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Improving Patient Flow Through an Outpatient Breast Clinic: A Quality Improvement Project.

Patricia Anderson

Royal College of Surgeons in Ireland, patriciaanderson@rcsi.ie
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Improving Patient Flow Through an Outpatient Breast Clinic: A Quality Improvement Project.

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Abstract

This consultant-led outpatient breast clinic in a large teaching hospital in Dublin often experiences clinic delays due to slow patient flow through the clinic processes. Patients have expressed dissatisfaction with the long queuing times and staff believe that patient flow can be improved with enhanced communication. The aim of this Quality Improvement Project is to examine the clinic process in detail using Lean and Six Sigma tools within a DMAIC framework to discover the priority delay points and recommend measures to improve patient flow. The choice of tools used was guided by a comprehensive literature review. Value Stream Mapping techniques are applied and a basic queuing simulation Gantt chart model is created to demonstrate that the proposed new consultation rates and staff availability changes can reduce patient clinic waiting times. Under the recommendations, no staffing, major process changes or extra funding is required to reduce queuing bottlenecks in the clinic, only the introduction of a patient flow co-ordinator role for a current staff member. The expected outcomes after implementation are an average reduction of waiting time to first clinician consultation for non-Triple Assessment patients of 28% and for Triple Assessment patients a 56% reduction, with clinics finishing 15 minutes earlier. Additionally, this project plan’s recommendations of improved clinic communication tools, patient flow control measures, monitoring, training and feedback proposals, should create a culture of continuous quality improvement and increase patient and staff satisfaction.
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1.0 Introduction

1.1 Introduction

This Quality Improvement (QI) project examines patient flow through an outpatient breast clinic in a large teaching hospital in Dublin, Ireland. Periods of waiting between clinical consultations and investigations can increase dissatisfaction and stress amongst patients and staff. It is hoped that implementing the proposed recommendations will reduce the average patient journey time through the clinic.

This chapter will describe the organisational context and clinic process before focusing on the rationale for quality improvement in the context of reducing inefficiencies in the clinic process with a brief description of the approach, aim and objectives of the QI project. Finally, an explanation of the role of the student in the improvement process is given.

1.2 Organisational Context and Current Clinic Process

This QI project examines a breast outpatient clinic in a major teaching hospital. This is a public hospital managed by a Hospital Board and since 2009 is one of 8 designated Cancer Centres of Excellence in the Republic of Ireland. It provides services to the North East Region and the local catchment area. Clinics for most medical and surgical specialities are run from a designated outpatient area of the hospital. Two separate clinics take place in one area and share the waiting room and administrative check in.

The Breast and General Surgery team operate a dedicated Triple Assessment Clinic (TAC) twice per week, intended for breast patients only who have current symptoms requiring assessment or those being reviewed. The clinic team consists of a Consultant surgeon, surgical Registrar, Senior House Officers
(SHOs), a Physician Associate (PA) and medical students all of whom take part in clinical consultations of patients. Diagnosis and treatment decisions are generally made by the Registrar or Consultant, requiring other clinicians to discuss each patient. Three Breast Care nurses are part of the clinical support team, initially triaging and later supporting patients who need treatment (Appendix 1: Clinic organisational hierarchy diagram). An administrator collects medical records prior to clinic and checks in patients as they arrive. General nursing staff are also present in clinic. Finally, radiology in the form of mammography and ultrasound, which is located separately on the lower ground floor, is staffed by 2 radiologists, radiographers and nursing and administration staff.

The TAC process involves three steps: clinical consultation, radiological assessment with a mammogram or ultrasound or both and a histological biopsy assessment, if required. non-TAC patients are not offered radiological assessment on the same day unless there is cause for concern. A maximum of 13 TAC patients are scheduled with 3 or 4 appointments block booked every 15 minutes from the clinic start at 8am and from 8.45 am non-TAC patients are scheduled, with the latest appointments at 10.45am. The administration, 40-seat waiting area and public toilet facilities are shared by two clinics, with average 44 patients and family members. At first consultation, the clinician completes a physical breast examination and TAC sheet. Afterwards, a patient sticker is placed in the TAC book indicating clinical findings and radiology ordered. Clinicians then see the non-TAC patients, some of whom will be waiting for test results.

All TAC patients go for mammography or ultrasound, sometimes both. During assessment the radiologist may complete an ultrasound–guided biopsy. The
patient then returns to the clinical area and waits to be seen by the clinician. Some consultants prefer to have a brief consultation with each TAC patient after the SHOs or PA has completed their post-radiology review of results, before discharge or further investigations.

1.3 Rationale for Quality Improvement

On placement as a PA student, I became increasingly aware of patients’ and clinicians’ frustration when:

1. first patient consultations start slowly
2. long delays in radiology left clinicians waiting for patients to return
3. reduced availability of Consultant/senior clinician for doctors-in-training to check their diagnosis and proposed treatment, delaying patient discharges

General observations suggested that waiting times for patients were very variable and perhaps unnecessarily long, causing patients to complain. The teaching nature of the hospital and clinical staff rotating through disciplines every 3 to 6 months could cause an increase in delays as new clinicians require guidance on correct process requirements.

Reducing patient and clinician dissatisfaction is an admirable reason to focus on QI through reducing inefficiencies but the need to increase clinic capacity in the future to accommodate changing demographics is inevitable. Statistical data from 2013 states that there were 540,000 people living in Ireland over the age of 65, accounting for 12% of the total population. This figure is projected to rise to 1.4 million, an increase of 22% by 2041, with life expectancy continuing to
rise beyond it’s current 81.6 years for women (Central Statistics Office, 2013).

The older population require increased levels of healthcare provision implying outpatient clinics will notice increases in referral numbers. Demographic changes will affect some types of clinics more than others. The clinics dealing with medical issues with a separate screening service, should be less affected. The Health Services Executive (HSE) currently provides a routine biannual Breast Screening Service, ‘BreastCheck’, for women aged 50-64 which will be extended to cover those up to age 69 by 2021. The rapidly expanding population of women 65 years and older, do not fall under the remit of the breast screening services, increasing the numbers being referred to the breast clinics by their General Practitioners suggesting breast outpatient clinics will need to increase their capacity to accommodate increasing numbers. The perception is that there is no capacity to increase clinic numbers in the current process. The aim of this project is to create more efficient patient flow, which could generate extra capacity when required.

1.4 Quality Improvement for the Breast Clinic

1.4.1 The Quality Improvement Approach

Staff suggest the clinic can be run more efficiently with delays and patient flow through the clinic being identified as the biggest problem. This QI project (QIP) first focuses on discovering the bottlenecks in the process and reasons for these delays by examining the patient flow through the clinic. A Stakeholder Analysis is completed to help identify strengths and weaknesses of the current system and from this, a Force Field Analysis is created with a view to
channeling the improvements and building on identified strengths.

Using a DMAIC model, the project examines ways of minimising delays and subsequently reducing the flow time of patients through the clinic by the use of LEAN Six Sigma, Value Stream Mapping techniques and other QI tools guided by evidence based practice. The early stages of the DMAIC process- Define, Measure and Analyse- give a clear picture of the problem areas and reveal the parts of the process which can be realistically improved to achieve the overall aim. Although more than one area is identified, practical considerations, financial constraints and patient requirements guide the choice of process point improvement. As a result, this QIP will focus on the priority issues allowing for further improvement initiatives to take place systematically in the future using the data collected.

1.4.2 Aim & Objectives

Aim: to improve patient flow through a breast outpatient clinic in a teaching hospital by reducing average patient waiting time.

Specific objectives:

1. To investigate at which stages clinic process delays happen by June 2017
2. To collect data using QI tools to explore why delays occur by July 2017
3. To agree the most appropriate process points to improve by August 2017
4. To agree a project improvement plan on one process point for improvement by October 2017
5. To recommend realistic and cost neutral strategies to improve patient flow and reduce waiting times by October 2017
1.5 Role of the student in the organisation and project

On clinical rotation I spent several weeks with this Breast and General Surgery team and observed the waiting room delays and witnessed conversations between clinicians and clinic staff discussing the perceived patient flow problems which inspired me to explore this topic in more detail. I examined the patient journey through the clinic and collected data on the length of time the patient spends at and in between each process. Additionally, the availability of clinicians was observed and noted with the clinician consultation rate recorded. I analyse and discuss the data before proposing a QI plan for the clinic with recommendations.

1.6 Summary

This chapter outlined the patient flow process through an outpatient breast clinic in a large teaching hospital in Ireland and set the aim of improving patient flow through a range of defined objectives. The reasons for choosing this project, with a brief outline of the quality improvement approach to be taken were discussed and the role of the Student explained.

The following chapter is a review of current literature on patient flow, patient satisfaction, QI methods in healthcare and the role of a Physician Associate (PA) in reducing waiting times, which is completed to guide the QI project. Chapter 3 describes the tools and methodology chosen for this project and the reasons for their choice. Data is collected and analysed with strategies for improvement suggested.

Chapter 4 proposes methods of evaluation and control before the final chapter discusses the strengths, weaknesses and learning points of the project and QI
process as a whole. Several QI recommendations are suggested to achieve the aim of improving patient flow focusing on the initial stages of the clinic process.
2.0 Literature Review

2.1 Introduction
In this chapter, literature is reviewed to support the rationale for this QI project and the methods selected to measure and analyse the clinic process. This literature review focuses on four themes, which the writer believes are most relevant to this QI project. The expected increase in patient referral numbers is discussed before appraising methods of improving patient satisfaction. Long waiting time is considered one of the most common issues in the majority of healthcare organisations (British Columbia Medical Association, 2006). It is also recognised as the central element for patient dissatisfaction (Eilers, 2004). By implication, improving flow in a clinic and reducing the amount of time patients spend waiting- non value-added time-, increased patient satisfaction could be expected. Literature is examined to determine what makes the patient journey more pleasant in addition to reducing waiting times before QI tools, implementation strategies and the role of PAs in quality improvement is discussed.

2.2 Search Strategy
The search parameters for this review were set from year 2011 to 2017 with a worldwide perspective, although some of the original research is older. Only studies most applicable to the Irish outpatient clinic setting, peer-reviewed and in English, were chosen.

The literature databases were searched using the MeSH terms ‘quality improvement’, ‘healthcare’, ‘outpatients’, ‘patient satisfaction’, ‘healthcare management’, ‘quality improvement and methods or techniques or strategies’, ‘Lean’, ‘Six sigma’ and ‘value stream mapping’. Additionally, a search was
completed for research under the MeSH term ‘physician associate or assistant’ using the same parameters. The following databases were searched using the terms above: MEDLINE, CINAHL Plus with Full Text, Health Business Elite and Scopus. Overall this resulted in 374 papers from 2011 to 2017 of which 63 were relevant to this quality improvement project.

The expansive nature of these terms came about from reading studies, which alerted the writer to other sources of evidence not previously considered, for example ‘The Journal of Improvement Science’. Some grey literature was also reviewed. Government publications on demographics, research documents and policy papers on Healthcare were also included.

2.3 Review of Themes

2.3.1 The Patient Flow Problem and Referral Numbers

Patient flow refers to the effective and efficient movement of patients through a healthcare process with minimal delays avoiding long waiting times within the outpatient clinic on the day of attendance. Expanding patient numbers will affect this flow. Increased patient referral numbers could be anticipated with Irish demographic calculations shifting rapidly, as suggested by the increase of 32.8% in the over 65 age group between 2007 and 2016 (Department of Health, 2016). The Irish Central Statistics Office (CSO) figures from 2015 have predicted that the population under 65 is expected to remain relatively unchanged (CSO, 2015). Fewer people proportionately of working age to support the aging population will cause a further projected effect of increasing health service costs but with extra financial budgeting pressures. These demographic changes will have a larger effect on clinics, which do not have a
separate screening service for people aged over 65.

Worth noting is the recent focus on the increasing numbers of cancers being diagnosed. This would be expected in an aging population and with improved screening tools. A large review of the current meta-analyses literature found the current trend of rising average body mass index (BMI) for both men and women significantly increases people’s chance of cancer in 11 different sites (Kyrgiou et al., 2017). Those cancers identified were mostly of the digestive organs and hormone-related malignancies, including breast cancer. Health projection models support this theory and estimates of increasing breast cancer diagnosis up to the year 2040. Estimates from the Department of Health expect the number of cases of female breast cancer to increase by about 130% between 2010 and 2040 (Department of Health, 2015).

2.3.2 Patient Satisfaction

Improving patient satisfaction requires a deep understanding of what the patient expects. Perhaps due to media coverage of the long waiting times, patients may grow to expect and accept delays and long waits at outpatient appointments. Evidence suggests there is a generally accepted correlation between increased waiting times and decreased patient satisfaction as was supported by reviewed studies (Eilers, 2004).

Increasing patient referral numbers slow flow, increase delays and create bottlenecks in the clinic process. Bottlenecks refer to points of congestion in a process causing queues to form and if there are several stages to the process, more opportunities for bottlenecks exist and resultant increased delays affect the patient satisfaction ratings. This highlights the need for focusing on the patient’s movement through the clinic process to determine delay points and the
parts to improve.

In a study exploring the effects of a Flow Cost Quality programme on two independent hospital Trusts in the UK under the NHS, both Trusts found that a key driver of change was to focus on the patients’ actual experience (Jones and Pereira, 2013). Several methods were used, in particular following the patient journey door to door and involving the patients in evaluating the incremental quality improvement changes. One Trust invented a fake patient who was depicted as old and frail and designed the service and care changes around this imaginary, less able patient. This kept the focus on patients’ needs rather than staff preferences.

With the complicated multistage nature of many clinics it is difficult to narrow down what customers feel is an acceptable period of waiting for any one stage or procedure. One study found that a range of between 30 and 60 min was deemed acceptable to be waiting to see the doctor (Ho, 2014). Another study suggested that the waiting time was not a big factor if an indicator or visually representative tracker of the patient’s journey was available. This seemed sufficient to sustain patient satisfaction ratings (Syed et al., 2012). Evidence points to a multi-factorial approach to increasing patient satisfaction and reducing frustration, streamlining flow through clinics and using a simple visual system to inform patients of their progress and estimate the waiting time to the next process point.

This suggests that purely focusing on waiting times may not provide the quality improvement desired in relation to patient satisfaction. Other non-time related factors do come into play and are worth considering to achieve small wins in a QI project. A short survey spanning three clinics managing chronic diseases in
the UK reported the views of 147 patients and found shorter waiting times and cheaper car parking transpired as sources of increased satisfaction most often (Land et al., 2012).

Patient stress and subsequent effects on satisfaction having been considered by several studies which look at environmental factors. One group of researchers used both Eastern and Western design concepts to reduce stress and make the waiting environment more pleasant by focusing on a holistic approach to comfort, thus reducing the perceived waiting time and stress levels (Bazley, 2016). Additionally, plants, either living or artificial, in the waiting area may improve the ambience. Studies have shown something as simple as wall posters of plants can significantly reduce the experienced levels of stress in a waiting room (Beukeboom, 2012).

Patient satisfaction or feedback questionnaires and interviews are also useful tools to guide QI projects. This was indicated in an analysis on healthcare leader's views (Barson, 2017), which showed that engaging with patients and families was an important factor in quality improvement approach and design. Interestingly, in an article discussing Non-Physician Medical Providers (NPMPs) improving healthcare quality by Boucher et al., (2015) one of the authors found that a short conversation with patients or their families on satisfaction levels with current care and simple possible solutions, improved satisfaction with the service. The families felt that the caregivers had listened to their issues and this, as part of a QI process, appeared to be more important than fixing the problem straight away (Boucher et al., 2015).

Feedback from patients can be used in different ways. In a change management dissertation submission on the introduction of Patient Reported
Outcome Measures (PROM), a form of Quality of Life questionnaire, to an orthognathic clinic in UK, showed the positive potential effects of publically displaying the results of feedback (Campbell, 2015). Campbell recommended that the monthly experience data be displayed in patient waiting areas as this would inform patients of the benefits and impacts of their feedback and reinforce multi-disciplinary team commitment to quality improvement. QI is also a qualitative judgement and perceived QI may be centred around reducing frustration, improving the environment and communication.

2.3.3 Quality Improvement Methods in Healthcare

Lengthy waiting lists for appointments are not a unique problem to Ireland and interestingly, a Canadian report concluded that it was not due to lack of capacity and waiting lists could be reduced largely by the use of queuing methods (Rachlis, 2005). This may suggest the best methods for shortening healthcare waiting lists are not just a matter of using either supply-side or demand-side strategies but instead, adjusting the process and movement within the clinic to free up extra capacity.

The effects of adopting a comprehensive QI project to deal with a clinic experiencing rapidly increasing waiting times can be quite dramatic. A descriptive case study was completed on a busy, acute general hospital specialist outpatient clinic in Hong Kong focusing on the application of lean management principles to improve the pre-consultation patient flow. The clinic had been experiencing increased patient volume and waiting times had doubled with increasing complaints. The clinic used a roadmap to show how the clinic can move from it’s current state to its new desired state and Value Stream Mapping (VSM) to evaluate the process (Chan, 2012). Although much of the
improvement could be attributed to the relocation of the clinic and automation of processes, other more generally applicable ideas were also shown to work. Staff communication and involvement were seen as paramount to the projects success and keeping patients informed of the queuing situation from the point of arrival with an information screen in the waiting area and monitors with queue numbers outside each consultation room, also helped reduce complaints and reduce waiting times by 33%.

VSM is a visual representation of a process drawn from sampling the patient journey and measuring the times spent in and between each step. This form of process mapping is a valuable analytical tool to pinpoint bottle-necks and non-value time. Sampling may not always be useful if there are large variations in times from person to person and day to day. This implies making note of the variances, not just the average time at each step, can be helpful. The effect of large variances can be more important than long averages to adjusting scheduling in queueing theory, as was found by Nasiri when examining the effects of Lean approaches in a clinic setting in the NHS UK healthcare system (Nasiri, 2009). This study also found that using modelling techniques to assess the effects of incremental changes to clinic scheduling is helpful.

Research highlighted the need for detailed measuring of waiting times to include the time spent with the clinician and time spent in the consultation room alone awaiting a senior physician. For example, Lean management techniques were tested in a children’s cystic fibrosis clinic to try to reduce the amount of time patients spend unattended in an examination room by mapping the patient flow from arrival and time-stamping their records at the beginning and end of each stage (Smith et al., 2011). Many factors were found to slow the clinic down including, but not limited to, empty rooms not being used, staff in full
rooms being interrupted and patients waiting for results. Quick win changes were then made by placing an engaged sign on the door, putting the patient chart in a holder on the door if the patient was waiting alone and front-loading scheduling so staff had plenty patients to see from the start than rather having to wait for patients to slowly arrive. Prior to the changes 19.3% of patients were seen in 60 minutes or less and after lean approaches were applied 41.5% were seen within the hour. Median and mean length of stay was also reduced by 10 minutes and as a result the hospital’s revenue increased with no additional administrative costs (Smith et al., 2011). Significant improvement results were also shown by Bush et al (2007) reducing the length of stay from 3.2 hours to 1.5 hours in the outpatient clinic in an American hospital-based residency programme using Six Sigma modelling and statistics to reduce inefficiencies. Patient satisfaction scores also increased from 5.74 to 8.54 after the process and the control group remained unchanged on both counts (Bush et al., 2007). This strong link between patient dissatisfaction and long waiting times was confirmed recently in the study of the application of VSM to a gynaecology clinic in Iran. The authors also showed, by visual mapping of the quantitative time measurements, that the examination room is the point of bottleneck in outpatient service delivery (Anisi et al., 2017).

Measuring and modelling patient flow through process mapping has been shown to achieve quick gains. Pudney (2017) examined his own oncology clinics taking measurements of all timings including the downtime of the clinician between patients and time spent away from clinic duties then, used modelling and showed graphs of the results. After interpretation of the results, clinics were rescheduled, a pre-clinic meeting with the clinic team was set up, which had the added benefit of making sure staff were on time for the start of
the clinic and efforts were made to curtail interruptions. This reduced average lead time- initial waiting time- from 55 minutes to 33 minutes (Pudney, 2017). In a different study, consultants or senior clinicians being delayed by emergency calls or ward visits and the start of clinics being subsequently delayed was found to be one of the factors in longer lead waiting time for patient consultations (Nasiri, 2009).

Another useful tool in a healthcare setting is the application of queuing theory and the use of simulations of clinic settings and process changes. A study exploring the usefulness of queuing models in an emergency department found they tend to oversimplify operations and under-estimate the level of congestion. This is more apparent the smaller the system. Queuing models also appeared to produce less realistic results than comparable models of simulation. However, the combination of queuing plus simulation was found to be a powerful approach (Hu, 2017).

Queuing theory was used to model a clinic in The Netherlands both pre and post alternative changes. Patient arrival time and time expected to be with staff were noted and length of stay and staff utilization rate were the performance measures. This data allowed the researchers to assess the model and reschedule appointments and tasks thus significantly increasing the patient capacity of the clinic (Zonderland et al, 2009). In another example a neurology clinic in the Netherlands used a computer simulation model to analyse and improve patient length of stay. Variations in demand as well as capacity scheduling were accommodated and the resultant simulation model was shown to be applicable to other clinics (Elkhuizen et al, 2007).

Studies completed on improving patient flow have needed to gather quantitative
data for analysis often using some form of simulation to assess the effects of changes. Detailed data also allowed the people involved to gain from review of failures and successes of small change trials (Jones and Pereira, 2013). Simulation modelling often involves complicated computerized simulation algorithms and programmes., but the same study found merely gathering the data and visually representing it can be helpful in pinpointing areas to change.

Discrete-event simulation (DES) tests operational changes. This is seen as a useful tool in the healthcare setting to diagnose inefficiencies and find and test potential solutions. One study in an adult medicine clinic in a large academic medical centre found bottlenecks in the administration of medicine and the checking out stage of the clinic. The DES process predicted that providing extra resources at times of extra demand would reduce the overall visit times from 124.3 minutes to 87.0 minutes (Parks, 2011). It was recognised that a real life copy of this simulated model would be unlikely to have such dramatic results but it is strong evidence of the benefits of using DES as part of the improvement process.

Appointment scheduling in One Stop Clinics (OSCs) is more difficult as there are several steps and sometimes a mix of different patient categories and subsequent process pathways. One study examining this problem achieved a 31% improvement in clinic productivity despite an almost infinite number of variables (Dodds, 2012). The author succeeded in reducing the waiting time and the number of late clinic finishes with an adequate, rather than perfect schedule, by the use of process measurements, Gantt chart scheduling, running variations through with a paper table-top prototype model and a DES programme.
The results of queuing and simulation are used in conjunction to help find the most effective schedule. This can be done using Gantt charts or graphs. Scheduling of patients into clinics and the individual parts of the process, in the most efficient manner was also discussed by Davidge (2016). A system flow map showed that none of the departments could apparently keep up with the scheduling in place and queues were always present (Davidge, 2016). The second part of this study looked for solutions to this flow capacity problem. Using PDSA cycles and the Model for Improvement, new scheduling ideas were examined and it was found that simply slowing the arrival rate down to accommodate the slowest process was the best option. It was also emphasized that in making any changes, there should not be an increase in workload for the staff involved (Davidge, 2017). Additionally, it was found in a discussion paper looking at a ThedaCare outpatient clinic in Wisconsin, USA that the average time required for clinician-patient interaction should also take into account the preparation and documentation time after the consultation is complete (Brandenburg et al., 2015). The focus of these two studies was on reducing lead-time and queuing time.

Ideally, staff should be heavily involved in QI from the beginning and sharing the data gathered with staff should increase staff engagement. Jones and Pereira (2013), found that having a clear mutual purpose and encouraging staff to identify and initiate the changes themselves on a voluntary basis, improved project ownership and generated a stronger desire for change amongst staff. Choosing clinical change champions from frontline staff and using the Oobeya process, a Japanese Lean manufacturing idea from Toyota Production Systems of creating a ‘war room’ for meetings with stakeholders and brainstorming sessions was also effective. Additionally, understanding the skill mix available
was seen as vital in maximising good quality flow through a healthcare department of any kind (Jones and Pereira, 2013). In a teaching hospital setting with regular staff rotations, analysing skill mix could be an important exercise to improving clinic patient flow.

For staff engagement, successful outcomes do not need to be large. Small wins have been found to increase staff engagement and happiness in the workplace disproportionately (Amabile and Kramer, 2011). However, this research on good workdays and bad workdays using almost 12000 journal entries from 238 individuals, also found failures, however small, can have an even greater negative effect.

### 2.3.4 The Role of the PA in Reducing Waiting Times

The PA is a relatively new healthcare profession currently being introduced to Ireland. PAs can now be found throughout healthcare around the world and are trained to a level required to provide suitable and safe patient care and treatment. Hospitals may have staff rotations which are likely to slow clinics down until new staff members become familiar with the process and gain the required medical knowledge to decide on a patient's management plan. The PA does not rotate through disciplines, so experienced PAs could be in a coordinative role to support a Non-Consultant Hospital Doctor (NCHD) new to the rotation with their understanding of the specialty, the staff and process of the clinic.

Additionally, the Non-physician Medical Practitioner (NPMP), which includes the PA, may be a good choice as a potential leader of QI projects (Boucher, 2015). The PA training places emphasis on continued professional development and regular recertification including involvement in research and organisational
change. Boucher et al found NPMPs are well placed to improve patient satisfaction as well as clinical outcomes.

The problem of lengthy waiting times has been seen in other countries, which have been able to use the skill sets of PAs and other trained healthcare professionals such as an Advanced Nurse Practitioner (ANP) to improve these parameters. There is limited research conducted on the effects of introducing PAs and ANPs to outpatient clinics but some international studies have been published which strongly suggest that their addition will have an ongoing positive influence on waiting times and length of stay without diluting the level of patient care.

Three studies of particular interest looked quantitatively at Waiting Time (WT) and Length of Stay (LOS) for patients before and after the introduction of PAs to specific health services. Two of these articles discussed studies in Emergency Departments (EDs) one in Ontario Canada with 6 different, medium sized hospitals involved (Ducharme, 2009) and the other a Fast-track (FT) system in Maastricht University Hospital, The Netherlands (Theunissen et al., 2014). Theunissen et al used a prospective study comparing a 3-month period prior to the introduction of the PA-led Fast-track (FT) system within an emergency department with the same three months the following year. The FT system was only available to lower priority patients at periods of longest delays, from 08.00 to 17.00hrs. Results showed significant reductions in WT and LOS for FT patients and additionally, lesser but still significant reductions for higher priority patients. A specifically trained PA, was working autonomously with support from a specialised nurse in this example.

The effect of the introduction of additional staff in the form of PAs and other
healthcare professionals to 6 emergency departments in Ontario, without Fast-track systems, is examined by Ducharme et al (2009). This study was completed retrospectively, gathering data from electronic health records from a 14 day period just prior to PAs’ introduction and a 14 day period six months after. The results obtained showed a significant reduction in WTs and LOS (Ducharme et al., 2009).

The final article is a retrospective study to examine if having a dedicated PA in an Infectious Diseases Consult Service (IDCS) in a general hospital in Toronto, Canada would decrease WTs and observed LOS over a 4 year period -two years prior to the PA joining and the following two years- (Decloe, 2015). A large sample size was used and a matched non-IDCS sample as control. The matching of patient samples from IDCS and general hospital patients (matched case-control methodology) removed the effects of general hospital improvements in efficiency as much as possible. Significant reductions in LOS and WT were found after introduction of PA when compared to the hospital-wide control group.

This research suggests that patient waiting times and length of stay could be significantly reduced if PAs were additionally employed and integrated into the Irish healthcare system. The Maastricht Fast-track study did not employ additional staff and redeployed experienced staff with good results.

2.4 Implications for the Project

The demographic projections for Ireland indicate that the percentage population of over 65 years will be increasing significantly and this coupled, with increasing BMI trends, will increase the number of people being referred to breast clinics.
Patient dissatisfaction with long waiting times in clinics is likely to increase as more pressure is placed on patient flow with the increasing numbers. These facts alone would support the rationale of improving patient flow. However, research showed that patient satisfaction is not entirely driven by waiting times. Several simple methods of improving the clinic experience with better communication, visual representations of progress through the clinic, environmental improvements and the use of interviews and questionnaires to focus on patient-centred improvements were all found to increase satisfaction.

The patient, as the centre of focus, was emphasised in research along with the importance of involving staff from the beginning of the process. Testing incremental changes and celebrating any small successes appears to be the best approach as failures have a strong negative effect on staff morale. Keeping the staff involved throughout also improved the success probability of QI measures in practice.

The successful studies cited, used a combination of Lean tools: value stream mapping, scheduling, simulation and sampling, to achieve better patient flow through clinics and emergency departments. The VSM and resultant understanding of where the wasted waiting time in the process lies, is shown to be fundamental to much research on QI in the healthcare setting. Simply getting clinics started on time and minimising interruptions may significantly improve flow so, examining possible ways to achieve this, may be a useful QI starting point. When a multipart, one stop clinic, is examined a good enough approach to scheduling was found appropriate to gain improvements. Re-scheduling appears to work well in improving flow and this will depend on the rate of the slowest part of the overall process.
Finally, the review of the role of a PA in reducing waiting times points to an overall improvement in patient flow, particularly if the PA is experienced. Additionally, the PA can act as a mentor and support to new NCHDs on rotation and was found to be a potentially good choice of QI project leader.

The process of reviewing this literature has given the writer a reasonable level of confidence that QI methods can deliver real changes in the clinic under examination. It would be anticipated that the improvements shown in these research articles could be replicated with improved flow, increased patient satisfaction and the potential for increased capacity in the breast clinic in the future.

2.5 Summary

This chapter reviewed current literature to provide a rationale for the QI project and guide the choice of methods by first focusing on the importance of improving patient flow and clinic efficiency to accommodate the demographic predictions of increasing referral numbers. This was followed by an analysis of the reasons for reduced patient satisfaction. Evidence suggests long waiting time is the main factor but it is also influenced by communication, ambience and patient consultation. Literature was reviewed on the most appropriate application of Lean and Six Sigma tools, queuing, scheduling and simulation to QI in Healthcare. Finally, research on the role of the Physician Associate in QI and the reduction of waiting times was examined.

The following chapter will explain in detail the tools and methodology selected in this QI project and the rationale for choosing them. This will follow a Define, Measure, Analyse and Improve format.
3.0 Methodology

3.1 Introduction

The Health and Information Quality Authority’s (HIQA) ‘Safer, Better Healthcare Standards’ defines quality by setting out 4 quality domains namely; person-centred, effective, safe and also for better health and well-being (HIQA, 2012). Keeping these domains in mind and the Framework for Improving Quality’s focus of quality improvement being achieved by making changes that produce better patient outcomes, experience of care whilst continuing the development and support of staff (HSE, 2016), this chapter describes the choice of methodology in the examination of the breast clinic processes.

In this chapter, Quality Improvement Models currently in use in healthcare will be examined to help focus and justify the choice of model the writer feels is most applicable to this type of QI project. Finally, a detailed breakdown of the chosen quality improvement model and most appropriate methods for this project is discussed to produce a detailed plan for potential implementation. This chapter also analyses the data gathered, the reasons for doing so and potential improvements.

3.2 Approaches to Quality Improvement

Quality improvement should be a continuous collection of good habits and the application of tools to allow measurement and analysis before improvement and control mechanisms can be applied. Much of quality improvement theory and method has come from business, in particular, manufacturing and has been widely adopted by the health sector.

Many QI models in use today have been developed from the work of W.
Edward Deming, which include PDSA and the Model for Improvement developed by the Institute of Healthcare Improvement (Langley et al., 2009). More recently, alternative models such as Lean and Six Sigma have been applied to certain healthcare settings with positive results. In this section the main QI models currently in use in healthcare will be briefly explained.

3.2.1 PDSA

Although the origins of Plan, Do, Study and Act (PDSA) cycles go back centuries, the modern 4-stage PDSA cycle was drawn up by W. Edward Deming in 1950 and modified in 1993 to become the PDSA as it is today. PDSA is designed to guide the process of problem solving when trying to make improvements or changes in a system. It focuses on the testing of ideas through actions, allowing a trial to test a potential improvement or change and revisions can then be made subsequent to the analyse phase to address identified problems.

![The PDSA Cycle for Learning and Improving](image)

Figure 1: The continuous nature of the PDSA Cycle

This model (Figure 1) is a continuous process, encouraging the user to go back to the planning stage again after the ‘act’ stage is completed. No stage should be ignored and PDSAs work best when small changes are made to achieve incremental improvement.

The PDSA cycle can be applied to individual parts of an overall project and
several cycles can be run one after the other, gaining deeper learning each time but not necessarily achieving improvement at each cycle (Leis and Shojania, 2017). This model has been used successfully in the healthcare setting on many occasions (Hooton et al., 2009; Lynch-Jordan et al., 2010). The PDSA cycle should be used in an iterative manner, building up knowledge, testing one change and if this achieves the desired result, layering another small change cycle on top.

In reality a healthcare culture of no time to plan can cause steps to be missed or be incomplete and in order to be successful, much time and effort needs to be invested in leadership, expertise and resources within each and every stage of the PDSA model (Reed and Card 2016). The writer believes the PDSA model needs an instigator, a reason for existing or data gleaned from investigations of an identified theoretical problem to spur on the plan stage initially. This could come from the wider methodological approaches of The Model for Improvement or Lean.

### 3.2.2 The Model for Improvement

**Figure 2: IHI Model for Improvement**

The Model for Improvement was developed by Associates in Product Improvement (API) and was adopted by the Institute of Healthcare Improvement (IHI) shortly after the PDSA cycle, in its modern form, was published. This incorporates two quality improvement models: A Total Quality
Management (TQM) philosophy and the Rapid-Cycle Improvement (RCI) strategy of PDSA. TQM focuses on customer satisfaction with participation of all employees in the improvement of the culture, services and workplace. The result is a framework that runs PDSA cycles with the addition of three vital questions to help guide the format (Figure 2: Langley et al., 1994). These questions are intended to keep QI practitioners focused on the aim, ways of measuring results and identifying key changes to achieve the improvement required. Multiple PDSA cycles can be used, testing the value of these changes.

3.2.3 Lean

Lean methodology was developed after World War II by Taiichi Ohno from Toyota Production Systems (TPS) for manufacturing control processes (Figure 3).

**Figure 3**: Lean Principles and the 7 Forms of Waste

It is a continuous improvement process methodology founded on five main principles.

1. Focus on ‘Value’ as described by the customer- the customer’s perspective
2. Use of Value Stream Mapping to assess the ‘value’ of process steps: Process mapping identifies the non-value-added steps from the customer’s point of view.
3. Strives to create a smooth patient flow with a continuous improvement ethos
4. Lean uses a pull philosophy- having the resources ready to pull the patients to them when available. Not queueing.
5. Elimination of 7 forms of waste from the process.

Lean follows a ‘roadmap’, which can be in many forms for example an A3 (a plan or roadmap drawn out on an A3 piece of paper) or a DMAIC approach, which explains the problem, shows current state measurements, indicates process improvement requirements and finally control measures.

Improvements in process due to Lean methodology are important for the customer but also for the frontline staff, who can feel overwhelmed by constant queues and a backlog of waiting patients (Jones and Pereira, 2013). Improvements in patient flow can create a win-win situation. The improved working situation is not the only reason to focus on the staff. Lean methodology is reliant on staff involvement and cooperation. In fact, staff and all other stakeholders should be involved in order to achieve the best results from the application of this QI methodology (Nasiri, 2009). Lean quality improvement strategies should also address variation in capacity to meet demand in order to optimise patient flow (Jones and Pereira, 2013). If resources are not sufficient to cope with times of high demand, queues will be unavoidable.
3.2.4 Six Sigma

Six Sigma was developed by Motorola in the 1980s. It focuses on variation within a process and reducing or eliminating this variation to gain improvements. This methodology places a greater emphasis on the collection and statistical analysis of data and mathematical modeling. Six Sigma improvements could be focused on arrival times with minimal variation or the standardisation of clinic consultation time spent with a patient, thus allowing predictability and control. Six Sigma methodology follows the DMAIC approach (Figure 4).

Figure 4: Six Sigma and DMAIC

Lean and Six-Sigma methodology both have merits and their application has led to successful improvements in healthcare (Chan, 2012) and (Tai, 2012).

Both Lean and in particular, Six Sigma, use the DMAIC structured approach within an ethos of continuous improvements. These models are complimentary and intended to be used to identify the root causes of delays or breakdowns in the process. The combination, Lean-Six Sigma, can be used to improve the variation and flow of processes and increase efficiency, enabling the people involved to work smarter without extra effort. The overlapping models could provide the potential benefits of improved quality and delivery with both satisfied customers and staff. The focus on continuous improvement is a very proactive
approach when compared to PDSA or the Model for Improvement. The latter two models are reacting to current problems rather than having the more preventative approach of Lean Six Sigma.

The DMAIC Approach

Define, Measure, Analyse, Improve and Control (DMAIC), is the main model approach for Six-Sigma. The first phase, ‘D’ define, was added to the original MAIC to drive the plan towards the need and the critical quality requirements for defined customer satisfaction. Within a functional DMAIC process there are many tools and QI methods embedded, including PDSA during the improve phase. The 3 fundamental questions from the Model of Improvement method are asked at the earlier stages when a solution is being sought for identified wastes found during process mapping.

Improving a process requires detailed examination; observing it in action before deciding which parts of the process need to be improved for the patient. This in-depth observational and quantitative, data-driven analysis will give a clear picture of where bottlenecks lie and how much of the process is not adding value and time is being wasted. The importance of this process is described by Rother and Shook, (1999) who believed that scrutinising the value stream of a process requires looking at the process as a whole and not just the individual elements thus enhancing the complete operation or system, not only the components (Rother and Shook, 1999).
3.3 Rationale for Model Selected

There are many methods that could be deployed to fit with the Framework for Improving Quality and goals of the HSE and those chosen largely depend on the type of change or improvement and process involved. Whichever method is chosen to focus and track the implementation of a QIP in healthcare, the importance of standardisation, ensuring the benefits to patients and taking on board the knowledge of frontline staff should be highlighted (HSE, 2016). In choosing a suitable QI model the likely type of measurement and analysis have to be considered first. The complicated nature of the clinic was also going to channel the writer's choice towards a model that may be able to handle this multi-stage type of setting and shine light on the reasons for process flow problems.

PDSAs can be an oversimplified method not always applicable to more complex scenarios (Reed and Card, 2016). The writer believes that the PDSA cycle is useful as a learning tool, assessing the relative worth of small changes to a process but not always be suitable on its own as a QI model. It may be useful to assess incremental changes within the improve section of DMAIC once a level of confidence has been gained that the improvement will be a success. As was discussed in the literature review, small failures can have a disproportionally negative effect on staff morale (Amabile and Kramer, 2011) so a high level of pretest confidence would be preferred. While the Model for Improvement is focused on answering questions and thus keeping track of progress, it would not be sufficiently analytical as a standalone model where the reasons for the flow problems are not immediately apparent, as is the case here.
The advantages of a Lean or Six Sigma approach for this QI project are several. The need for detailed focus on the improvement of patient flow and the reduction of non-value waiting times fits well with the Lean model. It is likely that many of the solutions sought will come through analysis of data and a root cause analysis process. This suggests a structured Lean Six Sigma and DMAIC approach to the overall project and the subsequent reduction of variations or improved predictability of processes would increase the chances of sustained success. This decision is supported by other healthcare studies, which believe a combined Lean Six Sigma approach is better as it incorporates the goals of waste reduction in Lean and process reduction in Six Sigma (Lee, 2016). Additionally, words of warning were noted regarding the importance of not beginning until full staff commitment was gained and a clear DMAIC roadmap put in place (Grima et al, 2014).

The writer believes that the methods to be used should be slanted towards Lean with the addition of Six Sigma as a secondary tool. In the breast clinic, reducing the variation of processes themselves would be a difficult task because the patient-clinician consultation has many unpredictable factors. However, reducing the variation of waiting times in conjunction with the reduction of overall waiting times between processes would be possible through a reasonably predictable first consultation time and a better clinician to patient ratio from the start of clinic.

The following section will examine the proposed tools by following a DMAIC approach. In the later phases of DMAIC, specifically the ‘Improve’ phase, a PDSA cycle is recommended to test the validity of the proposed improvements before controls are put in place. Thus, a combination of models would be used to achieve sustained improvement to the Breast clinic experience and process.
3.4 The application of the Lean Six Sigma Model by DMAIC

3.4.1 Define Phase

The improvement project is defined by the background setting, team/stakeholders, problem and scope (Table 1).

Table 1: Project Synopsis

<table>
<thead>
<tr>
<th>Background Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Busy Consultant-led Breast clinic with Triple Assessment Clinic (TAC), review, non-</td>
</tr>
<tr>
<td>urgent and routine patients in a large teaching hospital in Ireland.</td>
</tr>
<tr>
<td>2 mammogram and ultrasound machines are available, in a separate part of the</td>
</tr>
<tr>
<td>hospital but several minutes walk from the breast clinic.</td>
</tr>
<tr>
<td>Stereotactic or Ultrasound guided biopsies can be completed as an adjunct to</td>
</tr>
<tr>
<td>imaging on request. Core biopsies may be completed by trained clinicians during</td>
</tr>
<tr>
<td>clinic consultations if indicated.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Clinic Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tuesdays, 8 am to 12.30pm</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Stakeholders and Team</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frontline Team:</td>
</tr>
<tr>
<td>Clinicians including one Consultant</td>
</tr>
<tr>
<td>and an experienced Breast Physician</td>
</tr>
<tr>
<td>Associate, Specialist Breast Care</td>
</tr>
<tr>
<td>Nurses x3, Nurses, Administration</td>
</tr>
<tr>
<td>person.</td>
</tr>
<tr>
<td>Radiology / biopsies: 2 Radiologists</td>
</tr>
<tr>
<td>(3 on rotation), Radiographers,</td>
</tr>
<tr>
<td>Nurses, Administration staff.</td>
</tr>
<tr>
<td>Patients, their families, Hospital</td>
</tr>
<tr>
<td>executives.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Problem</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient Flow through the Breast</td>
</tr>
<tr>
<td>clinic is felt to be too slow by</td>
</tr>
<tr>
<td>both staff and patients.</td>
</tr>
<tr>
<td>Waiting times are long at several</td>
</tr>
<tr>
<td>points in the overall process</td>
</tr>
<tr>
<td>with bottlenecks being noticed and</td>
</tr>
<tr>
<td>overcrowded waiting rooms</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Project Scope</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assessing clinic process using QI</td>
</tr>
<tr>
<td>tools to address the reasons</td>
</tr>
<tr>
<td>for the excess waiting time.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Project Lead / Sponsor</th>
</tr>
</thead>
<tbody>
<tr>
<td>The writer has been acting Lead</td>
</tr>
<tr>
<td>in this proposed QI Project,</td>
</tr>
<tr>
<td>Sponsor plus one required to</td>
</tr>
<tr>
<td>implement.</td>
</tr>
</tbody>
</table>
Stakeholder Analysis

All quality improvement and change models highlight the importance of accessing the unique knowledge that frontline staff possess and involving them in any change and improvement process (HSE, 2016). Stakeholder analysis is a useful tool to assess the potential impact of changes and improvements on different people or groups involved in the overall process. It can also help expose the most influential stakeholders, enabling the quality improvement team or practitioner to involve these groups from the beginning. Gains from their active support at an early stage can improve the quality of the results and likelihood of success. The Stateholder Analysis (Figure 5), shows that the specialist Breast Care Nurses, Clinicians, Consultants and Radiologists, are assessed to be most invested in the project and these groups and individuals are targeted first, introducing them to the proposed project and encouraging their thoughts and feedback.

Figure 5: Stakeholders Analysis (Mendelow, 1991)

<table>
<thead>
<tr>
<th>Having Importance</th>
<th>Having Influence</th>
</tr>
</thead>
<tbody>
<tr>
<td>High Importance</td>
<td>High Influence</td>
</tr>
<tr>
<td>Low Influence</td>
<td>Radiologists</td>
</tr>
<tr>
<td>High Importance</td>
<td>High Influence</td>
</tr>
<tr>
<td>Radiologists</td>
<td>Nurses</td>
</tr>
<tr>
<td>Low Importance</td>
<td>Administration Staff</td>
</tr>
<tr>
<td>Low Influence</td>
<td>Nurses</td>
</tr>
<tr>
<td>Radiographers</td>
<td>Clinicians</td>
</tr>
<tr>
<td>Low Importance</td>
<td>Patients</td>
</tr>
<tr>
<td>Low Influence</td>
<td>Low Importance</td>
</tr>
<tr>
<td>High Influence</td>
<td>High Influence</td>
</tr>
</tbody>
</table>

42
Informal discussions with these stakeholders took place during clinic hours whenever an opportunity presented itself. The writer was unable to assemble representatives from all stakeholder groups at the same time, but this individual approach enabled people to speak freely. However, difficulties arose with continuity as new NCHDs started their rotation with the team mid-project, diluting the strength of some of the stakeholder analysis assumptions. Clinical staff turnover is one of the difficulties that this proposed project will need to overcome and is discussed in Chapter 5.

**Force field analysis**

Dealing with impediments and persuading people of the merits of a project right from the beginning is not a new concept. Kurt Lewin (1951) developed a Force Field Analysis theory, which focused on increasing the driving forces and reducing the restraining obstacles in the way of change to a new desired state. Using this in conjunction with Lewin’s 3-step model - Freeze, Change, Refreeze - and obtaining an equilibrium at the refreezing stage before moving on, was deemed by Lewin, important to the success of process changes (Lewin, 1951). Applying this analysis of forces that may affect an attempt to improve the patient flow in the clinic would be a useful process.

Forces that are favourable and driving the change, are noted and the same process for resisting forces is completed. These two sides are expanded as the process and clinic structure was further understood. Each side was rated by the writer as to it’s relative strength and ideally, equilibrium will be reached or stronger drivers will prevail as appears to be in Figure 6. It would have been more accurate if a stakeholder team had completed this analysis. Finally, further examination was completed on these forces to establish if any resisting forces
could be minimised or driving forces strengthened. This drew the writer’s attention to two of the resisting forces—lack of project leadership and lack of coordinated communication between team members. This will be addressed as a matter of priority in the QI recommendations.

**Figure 6**: Force Field Analysis: Improving patient flow through the breast clinic (Lewin, K. 1951; Field Theory in Social Science, New York: Harper Row)

<table>
<thead>
<tr>
<th>DRIVERS</th>
<th>RESISTORS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Staff and clinicians frustrated by current flow</td>
<td>Fear of change</td>
</tr>
<tr>
<td>Increased patient satisfaction will result</td>
<td>Lack of clear leadership for project</td>
</tr>
<tr>
<td>Increased future referral numbers</td>
<td>Fear of increased workload</td>
</tr>
<tr>
<td>Functionally sound system already in place</td>
<td>Lack of coordinated communication between team members</td>
</tr>
<tr>
<td>Consultant and senior staff on board</td>
<td>Rotating NCHD Staff not committed</td>
</tr>
</tbody>
</table>

**The Breast clinic process flow map**

Figure 7 represents the basic flow of patients on a typical day through a Triple Assessment Clinic (TAC). This was completed to get an overview of the process path from the initial visit to the GP by the patient. Only the TAC patient journey is considered in this project but the non-TAC interaction point is noted with waiting points indicated. The patient flow shows how the TAC patient
pathway interferes with the non-TAC patients' flow experience with all patients initially waiting for first clinical consultation potentially creating congestion.

**Figure 7:** Patient Flow through Clinic
3.4.2 Measure Phase:

The writer observed that the movement of the TAC patients through clinic largely controlled the waiting experiences of the other categories. Improvements to this flow system should take place first and separately to fully evaluate the success of any future QI. Data was gathered on process times for TAC patients only and a VSM was drawn up to expose bottlenecks and areas to be improved. It incorporates quantitative tools of measurement to assess for non-value added time or waste time. A summary of the most pertinent measurements is indicated below (Table 2) then diagrammatically represented in the VSM in Figure 8.

Table 2: Clinic measurements

<table>
<thead>
<tr>
<th>Measurement Description</th>
<th>Range (minutes)</th>
<th>Mean (minutes)</th>
<th>Median (minutes)</th>
<th>Mean /hour</th>
<th>Median /hour</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>The TAC patient total clinic time</td>
<td>166 to 247</td>
<td>200</td>
<td>199</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time of arrival to time of first clinical consultation for TAC patients</td>
<td>Wait time: 3 to 48 minutes</td>
<td>wait time: 32 min</td>
<td>wait time: 35 min</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>First consultation time (n=4 clinicians) with TAC patients</td>
<td>6 to 17 minutes</td>
<td>11 min</td>
<td>10 min</td>
<td>3.3 patients/hr</td>
<td>3.1 patients/hr</td>
<td>2.4-4.9 patients/hr</td>
</tr>
<tr>
<td>On return TAC patients wait for 2nd clinical Consultation</td>
<td>3 to 47 minutes</td>
<td>31 min</td>
<td>34 min</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The number of clinicians consulting</td>
<td>8am: range 1-2</td>
<td>8.15: range 2-3</td>
<td>8.30: range 2-3</td>
<td>8.45 range 2-3</td>
<td>9am: range 3-4</td>
<td>9.30 range 3-5</td>
</tr>
<tr>
<td>Waiting to be seen by a consultant (n=9)</td>
<td>added 5 to 27 min</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

A small random sample (n=10 patients) of TAC patients were observed in their journey through the clinic process on 5 different clinic days and several time measurements were noted. Additionally, clinician availability and consultation time measurements were taken during the first two hours to assess productivity and clinician utilisation. A full breakdown of measurements is given in Appendix 2.
<table>
<thead>
<tr>
<th>Sample size</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variance of times</td>
<td>20s to 48 min</td>
</tr>
<tr>
<td>Patient movements</td>
<td>patient check in</td>
</tr>
<tr>
<td>Admin and exchanges</td>
<td>sits in waiting area</td>
</tr>
</tbody>
</table>

Dark-shaded areas: waiting, queuing and non-value-added time.

Pale-shaded area: processes that do not occur for all patients

Unshaded areas (patient movements row): processes or patient consultations
These measurements indicate 3 delay points, before the first and second consultations and in the radiology process which the longest wait time. The data is analysed in the following phase and possible root causes identified.

3.4.3 Analyse Phase

There are several pinpointed bottlenecks with long and very variable waiting times for patients noted in the data measurement and VSM, so analysis tools are then used to identify possible reasons for these non-value-added stages. One way to do this is using the ‘5 whys’ technique. This is a non-statistical method invented by Toyota Productions Systems to get to the root cause of problem stages by asking ‘why’ preferably five times to the answer to the previous question. For example:

1. There a long and variable wait time after checking in to reception before the initial clinical consultation Why?
2. Clinicians are not ‘calling in’ the patients. Why?
3. There are not enough clinicians to match the patient arrival rates. Why?
4. The patients are early or Clinicians not ready or present. Why?
5. Clinicians delayed perhaps due to ward rounds. Why?

Answer: Ward rounds started late / all clinicians started ward rounds…

This ‘5 whys’ technique is quite linear and the more detailed Root Cause Analysis method is more applicable to this type of problem where there are many possible reasons for initial long wait times (Lau, 2015). The Root Cause Analysis is best completed by a multidisciplinary team but the writer has completed a preliminary example displayed as a Cause and Effect Diagram (Appendix 3). During the measurement phase there was an opportunity to informally discuss perceived issues in the clinic and listen to stakeholder’s ideas.
on what would help. Patients emphasised the inadequate waiting room environment and not knowing how long they would have to wait, whereas staff felt it was a slow start that caused problems. The cause and effect diagram is useful to find measures to support the Stakeholders’ beliefs. The first measured bottleneck appears at the early stage of the clinic when the TAC and other patient categories’ arrival rate is quicker than the clinicians can see them.

Analysis of the clinic measurements shows that there are several process issues for the clinic. The variability of the consultation rate from one clinician to the next and day by day was high as can be seen from the wide ranges of waiting time values. On 3 out of 5 occasions, only one clinician was seeing patients at 8 am. The consultation rate of mean 3.3 patients, median 3.1 patients per hour was low, but some clinicians were seeing nearly 5 per hour. Distractions were the main cause of slower rates.

In order to get a clear picture of the effect of patient scheduling on the flow through the clinic a Gantt scheduling chart is compiled (Table 3). The clinic usually consists of 44 patients, 13 TAC and 31 non-TAC. This chart assumes, from observed measured times, a clinician consultation plus administration, takes 15 minutes. The average number of clinicians available at each time was taken from clinic observations. The number of clinicians after 9.15 did fluctuate from the estimated 4, but for simplicity this number was not changed throughout the rest of the clinic on the simulated Gantt schedule. The observed reality was that many consultation doors were open 50% of the time, suggesting much slower progress than the discharge of 16 patients per hour which the Gantt schedule is relying on. This was supported by the mean (3.3 patients/hr) and median (3.1 patients/hr) consultation rates measured during data collection.
Table 3: Gantt chart Scheduling Simulation before QI improvements

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1. Mean waiting time Non-TAC patients (N) can be calculated by counting the total number of boxes representing the time between scheduled appointment time and first clinician consultation (C)

   \[
   \text{Mean waiting time} = \frac{(11 \text{ boxes} \times 15 \text{ min})}{31 \text{ patients}}
   \]

   So, mean waiting time to Clinical Consultation (non-TAC) = 53.7 min average

2. Mean waiting time (TAC patients) = (25 boxes \times 15 min) / 13 patients

   TAC waiting time = 28.8 min

Scheduling of patients does change from clinic to clinic but the example given would be a fair approximation. There is an obvious discrepancy between the rate of patient arrival and patient return from radiology, and the number of clinicians seeing the patients at any given time. As the clinic progresses, the lack of clinicians available or the speed of patient processing through the consultation stages is too slow, resulting in longer waits for the patients. It can be seen from the Gantt scheduling model, that a TAC patient arriving at 8.30am could still be waiting 45 minutes to see a clinician. If the consultation rate is less than 4 patients per hour, this may increase the waiting time further.

The rate of return to clinic from radiology is outwith the control of the breast
clinic and is entirely dependant on the process flow in radiology. It will not be factored into this initial project. The increasing waiting time as clinic progresses suggests that the number of clinicians receiving patients is too low from the beginning of the clinic. It is acknowledged that a more experienced clinician may have a faster consultation rate compared to a clinician new to the rotation. The Gantt simulation chart doesn’t account for variations just models a prediction of the results in a certain scenario based on theoretical averages. Here, it indicates that even if the consultation rate increases, the number of working clinicians will need to be increased.

The return to clinic for TAC patients involved another wait of up to 47 minutes to be seen again bringing total clinic time up to a mean of 3 hours 20 minutes, but if the initial flow problems are addressed and most of the non-TAC patients have been seen prior to the return of TAC patients from radiology, then this time could be reduced significantly.

The clinic environment as well as the waiting time, is cited, informally by patients during the writer’s research as being ‘overcrowded’ and the 40 seats were ‘uncomfortable’ and ‘worn’. It was noted that almost every patient brings a friend or relative, there were no free seats in the waiting room on some occasions and one of the seats is broken. Finally, the lack of communication regarding the length of wait or clinic time appears frustrating for patients.

3.4.4 Improve phase

The aim of this project is to improve the patient flow and the writer believes that addressing the delay to first consultation by increasing the number of clinicians available from the start and the monitoring and sustaining of a 4 patients per hour rate at the early clinic stage, is the best starting point. Having a more time-
focused system in place would reduce variability, remind clinicians to keep the 
flow moving and concurrently reduce the stress of seeing a backlog of files and 
a full waiting room. A second Gantt simulation chart of the possible future state 
was drawn up to demonstrate this (Table 4). This new state Gantt simply 
changes the clinician numbers to the new suggested levels and waiting times to 
first clinician consultation are reduced by 28% for Non-TAC (N) patients and 
56% for TAC (T). However, the writer understands that other factors will come 
into play and these are discussed in Chapter 5.

Table 4: Gantt Chart Scheduling Simulation: Post-QI Post control of clinician 
availability

1. Average waiting time to see clinician (Non-TAC patients, N), post-QI:
   Area under graph (80x15 min) / 31 patients = 38.7 min
   Compared to pre QI Gantt calculation (Table 5) = 53.7 min
   Equates to an average reduction of waiting time of 15 min or 28% for Non-TAC.

2. Average waiting time to see clinician (TAC patients, T), post QI
   = (11 x 15 min) /13 patients = 12.7 min
   Compared to pre QI (TAC) average waiting time = 28.8 min,
   Equates to 16.1 min or 56% improvement in waiting time for TAC patients.

3. Clinic should finish 15 minutes earlier, all other things being equal.
Improvement strategies could be discussed in a Kaizen event, with as many of the stakeholders as possible attending, to brainstorm realistic ways of addressing the apparent reduced efficiency of the clinic. Kaizen is a Japanese word meaning continuous improvement through small changes and involves all employees. PDSA cycles could be used to test strategies which increase clinician availability and possible scheduling changes, one by one. Focus should be kept on measuring the changes after any PDSA cycle.

The goals of the PDSA cycles tested, should be SMART: specific, measureable, achievable, relevant and time-focused. These objectives are measurable but there is no system in place to note when the patients first meet with a clinician or when patients are discharged from clinic. The Framework for Quality Improvement acknowledges that the need for staff to collect extra data should be minimised and that sharing and displaying of the results is vital in achieving success in a QI project (HSE, 2016). The clinic uses a book to keep note of which radiological and biopsy studies have been requested on all TAC patients as they leave the first clinical consultation. The writer suggests the clinician writes the beginning of the consultation time in this book for each patient. In order to follow the patient’s total time in the TAC process, the scheduled time of arrival could be noted by administration staff and completion time by the clinician on the TAC sheet these total clinic times could be noted and displayed during any trial PDSA cycles. The same procedure could be applied to non-TAC patients by noting scheduled arrival time on the file beside the clinic stamp and the clinician noting finishing time and total clinic time.

The writer suggests a communication system could be put in place to ensure that a minimum of 3 experienced named clinicians (through a rota on ‘Whatsapp’, for example) are ready to see patients at 8 am and that, through a
time notification system in the TAC radiology book, a rate of 4 patients per hour average is achieved and can be monitored. These three experienced clinicians could be, for example, a Registrar or experienced Senior House Officer (SHO), a non-rotating SHO and the Physician Associate. If students or less experienced clinicians are involved in teaching then this would represent a fourth and supplementary clinical addition to the efficient 3 person clinic. If this change is applied, then it would be expected that a maximum wait of 30 minutes to first clinical consultation for TAC patients would be achieved. The knock on effect of this would also mean that other categories of patients would be seen sooner, which is particularly important for patients experiencing the stress of waiting for results.

The clinic environment was an issue for some patients and research discussed in the literature review, pointed to the addition of simple posters of plants improving the ambience which should be considered as an inexpensive QI measure. Furthermore, patients mentioned lack of communication about their length of stay within the clinic process is a problem when informally asked for opinions. Reviewed literature showed how the use of queue information displays could help and could be looked at in a QI project to be implemented in the future. A measure of whether the patient satisfaction increased, with a significant percentage of patients reporting being satisfied or very satisfied with the improved service could be put in place (example in Appendix 6).

3.5 Summary

In this chapter the writer explained the choice of a Lean Six Sigma model of QI and a detailed explanation of how the subsequent DMAIC approach was applied. The project scope and boundaries were identified with the Leader of the QI plan needing to be agreed prior to implementation. A Stakeholder
Analysis was completed to pinpoint key staff for discussion and feedback to facilitate smooth running of the project before a Force Field Analysis could be drawn up. This showed the potential importance of a project leader and better team communications.

A VSM was produced after following the patient journey and measurements of timed processes and resource numbers were made which highlighted several bottleneck points. The reasons for these delays were examined using a cause and effect analysis process and a Gantt simulation chart of clinic scheduling was constructed to clarify the relationship between clinician numbers and patient wait times. The analysis showed that the number of available clinicians and consultation rate were the main factors contributing to the slow patient flow from the clinic start.

Finally, a Kaizen event was suggested prior to PDSA cycles being implemented and measures to indicate the potential success were discussed. A second theoretical new state Gantt was drawn up to show the significant reductions in waiting time that could be achieved after the introduction of increased clinician availability from the start of a clinic. The suggested improvement testing phase will require the setting up of a communication system to organise a rota, a designated person to oversee patient flow and react to problems and timing notification procedures to track improvements. These strategies should achieve the aim of improved clinic patient flow.

The following chapter will focus on evaluating the QI project and discussing the expected outcomes. The ongoing monitoring and placement of control measures to sustain quality improvements will be examined and a dissemination plan will be suggested.
4.0 Evaluation

4.1 Introduction

This chapter will review the proposed QI plan and the expected patient flow outcomes. Using examples of similar QI projects, the process will be critically evaluated against the objectives stated in Chapter 1. As part of the DMAIC approach, an examination of methods to control improvements and sustain results will follow. Finally, proposed outcomes from both a short and long-term perspective will be scrutinised before a potential dissemination plan is put forward.

4.2 Overview of QI Plan and Expected Outcomes

This Quality Improvement project uses Lean Six Sigma methods within a DMAIC approach to examine and improve patient flow through a Triple Assessment Breast clinic (TAC) in a busy teaching hospital. Detailed measurements and analysis show that several waiting room bottlenecks are present. The first waiting room delay comes at the beginning of the process, waiting for the first clinician consultation. This occurs due to three factors—too few clinicians at start of clinic, too slow a consultation rate and the interconnected mismatch between total clinician consultation rate and the number of patients scheduled at any given time. The effect of increasing clinician numbers to 3 from the start of the clinic tested by simulation Gantt scheduling suggests that reducing waiting time to a maximum of 30 minutes from scheduled appointment time to initial consultation for TAC patients, is achievable providing a rate of one patient every 15 minutes is attained. The average waiting time appears to reduce by 56%.

Another expected outcome from achieving this initial consultation rate could be
the reduction of clinic time for clinician-only visits for non-TAC patients to 1 hour from scheduled appointment time. This will require the presence of a senior clinician or consultant from 9 am. A minimum of 4 clinicians would be required at this time. The post QI Gantt simulation indicates that an average time of under 38 minutes which is a 28% improvement could be achieved.

The overall clinic time includes the radiological assessment process, which is noted to have variable long delays, hindering patients' return to the clinic. Radiology process delays will control and limit the reduction in overall clinic time. However, the Gantt chart based on increasing clinician numbers, suggests that a 15 minute reduction in the overall clinic time for TAC patients is possible as a result of the earlier changes.

Prior to testing changes, a measure of patient experience could be put in place then reviewed post changes to see if a significantly increased percentage of patients report being satisfied or very satisfied with the revised service. Providing the rate and personnel availability changes are monitored with the noting of consultation times and a rota and communication system is put in place, these outcomes could be achieved within one month of implementation. This would allow staff to become accustomed to the new speedier flow expectations and process of noting of timings.

4.3 Evaluation

4.3.1 Aim and Evaluation of Control Phase of DMAIC

Once patient flow improvements have been achieved, the measurement strategies implemented to calculate the size of the changes can be continued as standard practice to control and sustain the gains made and feedback
successes. (Appendix 4 shows the process flow with control measures marked). Monitoring of consultation rate will also act as a control measure. The control phase of DMAIC is focused on choosing methods to sustain the improvements (Table 5).

**Table 5: Evaluation and Control Strategies**

<table>
<thead>
<tr>
<th>Staff responsible for task</th>
<th>Task/strategy</th>
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<tbody>
<tr>
<td>1 Administration</td>
<td>Notation of patient scheduled appointment time by administration team and</td>
</tr>
<tr>
<td>2 QI team:</td>
<td>The introduction of a designated person (Flow Co-ordinator) rotating role</td>
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<tr>
<td>3 Flow Co-ordinator</td>
<td>-track flow delays</td>
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<td>-use online or group text system to request extra clinician help in clinic</td>
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<td></td>
<td>-monitor consultation rate</td>
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<td></td>
<td>-Visual display of successful waiting time reductions for both staff and patients to see and celebrate. Eg. Bar charts or plotted graphs of measurement achievements</td>
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<td>4 All clinicians</td>
<td>The use of social media for access and display of a clinician rota for clinic</td>
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<tr>
<td>5 All clinicians</td>
<td>An online calendar noting key staff predicted absences for training, conferences or annual leave.</td>
</tr>
<tr>
<td>6 Clinicians</td>
<td>record the consultation time in the TAC clinic radiology referral book to achieve TAC patient initial consultation completion by 9.15am.</td>
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<tr>
<td></td>
<td>individual consultation rate tracked if the clinician initials beside the patient details.</td>
</tr>
<tr>
<td>7 Clinicians</td>
<td>Notation of discharge times by clinicians on TAC sheet and patient medical records.</td>
</tr>
<tr>
<td>8 QI team</td>
<td>Review of quality and flow progress- set up by a small team of senior staff regularly to align with rotating staff changes as a staff induction and debriefing session every three months.</td>
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</table>
The similar improvement and control measures have been successful in other evaluated projects in healthcare, providing the writer with some confidence that the approaches chosen are appropriate. For example, Lean Six Sigma methods improved efficiency of patient flow in an Otolaryngology clinic by using mapping and a time-stamped observation study to produce significant improvements in reducing clinic bottlenecks (Lin, 2013). The authors also found that engagement of staff was vital to the success of the improvement plan. This point was reinforced by a case study of the successful implementation of lean improvement methodology in a specialist outpatient service in Hong Kong (Chan, 2012).

Grima et al (2014) also support the writer’s suggestion of a co-ordinator role and a small team approach to overseeing this plan. They added that it was fundamental that the appointed person be a champion of quality improvement, understand the DMAIC approach and be familiar with why measurements are being followed (Grima et al., 2014). Additionally, in Wisconsin, Thedacare clinic also found a key component to success was the allocation of responsibility to one person for clinic flow with an intervention process in place (Brandenburg et al, 2015).

4.3.2 Monitoring & Review

During the initial trial implementation month, a checklist could be used to record each clinic’s timing data against the desired objectives of the QI plan (see Appendix 5). This could be completed by the designated member of staff for patient flow during and after each clinic. The clinician should calculate the total clinic time for patients on the TAC sheet or medical record. Average clinic time can then be calculated and displayed along with a simple ‘yes’ or ‘no’ as to whether the TAC clinic was complete by 9.15. If the TAC patient consultations
were not complete by the agreed time, the consultation rates could then be reviewed to discover why. This process can help focus staff attention on time and flow which should become a habit over a period of weeks. This full review will not be necessary at every clinic as time goes on.

An overall review of quality and flow progress can be set up regularly by senior staff to align with rotating NCHDs every three months and act as a staff induction training and debriefing session. The opportunity to talk about successes, make changes and prepare new quality improvement plans can be part of the culture of the clinic stakeholders. This suggestion is supported by Pocha (2010) who examined challenges of Six Sigma implementation at a Veterans Affairs Medical Centre and found that staff ‘buy in’ and involvement and the incorporation of improvement methodology into the hospital culture is important for success (Pocha, 2010).

Grima et al (2014) also point out that projects should follow a plan and have a definite start date and end date, separated by no more than a few months, which would support the proposed assessment of the plan after three months from implementation (Grima et al., 2014).

It would be advisable that patient feedback is included into the review process through the use of a questionnaire, satisfaction assessment or suggestions box (example is given in Appendix 6). As pinpointed in the literature review, patient satisfaction is strongly linked to wait time, so satisfaction levels would be expected to increase as waiting and queues reduced. The inclusion of infographics including details of the results of QI measures may help staff and patients by keeping people informed of each small improvement success and reduce stress. Furthermore, improving the ambience of the waiting area with
posters of plants and nature could add to this effect.

Celebrating successes and feedback to all staff on the effects of the improvement strategies should continue indefinitely. A ‘what can we add to this next’ attitude to QI could be timetabled and encouraged. Focus should remain on patient-centred care with a multi-disciplinary team approach to continuous improvement of the whole process from GP referral to patient discharge.

4.3.3 Expected Results

In the short term the project plan expected results should align with the aim of improving flow and the extent of the reductions in waiting time is discussed in section 4.2. As the habits of timing documentation become ingrained it would be anticipated that staff feel the positive effects of a smoother patient flow. They should notice the backlog of waiting files is smaller and the waiting room less busy. Staff stress levels should reduce but in order to notice this, a short questionnaire could be prepared and utilised prior to the implementation of this plan and again at three months to gauge stress levels and causes (example Appendix 7). Additionally, as patient dissatisfaction reduces, staff may notice fewer patient questions about queuing and waiting.

It is hoped that the improvements will be sustained throughout the first three months to the next new rotation review time. The three-monthly reviews can give stakeholders an opportunity to discuss progress, make adjustments and plan further improvements to speed patient flow and improve satisfaction.

Long-term expectations will focus on enduring improvement through support and monitoring. In future there may be a need to expand capacity in outpatient clinics, if demographic projections are realised. Tighter control of patient flow may accommodate increased patient numbers providing both clinical and
radiological resources are available. The opportunity is there for other clinics to adopt these ideas once objectives are achieved and sustained after a six month period.

4.4 Dissemination Plan

It is intended that this QI Plan will be presented to key stakeholders including the Sponsor to discuss findings and gather feedback. This may include a communication plan for presentation to staff at a future date. It would be helpful to have a multi-disciplinary level meeting to agree on the proposed methods of data collection, communication, potential pre-implementation questionnaires and the likely choice of change agent and flow co-ordinator.

The writer hopes that this QI Plan meets its aim and objectives and additionally, frontline personnel are more content with their clinic experience. If successes are forthcoming a poster could be designed to display a synopsis of the overall plan with results, to be presented to staff and interested parties outside of the Breast and General surgery teams.

4.5 Summary

This chapter described the continued used of timing measurements to control and monitor progress and evaluate the success of the QI plan under the DMAIC approach. The expected short and long-term outcomes and expectations were considered. Methods of sustaining achievement of the specific aim of improving patient flow, as a result of a Lean Six Sigma QI model having been instigated, were discussed. The importance of leadership and a designated co-ordinator
role within a small project team in addition to staff involvement, regular feedback and training sessions were recommended and supported by evidence in the literature. The final objective of improving patient and staff satisfaction could be evaluated by putting in place a questionnaire or feedback mechanism before and after implementation. Lastly, methods of involving stakeholders from the beginning with satisfaction questionnaires, pre-implementation training and feedback sessions, were examined including a possible dissemination plan.

The final chapter will critique the QI plan and the project impact on patients, other stakeholders, the service and the organisation as a whole. Recommendations to improve the probability of overall success will be discussed including an examination of areas the writer feels they may approach differently if the process was to be repeated. Finally, consideration of personal learning and the implications of the project process on the writer’s future career will be completed before final conclusions are made.
5.0 Discussion & Conclusions

5.1 Introduction

This final chapter examines the project impact on patients, stakeholders, the service and the organisation and critically evaluates the QI plan as a whole. The strengths and limitations of the plan are discussed including recommendations and supporting strategies to improve the success potential. Any areas the writer believes they may approach differently if the process is to be repeated in the future, will be considered including personal learning and the implications of the project process on the writer’s future career will be completed before final conclusions made.

5.2 Project Impact

5.2.1 Stakeholders

The improvement of patient flow should enhance the clinic experience for all staff with basic workloads not changing, just a couple of administrative additions. Some clinicians are already achieving the new preferred consultation rate of 4 patients per hour. More clinicians delivering this rate and seeing patients from clinic onset will result in reduced waiting time in busy waiting rooms and the accumulation of files will be smaller, potentially reducing clinician stress. Additionally, patients waiting for important results will be not be waiting as long. Benefits to patients of reduced waiting times and time saved are numerous: less time away from their employment, reduced parking charges, fewer childcare problems and hypothetically, less stress which can be monitored by feedback forms. Specialist Breast nurses and administrators who support these stressed, nervous and frustrated patients as they wait, should also notice positive effects from improved patient flow.
5.2.2 Practice

This QI project aims to examine patient process flow and recommend strategies to improve efficiencies by way of a QI plan. The impact of the this plan on clinic practice should be seen in the change to a steadier work rate and workload from the clinic onset, rather than the pre-implementation slower start and the apparently stressed mid-clinic stages as a backlog of patients builds up. The new process strategies will focus clinicians on the speed of first TAC patient consultation rate and encourage a more target-based mindset than previously. The early clinic flow rate being monitored may feel intrusive to clinicians, but the intention is to reduce stress for staff and improve patient satisfaction by reducing periods of waiting.

The number of clinicians at any given time would be pre-organised and a decision-making senior clinician or consultant being present from an agreed time. A rota and online communication system, to ensure sufficient clinician cover is available, could be put in place and this system can be utilised by a designated flow co-ordinator to react to delays immediately should they happen.

These control measures should be monitored to assess the success of the improvements on a daily and longterm basis. The improvements will require the clinician to monitor patients time spent in the clinic which can be effectively completed by noting times and a simple end calculation. The process flow map with QI changes can be seen in Appendix 4. Further impacts will be discussed in project strengths and limitations to follow.

5.3 Project Strengths

5.3.1 Strength of approach

The writer believes that examining the overall patient journey through the clinic
is vital to uncovering areas requiring improvement. This exposed several issues for the clinic which could be improved. The clinic staff have been open and helpful through the project period and indicated their wish to see process improvements. It became clear that when dealing with variability and reduction of wasted resources, a Lean Six Sigma approach Quality Improvement plan was most appropriate, particularly given the support and enthusiasm of the staff which is fundamental to the Lean process.

Putting a structure to the improvement process by following DMAIC should provide a level of confidence that the suggested improvement strategies will be successful in achieving improved patient flow and reduced clinic time. The research and the analysis of the theoretical reductions in waiting time indicates substantial improvements can be achieved.

5.3.2 Existing work structure.

The clinic is already providing a service which reaches and surpasses Key Performance Indicators (KPIs) so the results, structure and level of expertise were not in question; it is a process flow issue. Choosing to improve ‘time to first consultation’ would be the easiest area to control for the staff overseeing the plan, with minimal change or extra work. The process is not being changed. Instead, work rate, communication and clinician availability checking processes are added.

The staff involved are experienced, skilled and have a positive attitude to change and improvement of this process, which is a further strength of this QI plan. The culture of the organisation is often cited as the main reason why QI fails so enthusiastic frontline staff, will be a significant driving force for success.
5.3.3 Cost Neutral

Concentrating on initial consultation stage is financially cost free. Budgeting is important in healthcare and the opportunity to see improvements without increasing costs will be welcomed. The implementation of these relatively simple strategies can be encouraged by management to be applied to other outpatient clinic services within the hospital.

Everybody should gain: Patients move through clinics faster and satisfaction rise; clinicians workload will not be significantly changed and stress levels may reduce due to a steadier flow; other frontline staff should feel the benefits of these two results and clinics are more likely to finish on time. It is difficult to see what negative effects or limitations this plan may have.

5.4 Project Limitations

There are two main limitations to this QI plan. The first would the possible unintentional effect of the increased bottlenecks further along the process. The quicker initial patient processing rates could result in the patient arriving for radiological assessment earlier and if all the TAC patients are assessed by 9.15 this would lead to many patients arriving at radiology within a short time period, faster than the department may be able to handle.

Additionally, two breast clinics may run concurrently, which could mean as many as 26 patients arriving at radiology within an hour, should both consultant clinics choose to adopt this plan. However, this does not mean that patients will spend more overall time in the clinic process. This could be avoided by rescheduling the TAC patients so that their initial arrival time to clinic is spread out over the first 2 hours rather than block booked within the first hour. The
writer suggests that this rescheduling be the subject of the next part of the QI process once the initial clinician work flow rates are well established and communication strategies are in place.

The second limitation is the small sample size taken for measurement purposes with only 10 patients and 4 clinicians being observed. It was completed over 5 different clinics to give an overview and small representative sample of process experience. The writer would have preferred to have taken larger sample sizes over these 5 clinics but this would have required more than one researcher collecting data on a given day due to dual location nature of the clinic process. The large variability of the measures would still be apparent with a greater sample size as the earlier stages of the clinic process were extremely unpredictable. The writer realises that initial days of implementation will be unlikely to fully realise the improvement outcomes.

5.5 Recommendations

This section puts forward two sets of recommendations. The first being strategies to apply to achieve the aim of improved patient flow in the outpatient clinic (Table 6) and the other set are general recommendations to support the proposed strategies and patient and staff satisfaction (Table 7). If the latter are established at implementation, measureable improvements should be seen immediately.

The writer suggests discussing these strategies with a small group of key implementers (QI team) before introduction to all stakeholders to anticipate questions and guide the session to a positive conclusion.
<table>
<thead>
<tr>
<th>No.</th>
<th>Recommendation</th>
<th>Person responsible</th>
<th>Additional Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>3 clinicians ready start the TAC clinic by 8am</td>
<td>Individual</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>4 clinicians in consults with patients by 9 am</td>
<td>individual responsibilty</td>
<td>includes 1 senior decision-making clinician/consultant</td>
</tr>
<tr>
<td>3</td>
<td>senior clinician/consultant should be available for consults/TAC</td>
<td>senior clinician</td>
<td>after seeing review patients personally</td>
</tr>
<tr>
<td>4</td>
<td>The designation of an experienced staff member as patient flow Co-ordinator</td>
<td>QI team</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Online or group text communication system put in place</td>
<td>QI Team</td>
<td>to timetable a rota of available clinicians for 8 am and 9 am clinic start</td>
</tr>
<tr>
<td></td>
<td></td>
<td>QI Team</td>
<td>to notify staff of absences and when cover required</td>
</tr>
<tr>
<td></td>
<td></td>
<td>QI Team</td>
<td>to enable patient flow co-ordinator to request extra clinician help as required</td>
</tr>
<tr>
<td>6</td>
<td>The noting of patient scheduled arrival times on TAC sheet or patient records</td>
<td>Administration staff</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Clinicians recording consultation times</td>
<td>clinicians</td>
<td>- completion time of initial consultation in TAC clinic radiological assessment book and initialing beside the patient details</td>
</tr>
<tr>
<td></td>
<td></td>
<td>clinicians</td>
<td>- time of discharge after second TAC consultation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>clinicians</td>
<td>- total clinic time for each patient</td>
</tr>
<tr>
<td></td>
<td></td>
<td>clinicians</td>
<td>time of discharge for non-TAC patients and clinic waiting time</td>
</tr>
<tr>
<td>7</td>
<td>A rate of average 4 patients per hour to be achieved by clinicians</td>
<td>Flow co-ordinator</td>
<td></td>
</tr>
</tbody>
</table>
**Table 7: Supporting recommendations**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>The designated flow co-ordinator is a non-rotating staff member either one of the Specialist Breast Care nurses, a non-rotating physician or a Physician Associate</td>
</tr>
<tr>
<td>2</td>
<td>Patient appointment letters recommend that patients do not arrive more than 15 minutes before appointment time to control the number in the waiting room.</td>
</tr>
<tr>
<td>3</td>
<td>A measure of patient satisfaction is employed, before and after the QI plan is implemented</td>
</tr>
<tr>
<td>4</td>
<td>A measure of staff stress and clinic satisfaction is employed before and after implementation</td>
</tr>
<tr>
<td>5</td>
<td>Info-graphics are displayed of the QI aim and progress for staff and patients to see</td>
</tr>
<tr>
<td>6</td>
<td>Waiting area ambience is improved with plants or posters of plants</td>
</tr>
</tbody>
</table>

**5.6 Learning on Quality Improvement**

The most stark learning point for the writer was the importance of not jumping to conclusions regarding which elements need to be adjusted. Initially, I felt that the timing of radiology access would be my focus as this was the rate limiting resource point creating the largest bottleneck. When I examined the different processes and the reasons for delays at different stages I realised that choosing a process point that could be realistically changed to achieve patient flow improvements does not necessarily mean picking the most obvious target. I could have created a plan to reduce waiting times in radiology but without the tightening of clinician workflow rate, very little difference in overall rate and patient satisfaction would be achieved. Additionally, frontline clinic staff would have no improvement to their experience of the clinic.

The stakeholder analysis process ensured that I identified all the people who could be affected by any change and those who could influence it’s success. As I spent more time with staff, the issue of slow starts to clinics became more apparent and was regularly mentioned. I realised that working on a QI plan and
having staff on board would vastly improve the chance of involvement and eventual implementation.

One of the most important parts of this QI experience was reading examples of other successful QI projects which employed similar methods to comparable situations. The literature review process encouraged me to examine working examples of tools and choose the most appropriate. On more than one occasion I changed my path after realising some methods were not adding to the QI project.

With little experience of quality improvement on this scale, following the proven approach of DMAIC was helpful, making sure I focused on each phase and giving me a structure to apply my QI knowledge. However, preparing a clear roadmap for a plan was more involved than I thought. Picking control tools and measurements that can be easily replicated and followed over time to track improvements, was a challenge as was having a detailed understanding of the administrative requirements. I have learned the importance of having a clear and workable plan to follow, making QI as easy and smooth running as possible for staff.

I enjoyed the problem solving nature of this QI dissertation and appreciated the chance to potentially make real improvements to a process within the Health Service. I would enjoy the opportunity to apply this new knowledge and understanding to further processes.

5.7 Summary and Conclusion

This quality improvement project uses Lean and Six Sigma tools and DMAIC
methodology to produce a QI plan to achieve improvement in patient flow and reduce waiting times in an outpatient breast clinic. The detailed examination of clinic measurements and use of Value Stream Mapping revealed large variances in consultation and process rates and unnecessarily slow flow of patients through the early clinic stage. Tighter control of clinician availability through online timetabling and the monitoring of consultation rates by a designated flow co-ordinator at the start of clinics was shown to potentially achieve significant reductions in waiting times. The project objectives were all met with the proposed QI plan recommendations for the clinic not incurring costs, fundamentally changing the clinic processes or the patient journey.

The methods used are easily transferable to other clinics within the organisation which could apply similar strategies to improve patient flow. Achieving the overall aim of improving patient flow will hopefully increase patient satisfaction and reduce staff stress which can be verified by comparison of questionnaires before and 3 months after the planned implementation date. Finally, the continued control and monitoring of these improvement strategies and regular staff induction, training and feedback sessions will help deliver a continuous QI ethos in the breast outpatient clinic.
References


Central Statistics Office, 2015: *CSO Population and labour force projections 2016-2046* fig 5 p18


Poche, C., 2010. Lean six sigma in health care and the challenge of implementation of six sigma methodologies at Veterans Affairs Medical Center. *Quality Management in Health Care* 19(4); p312-318.


Appendices

Appendix 1: Clinic Organisational Structure

- Consultant breast surgeon
  - Consultant’s secretary
  - Registrar
    - 3 Breast care nurse specialists
    - Administration
    - Physician Associate
      - PA student
    - SHO
    - Senior House Officer (SHO)
      - SHO
      - RCSI tutor
      - +/- Intern
Appendix 2: Full Clinic Measurements and Data

Note:

- Demographic Profiles of patients sampled were not noted and sample size 10, random.

1. TAC patient total clinic time: Range 166 min to 247 min, av 194, mean 199

2. The number of clinicians per clinic, taking patients for consultation:
   - 8am range 1-2, 8.15 range 2-3, 8.30 range 2-3, 8.45 range 2-3, 9am range 3-4, 9.30 range 3-5
   - Consultant / Acting Consultant arrives in clinic: 9.00 - 9.30

3. Time of arrival to time of first clinical consultation for TAC patients (not including the consultation time):
   - Wait time range: 3 min to 48 min
   - Mean wait time: 32 min
   - Median wait time: 35 min

4. First consultation time (n=4 clinicians) with TAC patients and between patients was also measured 8 am to 10 am:
   - Consultation time range: 6 min to 17 min
   - Mean consultation time: 11min
   - Median consultation time: 10 min 15 sec
   - Mean number of patients seen per hour: 3.3 pts
   - Median number of patients seen per hour: 3.1 patients

5. TAC patients average waiting time for mammogram (n=8):
   - 66 min (range 12 to 118)
   - TAC patients average waiting time for ultrasound only (n=2):
     - 38 min (range 8 to 57)
On return TAC patients wait for 2nd Clinical Consultation:

Mean 31, Median 34, Range 3 min to 47 min

6. Waiting to be seen by a consultant (n=9) added between 5 min and 27 min to clinic time.

**Table:** Individual sampled times with mean, median tabulated

<table>
<thead>
<tr>
<th>Measurements (minutes) [Sample No.]</th>
<th>Range (minutes)</th>
<th>Mean (minutes)</th>
<th>Median (minutes)</th>
<th>Mean /hour Median /hour</th>
</tr>
</thead>
<tbody>
<tr>
<td>The TAC patient total clinic time</td>
<td>166, 177, 187, 189, 198, 200, 203, 217, 222, 247 [10]</td>
<td>166 to 247</td>
<td>200</td>
<td>199</td>
</tr>
<tr>
<td>Time of arrival to time of first clinical consultation for TAC patients</td>
<td>3, 17, 30, 31, 34, 36, 37, 41, 44, 48 [10]</td>
<td>Wait time 3 to 48 minutes</td>
<td>wait time: 32 min</td>
<td>wait time: 35 min</td>
</tr>
<tr>
<td>First consultation time (n=4 clinicians) with TAC patients</td>
<td>Consult Rates: 2.1, 2.3, 3.9, 4.9 [4]</td>
<td>6 to 17 minutes</td>
<td>11 min</td>
<td>10 min</td>
</tr>
<tr>
<td>On return TAC patients wait for 2nd clinic Consultation</td>
<td>3, 13, 24, 27, 29, 34, 39, 42, 44, 47 [10]</td>
<td>3 to 47 minutes</td>
<td>31 min</td>
<td>34 min</td>
</tr>
<tr>
<td>The number of clinicians taking patients for consultation</td>
<td></td>
<td>8am: range 1-2</td>
<td>8.15: range 2-3</td>
<td>8.30: range 2-3</td>
</tr>
<tr>
<td>Waiting to be seen by a consultant (n=9)</td>
<td>5, 8, 9, 11, 14, 16, 17, 19, 27 [9]</td>
<td>added 5 to 27 min to clinic time</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Appendix 3: Cause and Effect Diagram

Breast Outpatient Clinic

Problem or Outcome:
Reducing patient Waiting Time

Environment
- Nothing for patients to do-
wait feels longer
- Overcrowded waiting room- patients leave
- Difficult to find correct clinic
- No communication system on length of wait

Clinics staff
- Clinicians-too few at start
- Senior clinician not available
- Clinician Consultation rate too slow
- New NCHD's inexperienced

Other people
- Radiologists multi-tasking
- Not enough radiologists when busy
- Clinician Consultation rate too slow

Appointment System
- Not warned of potential delays and arriving early
- Not enough parking delays arrivals

Equipment
- Too few mammogram machines when busy
- Radiology results delayed to physicians
- No live updates on scans notification on system

Method/Process
- No system to inform of absences
- Scans for all TAC policy
- All TAC to see Consultant
- Process on two levels- not disabled/elderly friendly
Appendix 4: Clinic Patient Flow with QI Strategy Points

Symptomatic patients, Visit GP

GP Triage & Referral

Specialist Breast Care Nurse - Triage urgent?

YES

Appointment check in

Clinical consult 1

Radiology

Mammogram

Ultrasound

Biopsy

Clinical Consultation 2

Consultant review

Check out

Review patients

NO

Consultation start time of non-TAC noted by Clinicians

TAC patient flow

Non urgent patient flow

Review patient flow

- online communication/rota
- admin note patient appointment time
- flow co-ordinator monitors rate (checklist)
- 8 am = 3 clinicians available
- 9 am = 4 clinicians available
- Clinicians note patient time consult complete
- times noted in radiology book
Appendix 5: Checklist Monitoring Clinic Flow

4-weekly Clinic Flow Checklist

Flow Co-ordinator Name ________________________________

| Clinic date: | Clinic date: |
| Consultant: | Consultant: |
| No. of TAC patients: | No. of TAC patients: |
| No. of TAC patients complete by 9.15 | No. of TAC patients complete by 9.15 |
| Help requested? | Help requested? |
| / Time? | / Time? |
| Clinic date: | Clinic date: |
| Consultant: | Consultant: |
| No. of TAC patients: | No. of TAC patients: |
| No. of TAC patients complete by 9.15 | No. of TAC patients complete by 9.15 |
| Help requested? | Help requested? |
| / Time? | / Time? |

Comments:

_______________________________________________________________

_______________________________________________________________

_______________________________________________________________

_______________________________________________________________

85
Appendix 6: Patient Satisfaction Feedback Form

In order to reduce delays for the patients in the clinic, all staff are testing ways to improve the clinic process.

Please take a minute to answer these questions. Thank you.

1. How satisfied are you with the clinic experience overall?

Not happy           disappointed           satisfied           very satisfied

Please circle one

2. How satisfied are you with the seating and facilities in the waiting area?

Not happy           disappointed           satisfied           very satisfied

Please circle one

3. How satisfied are you with the length of time you were in the clinic?

Not happy           disappointed           satisfied           very satisfied

Please circle one

4. How satisfied are you with the communication about waiting times?

Not happy           disappointed           satisfied           very satisfied

Please circle one

Would you like to suggest a change to the clinic experience?

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
Appendix 7: Staff Satisfaction Feedback Questionnaire

In order to reduce delays in clinics and improve staff satisfaction and stress levels quality improvement strategies are being designed and tested.

Please take a minute to answer these questions. Thank you.

1. How satisfied are you with your clinic experience overall? Please circle one

1 2 3 4 5 6 7 8 9 10
Not happy very satisfied

2. How stressful can outpatient clinics be for you?

1 2 3 4 5 6 7 8 9 10
not stressful very stressful

3. How satisfied are you with clinic process overall?

Not happy could be better satisfied very satisfied
Please circle one

4. How satisfied are you with clinic communication processes between staff members?

Not happy could be better satisfied very satisfied
Please circle one

How would you like to improve to the clinic experience?

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________