing IT systems.

During the regrouping session there was a significant amount of discussion and some healthy conflict about some suggestions and their feasibility. For example, the idea that the referring consultant could refer directly to the

community, suggested by one participant, rather than referring to the internal physiotherapy department was discussed at length. This would reduce the steps the referral (and the patient) goes through to get to the community physiotherapy services and would ensure the patient is seen in the most appropriate setting. It was suggested that this would involve significant training, change management and the group determined it was best to stay within the locus of control initially.

Perceived benefits outlined at the focus group involved reducing the number of steps and hence the time frame to complete processes all of which would indirectly impact on the time patients have to wait for an appointment and the time the physiotherapist spends in the cubicle with the patient on direct patient care. Other benefits related to the introduction of electronic clinical documentation and included (1) access to the patient's previous records (2) data accuracy and more reliable profiling of patients (3) reduction in paper with associated costs and environmental impact.

All benefits relate back to the quality aims outlined by the IOM (2001) and those outlined by the HIQA standards (2012) whereby the patient is at the centre and the care provided is safe, timely, effective, efficient and equitable and IT and information are used to enable improvement.

Some fear was expressed about getting rid of all paper when electronic clinical documentation was discussed and the importance of having a contingency plan in the event of systems going down. Otherwise no other challenges were highlighted.

Some ideas that were not suggested during the focus group but were noted as possible improvements by the researcher during the observation phase were: (1) a system similar to "Choose and Book" in the UK whereby the referrer can book the patient directly into a physiotherapy appointment slot **(I^{22})**, (2) asking patients to complete outcome measures prior to seeing the physiotherapist (as many are self-reported) **(I^{23})** and (3) the use of

computerised clinical decision support **(I^{24})** with electronic clinical documentation.

Some comments were made by participants when they returned their prioritised list; one participant stressed that she didn't believe that electronic clinical documentation would reduce time the physiotherapist spent on documentation, some participants prioritised what they felt were "quick wins" for staff and the patients.

A few gaps were noted in the workflow by the researcher and by participants at the focus group. These are outlined as follows:

- Time spent calculating waiting list times
- Time spent by clerical staff ringing and booking patients
- Is community or local referral recorded on the referrals spread sheet? YES
- Is the fact that an appointment is given to a patient ever recorded on the referrals spread sheet? NO this is captured as an appointment allocated on the PAS
- If the patient is late what happens? One participant suggested it depends on many factors; clinical need, how late, clinical staff on the particular day

4.6 Conclusion

The methodology used in this study assisted in answering the research questions. The question of which process improvement methodology to use was answered through the literature review with the researcher identifying a process improvement methodology and tools based on the principles of Lean Thinking. The baseline data, process mapping, interviews and focus group all answered the questions as to which processes should be improved and what those improvements could look like. The literature review, interviews and focus group outlined the potential benefits and some perceived challenges of the suggested improvements.

A more detailed discussion on how this methodology assisted in answering the research questions will be outlined in the next chapter. As will be seen there was significant overlap in the suggested improvements that emerged from the interviews and focus group.

CHAPTER 5

ANALYSIS AND DISCUSSION

5.1 Introduction

This chapter will now revisit the research questions and give more detail on answers this research has provided. It must again be acknowledged that the scope of this research did not involve implementation of the suggested improvements. However, some suggested improvements have been progressed and others are planned (section 5.4). Measurement of the impact of improvements that have been progressed (Figures 5.2 to 5.4) and those that will take place in the future will need to be continuous.

5.2 Research questions

Main Question (MQ):

- How can processes be improved in a physiotherapy outpatients setting?

Sub questions:

- What process improvement methodology is appropriate to apply in the physiotherapy outpatient setting? (SQ1)
- Which processes should be improved? (SQ2)
- How should processes be improved? (SQ3)
- What are the potential benefits of any suggested improvements? (SQ4)
- What are the perceived challenges of any suggested improvements? (SQ5)

5.3 Findings

As outlined in chapter 4 the methodology used in this study assisted in answering the research questions posed. The answers to the sub-questions will be presented first before returning to the main research question.

5.3.1 What process improvement methodology is appropriate to apply in the physiotherapy outpatient setting? (SQ1)

In order to answer the overall research question, the researcher needed to first look to the literature to determine which process improvement methodologies are prevalent in healthcare and which methodology and tools would be appropriate for use in the study setting.

From the literature review the researcher identified a process improvement methodology and tools based on the principles of Lean Thinking as the best fit for the study setting. Lean Thinking principles are simple to understand, yet are very powerful at exposing waste. Before commencing this research, issues of waste, lack of standardisation and the need for improved efficiency due to reduced clerical capacity (section 1.1) were identified by the researcher. In section 2.3.1 we learned that Lean Thinking as a methodology is often selected where an organisation values visual improvement along with positive changes in speed and efficiency. The focus of Lean Thinking is the process and visualisation of the process. The customer (patient and staff) is placed at the centre and the emphasis is on the elimination of any steps that do not add value (waste) from the customer's perspective. Data which is practical and meaningful and does not require complex statistical analysis is used. Staff engagement is crucial. The researcher then chose the tools from the literature that appeared to be the most applicable to the research questions and context; process mapping, interviews and focus group. All of these aspects fit clearly with the aims of quality outlined by the IOM (2001) and those outlined nationally in the HIQA standards (2012).

The Six Sigma methodology focusses on problem solving and involves more extensive statistical analysis than was required for the study context and the researcher did not think this methodology was appropriate in the study setting (section 2.3.2). The PDSA cycles are learning cycles and are appropriate for use for small tests of change (section 2.3.3). As improvements progress through various iterations the PDSA methodology

will be applied to continuously improve any solutions implemented. It was not, however, identified as an appropriate methodology to answer the research questions and determine *how* processes could be improved in the first instance.

5.3.2 Which processes should be improved? (SQ2)

The recommendation to collect baseline data (Fillingham, 2008; McGrath, et al., 2008) both to highlight, where improvements are required and to determine, if any change is indeed an improvement assisted in answering the question of which processes need to be improved. With implementation of improvements it would be hoped that there would be an improvement in throughput, waiting times, paper costs, notes retrieved and filed and the number of calls unanswered and this will be closely monitored. It would also be hoped that the time taken to complete processes and the number of steps involved could be reduced.

Process mapping, the interviews and the focus group also assisted in answering the question of which processes should be improved (SQ2). Table 5.1 outlines the processes that should be improved as identified from the process mapping, interviews and focus group.

Table 5.1 Which processes should be improved?

Which process?	Relevant process map and narrative	Suggested Improvement Code
There is no agreement as to when new patients can be booked in to return slots. Clerical staff say 1 day in advance whereas physiotherapists say 3 days in advance	4.5 Step B(a)8	I^1
No standardisation in use of notations on body chart	4.12	I^2
Unanswered phone calls	Across full patient journey	I^3

Paper trail and staff movement involved in Referral Management & Triage	4.4 Steps A1 to A11	I^{4}
Counting waiting list manually	4.6 Steps B(b)1 to B(b)5	I^{5}
Printing front sheet which is not used for anything	4.7 Step C(a)6	I^{6}
Use of yellow card for registration	4.7	I^{7}
Text message reminder sent 5 days in advance of appointment	4.7 Step C(a)1	I^{8}
Paper based referral onwards on discharge	4.10	I^{9}
Registration process	4.8 & 4.7 (Steps C (a) 4 & C (a)9)	I^{10}
Paper based documentation, specifically the retrieval and filing of notes and access to information	4.11 and 4.12	I^{11}
No standardisation of the actual process carried out by clerical staff when ringing patients and booking an appointment on the PAS.	4.5 Steps B(a)1 to B(a)5	I^{12}
Process for dealing with patient queries is not standardised or patient centred	4.6 Steps B(b)6 to B(b) 12	I^{13}
Coding at point of triage	4.4 Step A8	I^{14}

Process mapping highlighted the complexity of the processes, that there are multiple repositories of patient information (figure 4.2) and a significant number of documents and data are produced in the department (tables 4.4, 4.5 and 4.6). The processes need to be simplified and the number of repositories could be reduced **(I^{11})**.

Process mapping also demonstrated the need for standardisation of some processes and this was further highlighted by the interviews and focus group. Examples are the use of notations on the body chart **(I^{2})**, the policy for booking new patients into return slots **(I^{1})**, the actual process for ringing patients and booking appointments (figure 4.5) **(I^{12})** and the process that occurs when a patient rings the department with a query (figure 4.6) **(I^{13})**.

In particular, capturing the existing process of booking new patients into return slots showed up inconsistencies in the implementation of the current booking policy **(I^{1})**, and allowed it to be corrected immediately. The effect of this on waiting lists was significant and immediate – see section 5.4.

The three stages of application of the process improvement methodology showed without a doubt that the concurrent use of paper-based systems **(I^{9} & I^{11})** and disparate IT systems is resulting in duplication of effort **(I^{5})** and inefficiencies (Unertl, Weinger and Johnson, 2006).

The referral management and triage process (figure 4.4) **(I^{4})** and patient attendance (figure 4.7) involve a significant amount of transportation of people and paper and some non-essential activity **(I^{6})** and duplication.

The text message reminder was sent 5 days in advance of an appointment which was felt to be too early **(I^{8})**. Clerical staff rely heavily on the details written on the yellow appointment card to complete the registration process and if the patient misplaces this card the registration process takes much longer **(I^{7})**.

During the observation the researcher witnessed a significant number of interruptions from phones yet 20% of calls remain unanswered and many

calls were put on hold (waiting) **(I^3)**. These interruptions led to variation in the time taken to complete some processes, for example, registration (figure 4.8) **(I^{10})**.

As outlined in section 2.3.1 in Lean Thinking all steps should add value to the customer's journey. Referring back to the 7 types of waste we can see there is substantial waste in terms of overproduction, waiting, transportation, nonessential activity and variation.

Finally these three stages also suggested that the current processes in use for the IT systems could be improved and lead to more extensive use of the systems.

5.3.3 How can processes be improved in a physiotherapy outpatients setting? (SQ3)

This section looks at the "how" or in other words what improvements might look like.

The case studies in the literature review (section 2.6) outlined some improvements that have been implemented elsewhere. Section 2.8 outlined process improvements through the introduction of IT in physiotherapy. The literature review gave the researcher several ideas of what improvements might look like, which included

- More efficient referral pathways
- Self-registration kiosks
- Electronic clinical documentation
- and associated clinical decision support

Through the semi-structured interviews with key informants and through the focus group several ways to improve processes also emerged. All ideas outlined had a focus on the patient and staff as customers of the service either directly or indirectly. An overview of suggestions that emerged from the interviews and focus group is presented in figure 5.1 in the form of a Venn diagram to demonstrate where there was overlap.

Some of the suggested improvements are outlined a little further here. Electronic triage refers to changing the current paper-based process of triaging referrals to on-line triaging **(I^4)**. This would eliminate the excessive movement of paper and staff in the current process. Text messaging refers to a suggested change to the current text message patients get from a reminder 5 days in advance to 2 days in advance and also to change the message to include details that would be useful for the registration process in cases where the patient misplaces their yellow card **($I^{7\&8}$)**. Gathering waiting list data electronically would increase the accuracy and reliability of the data **(I^5)**. Electronic referral onwards to community care or other hospital via secure e-mail would improve the efficiency of the current process and ensure necessary information is received at the receiving site **(I^9)**. Standardisation of the policy for booking new patients into return slots **(I^1)** and the process for actually booking appointments ensures all patients are treated in an equitable manner and there are no unnecessary delays **(I^{12})**.

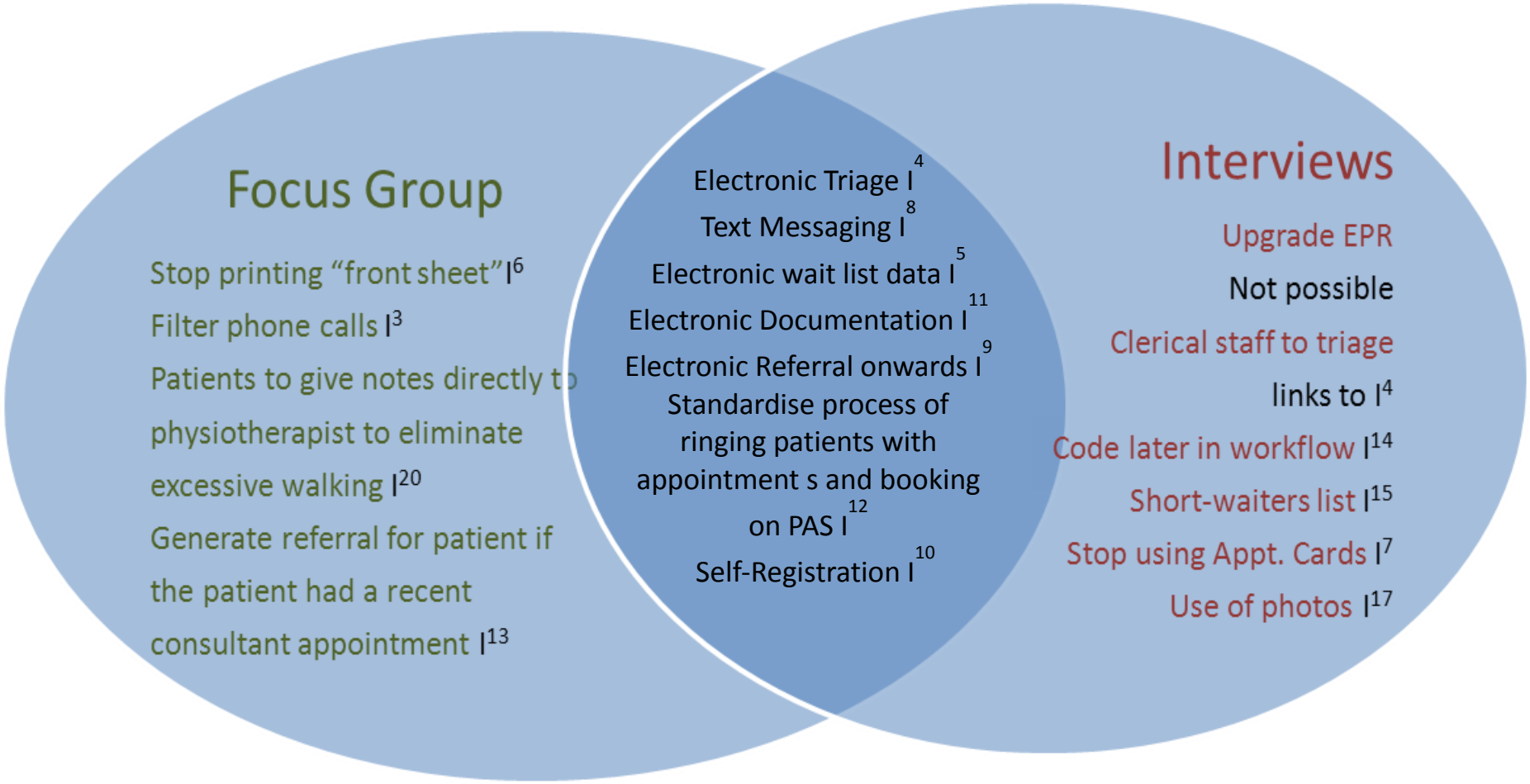

Figure 5.1 Venn diagram of suggested improvements from interviews and focus group

5.3.4 What are the potential benefits of any suggested improvements? (SQ4)

The literature review, interviews and focus group all outlined the potential benefits of implementing improvements.

An overview of the benefits highlighted from the literature review includes:

- Patients getting more time with providers
- More timely results
- Improved staff morale
- Improved customer satisfaction
- Reduction in errors
- Improvement in outcomes
- Throughout
- Safety
- Overall quality of care

Those highlighted through the interviews and focus group were more specific to the context of the study. For the focus group an attempt was made by participants to stick to the overall goals outlined. The benefits are summarised below in no particular order:

- Easier access to patient information and previous physiotherapy notes
- Reduced time to triage referrals
- Reduced time from referral received to waiting list to appointment
- Reduced paper – cost and environmental
- Improved data accuracy as not manually collated
- Reduced delays for patients
- Improved customer service – patient and staff

All benefits impact on the quality of care provided: effectiveness, timeliness, efficiency, equity, safety and most importantly patient centeredness. A draft benefits realisation plan is outlined in Appendix H.

5.3.5 What are the perceived challenges of any suggested improvements? (SQ5)

Challenges outlined in the literature (section 2.9) were summarised as the general characteristics of healthcare, the need for staff involvement, importance of data to demonstrate the need for improvement and if a change is indeed an improvement and visible leadership. These or other significant challenges did not emerge during the interviews and focus group except for the need for staff buy-in from start to finish (interviews) and the fear of a completely paperless department (focus group). However, those highlighted in the literature review must be acknowledged and the need for a clear change management strategy is evident. How some of these challenges have been or will be addressed will be discussed in section 5.4.4. Perhaps these methods were not the most appropriate way of determining possible challenges despite the literature suggesting them as a methodology and further context specific challenges will most likely arise as improvements are progressed (Victorian Government report on using data for quality improvement, 2008).

5.3.6 Conclusion to Research Questions

The main research question of how processes can be improved in physiotherapy outpatients setting has been answered through the sub-questions which have determined which process improvement methodology could be used (SQ1), which process should be improved (SQ2) and what this could look like (SQ3), the potential benefits (SQ4) and challenges of making any suggested improvements (SQ5).

There is more detail on the proposed improvements and their implementation in section 5.4.

5.4 Progress and Plans for Suggested Improvements

In this section some detail of the progress to date and plans for the improvements outlined is provided.

5.4.1 Progress made to date

As noted in section 4.3, when process mapping the booking of new patients into return slots, misunderstandings became apparent, the policy was clarified and agreement reached to adopt the clarified policy. This occurred in the 3rd week in January 2013. By getting an agreement on the booking policy **(I^1)** an improvement in numbers waiting and waiting times was immediately evident – see figures 5.2 and 5.3 which show no patients waited for the 3 months following the improvement in the two specialties under study. Figures 5.3 and 5.4 show the number of weeks waiting for the same patient cohort. These changes occurred with no increase in staff resources or decrease in referrals to the physiotherapy outpatient service. Comments from patients on the "comment cards" have also outlined that patients who attended in the past have been surprised that they were called for their appointment so quickly. If this short waiting list continues there will be no need to look at "the short waiters" option **(I^{15})**.

The number of new and return patients seen per month has also increased with the clarification of the booking policy. The average number of new rheumatology patients seen per month increased to 38 (from 27) and the average number of return patients to 132 (from 104). The average number of new orthopaedic patients seen per month increased to 162 (from 140) and the average number of return patients to 452 (from 422) (see table 4.1).

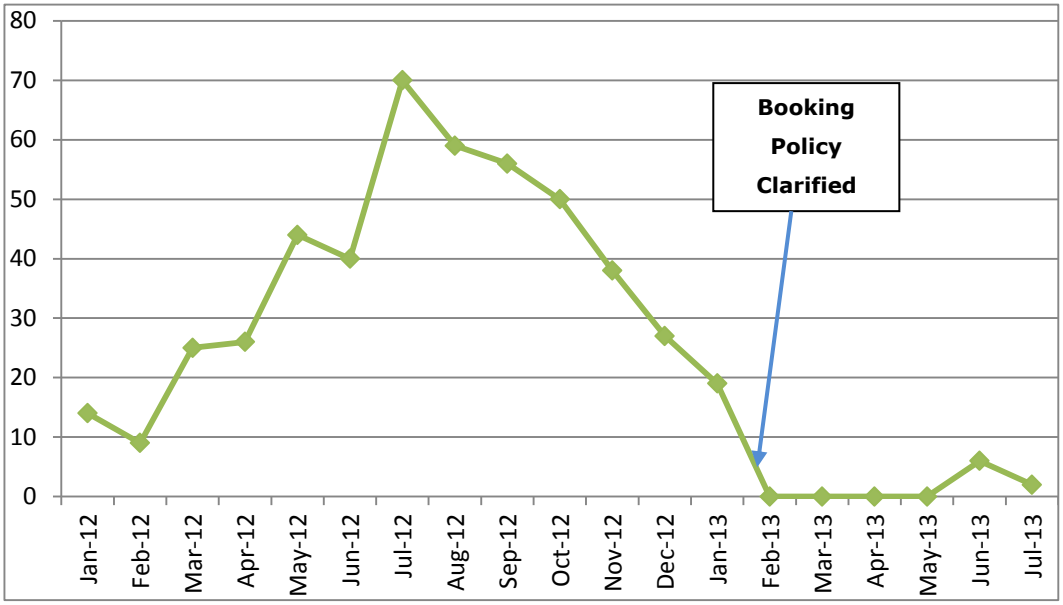

Figure 5.2 Number of patients waiting for a rheumatology physiotherapy appointment Jan 2012 – July 2013

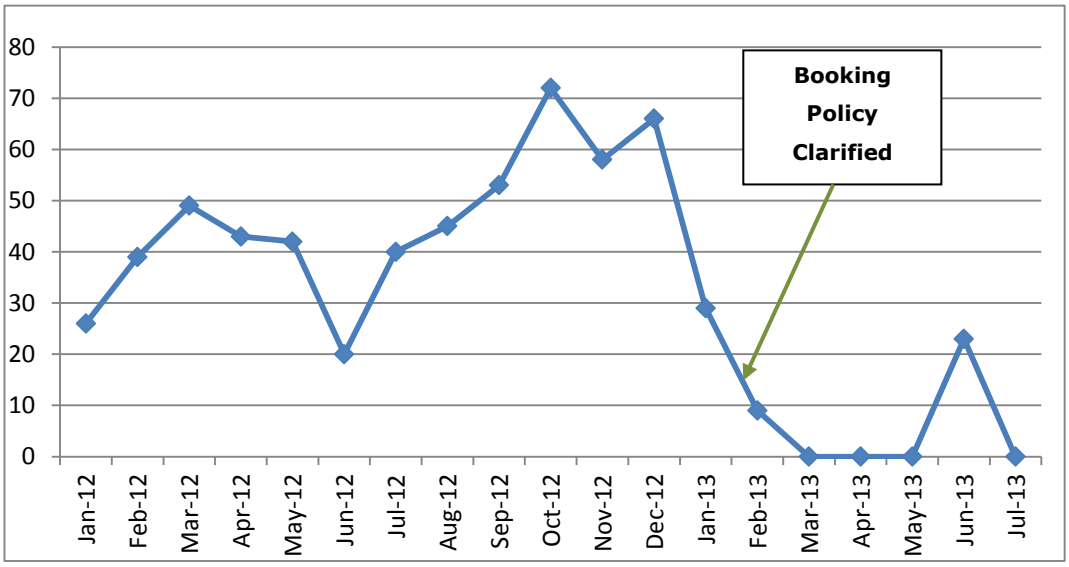

Figure 5.3 Number of patients waiting for an orthopaedic physiotherapy appointment Jan 2012 – July 2013

The reason for there being 23 patients on the orthopaedic waiting list in June (figure 5.3) with a 2 week wait (figure 5.5) was due to this service being reduced by one member of staff due to a period of annual leave with no backfill. Once the staffing level was restored there was no waiting.

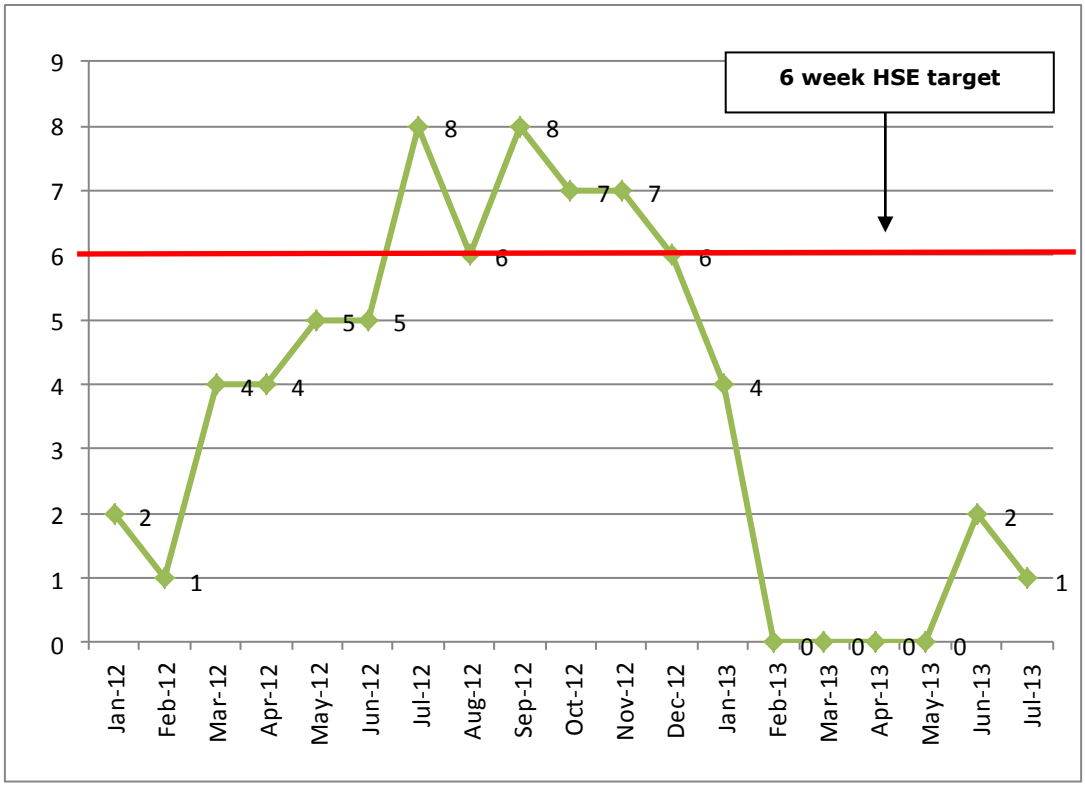

Figure 5.4 Number of weeks patients waited for a rheumatology physiotherapy appointment Jan 2012 – July 2013

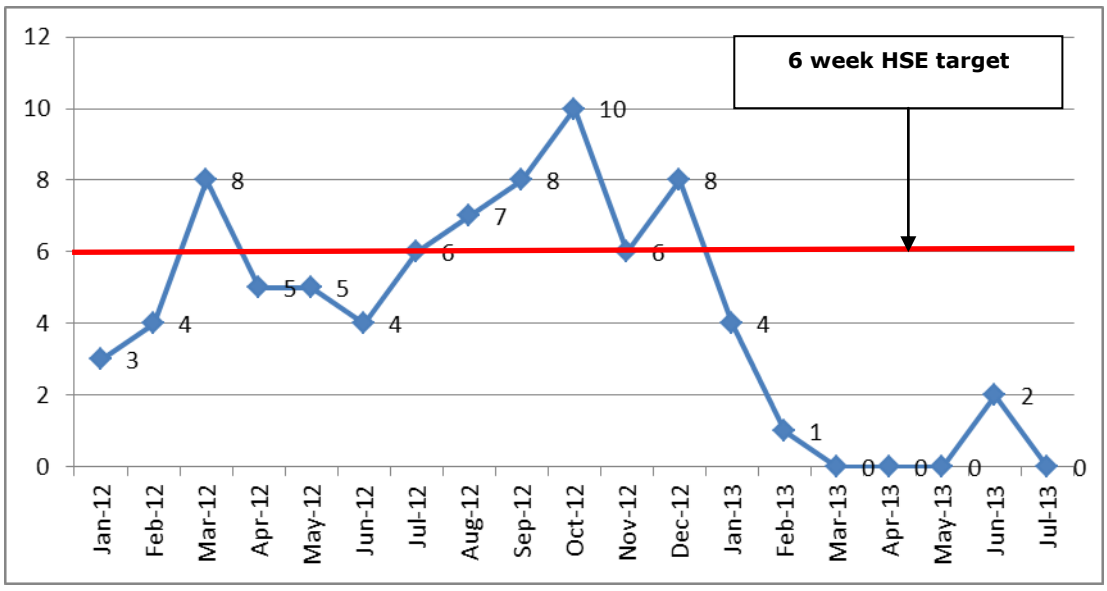

Figure 5.5 Number of weeks patients waited for an orthopaedic physiotherapy appointment Jan 2012 to July 2013

- The body chart notations are now standardised in preparation for electronic clinical documentation **(I^2)**
- The script for the answering machine message and how phone calls can be filtered has been implemented **(I^3)**. This has led to a reduction in unanswered calls. This has, however, led to an unintended consequence of a small number of patient queries being filtered to the manager's phone as this can be chosen as one of the options.
- The IT department has given a demonstration to clerical and physiotherapy staff of an on-line triaging system in the EPR and PAS **(I^4)**. This system will allow for on-line triage, direct booking of appointments and automatic reporting of waiting list data **(I^5)**. The current format needs to be changed somewhat but the initial response from staff was very positive. When this is implemented triaging and the booking of appointments will be standardised by the introduction of IT
- The front sheet is no longer printed which means the elimination of printing of 5,500 sheets of paper each year (across all the physiotherapy outpatient services). This has also allowed the reception area to amalgamate their printer use into one printer with two trays (previously there was two printers with two trays in each) which was an unexpected benefit and will reduce toner costs **(I^6)**
- The text message has been updated to include the therapist's name, information that is useful to the clerical staff at the point of registration and which could eliminate the need for the yellow appointment card in the future **(I^7)**
- The text message reminder has been changed (in line with the changes to the booking policy) from 5 to 2 days and the patients will also get a text message as confirmation when their initial appointment is made **(I^8)**

- The IT staff have given a demonstration to physiotherapy staff of a body chart embedded in the current EPR and the initial response is that it is a very good solution – see screenshot in figure 5.6 below This improvement relates to **(I[11])** or the preparation for Electronic documentation (see section 5.4.2 below)

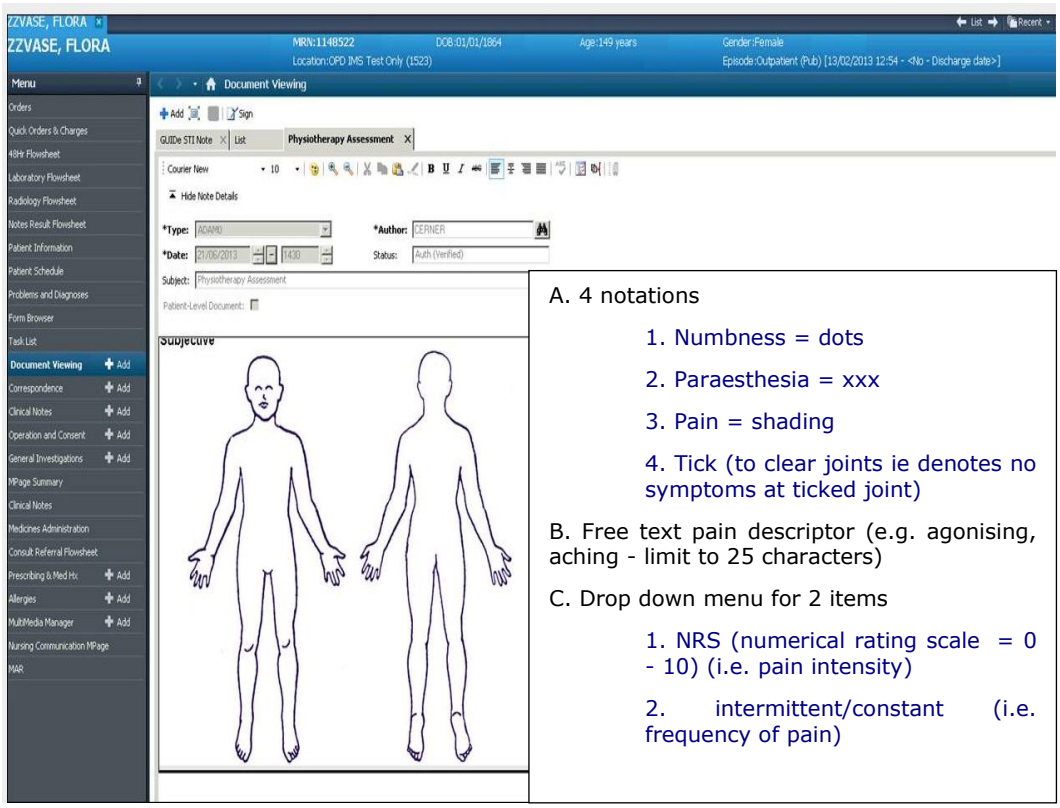

Figure 5.6 Body Chart in Cerner Millenium EPR

5.4.2 Plans for the future

- There are plans to pilot an electronic community referral with one community area in the coming months – the community referral form is already built in the EPR and a feasible secure e-mail solution has been identified **(I[9])**
- A self-registration pilot is taking place in another section of the hospital but it is unclear at this stage if this will be rolled out to other departments. A similar project has been successfully piloted in another large acute teaching hospital **(I[10])**

- Complete electronic clinical documentation on the EPR is progressing and all forms currently used are gathered, common fields across all forms identified and conditional logic outlined **(I^{11})**

A future process map might look something like Figure 5.7 and key repositories like Figure 5.8

- ALL referrals are placed on the EPR and referrals do not print so there is no waiting list folders or new referrals box
- Triage occurs on-line on the EPR /PAS and there is no requirement for a separate referrals database
- Appointment booking occurs directly on to the PAS by having EPR and PAS open simultaneously
- Waiting list data required for HSE CompStat is retrieved electronically
- Community referrals are completed on the EPR and are e-mailed to the relevant community care service via a secure e-mail solution
- There is no need for a separate database to be maintained of all patients referred to the community as this information will be available electronically
- Text message reminders are used for appointment confirmation as well as reducing the need for (while not eliminating) the need for yellow appointment cards
- Patients self-register their attendance for all appointments – there is some debate about whether this could be used for new appointments or only return. It is also likely that not all patients will be happy to use the self-registration system
- Electronic clinical documentation on the EPR and available on a mobile device allows for clinical decision support to be embedded and for the clinician to view the patient's results without leaving the cubicle/in conjunction with the patient

- Patients can complete self-reported outcome measures prior to seeing their physiotherapist
- Audit and research are more easily carried out
- DNA and cancellation reports will continue each month but there will be no need for the physiotherapists to retrieve the notes of patients who cancelled and did not make another appointment as all notes will be on-line
- Discharge summaries will be available on the EPR to close the loop and as a reference point for repeat referrals
- The archive of physiotherapy paper notes will need to be maintained in the interim
- The EPR and PAS will become the main repositories leading to a significant reduction in paper use

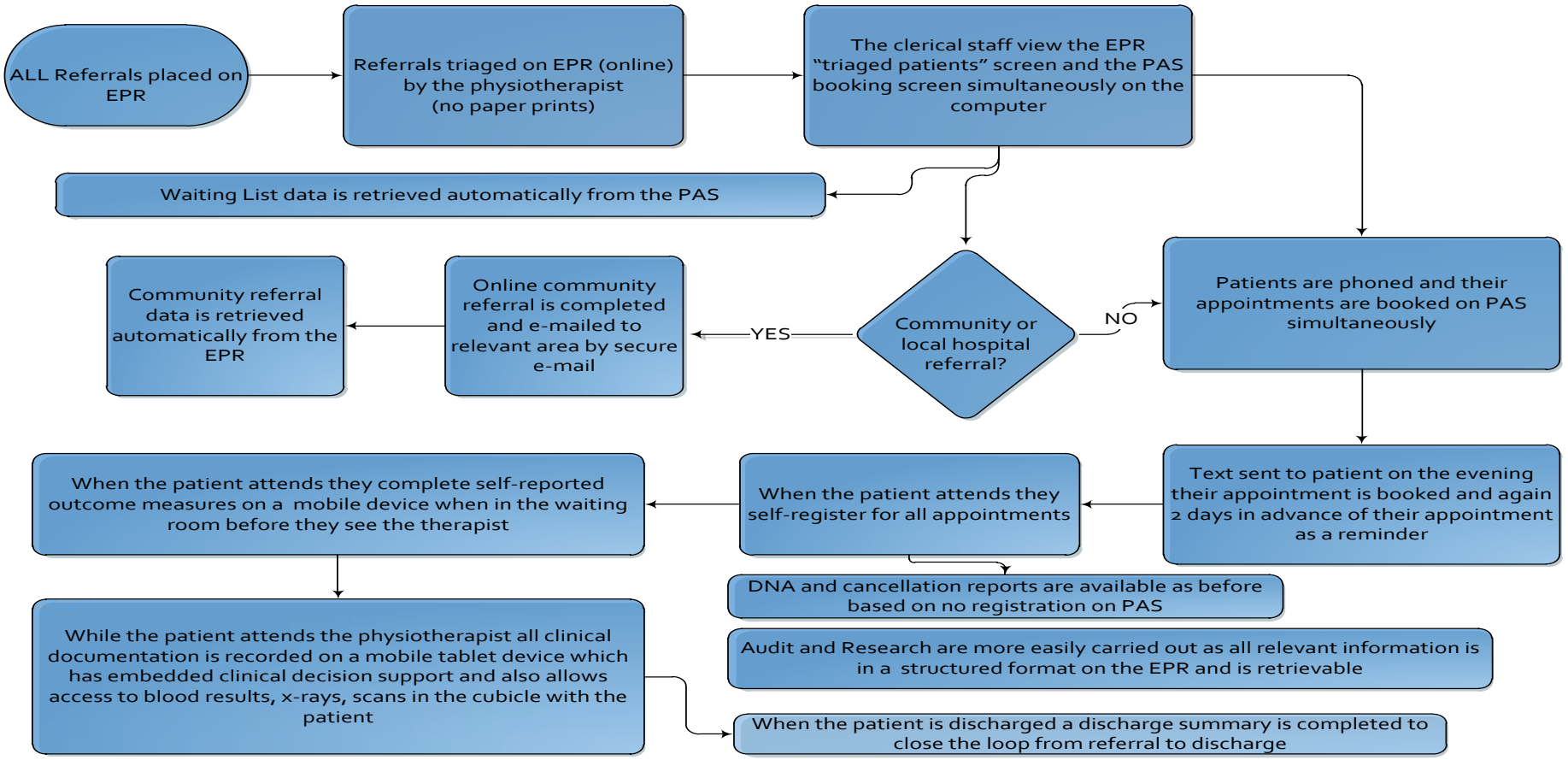

Figure 5.7 Possible Future Process Map

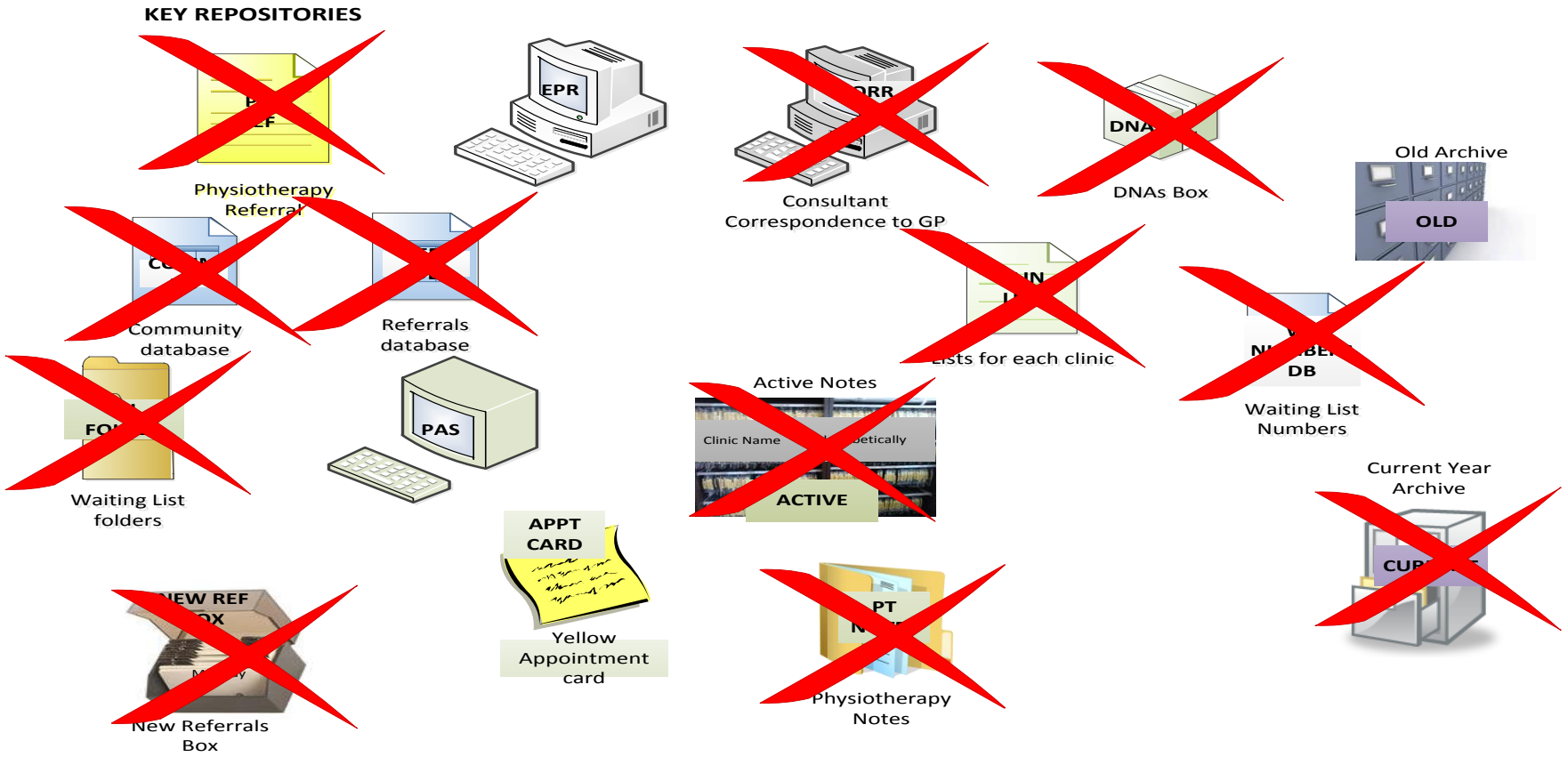

Figure 5.8 Possible Future Key Repositories

5.4.3 Suggested improvements that cannot be progressed or have not been progressed to date

Through discussions with the IT department it has emerged that allowing a reply to the text messages is not possible and there are no plans to introduce this functionality (suggestion from interviews).

The suggestion by one of the interviewees that adding a physiotherapy code to the patient's record at the point of discharge rather than as it currently happens at the point of triage is an interesting one **(I^{14})**. The European Core standards of physiotherapy[15] do specify that a physiotherapy diagnosis should be added to the patient record but they do not specify at which point this should be done. However, it is acknowledged that to use clinical decision support and aid treatment planning adding the physiotherapy diagnostic code early on in the process would be advised.

Table 5.2 outlines some of the other suggested improvements outlined at the focus group and interviews that have not been progressed to date.

Table 5.2 Suggested Improvements not yet progressed

Suggested Improvement	Relevant process map and narrative	Suggested Improvement Code
Have a short waiter's list	Figure 4.5	I^{15}
Install a self-appointment making booth	Figure 4.5	I^{16}
Take photos over time to demonstrate patient progress	Figure 4.12	I^{17}
Embed outcome measures in the patient's record (links to electronic clinical documentation)	Figure 4.12	I^{18}
Clarity around what services are actually available in the HSE	Figure 4.10	I^{19}

[15] http://www.physio-europe.org/download.php?document=71&downloadarea=6

Agreement with referrers to give a discharge summary only if requested	Figure 4.10	I^{20}
Clerical staff to give notes to the patient to avoid excessive walking	Figure 4.7	I^{21}
A process similar to Choose and Book	Figure 4.5	I^{22}
Patients completing self-reported outcome measures prior to attendance	Figure 4.7	I^{23}
Computerised Clinical Decision Support	Figure 4.12	I^{24}

5.4.4 Proposals to address challenges

As outlined previously staff involvement, a focus on the customer and data are key to the success of process improvement. Improvements are more likely to be sustained if staff have been involved and change has been successfully managed. As has been seen in this research, data can be used to convince staff that improvement is needed and that a change is indeed an improvement. To date physiotherapy department and IT department staff involved in the focus group will be key to the realisation of any improvements and the associated benefits and it will be important to engage with them on a continuous basis. A continued focus on the customer and how any change impacts is essential, both now and in the future.

5.5 Conclusion

This chapter outlined how the methodology used answered the research questions. Which processes should be improved was highlighted along with suggestions as to how this could be done. The benefits of any suggestions were then outlined along with some challenges to any implementation. The next chapter outlines recommendations for future research and some of the limitations of this study.

The mixed methods approach applied in this research, with collection of quantitative and qualitative data, adds to the validity of the results. When improvements are carried out in the future having all of this data would assist greatly in monitoring improvement.

CHAPTER 6

CONCLUSION

6.1 Introduction

A process improvement methodology and tools based on Lean Thinking principles was successfully used to determine how processes could be improved in a physiotherapy outpatients department. Ample opportunities for process improvement in the physiotherapy outpatients department under study emerged. Staff engagement in determining opportunities for process improvement and the priority in which these opportunities should be explored has assisted greatly with staff buy-in. It will be important that a phased approach is used going forward as too many changes can exhaust staff (Azad, 2012). Availability of data on an on-going basis, preferably electronically (for accuracy and credibility) will be crucial.

6.2 Recommendations for Future Research

Any future work should involve continuous review of the baseline data as the suggested changes are implemented. It will be necessary to monitor patient throughput, which has already increased, and the impact this change has on the number of notes that require retrieval and filing on a daily basis and the impact on storage facilities.

As outlined in the literature, patient engagement and involvement is important in any process improvement and any change should be seen as valuable to the patient (Locock, 2003 (b); Ben-Tovim, Dougherty, O'Connell and McGrath, 2008; Azad, 2012). McGrath, et al. (2008) outline how often the most innovative solutions come from patients so engagement of patients with process improvement initiatives through focus groups or surveys would be a good idea for future work. It is acknowledged that the department under study does have a comment card system and makes changes suggested by patients as appropriate. However, the patient

experience of any improvements will need to be assessed further (Mazzocato, et al., 2010).

Staff satisfaction should also be assessed and has not been extensively measured (Holden, 2011).

Communication flows and methods of communication – to community, to other referral sources, to patients, to referrers should be looked at more thoroughly. It will also be useful to look at any unintended consequences of improved processes e.g. more efficient referral onwards to the community could lead to a backlog in that system. Finally, if processes are streamlined and information technology is introduced there will be possibilities for further research into other quality aspects such as patient outcomes from various treatments.

6.3 Study limitations

This study had a few limitations.

- This was a single case study and a comparative study with another similar department may have been useful and may have increased the scalability of the results to other physiotherapy departments.
- There was no external expert guiding the process (Mazzocato, et al., 2012). However, as can be seen from the study by Scott, et al. (2011) process improvements led internally are often more successful. Also the literature was reviewed, guidance was received from the researcher's supervisor and experts were consulted. Since January 2013 the researcher has also undertaken a 6 day course on leadership and quality improvement. However, the main focus of the course was PDSA cycles.
- It must be acknowledged that the department under study has limited experience in this area. Trinity Health spent seven years training physicians and other staff in the use of improvement tools, data use and process maps (Brokel and Harrison, 2009). Despite this,

as outlined by Locock (2003 (b)) much of it is common sense and as highlighted extensively in the literature having the staff who work on the frontline and best know the processes and where improvements can be made is key. Staff easily understood the process maps at the focus group and embraced the challenge of seeking out opportunities for improvement with significant enthusiasm.

- As outlined in section 2.5.1 consideration should be given to using more than one type of process mapping.
- The Hawthorne effect needs to be acknowledged as the researcher is one of the managers in the department under study and there is always the possibility of performance bias in such a situation. Enthusiasm and the buy-in for the process improvement initiatives outlined which has been witnessed to date could be down to the fact that the focus has been on the staff. Some of the comments made at the focus group and in e-mails to the researcher afterwards would give some credence to this theory.

  "*We always knew it was a busy department but it is great to have this information documented objectively and acknowledged"*

  "*It's great that someone is doing their Masters on this as otherwise there would never be the time to look at it*" This comment concurs with the comment made by one of the interviewees that a 3-5 day "Kaizen event" would have been worthwhile but would it have been possible with service demands as they are?

  "It's great to be a part of a group that is willing to look at a problem and try and conjure some ideas that will improve the patient experience – it's very inspiring".

6.4 Conclusion

This research demonstrated that a process improvement methodology and tools based on the principles of Lean Thinking can be applied in a

physiotherapy outpatient setting to determine how processes can be improved. Data and staff engagement, including IT department staff, have to date, and will continue to be key to the success of any initiative.

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- *1.2 Process mapping, analysis and redesign*

http://www.clahrc-northwestlondon.nihr.ac.uk/inc/files/documents/improvement-methodology-resources-section/ilg_1.2_process_mapping_analysis_and_redesign.pdf

- *1.3 Working with groups*

  http://www.clahrc-northwestlondon.nihr.ac.uk/inc/files/documents/improvement-methodology-resources-section/ilg_1.3_working_with_groups.pdf

- *1.4 Involving patients and carers*

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- *1.5 Evaluating Improvement*

  http://www.clahrc-northwestlondon.nihr.ac.uk/inc/files/documents/improvement-methodology-resources-section/ilg_1.5_evaluating_improvement.pdf

- *2.1 Measuring for Improvement*

  http://www.clahrc-northwestlondon.nihr.ac.uk/inc/files/documents/improvement-methodology-resources-section/ilg_2.1_measuring_for_improvement.pdf

- *2.2 Matching Capacity and Demand*

  http://www.clahrc-northwestlondon.nihr.ac.uk/inc/files/documents/improvement-methodology-resources-section/ilg_2.2_matching_capacity_and_demand.pdf

- *2.3 Improving Flow*

  http://www.clahrc-northwestlondon.nihr.ac.uk/inc/files/documents/improvement-methodology-resources-section/ilg_2.3_improving_flow.pdf

- *2.4 Working in systems*

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- *1.6 Use of Technology to improve service*

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- *1.7 Sustainability*

  http://www.clahrc-northwestlondon.nihr.ac.uk/inc/files/documents/improvement-methodology-resources-section/ilg_1.7_substainability_and_its_relationship_with_spread_and_adoption.pdf

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Appendices

Appendix A: Overview of physiotherapy

Outpatient physiotherapists treat patients residing at home and aim to achieve the best possible outcome and provide advice to increase and maintain the patient's quality of life and independence.

The main focus of physiotherapy is movement, which is essential for everyday function. Outpatient physiotherapy involves the assessment and treatment of muscles, tendons, ligaments, bones, spinal discs, nerves and other structures in order to restore normal movement. A large part of physiotherapy also focuses on health promotion.

In the outpatient physiotherapy setting (following consent from the patient for treatment) the patient receives an initial assessment from an individual physiotherapist. Depending on the condition or reason for referral the patient may continue to see the physiotherapist individually, or may be referred on to an exercise class within the outpatients department or referred to their local community physiotherapy service (for follow-up in a more appropriate setting).

All information from the initial and follow-up assessments is usually recorded on a standardised assessment form. Clinical information is recorded in the form of a SOAP note (Subjective, Objective, Assessment and Plan) and adheres to the European Core Standards for Physical Therapy, standard 14. The SOAP note was developed by Dr. Laurence Weed in 1968 as part of the problem oriented medical record (POMR).

The first stage of an outpatient's assessment is a subjective examination. During this exam the physiotherapist will observe the patient's gait. The physiotherapist will then take a medical history, followed by a history of the present complaint. This will involve asking about how the present complaint started, the cause, whether it has progressed, and whether the patient has had any treatment to date.

The presenting complaint is usually recorded on a body chart. Figure 1.1 is a standard view of a body chart. It shows an anterior and posterior view of the body (some charts have left and right views as well). Physiotherapists use symbols to describe the location and the nature of the pain (sharp, ache), the frequency of the pain (intermittent, constant) and whether the pain radiates and to where. The symbols used are not currently standardised among physiotherapists.

A number of more specific questions may follow depending on what the presenting complaint is in order to provide the physiotherapist with as much information as possible from which to draw up a treatment plan. In addition social history will be investigated.

Assessment of red flags is a key part of the physiotherapist's examination to rule out a more serious condition. While most patients will have musculoskeletal conditions as an explanation of their symptoms, a small number will have a more serious underlying issue. These people need to be identified and referred urgently to a medical specialist. Going through the list of red flags systematically greatly reduces the risk of missing anything important. There is no substitute for going through a checklist. An example of a red flag in a patient with a presenting complaint of low back pain would be a change in bladder and/or bowel. Any incontinence not previously present or an inability to pass water (retention) is important and should be immediately reported.

The final question a physiotherapist will ask is what the patient wants from their treatment; what goals they would like to achieve. Patient involvement is important to achieve the best possible outcome.

Following this rigorous questioning the physiotherapist will conduct an objective assessment. The first step of this stage is to observe any discolouration, swelling, bruising, or scar tissue around the site of injury; this is followed by the physiotherapist checking for any heat or tenderness in the same region.

The next stage is an observation of movement, both active (patient carrying out the movement) and passive (physiotherapist manipulating the movement), allowing for a better understanding of which specific structures are involved in the injury. Resistive movements are the next stage where movement against resistance is studied. Based on their findings, the physiotherapist will decide whether there is a need for a neurological assessment based on reflexes and sensation, in particular looking for areas of numbness, increased sensitivity, or muscular weakness.

Sometimes the physiotherapist will conduct joint manipulations for more information. Next, balance and posture might also be observed.

There are many other specialised tests that may be performed for a more specific study of affected structures, but these vary and are dependent on the findings throughout the initial stages of assessment.

Physiotherapists generally use an outcome measure at the initial assessment and intermittently at treatment sessions to determine patient progress. An example of such an outcome measure is the Roland and Morris Questionnaire for patients with low back pain. However, due to time constraints and difficulties with analysing the resulting data they are often not used consistently. Standardized outcome measures have been advocated for use by physiotherapists for many years. They assist the direction of the treatment plan and enhance communication with patients (Jette, et al., 2009).

After assessment the physiotherapist will use the information gathered during the assessment to formulate a treatment plan based on the problems identified and the objectives the patient wants to achieve through physiotherapy. The problem will be discussed along with treatment options and recommendations.

Treatment may include some or all of the following: Exercise, mobilisation, manipulation, soft tissue techniques, electrical modalities and acupuncture. Advice and education are very important parts of a physiotherapist's role, and they will give further resources to the patient such as an exercise sheet or information on their condition to give the patient some level of control over the management of their complaint. Further appointments, if necessary, will be arranged according to the plan, the physiotherapist and the severity of the condition.

When treatment is complete the patient is discharged back to the referring consultant and a discharge summary is written to the consultant outlining the treatment undertaken and the progress to date. This discharge summary is often manually written and is usually not in a standardised format.

Physiotherapists refer to the evidence base for advice on the most relevant outcome measures, clinical pathways and the latest evidence. This usually occurs outside patient treatment times due to time constraints and issues with access to this information.

Some outpatient physiotherapy departments in Ireland do have electronic referral systems and outpatient scheduling systems. However, these systems are often not linked together and there can be duplication of effort with parallel paper based systems.

Currently in Ireland outpatient physiotherapy departments in acute hospitals have paper based clinical documentation, referrals onwards, discharge summaries,

outcome measures and audit and research processes. In fact, audit and research can be a long winded paper-based exercise in many physiotherapy departments due to the lack of adequate electronic databases. This makes it extremely challenging to review patient outcomes and make improvements. Determining the profile of patients referred is also a difficulty and this causes problems in determining staff training needs and service needs e.g. group versus individual treatment requirements.

Management reports may be possible in the acute hospital outpatient departments with electronic referral systems and scheduling systems e.g. DNAs (Did Not Attends), cancellations and number of new and return patients. However, other metrics such as waiting time (required by the Health Service Executive (HSE) often continue to be determined through inefficient manual processes.

Appendix B: Protocol for semi-structured interviews with experts

Title of research study

Opportunities for, potential benefits of and challenges to Process Improvement (based on the introduction of information technology) in an Outpatient Physiotherapy Department

Lead Researcher

Marie Byrne Date:

Time start: Time finish:

Thank participant for accepting the invitation to participate

So the purpose of this research is determine what if any are the opportunities for process improvement in the physiotherapy out-patients department, what the benefits of any improvement initiative would be and what could be the perceived challenges

Ask participants not to name third parties

You received an e-mail which outlines the detail of the current workflow in the Physiotherapy out-patients department at St. James's hospital, Dublin

Where there any steps in the workflow that were unclear?

If yes, please outline

From your review of the workflow please highlight the steps were you believe processes could be improved

What changes would you suggest to improve the process at each of these steps?

What would the potential benefits be of improving the process at each of these steps?

What challenges could prevent the realisation of such benefits?

Please outline any key people that you are aware of that have expert knowledge in this area and who may be willing to participate (snowballing).

Appendix C: Consent Form

TRINITY COLLEGE DUBLIN

INFORMED CONSENT FORM

LEAD RESEARCHER: Marie Byrne

BACKGROUND OF RESEARCH:

The purpose of this research study is to carry out a detailed review of opportunities for, potential benefits of and challenges to process improvement (based on the introduction of information technology) in the outpatient physiotherapy department at St. James's Hospital.

PROCEDURES OF THIS STUDY:

The researcher will carry out a literature review. The research methodology will be to document a detailed workflow using observation, confirm this workflow with the physiotherapists and clerical staff involved, carry out semi-structured interviews with experts in the area and a focus group with key stakeholders to evaluate potential benefits of automating key points in the workflow and highlight any possible challenges.

A comprehensive information sheet will be made available to all potential participants.

PUBLICATION:

The results of the research will be submitted in partial fulfilment of the Masters in Health Informatics at Trinity College, Dublin. The work may be further developed with the intention of publication in a peer reviewed journal. The research may be used by others for academic research. In addition the research outcomes are likely to be presented at selected conferences, seminars or workshops in Ireland.

The results will be made available to all research participants on completion of the research study.

DECLARATION:

- I am 18 years or older and am competent to provide consent.

- I have read, or had read to me, a document providing information about this research and this consent form. I have had the opportunity to ask questions and all my questions have been answered to my satisfaction and understand the description of the research that is being provided to me.
- I agree that my data is used for scientific purposes and I have no objection that my data is published in scientific publications in a way that does not reveal my identity.
- I understand that if I make illicit activities known, these will be reported to appropriate authorities.
- I understand that I may stop electronic recordings at any time, and that I may at any time, even subsequent to my participation have such recordings destroyed (except in situations such as above).
- I understand that, subject to the constraints above, no recordings will be replayed in any public forum or made available to any audience other than the current researcher.
- I freely and voluntarily agree to be part of this research study, though without prejudice to my legal and ethical rights.
- I understand that I may refuse to answer any question and that I may withdraw at any time without penalty.
- I understand that no personal details about me will be recorded.
- I have received a copy of this agreement.

PARTICIPANT'S NAME: **PARTICIPANT'S SIGNATURE:**

Date:

_____ _____

Statement of investigators' responsibility: I have explained the nature and purpose of this research, the procedures to be undertaken and any risks that may be involved. I have offered to answer any questions and fully answered such

questions. I believe that the participant understands my explanation and has freely given informed consent.

RESEARCHERS CONTACT DETAILS: mlbyrne@stjames.ie or by phone: 01 4162486

INVESTIGATORS' SIGNATURE: **Date:**

Marie Byrne

Appendix D: Participant Information Sheets

TRINITY COLLEGE DUBLIN

INFORMATION SHEET FOR PARTICIPANTS – OBSERVATION OF WORKFLOW

Dear Colleague,

I would like to invite you to take part in a research study entitled "Opportunities for, potential benefits of and challenges to process improvement (based on the introduction of information technology) in the outpatient physiotherapy department at St. James's Hospital". This research is being undertaken as part fulfilment of an MSc in Health Informatics in Trinity College Dublin (TCD).

Please read the following information carefully and ask if you do not understand any part of it or would like more information.

Who is organising the research study?

This research study is being undertaken by Ms. Marie Byrne as part of an MSc in Health Informatics in Trinity College, Dublin.

The study will be completed between January and May 2013.

Why have I been chosen?

We are inviting you to participate in this study as you are familiar with the current processes in the outpatient physiotherapy department at St. James's Hospital.

Background of research:

This research study is concerned with a detailed review of the workflow in an outpatient physiotherapy setting to seek out opportunities for, potential benefits of and challenges to process improvement (based on the introduction of information technology).

The overall aim of this research is to provide a roadmap to process improvement in outpatient physiotherapy and similar settings as there is a very limited research base in this area.

Objectives:

- To outline the goals of process improvement
- To map out the current workflow from patient referral to discharge and/or onward referral
- To validate this workflow with relevant team members to ensure the current situation is accurately reflected in the workflow
- To collect baseline data to allow for benefit realisation studies to take place in the future
- To highlight process improvement opportunities
- To determine potential benefits of any process improvements

- To outline possible challenges

What is the purpose of the research study?

The purpose of this study is to review opportunities for process improvement (based on the introduction of information technology) along the physiotherapy out-patient pathway, to outline potential benefits of any change and to highlight any challenges that may exist to prevent realisation of such benefits.

What will happen to me if I take part?

You will be observed carrying out your work in order to clearly document the current workflow/processes and you will be asked to confirm the workflow documented by the researcher afterwards

What will happen to the results of the research study?

The results of the research will serve to inform the researcher of opportunities for the introduction of IT, the benefits of such an introduction and the possible challenges to realization of such benefits.

The results of the study will be submitted as part of the TCD masters programme. The work may be further developed with the intention of publication in a peer reviewed journal. The research may be used by others for academic research. In addition the research outcomes are likely to be presented at selected conferences, seminars or workshops in Ireland.

The results can be made available to all research participants on completion of the research study.

Confidentiality - who will know I am taking part in the research study?

All information, which is collected during the course of the research, will be kept strictly confidential.

Conflict of interest:

The main researcher is a physiotherapy manager in the physiotherapy department in which the research will be undertaken.

Expected duration:

It will take approximately 45 minutes for the researcher to complete each observation.

Confirmation of workflow will take a further 15 minutes.

Procedure to be used if assistance or advice is needed

In the event that you require further information about this study please contact Marie Byrne who will be happy to answer your questions. Marie can be contacted by email: mlbyrne@stjames.ie or by phone: 01 4162486.

Voluntary Participation

Your participation in this study is voluntary and you are free to withdraw at any time without providing a reason. If you are happy to participate please complete the attached consent form and return to Ms. Marie Byrne before taking part. Thank you for taking the time to read this correspondence and for considering taking part in this research.

Yours sincerely

Marie Byrne

TRINITY COLLEGE DUBLIN

INFORMATION SHEET FOR PARTICIPANTS – SEMI-STRUCTURED INTERVIEWS

Dear Colleague,

I would like to invite you to take part in a research study entitled "Opportunities for, potential benefits of and challenges to process improvement (based on the introduction of information technology) in the outpatient physiotherapy department at St. James's Hospital". This research is being undertaken as part fulfilment of an MSc in Health Informatics in Trinity College Dublin (TCD).

Please read the following information carefully and ask if you do not understand any part of it or would like more information.

Who is organising the research study?

This research study is being undertaken by Ms. Marie Byrne as part of an MSc in Health Informatics in Trinity College, Dublin.

The study will be completed between January and May 2013.

Why have I been chosen?

We are inviting you to participate in this study as you have carried out a process improvement initiative in a physiotherapy or another similar setting.

Background of research:

This research study is concerned with a detailed review of the workflow in an outpatient physiotherapy setting to seek out opportunities for, potential benefits of and challenges to process improvement (based on the introduction of information technology).

The overall aim of this research is to provide a roadmap to process improvement in outpatient physiotherapy and similar settings as there is a very limited research base in this area.

Objectives:

- To outline the goals of process improvement
- To map out the current workflow from patient referral to discharge and/or onward referral
- To validate this workflow with relevant team members to ensure the current situation is accurately reflected in the workflow
- To collect baseline data to allow for benefit realisation studies to take place in the future
- To highlight process improvement opportunities
- To determine potential benefits of any process improvements
- To outline possible challenges

What is the purpose of the research study?

The purpose of this study is to review opportunities for process improvement (based on the introduction of information technology) along the physiotherapy out-patient pathway, to outline potential benefits of any change and to highlight any challenges that may exist to prevent realisation of such benefits.

What will happen to me if I take part?

You will be e-mailed the detail of the current workflow in the outpatient physiotherapy department at St. James's Hospital to review. The researcher will then carry out a semi-structured telephone interview with you where you will be asked to highlight opportunities for, benefits of and challenges to process improvement as you see them. The researcher will take written notes of the interview, transcribe these notes into a soft copy format and e-mail the notes to you to confirm their accuracy.

What will happen to the results of the research study?

The results of the research will serve to inform the researcher of opportunities for the introduction of IT, the benefits of such an introduction and the possible challenges to realization of such benefits.

The results of the study will be submitted as part of the TCD masters programme. The work may be further developed with the intention of publication in a peer reviewed journal. The research may be used by others for academic research. In addition the research outcomes are likely to be presented at selected conferences, seminars or workshops in Ireland.

The results can be made available to all research participants on completion of the research study.

Confidentiality - who will know I am taking part in the research study?

All information, which is collected during the course of the research, will be kept strictly confidential.

Conflict of interest:

The main researcher is a physiotherapy manager in the physiotherapy department in which the research will be undertaken.

Expected duration:

It will take approximately one hour to complete each interview.

Procedure to be used if assistance or advice is needed

In the event that you require further information about this study please contact Marie Byrne who will be happy to answer your questions. Marie can be contacted by email: mlbyrne@stjames.ie or by phone: 01 4162486.

Voluntary Participation

Your participation in this study is voluntary and you are free to withdraw at any time without providing a reason. If you are happy to participate please complete the attached consent form and return to Ms. Marie Byrne before taking part. Thank you for taking the time to read this correspondence and for considering taking part in this research.

Yours sincerely

Marie Byrne

TRINITY COLLEGE DUBLIN

INFORMATION SHEET FOR PARTICIPANTS – FOCUS GROUP

Dear Colleague,

I would like to invite you to take part in a research study entitled "Opportunities for, potential benefits of and challenges to process improvement (based on the introduction of information technology) in the outpatient physiotherapy department at St. James's Hospital". This research is being undertaken as part fulfilment of an MSc in Health Informatics in Trinity College Dublin (TCD).

Please read the following information carefully and ask if you do not understand any part of it or would like more information.

Who is organising the research study?

This research study is being undertaken by Ms. Marie Byrne as part of an MSc in Health Informatics in Trinity College, Dublin.

The study will be completed between January and May 2013.

Why have I been chosen?

We are inviting you to participate in this study as you are familiar with the current processes in the outpatient physiotherapy department at St. James's Hospital or have an interest in information technology in this or another setting.

Background of research:

This research study is concerned with a detailed review of the workflow in an outpatient physiotherapy setting to seek out opportunities for, potential benefits of and challenges to process improvement (based on the introduction of information technology).

The overall aim of this research is to provide a roadmap to process improvement in outpatient physiotherapy and similar settings as there is a very limited research base in this area.

Objectives:

- To outline the goals of process improvement
- To map out the current workflow from patient referral to discharge and/or onward referral
- To validate this workflow with relevant team members to ensure the current situation is accurately reflected in the workflow
- To collect baseline data to allow for benefit realisation studies to take place in the future
- To highlight process improvement opportunities
- To determine potential benefits of any process improvements
- To outline possible challenges

What is the purpose of the research study?

The purpose of this study is to review opportunities for process improvement (based on the introduction of information technology) along the physiotherapy out-patient pathway, to outline potential benefits of any change and to highlight any challenges that may exist to prevent realisation of such benefits.

What will happen to me if I take part?

You will be involved in a focus group to review the workflow with approximately five other participants. Participants will be asked to highlight opportunities for process improvement along with potential benefits and challenges. The focus group will be recorded on a Dictaphone and the researcher will take written notes.

What will happen to the results of the research study?

The results of the research will serve to inform the researcher of opportunities for the introduction of IT, the benefits of such an introduction and the possible challenges to realization of such benefits.

The results of the study will be submitted as part of the TCD masters programme. The work may be further developed with the intention of publication in a peer

reviewed journal. The research may be used by others for academic research. In addition the research outcomes are likely to be presented at selected conferences, seminars or workshops in Ireland.

The results can be made available to all research participants on completion of the research study.

Confidentiality - who will know I am taking part in the research study?

All information, which is collected during the course of the research, will be kept strictly confidential.

Conflict of interest:

The main researcher is a physiotherapy manager in the physiotherapy department in which the research will be undertaken.

Expected duration:

The focus group will take a maximum of two hours.

Procedure to be used if assistance or advice is needed

In the event that you require further information about this study please contact Marie Byrne who will be happy to answer your questions. Marie can be contacted by email: mlbyrne@stjames.ie or by phone: 01 4162486.

Voluntary Participation

Your participation in this study is voluntary and you are free to withdraw at any time without providing a reason. If you are happy to participate please complete the attached consent form and return to Ms. Marie Byrne before taking part. Thank you for taking the time to read this correspondence and for considering taking part in this research.

Yours sincerely

Marie Byrne

Appendix E:

Ethics

THIS NOTEPAPER MUST NOT BE USED FOR PRESCRIPTIONS OR INVOICING PURPOSES

THE ADELAIDE & MEATH HOSPITAL, DUBLIN
INCORPORATING
THE NATIONAL CHILDREN'S HOSPITAL

TALLAGHT, DUBLIN 24, IRELAND
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SJH/AMNCH Research Ethics Committee Secretariat
Ursula Ryan Ph: 4142342 email: Ursula.Ryan@amnch.ie
Secretariat Fax 4142371

Received 29/11/2012
Marie Byrne.

Ms. Marie Byrne
Physiotherapy Department
St. James's Hospital
Dublin 8

November 15th 2012

Re: Towards a Paperless Physiotherapy Out-Patients' Department – Opportunities, Benefits and Challenges

Please quote this reference in any follow up to this letter: 2012/11/15 Chairman's Action

Dear Ms. Byrne,

Thank you for your recent submission of the above proposal to the SJH/AMNCH Research Ethics Committee.

The Chairman, having reviewed the proposal on behalf of the SJH/AMNCH Research Ethics Committee acknowledges receipt of this submission and has noted it does not require Ethical Review.

Yours sincerely

Ms. Ursula Ryan
Secretary,
SJH/AMNCH Research Ethics Committee

Research Ethics <research-ethics@scss.tcd.ie> 12/14/12

to me

Dear Marie,

Thank you for your application. On review of the materials submitted the Committee requires the following modification:

In your information sheet for participants you should state that you will stop audio recording at any time, if the participant requests you to do so.

When you have made this modification, please forward it to me for final approval.

Kind regards

Gillian

On Tue, Dec 18, 2012 at 10:28 AM, Research Ethics <research-ethics@scss.tcd.ie> wrote:

> Dear Marie,
>
> Thank you for this revision. You may now proceed with this study.
>
> We wish you success in your research.
>
> Kind regards
>
> Gillian

Appendix F: Key to notations on process maps

A-REFERRAL MANAGEMENT AND TRIAGE

A1 Referral to physiotherapy is placed on the EPR (Cerner Electronic Patient Record) by an internal consultant or physiotherapist (at fracture clinics)

A2 An EPR referral is not currently generated for external referrals (GP referrals for staff and patient referrals from other hospitals) so the paper referral for these categories arrives in the post or is handed in by the patient (make up less than 5% of referrals)

A3 Paper referrals are lifted from the printer by the clerical staff

It takes an average of 10.5 seconds to complete steps A3, A4 and A5 for each referral. These are steps are carried out on a batch of referrals rather than individual referrals.

A4 Clerical staff log on to the EPR, enter the patient's MRN and "complete" in message centre list. This indicates to the referrer that the referral has been received in physiotherapy

A5 Paper referrals that have been "completed" on the EPR by the clerical staff are carried from reception and put in a tray in the main physiotherapy out-patient department

A6 The paper referrals (from external source and internal (EPR)) are triaged by a senior physiotherapist

A7 The physiotherapist decides whether the referral is "Urgent", "Routine" or "Fracture" or to be referred locally/to community (note there are 4 triaging categories) and writes this on the paper referral

A8 Using a physiotherapy coding system the physiotherapist determines the anatomy and pathology of the reason for referral and writes this on the paper referral. Each referral will have a 2 or 3 character code written on it

A9 Paper referrals that have been triaged by the physiotherapist are carried from the main physiotherapy outpatients area and put in a tray in the physiotherapy reception

It takes an average of 39.38 seconds to complete steps A6, A7, A8 and A9 for each referral. These are steps are carried out on a batch of referrals rather than individual referrals. As for steps A3, A4 and A5 one referral would involve as much walking as 10 or 20. Some referrals are difficult to triage and code due to the limited amount of

information on them and so further background information on the patient is sought from the EPR (scans, x-rays, correspondence)

A10 The clerical staff enter the referral details on an Excel waiting list spread sheet. This involves transcribing all of the details on the paper referral in to the spread sheet. The spread sheet is saved on the physiotherapy department G Drive and is a list of all referrals to physiotherapy out-patients

A11 Once entered on the spread sheet the paper referrals are separated into routine and urgent and those to be referred to community/locally. The routine and urgent referrals are put into separate manual folders. Fracture (#) clinic referrals get a new file made up for each of them as they don't go on the waiting list as have return appointments. Fracture clinic patients are patients that are seen by a physiotherapist attending a consultant orthopaedic clinic where the patient is seen directly by the physiotherapist for advice and exercise and given a follow-up appointment in the main physiotherapy out-patients department before they leave the # clinic

It takes an average of 38.7 seconds to complete steps A10 and A11 for each referral. These are steps are carried out on a batch of referrals rather than individual referrals.

A12 If a patient is referred onwards to the community services or their local hospital they exit the workflow at this point and are discharged

B (a)-WAITING LIST MANAGEMENT AND APPOINMTENT BOOKING

There is some variation between the clerical staff as to what happens when the appointment is allocated

B (a) 1 The manual waiting list folders (paper referrals in standard folders) are reviewed by the clerical staff in conjunction with free new patient slots on the PAS

OR

B (a) 2 The clerical staff review all of the new patient slots in all clinics on the PAS for the coming 3 weeks. This involves going into each clinic individually then each day individually

B (a) 3 Any new slots that are free are documented on a piece of paper

B (a) 4 The manual waiting lists are then reviewed to determine which patients are next in line for appointments

B (a) 5 The clerical staff ring the next patient on the manual waiting list

B (a) 6 The patient tells the clerical staff member they no long need physiotherapy or they wish to be referred locally

B (a) 7 The clerical staff book patients in to all of the available clinic slots on the PAS

B (a) 8 Following the printing of all clinic lists and pulling of physiotherapy notes [which happens on a daily basis for the following day] the clerical staff review the clinic lists and determine which return slots are free. Return slots are set up on creation of a clinic template to allow patients returning to physiotherapy out-patients to be booked in as needed

B (a) 9 The need for a follow-up appointment at the end of a scheduled appointment is based on clinical need which is determined by the physiotherapist

B (a) 10 Patients book another appointment as required before leaving the department

The average time to carry out this task is outlined as 60.64 seconds (range 20.25 – 124.9 seconds).

B (b) – WAITING LIST DATA

B (b) 1 Each month physiotherapy management request data on the length of the waiting list and the numbers waiting in various categories 0-2 weeks, 3-6 weeks, 7-10 weeks. This information is manually calculated from the manual waiting list folders that store the paper referrals. The information on the length of the waiting list and the numbers waiting is entered into an Excel waiting list spread sheet. This spread sheet divides the waiting list up per consultant, per specialty and outlines the numbers waiting in each of the HSE categories. This information is required for HSE CompStat and is benchmarked against 29 hospitals nationally

B (b) 2 The manual waiting list folders are reviewed. This is a completely manual process

B (b) 3 The number of referrals in each of the folders is manually counted

B (b) 4 Waiting time is calculated for urgent and routine referrals. This is done by calculating the time of referral to today for the longest person waiting in each of the triage categories

B (b) 5 Data on numbers in each category and time to routine and urgent appointment are entered on the Excel waiting list spread sheet

B (b) 6 A patient phones the department asking when they will receive an appointment

B (b) 7 The clerical staff ask the patient when they were seen at the consultant clinic

B (b) 8 The clerical staff review the EPR to determine if a referral was placed

B (b) 9 The clerical staff check the manual waiting list folder to determine if the referral is there

B (b) 10 The clerical staff review the spread sheet with all the referral details to ensure a referral was received

B (b) 11 Patient advised that their referral has been received and is told length of waiting list

B (b) 12 Patient advised no referral received and they need to go back to their consultant

B (b) 13 The clerical staff refer to the PAS to determine when the patient was at the consultant's clinic if the patient does not know

C (a)-PATIENT ATTENDANCE

C (a) 1 The patient receives a reminder text message for all appointments 5 days in advance. This reminder is set up in an Outpatient Reminder System (ORPS) which is linked to the PAS

C (a) 2 The patient arrives in to the physiotherapy out-patient department

C (a) 3 The clerical staff determine if this is the patient's first appointment

C (a) 4 The patient is registered to the relevant clinic on the PAS as a NEW attendance with the clerical staff confirming the patient's details (e.g. mobile phone number)

C (a) 5 The clerical staff retrieve the patient's referral from the new referrals box

C (a) 6 A front sheet is printed from the PAS. This sheet outlines the patient's personal details including GP, medical card number and attendances at consultant out-patient clinics

C (a) 7 Department policies are outlined to the patient and a copy given to the patient with a yellow appointment card

C (a) 8 The clerical staff make up physiotherapy notes which include the referral, front sheet, an assessment sheet, a database and continuation sheets and walk through to the main department to give the notes to the physiotherapist

C (a) 9 The patient is registered to the relevant clinic on the PAS as a RETURN attendance

C (a) 10 The physiotherapist treats the patient for the duration of their scheduled appointment

C (a) 11 A decision is made by the physiotherapist based on the patient's clinical need that further treatment is or is not require

C (b) PATIENT NON-ATTENDANCE

Did Not Attends (DNA)

C (b) 1 Patient does not attend (DNA) for their scheduled physiotherapy out-patient appointment so they are not registered on the PAS

C (b) 2 This DNA is automatically registered on the PAS 24 hours after the scheduled appointment time

C (b) 3 The physiotherapist determines if this is the patient's first appointment – if it is they are discharged as per policy.

C (b) 4 If it is not the patient's first appointment they are given two weeks to make a further appointment before they are discharged

Cancellations

C (b) 5 Patient rings to cancel a scheduled appointment

C (b) 6 Patient determines no further treatment is required so they self-discharge

C (b) 7 The patient makes another appointment directly at the time of cancelling

C (b) 8 The physiotherapist determines if this is the third consecutive cancellation recorded on the PAS and if so the patient is discharged

D-DISCHARGE

D1 The physiotherapist decides if a referral to community is most appropriate

D2 The physiotherapist decides if a referral to the patient's local hospital is most appropriate

D3 The physiotherapist prints off any relevant x-ray/scan results from the EPR and attaches these to the referral

D4 The referral with all relevant details attached is posted to the patient's local hospital/community care area

D5 Community care area is based on the patient's address and it is necessary to look up a street index to determine the correct area. This is a manual process which involves accessing a separate PDF document. This is carried out by the physiotherapist

D6 The patient is informed by posted letter that they have been referred to their community service

D7 Details of all referrals to the community are entered into the community referrals Excel database

D8 Patient Discharged is written on the referral/physiotherapy notes

D9 Referrals/physiotherapy notes are filed away in the current year archive

The physiotherapist does not routinely write a discharge letter or update letter to the referrer (since Nov '12 due to lack of clerical capacity)

Exceptions:

- If the physiotherapist feels the patient needs to access further investigations (MRI) or needs further interventions (Injections)
- If the patient is unsuitable for physiotherapy

E-RETRIEVING AND FILING NOTES

E1 Each day the physiotherapists file away return patient physiotherapy notes

E2 Each day the clerical staff file away new patient physiotherapy notes (a new file needs to be made up for these patients)

E3 Each day the clerical staff retrieve physiotherapy notes for all of the patients due to attend the next day. This is based on the clinic list for each clinic which is printed off the PAS. The notes are stored in the main reception area and are filed by clinic, alphabetically. It takes an average of 10.44 seconds to retrieve each file (an average of 25 files are retrieved daily)

E4 As time allows the clerical staff archive physiotherapy notes of patients who have been discharged. The current year notes are stored in an office beside the main reception area. It takes an average of 16.3 seconds to file each set of notes

E5 Medico legal requests including; Freedom of Information (FOI), Routine Access and Medico legal reports require the clerical staff to retrieve the relevant patient notes. These notes might be filed in the current year archive or old archive

E6 If a patient DNAs their appointment the physiotherapist does not file the notes away. These notes are kept for 2 weeks in a DNA box and then discharged if the patient has not made another appointment within that time frame

E7 If a patient Cancels their appointment and does not wish/need to make another appointment the physiotherapist removes these notes from the active notes immediately and they are discharged

E8 If a patient Cancels their appointment and does not make another appointment for 2 weeks their notes are removed from the active notes by the physiotherapist as time allows and they are filed away with the discharged notes. When they are removed from the active files is adhoc and involves the physiotherapist going through their clinic files one by one

Appendix G: Stakeholder Analysis

Stakeholder
Patient
Physiotherapists
Clerical Staff
Physiotherapy Managers internal
Physiotherapy Managers external (29 acute hospitals compared)
Senior Management
HSE staff
IT staff
Finance staff
Community
Other hospitals
All consultants currently referring and who may refer in the future

Appendix H: Draft Benefits Realisation Plan

Benefits	Measures
Decrease in waiting time for patients	Numbers waiting Waiting times Throughput (new patients seen and New: Return ratios)
Improved patient outcomes as patients don't become chronic while waiting	New: Return ratios
Reduced time to triage referrals for physiotherapists and clerical staff	Reduction in number of steps in process and actual time to complete triaging
Decreased cost of paper and printing components	Total cost
Decreased time spent retrieving and filing notes	Number of notes filed and retrieved Time spent
Reduction in number of unanswered calls	% of calls unanswered
Easier access to information	Staff satisfaction with information access Staff presentation of data retrieved

	for annual reports/audits
Improved staff satisfaction	Survey
Improved Patient satisfaction	Survey
Close off of patient attendance	Discharge summaries
Decreased non-clinical activity for physiotherapists	Review of process steps and timings