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An Investigation of Factors Contributing to Long Waiting of Patients Collecting Repeat Medication in a Tertiary Hospital Pharmacy

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AN INVESTIGATION OF FACTORS CONTRIBUTING TO LONG WAITING OF PATIENTS COLLECTING REPEAT MEDICATION IN A TERTIARY HOSPITAL PHARMACY

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A Research Report for a 50/50 Masters degree submitted to the Faculty of Engineering and the Built Environment, University of the Witwatersrand, in fulfilment of the requirements for the degree of Masters in Engineering

2022

DECLARATION

I, **Rekgopetse Victoria Oladipupo**, hereby declare that the work on which this study is based is original, except where acknowledgements indicate otherwise.

This research report is submitted for the 50/50 Masters degree of Industrial Engineering at the University of Witwatersrand. Neither the whole work nor any part of it has been submitted before for any degree or examination at this or any other university.

Signed……..…on the……day of……..

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DEDICATION

To the Lord God Almighty

Thank you for affording me the opportunity to do this work.

Your mercies are new every morning (Lamentations 3:22-23) and Your grace is sufficient to me (2 Corinthians 12:9).

I can do all things through Christ who gives me the strength (Philippians 4:13).

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ACRONYMS

ADC	Automated Dispensing Cabinets
CCMDD	Centralized Chronic Medicines Dispensing and Distribution
DMAIC	Define Measure Analyze Improve Control
DPMO	Defects per Million Opportunities
FIFO	First In First Out
GPP	Good Pharmacy Practice
ICSM	Integrated Clinical Service Management
IV	Intravenous
JIT	Just in Time
LBPA	Learner Basic Pharmacist Assistant
LIFO	Last In First Out
LSS	Lean Six Stigma
MBWA	Management by Walk About
NDoH	National Department of Health
NHI	National Health Insurance
OPD	Outpatient Department
PHC	Primary Health Care
PBPA	Post Basic Pharmacist Assistant
PDSA	Plan Do Study Act
PWT	Patient Waiting Time
QIP	Quality Improvement Plan
SA	South Africa

SAPC South African Pharmacy Council

TOC Theory of Constraints

TPS Toyota Production System

UK United Kingdom

UNC University of North Carolina

USA United States of America

VSM Value Stream Mapping

WIP Work in Process

WHO World Health Organization

ABSTRACT

According to the World Health Organization (WHO) patient waiting time is identified as a key measurement to a responsive healthcare service and is an important indicator of quality of services offered by hospitals (NDoH, 2011) as it affects the patient's responsiveness to the services received (NDoH, 2011; SA FAM PRACTICE, 2008; Tegabu, 2008; Pandit et, al. 2016). Long waiting times at healthcare facilities undermines the services rendered resulting in compromised or unfulfilled patient care (Afolabi & Erhun, 2003).

This research studies the processes associated with the collection of repeat medication in a tertiary hospital pharmacy in order to identify value adding activities and non-value adding activities that could be impacting patient waiting time using the Lean thinking concept of driving out waste.

A qualitative observational method was therefore employed to observe all the steps involved during the journey of the patient collecting repeat medication from the registration point until medication was issued at the pharmacy. Value stream mapping (one of Lean Thinking principle) was employed to analyze the processes that took place. Patient waiting time was also measured from the registration point to the pharmacy.

On average patients had to wait a total 159 minutes before they could access services both at the registration point (67 minutes) and at pharmacy (92 minutes). The service time was 29 minutes at both registration point (11 minutes) and pharmacy (18 minutes). Of the 18 minutes pharmacy service time; eight minutes were found to be value-adding while 10 minutes were non-value-adding mainly due to prescriptions waiting on queue to be picked, waiting to be signed by the pharmacist and waiting to be issued out to the patient.

Lack of a dedicated pharmacy service points exclusively for chronic repeat patients, manual dispensing, illegible doctor's prescriptions, were found to prolong the time it takes the Pharmacist to complete a prescription. Post Basic Pharmacist Assistants performing duties that could be performed by a less qualified staff (e.g., Learner Basic Pharmacist Assistants) during peak hours was not value adding and thus decreasing productivity. The level of staff commitment in addressing issues of quality such as long waiting time was questionable. The demand / workload and capacity during the early hours of business at the registration point did not seem to match, thus resulting in bottlenecks at the patient registration point and throughout the system.

CHAPTER 1

INTRODUCTION

1.1. RESEARCH BACKGROUND

Patient waiting time refers to the amount of time a patient spends waiting for services before being seen by the medical staff for consultation or treatment (NDoH, 2015). According to the World Health Organisation (WHO) patient waiting time is identified as a key measurement to a responsive healthcare service and is an important indicator of quality of services offered by hospitals (NDoH, 2011). Studies show that patient waiting time affects the patient's responsiveness to the services received. The more the waiting the less likely the patient will continue using the medical services or comply with the medical treatment plan (MACPAC, 2016). A survey conducted by Statistics Canada on healthcare services revealed that 20% of those who required healthcare services had difficulties accessing care because of long waiting for health care (Sanmartan, 2002).

According to a study conducted at Tshwane District Hospital in South Africa (SA), patients have to wait in most hospitals (SA FAM PRAC, 2008). Waiting time varies depending on the service capacity of the particular hospital. Waiting time is also called "customer sacrifice". Customer must sacrifice their time and other opportunities in order to obtain desired health services (SA FAM PRAC, 2008). This from a customer's point of view is non-value adding and thus considered to be wasteful (Liker, 2004; IHI, 2005).

The Policy on Quality in Health Care for South Africa (2015), defines quality as getting the best results possible within the available resources while the WHO defines quality in health care as the level of attainment of health systems' intrinsic goals for health improvement and responsiveness to legitimate expectations of the population (NDoH, 2015). The SA National Core Standards which are aimed at setting the benchmark standards of quality care against which delivery of services can be monitored identifies waiting times as an indicator of quality health services (NDoH, 2019). Patient waiting times is listed among the six key priorities for improving health services (NDoH, 2019). According to the National Department of health's policy on management of patient waiting times in outpatient departments, waiting times has been standardized as follows:

Table 1: Standardized Patient waiting time in various public health facilities (NDoH, 2015).

Level of a hospital	Patient waiting time (in hours) for service/s per visit	Total time (in hours) spent by a patient per visit
Specialized hospitals	1	2

Primary Health Care (PHC)	2	3
District Hospitals	2	3
Regional hospitals	3	4
Tertiary hospitals	3	4

A patient's experience of waiting can influence the patient's perceptions of service quality. In a study carried out at the University of Southern California, Los Angeles, USA, it was shown that the overall satisfaction of patients with pharmaceutical services is closely related to their satisfaction with waiting time (Afolabi & Erhun, 2003). Lengthy waiting time has long been considered frustrating to patients and thus appears to be a consistent and significant potential cause of patient dissatisfaction. A strong relationship between patient satisfaction and long waiting time has been demonstrated by many studies (Afolabi & Erhun, 2003; Tegabu, 2008; Pandit et, al. 2016).

1.2. PROBLEM STATEMENT

Patients on chronic medication usually visit a hospital, a clinic or a pharmacy on a monthly basis to collect their repeatable chronic medication. At a tertiary academic hospital in Gauteng Province SA, approximately 500 chronic patients visit the hospital daily to collect repeat medication. The waiting period from the arrival of the patient in the hospital to the time he or she collects medication ranges from 2 hours to 8 hours, which is not aligned with the standardized patient waiting time of 4 hours (maximum) for a tertiary hospital.

Upon arrival in the hospital there are processes that are followed before the patient can be issued with medication from the hospital pharmacy. For example, the patient first has to wait in the queue to get a file, then join another queue to register the file and pay before they can join the pharmacy queue for collection of medication. At the pharmacy patients are allocated numbers while waiting and they are called sequentially to the available window to receive their medication. Inside the pharmacy there are processes that unfold before a prescription is dispensed. Patients collecting repeat medication have been found to wait long before receiving their medication. They usually arrive as early as 6 am only to leave the hospital at 4 pm or later. Most of these patients are stable and live active lives. However, a full day that could have been productive is wasted in various queues in the hospital just to collect medication. In a year this can amounts to 12 days of absence from work considering that the patient has to collect chronic repeatable medication every month. Numerous complaints from patients have been submitted to the hospital complaints desk related to long waiting times. According to Tana (2013), long waiting for services result in dissatisfied clients and it is regarded as poor service delivery. In 2011, the South African Ministry of Health identified

reduction of waiting times as one of the key priorities to improving the quality of health care services in SA (NDoH, 2011).

There is thus a need to study the various processes involved in the patient receiving medication and identify factors which are value adding and non-value adding in the system and to provide suitable recommendations

1.3. RESEARCH QUESTION

How can the waiting period for collection of chronic medication at a hospital pharmacy be improved?

1.4. RESEARCH OBJECTIVES

The objectives of this research were to:

- Identify the factors that contribute to long waiting in the registration of chronic repeat patients and dispensing of a prescription.
- Investigate ways of eliminating or reducing wasteful practices in these processes.
- Evaluate opportunities for improvement using a benefit matrix.

It is hoped that this study will provide another view to the body of knowledge in terms of a qualitative approach in identifying root causes for patient waiting time in a pharmacy especially with the employment of lean tools to detect wasteful practices in a pharmacy setting.

1.5. SUMMARY OF RESEARCH METHODS

A qualitative observational method was employed to carry out this study. The researcher observed the processes that took place when a patient collects repeat medication from the hospital pharmacy. Approval from the University of the Witwatersrand Human Research Ethics Committee (Medical) was obtained prior to commencing with the study. A clearance certificate number M190286 (Appendix A) was thus allocated to this study.

1.6. DELIMITATIONS

- The timeframe for the data collection of this research was limited to two weeks (10/06/2019 to 27/06/2019).

1.7. OUTLINE OF CHAPTERS

In Chapter 2, an overview of the literature regarding patient waiting times is presented. Tools available in the field to address patient waiting time and previous studies conducted to address long waiting times in pharmacies are also looked into.

Chapter 3 describes the methodology employed to carry out this study.

Chapter 4 provides the results of this research.

Chapter 5 presents the discussions based on the research findings using relevant literature.

Finally, in Chapter 6 conclusions are drawn based on the research question, objectives and results of the study. Recommendations to address the issues identified in the study are also presented.

CHAPTER 2

LITERATURE REVIEW

2.1. INTRODUCTION

In this chapter, the literature related to waiting times of patients in a pharmacy and previous studies within the context of the study will be discussed. Tools available in the field to address patient waiting time and their relevance to addressing long waiting times in pharmacies are also flagged.

2.2. CAUSES OF LONG WAITING TIME

In their study of the Efficiency of Waiting Time in an Outpatient Pharmacy, Alodan et.al (2020) identified the following to be the pharmacy's major problems contributing to long waiting times:

- Prescriptions are written manually by doctors which might be difficult to read by pharmacists and also, the medicine might not be available at the pharmacy. This is supported by a South African study by Modi et.al (2022) on the impact of illegible prescriptions on dispensing practices.
- Lack of patient categorization, all types of patients are served from the same window. Each type of patient consumes the pharmacist's time differently. For example, the special needs & low immunity patients require more time since the pharmacists needs to explain thoroughly the prescription. On the other hand, the repeat / refill patient service should be by itself and fast.
- The pharmacy serves all outpatients from all clinics which results in long patient waiting time at the pharmacy.
- High number of unclaimed prescriptions which requires storage and consumes the pharmacist's time.
- The pharmacy's space is small and tight compared to the number of patients served and number of medicines stored which is uncomfortable for both patients and pharmacists.

Tana (2013) and Tegabu (2008) also found that long waiting times at public health facilities was primarily due to mismatch of patient arrival (arrived too early) and service commencement, and staff inefficiencies in prioritizing and attending to patients. Most government facilities tend to address long waiting times and overcrowding by assigning

more staff rather than investigating the causes for long waiting times and possibly providing inexpensive and simple solutions to the long wait (Tegabu, 2008). Such solutions may include designing appointment systems, more efficient staff utilization, and avoidance of traffic jams or arrival of large batches (Tana, 2013 and Tegabu, 2008).

A study conducted by Loh et.al. (2017) identified the following factors to be increasing pharmacy patient waiting times: inexperienced personnel unfamiliar with dispensing, workflow, drug arrangements, insufficient manpower, high burden of prescriptions when multiple clinics were in operation, handling prescription errors, additional steps in dispensing procedures and prescriptions containing controlled substances. Other factors such as physical environment, process design, inventory management, scheduling, and human resources management and personnel well-being were also found to affect pharmacy performance and thus patient waiting time (Uys, 2015).

According to Sun et.al. (2017), the waiting time problem in the Chinese health systems lies in two aspects: one is the long waiting time at the registration point and also at the admission windows. This is mainly because most Chinese hospitals do not schedule the appointments. Patients get registered upon arrival at hospitals at the service window. Thus, the unplanned patient flow results in overcrowding and congestion in healthcare facilities.

Visits to healthcare facilities should be per appointment-schedule to ensure patients' timely access to services. Multiple appointment-scheduling methods (including web, landline, smart phone, and automatic teller machine "ATM"-based methods) have been used to replace the traditional process where patients were asked to make the appointment physically inside hospitals (Sun et. al., 2017).

Waiting for laboratory results, lack of knowledge of hospital flow and lack of staff engagement to resolve the barriers were the main contributors to wait time identified by a study conducted by Altema et.al.(2020).

2.3. WAITING TIME AND QUALITY

The Patient's Charter of the United Kingdom (UK) Government sets a series of standards which state that all patients must be seen within 30 min of their appointment time (NHS, 2020). In South Africa (SA), the National Core Standards which are aimed at setting the benchmark standards of quality care against which delivery of services can be monitored identifies waiting times as an indicator of quality health services (National Department of Health, 2011). Patient waiting time is listed among the six key priorities for improving health services with a benchmark waiting time of not more than three hours for Primary Health Care Clinics and District Hospitals, and four hours for Regional and Tertiary Hospitals

(National Department of Health, 2015). Studies reveal that a waiting time of more than 30 minutes for a service is unacceptable to the client (Tegabu, 2008; Pandit et, al. 2016). By considering the actual waiting times and patient and staff opinion about the duration of "acceptable" waiting times, a waiting times norm of 30 minutes for public facilities and six (6) minutes for private facilities is suggested (Tegabu, 2008).

Excessive waiting times undermine pharmacy efficiency and according to a study by Afolabi & Erhun (2003) excessive waiting time may result in poor patient compliance of the instruction given at the pharmacy.

A direct relationship exists between quality and client satisfaction which actually determines the survival of any business. If the client is not happy with the product or services rendered; s(he) will most likely stop using the services and look elsewhere for good and quality service (Williams & Naumann, 2011). It is therefore necessary to regularly get customer feedback and assess client satisfaction about the services rendered. Studies, surveys and feedback from clients in many sectors indicate that no one likes to wait long for service delivery (Huang, 1994; Tegabu, 2008; Williams & Naumann, 2011). Chu (2019) indicates that although most patients can tolerate some degree of wait in a healthcare facility, when the wait time exceeds the patients' expectations or norms, and is judged to be excessive, patients want their provider to acknowledge this delay.

2.4. PATIENT WAITING TIMES STUDIES

Most patient waiting time studies in literature are based on the queueing theory which involves breakdown into six elements, i.e.: the arrival process, the service, and departure process, the number of servers available, the discipline of the queue (such as first-in, first-out), queue capacity, and numbers served. Creating a model of the entire process from beginning to end allows the cause(s) of the congestion to be identified and addressed (Drew, 2022). As already mentioned, there is often a mismatch between the patient's arrival time and the service delivery starting time. Patients usually arrive early before operating hours in order to book a queue (Tegabu, 2008). This is worsened by the fact that patients are not prioritized according to their urgency (Tegabu, 2008).

In their study to find an efficient pharmacy layout design McDowell and Huang (2012) provided alternative layouts that align more with work patterns which include placing fast moving items within easy reach of pharmacist workstations and providing quick and easy access for pharmacist to patient consulting areas. This reduces pharmacist travelling time, and lead time and thus reducing patient waiting time. Other factors, such as perceived spaciousness, architectural design and other interior design factors also have been shown to have a positive psychological effect on health care workers which can improve their

efficiency and decrease staff turnover (Mourshed and Zhao, 2012). However, research conducted by Coblio N (2011) on the impact of pharmacy work design on pharmacist productivity indicated that the physical design interventions to increase productivity had no real effect on productivity and that the motivation of the pharmacists may be the most significant factor to increase productivity. According to the Good Pharmacy Practice (GPP) manual which is guided by the Pharmacy law, arrangement of medicine must follow a systematic order (SAPC, 2010). For example, antibiotics must be stored separately from other general medication, alphabetic arrangement of medicine, high scheduled items (Schedule 5 and Schedule 6) must be stored separately under lock and key. Thus, it may not always be easy to have all fast-moving items within the pharmacist's reach. Another challenging reality is that most state-owned hospital pharmacies function under very limited space and options to extend current structures or build new pharmacies to accommodate desired designs are narrow because of constrained budgets (Quva Pharma, 2022).

In their study on determinants of patient waiting time in the general outpatient department of a tertiary health institution in North Western Nigeria, Oche and Adamu (2013) found that shortage of staff directly affect patient waiting time. Therefore, it is important to match the demand (workload) with the supply (staff). This is supported by a number of studies that proved that high workload negatively affect productivity as it increases work-related stress (McCann et al., 2009; Burford et al.,2011 & James et al.,2009). A work-place stressors study conducted by McCann et al.(2009) in Northern Ireland community pharmacies, revealed that long working days, work overload and being a pharmacy manager were associated with higher reported levels of stress across a number of work-related stressors including work overload, control and the job itself. In a literature review of 60 papers on dispensing errors in the United Kingdom, United States, Australia, Brazil and Spain, James et al. (2009) found that the most common contributory factors to dispensing errors were workload, interruptions, distractions and inadequate lighting. Interruptions in a pharmacy not only reduce productivity, but also increase error rates (Burford et al., 2011 & James et al. (2009). Reducing interruptions, or just standardizing the way in which they are addressed, have been shown to significantly improve efficiency and prevent errors in pharmacies. On the other hand, Diwas and Christian (2009) found that the processing speed of service workers is influenced by the system load. Their study on Impact of Workload on Service Time and Patient Safety revealed that workers accelerate the service rate as load increases. They found that a 10% increase in work load reduces length of stay by two days for cardiothoracic surgery patients, whereas a 20% increase in the load for patient transporters reduces the transport time by 30 seconds. But such acceleration was not sustainable over long periods. Matching the workload with staff is therefore important and will require the manager to be knowledgeable about the proper staffing norms or ratio of worker to patients in order to

adequately correct the imbalance of staff to workload ratio. An overstaffed team can be very costly to the organization, less committed and counterproductive (Stace, 2022).

A study on reducing pharmacy patient waiting time by Shoaibi et.al (2017) revealed the following as techniques and methods that can be successfully employed to reduce waiting time:

- automated queuing technology,
- tele-pharmacy,
- automated pharmacy devices/machines for quick and accurate filling and dispensing,
- computer simulation modelling,
- infrastructure for smooth workflow and
- Six Sigma.

The use of technology to reduce waiting time is supported by a study by Bin et al (2022) on the impact of artificial intelligence on waiting time for medical care in an urgent care service for COVID-19. The results of the study proved that digital solution was able to reduce nonvalue-added activities, without a substantial impact on health screening, and further saved waiting time for medical care in an urgent care service in Brazil during the COVID-19 pandemic (Bin et al, 2022). With the increasing numbers of patients demanding services in healthcare facilities and the burden of disease worldwide, automation appears to be an appropriate way to employ in this time and age to improve efficiency in an organization (Enright, 2020). It is important, though, not to totally eliminate the manual way of performing tasks as it will provide a backup system whenever technology (automation) fails (Shacklett, 2018).

2.5. TOOLS TO ADRESS PATIENT WAITING TIME

2.5.1. Plan Do Study Act (PDSA)

The PDSA cycle is one of the basic continuous improvement tools. This repetitive cycle starts with researching and choosing a desired future state and the actions to achieve it (Plan), then implementation (Do), followed by reflection and evaluation of results (Study) and finally adjusting in response to the results to achieve standardization or the desired effect (Act) (Orsini, 2013). The focus of PDSA lies in the planning phase, where root cause and risk analysis of the system in question is performed. For this, one of the seven quality tools of Ishikawa can be used, namely:

- Cause-and-effect (or fishbone) diagrams are used to determine and group common causal factors of a quality characteristic.

- Check sheets are used to obtain data in such a way as to allow for automated analysis.
- Histograms are used in data analysis to observe the frequency of data in a defined interval.
- Control charts are used to observe the impact of a changing factor in a process over time.
- Pareto charts are used to determine the most prevalent common causal factor of a quality characteristic.
- Matrix diagrams are used to organize data of two factors into subsets for comparison (Gitlow et al., 2005).
- 5 why's diagrams relentlessly ask "why?" to a problem and the subsequent answers until a root cause is identified (Nelsen, 2003).

PDSA provides a structure for staff to focus on improving the program and it allows staff to test the change they wanted to see (Coury et al., 2017). Yuzeng and Hui (2019) study on improving the wait time to triage at the emergency department in Singapore general hospital recorded a 26% decrease in wait times after implementing PDSA cycle over a 2 years period. A commonly reported challenge was measuring the success of the PDSA process with the available electronic medical record tools (Coury et al., 2017).

2.5.2. Lean Thinking (Lean Methodology)

Lean Thinking is a management philosophy intent on achieving an efficient production line by exposing bottlenecks and eliminating waste (Antony, 2011). It aims to maximize value for customers or patients in the case of health care while minimizing waste.

Principles of lean in healthcare (Bicheno & Holweg 2016; Jacobson, 2021; Womack & Jones, 2003) include:

- Value creation – provide value from the patient's perspective. Not just what we do, but what the patient wants to achieve in terms of health goals.
- Identify the value stream - deals with the processes involved in the service delivery chain to the patient. These processes have to be organized according to the perspective of the customer not to what the different departments in an organization crave.
- Continuous improvement – culture of constant improvement where leaders are continually raising the bar to drive more value - Pull production and striving for perfection.
- The creation of the value flow - decrease delays of activities that add value to the service and remove or improve the activities that do not add value.

- Root cause problem solving – workers must identify causes of problems and change standards to optimize processes.
- Visual management – help identify problem, provide easy access to data, serve as places for communicating concerns and new opportunities.
- Unity of purpose – unify teams around shared goals and desired outcomes.
- Respect for the people who do the work.

McBride (2003) defines waste as any product or activity that does not add value for the customer. Anything other than the minimum amount of equipment, materials, parts and workers (working time) which are absolutely essential to production is considered to be waste. Types of waste thus include overproduction, waiting time, transportation, inventory, over processing, motion and product defects. Elements to address such waste, according to Chase et al. (2007) and Liker (2013) include:

- Just in Time (JIT) production systems. This is one of the tools used in lean practice that aims at reducing buffers between steps. The JIT philosophy advocates producing and/or delivering only the necessary parts, within the necessary time in the necessary quantity using the minimum necessary resources. The company receives goods as close as possible to when they are actually needed. Excess inventory and carrying costs, along with the possibility that the items' shelf life might render the items obsolete, create waste (Liker, 2013).
- The 5S. 5S is a lean tool that provides a structured technique that results in a well-organized workplace complete with visual controls and order. It consists of ensuring that an environment has a place for everything and everything is in its place, when you need it. The five steps of the Japanese 5S include: Seiri (Sort) distinguish between necessary and unnecessary items and remove the latter, Seiton (Set in order) enforce the motto 'a place for everything and everything in its place', Seiso (Shine) clean up the workplace and look for ways to keep it clean, Seiketsu (Standardize) maintain and monitor adherence to the first three S, Shitsuke (Sustain) follow the rule to keep the workplace 5S-right.
- Takt time. Takt time is the rate at which a task (products or services) must be completed in order to meet customer demand, the customer's pull (Waida, 2021). It includes the identification of the demand capacity gap and failure demand. It does not include unsupervised work time such as lunch breaks.
- Continuous flow processing (the Kaizen). Eliminating the congestion of parts within a process or between processes and achieving sequential flow production, ideally one piece from station to station, is called "continuous flow processing" (KII, 2014; Basic TPS Handbook, 2010). Those places in the production process where a flow has not

been established produce considerable waste. Continuous Flow Processing decreases work in process (WIP) requirements, decreases floor space required, often improves labour efficiency, shorter lead times, fewer defects and can easily shift production among different types.

- Kanban and Andon (pull systems). Kanban and Andon include the use of signaling tools like information cards and status boards that visually display what is needed to keep a process moving and how well it is progressing (Basic TPS Handbook, 2010). Kanban system not only helps to manage tasks better, but also provide the clarity of what to do, and evaluate how well it is done. It ensures that you can continue at a sustainable pace while providing you with the information to continuously improve, and can be applied to any situation or process where work is performed - both in professional and private lives. It will show you at a glance how you are doing and highlight the bottlenecks where you can improve (Kanban Guide, 2020).
- The A3 problem solving. The A3 methodology is a lean thinking process where the problem owner should go through the model's different steps until there is a proper solution to be implemented. The owner needs to communicate actively with his/her colleagues and the mentor of the project. The A3 problem solving tool comprises of process mapping (background, current situation and setting goals / targets), root cause analysis, counter measures, implementation plan, effect confirmation and follow up (Vector Solutions, 2020).

Lean methodology has been employed considerably in health care to reduce waiting times and to improve service delivery. Success stories have been recorded such in the Mitchell's Plain Community Health Centre in the Western Cape (SA) where continuous flow processing (the kaizen), Pareto analysis, fishbone diagram and 5 why's were successfully used to address the overcrowded triage area (Isaacs and Hellenberg, 2009). Ortega and Gilchrist, also recorded another success story where Lean was implemented in the department of pharmacy's improvement project. The 5S tools were used to organize their intravenous (IV) storage area, Ishikawa (fishbone) diagram was used to find and address the root causes of medicine stock outs and PDSA cycle to address inefficiencies with their automated dispensing cabinets (ADC's) in the hospital (Ortega and Gillchrist, 2017). University of Utah researchers used Lean methodology to identify and eliminate non-value adding and wasteful activities at 2 clinics in their regional system. They were able to delegate nonclinical work such as materials compilation and electronic documentation to support staff members while freeing clinical staff to perform clinical functions. Further, the printers at their family medicine clinic were conveniently located by moving them to a convenient location and changing default print settings thus preventing repeated, small, wasteful activities (Pharmacy Times, 2016).

Lean teams will have to be established and together agree on what is value from the patient's viewpoint. The team will go through the processes that are involved in rendering the service to the patient and study the time involved in all the stages (value stream mapping). Value added activities and non-value adding activities will be identified. Patient waiting time is classified as waste according to lean concept (Bicheno & Holweg, 2016, Mc Bride, 2003). Delays identified in activities that add value to the service will have to be reduced and activities that do not add value will have to be removed or improved using the most suitable lean tools. Pharmacists can delegate many tasks to technicians (depending on state laws) to free up time for pharmacist-exclusive services.

2.5.3. Six Sigma:

The Six Sigma Black Belt Handbook (McCarty et al., 2005) describes Six Sigma as a metric, methodology and overall management system. Six Sigma is used to measure quality on a scale that shows Defects per Million Opportunities (DPMO), with the target of Six Sigma being 3.4 DPMO. In this way, various processes can be compared to each other. As a problem solving and continuous improvement methodology, Six Sigma uses the metric and root cause analysis tools of DMAIC which stands for: Define (Who are the patients, and what do they want?), Measure (What will improvement look like?), Analyze (Collect data and analyze using proven tools), Improve (Implement modifications to improve the process), Control (Monitor performance to maintain improvement) (McCarty et al., 2005; Villanova University, 2022) to reduce process variation and errors. As a management system, Six Sigma focuses on understanding customer requirements and orientating processes to meet them, reducing process variation through rigorous data analysis and encouraging quick and sustainable continuous improvement. Employing Six Sigma principles in healthcare settings can help eliminate defects and variations in processes, and it can help make procedures more streamlined, less costly and help improve patient care (Villanova University, 2022). In healthcare environments, a defect is defined as a factor that leads to patient dissatisfaction. Examples of defects range from the frustrating kind, such as a long wait to see a doctor, to the serious kind, such as an incorrect diagnosis or treatment (Villanova University, 2022). According to Villanova University (2022) Six Sigma has been successfully implemented in a number of healthcare facilities such as: Mount Carmel Health System where two years of Six Sigma projects focused on operational issues and business management helped save the healthcare organization $3.1 million. Employee and physician satisfaction rates also improved, and Rapides Regional Medical Center where through the use of Six Sigma methodology defects were reduced in its emergency department. Wait times declined, providers saw more patients and the hospital saved more than $950,000 annually.

2.5.4. Lean Six Sigma (LSS):

Six Sigma initiatives focus heavily on quality, often neglecting the need for efficiency. Lean processes however focus on efficiency, the elimination of waste and process simplification, often neglecting rigorous data analysis and effectiveness (Antony, 2011). The two philosophies have proven to be complementary, forming a LSS business strategy that has been accepted in many sectors (Drohomeretski et al., 2014; Atmaca and Girenes, 2011; Salah et al., 2010). LSS uses the Six Sigma DMAIC tool, but during the Analysis phase lean tools like kanban, push/pull and JIT are used to eliminate waste as well as improve quality (Snee, 2010).

As already mentioned, it was during an LSS quality improvement project that the pharmacy department at the University of North Carolina (UNC) Hospitals benefited in efficient arrangement of code trays for the medication, reduction of expired medication, accurate ordering and improved communication with nursing staff in terms of missing doses and intravenous (IV) compatibility (Mann et. al, 2014). This is supported by a study on application of LSS to reduce patient waiting time by Al-Zuheri et al. (2021) where there was a significant reduction of patient waiting times in healthcare centers after LSS application.

2.5.5. Failure Demand:

Failure demand is a systems concept used in service organizations first discovered and articulated by Professor John Seddon as demand caused by a failure to do something or do something right for the customer. Failure demand represents a common type of waste found in service organizations (Seddon, 2018). The distinction between failure demand and value demand is that value demand is the demand for service from customers, while failure demand is the demand caused by a failure to do something right for the customer. Failure demand is thus demand that only exists because initial demand was not satisfied properly. In their study, Hartman and Sunjka (2013) identified the following issues as failure demand in the healthcare systems which occur as a result of system failure:

- Medical Errors. Medical errors can range from wrong diagnosis, incorrect scripts written, administering incorrect drugs or incorrect dosages, incorrect site surgeries or infection arising from poor practice. Toussaint and Gerard (2010) state that American clinicians make as many as 15 million medical errors. In the UK, the government reported that a million patients are “put in hospitals “annually due to medical errors (Smyth, 2017). Attention to reducing medical errors in a systematic way can have dramatic results, as was famously shown at Allegheny General hospital, where the prevalence of central line infections was virtually eliminated (Shannon et al., 2006) by using the principles of the Toyota Production System (Liker, 2004). Similar improvements were made at Virginia Mason Hospital.

- Patient Errors. This includes patients arriving at the wrong site, or at the wrong time, patients who disobey pre-treatment instructions, or those who arrive with the incorrect paperwork. All these patient errors are a reflection of a system failure. The health system should adequately inform patients of their duties, obligations and functions so that they do not make a mistake. According to Deming (1986) a system should be designed in such a way that people cannot make mistakes. A system wide intervention to inform patients, familiarize them with the operational modes of the health system and encouraging compliance is a systemic intervention that could reduce failure demand. Simultaneously the health system should be reengineered to make it more difficult to make errors (Hartman et.al, 2021)
- Long Queues. Queues can be as a result of poor planning in terms of adequate capacity to handle the standard workload or by variation in load due to the unpredictable nature of disease requiring that patients of critical triage levels are prioritized higher than those needing less critical care (Tegabu, 2008; Liker 2004).
- Operational Environment. This includes patients who have insufficient financial means for treatment, poor inventory management, staff unavailability, support and diagnostic service delays and lack of infrastructure.

Hartman and Sunjka suggests the causal relationship between system failures as the root cause and failure demand as the symptom. Events that are system failure are identified, which upon a patient's return, becomes failure demand.

A study by Hartmann et al., (2021) of understanding system failure in health care indicated that identifying and managing failure demand in health care settings can lead to a reduced system load, thus reducing costs and increasing system efficiency and quality. The ability to identify the causes of failures in the system (including long patient waiting times) and implement ways to eliminate such failures will result in more efficient service delivery to the customer.

2.5.6. Theory of Constraints (TOC):

TOC is a managerial philosophy aimed at effecting continuous improvement in an organization by focusing on the constraints affecting the system. Eliyah Goldratt, the pioneer of TOC, defined a constraint as "anything that limits a system from achieving higher performance versus its goal" (Chase et al., 2007). The focus of TOC is to systematically identify, exploit and elevate the constraints in a system to achieve higher system performance through continuous improvement.

In a research where Theory of Constraints was used to resolve long-standing resource and service issues in a large public hospital, the outcomes included dramatically reduced patient wait times and staff overtime, increased patient satisfaction, increased efficiencies,

smoothed workload, and improved staff morale and retention, while maintaining patient safety and integrity of treatment, and staying within defined cost parameters (Mabin et al., 2017).

2.5.7. Customer Satisfaction

Customer satisfaction is a measure of how products and services supplied by a company meet or surpass customer expectation (Staffaroni, 2021). There is a direct relationship between long patient waiting times and dissatisfied customers (Tegabu, 2008). Historically, customers were considered as those who used a company's products and suppliers who provided the materials needed to produce the products were considered as outsiders. A more contemporary approach is that every organization has both internal and external customers. An external customer is the one referred to in the traditional definition while an internal customer is any employee whose work depends on that of employees whose work precedes his or hers (Goetsch and Davis, 2016). In total quality setting, customers (both external and internal) define quality. Therefore, customer satisfaction must be the highest priority. Customer satisfaction is achieved by producing high quality products or services that meet or exceed customer expectations. Goetsch and Davis, 2016 explains that the key to establishing a customer focus is to put employees in touch with customers so that customer needs are known and understood. They provide a six-step strategy for identifying customer needs which is: speculate about results, develop an information gathering plan, gather information, analyze the results, check the validity of conclusions, and take action (Goetsch and Davis, 2016). Customer needs are not static. Therefore, constant contact with customers is essential in a total quality setting. Whenever possible, this contact should be in person or by telephone. Written surveys can be used but will not produce the level of feedback that personal contact can generate.

Continuous engagement with the customers to get feedback will compel the team to address issues raised by customers such as long waiting time.

2.5.8. Employee Empowerment

It is important to empower employees so that they can take ownership in the organization's performance. According to Goetsch and Davis, 2016, empowerment means engaging employees in the thinking processes of the organization in ways that matter while involvement means having input. It means having input that is heard and used, and it means giving employees ownership to their jobs. Empowerment requires a change in organizational culture, but it does not mean that managers abandon their responsibility or authority. The rationale for empowerment is that it is the best way to increase creative thinking and initiative on the part of employees. This in turn, is an excellent way to enhance an organization's competitiveness and it can be an outstanding motivator to the employees.

The primary inhibitor of empowerment is resistance to change which may come from employees, unions, and management.

Management's role in empowerment is best described as commitment, leadership and facilitation. The kinds of support managers can provide include having a supportive attitude, role modelling, training, facilitating, employing management by walk about (MBWA), taking quick action on recommendations, and recognizing the accomplishment of employees.

Four steps to creating a supportive environment:

- Targeting and overcoming inhibitors of empowerment,
- Putting the vehicles in place i.e., brainstorming, nominal group technique, quality circles, suggestion boxes, walking and talking,
- Assessing, adjusting and,
- Improving.

2.5.9. Leadership

A committed, skilled and capable leadership is a necessity to the success of any project or organization. Leadership is the ability to inspire people to make a total, willing, and voluntary commitment to accomplishing or exceeding organizational goals (Goetsch and Davis, 2016). Good leaders overcome resistance to change, establish an ethical framework, are committed to both the job to be done and the people who must do it. They are good communicators and they are persuasive. Leaders should learn to follow first and then lead.

The key elements of leadership for quality are:

- Customer focus
- Obsession with quality
- Recognition of the structure of work
- Freedom through control
- Unity of purpose
- Looking for faults in the systems
- Teamwork
- Continuing education and training
- Emphasis on best practices/ peak performance

2.5.10. Team Building and Team Work

A team is a group of people with common, collective goal. The rationale for the team approach to work is that "two heads are better than one" (Goetsch and Davis, 2016)

There is interdependency to each other for the success of the team. The one employee cannot do a good job if the previous one in the chain has compromised quality (Goetsch and Davis, 2016). After a team has been formed a mission statement should be drafted summarizing the team's reason for being.

There are character traits that promote successful teamwork which can be adopted by the team: Honesty, Selflessness, Dependability, Enthusiasm, Responsibility, Cooperativeness, Initiative, Patience, Resourcefulness, Punctuality, Tolerance / Sensitivity, and Perseverance.

Team and individual compensation can be developed to recognize and reward good work as follows:

- Decide what performance to measure
- Determine how to measure the performance
- Identify the rewards to be offered
- Integrate related processes

Challenges faced when leading multicultural teams include:

- Differing approaches to decision making
- Different attitudes toward authority
- Different attitudes toward work
- Differing approaches to communicating

2.6. THE SOUTH AFRICAN GUIDELINE ON MANAGEMENT OF PATIENT WAITING TIMES

The National Department of Health has provided a stepwise guideline on the management of patient waiting times(PWT) in public health care facilities as follows (NDoH, 2019):

2.6.1. Regular measurement and reporting of PWT.

Step 1: Schedule a day in quarter 2 and quarter 4 of every financial year to conduct the PWT survey.

Step 2: Determine the sample size of patients to be surveyed. To ensure that the sample size lay within the 95% Confidence Interval, use the World Health's Organizations' sample size determination in health studies practical manual to determine the sample size.

Step 3: Make copies of the PWT Monitoring Tool according to the number of patients to be surveyed as determined in Step 2 and complete the forms appropriately as per instruction on the form.

Step 4: On the day of the survey use systematic sampling to select the patients according to the sample size that was determined in Step 2.

Step 5: The queue marshal (or designated staff member) must hand a copy of the PWT Monitoring Tool to every patient with time of entry into the unit recorded on the Tool.

Step 6: Reception staff (or designated staff member) must place the PWT Monitoring Tool in the records of those patients that were selected for the survey.

Step 7: Each health care provider that interacts with the patient must record the time the patient enters and leaves the service point, i.e. if referred from medical officer to medical specialist, allied health services (Rehab, social worker, nutritionist, etc), diagnostic services (radiology, imaging services, laboratory) and pharmacy. Every touch point must record start and end time of each interaction with the patient.

Step 8: Record the time at the last touch point as defined below.

i. Admission: all administrative processes completed and patients allocated a designated bed in the ward.

ii. Outpatient department (OPD): the pharmacy is usually the exit touch point after patient has made their return appointment at the designated reception or administrative point.

iii. Emergency unit: on discharge to go home or transfer from Emergency unit into inpatient ward or admission for observations within the Emergency unit.

Step 9: At the end of the day, the completed PWT Monitoring Tool must be collected from the records by the designated staff member and reconciled to ensure that all copies are returned for analysis.

Step 10: All returns to be captured by the designated member using the PWT Module on the Ideal Health Facility web-based information system (www.idealhealthfacility.gov.za).

2.6.2. Analysis and results.

Step 11: Analyze the PWT data using the PWT Calculation Tool (provided in the ideal health facility manual). If the web-based information system is used, the times will be auto generated.

Step 12: Summarize the results.

Step 13: Compare the PWT for each quarter with the previous quarter to establish trends and need for improvement.

Step 14: If the average time spent in each of the identified service areas by patients exceeds three hours, establish what and where the bottle-necks are in each area by using the National Quality Improvement Guideline.

2.6.3. Interventions

Step 15: Address identified deficiencies in bottle-neck areas

Recommended interventions to alleviate long waiting times

i) Patient record management

To reduce PWT, records should be retrieved in the shortest possible time. The following principles should be instituted to ensure the quick retrieval of patient records:

- Single record storage room: Patient records should ideally be stored in a single record storage room that is in close proximity to the patient registration desk.
- Effective and efficient filing system refer to: The National Guideline for filing, archiving and disposal of patient records in PHC facilities to file, archive and dispose patient records that is in line with the National Archives and Records Service of South Africa Act, 1996 (Act 43 of 1996). The same principles can be applied for hospitals.
- Archiving and disposal of patient records refer to: The National Guideline for filing, archiving and disposal of patient records in PHC facilities provides guidelines for PHC facilities to file, archive and dispose patient records that is in line with the National Archives and Records Service of South Africa Act, 1996 (Act 43 of 1996). The same principles can be applied for hospitals.
- Pre-retrieval of patient records with booked appointments: Where applicable, appointments must be scheduled for patients. The records for patients with appointments must be pre-retrieved not later than a day before the patient's appointment.
- Electronic patient record information management system: Assists with retrieval of patient records. The system also provides a back up to ensure that patient record is not lost.
- Electronic patient record: prevent loss of records and easy access.

ii) Facility navigation

- Signage - Adequate and appropriate signage should be provided. This signage should be colour coded and provided in different local languages to ensure that the vast majority of the user of the service can find their way around the facility.
- Help Desk - Ensure consistent availability of a help desk official at the help desk to provide required information to users.
- Queue marshals - Queue marshals facilitate movement of patients in waiting areas.

iii) Facility infrastructure design

- The design of the facility should enhance the lean principles of patient flow to ensure patients can access services in a unidirectional manner thus saving time in moving from one service point to the next.

iv) Clinical services organization

- Integrated Clinical Service Management (ICSM): at PHC facilities the ICSM model should be instituted to ensure patients are managed based on the need for the various services.
- Patient appointment system: an appointment system that include both date and time allocations should be implemented to ensure all available human resources are adequately and efficiently utilized.
- Triage: In Emergency units at hospitals and Community Health Care centers triage must be instituted to ensure that very ill patients are not compromised by long PWT.
- Centralized Chronic Medicines Dispensing and Distribution (CCMDD): Stable patients with chronic health conditions should be registered and moved over to the CCMDD programme. This would ensure that patients can access their chronic medication at external pick-up points without overcrowding health facilities. The pick-up point can be a nearby retail pharmacy, doctor's surgery, post office, PHC clinic, hospital or other business sites approved by NDoH to provide the service of handing out patient medicine parcels (Health Systems Trust, 2019).

The use of technology in the form of smart lockers (the Pelebox and Collect & Go smart lockers) has been introduced in some of the provinces such as Kwazulu Natal, Mpumalanga, Gauteng and Free State as pick up points for the CCMDD programme. The use of the smart lockers has been seen to greatly alleviate wait times and improve access to medication. Patients can simply pick up their medications from the locker at a time that is convenient for them, without having to wait in long lines at the pharmacy. Smart lockers also benefit healthcare providers by streamlining medication dispensing and reducing staff workload (ITWEB, 2019 and Health Systems Trust, 2023).

- Ward based PHC outreach teams: To improve access to health services by patients at community level though delivery of medicines, public health information, screening and appropriate referral.

- Home based care: this service would decrease burden on facilities.

v) Referrals

- The National Referral Policy and Implementation guidelines should be used to determine referral pathways to the various levels within the health system and thus ensure that patients are not being seen at inappropriate levels or facilities.

vi) Communication

- Public Health education at community level on the use of services at the appropriate level: to ensure that all patients are seen in a timeous manner for the conditions that they have to decrease self-referrals to inappropriate higher levels of care.
- Health education on primary and secondary prevention of disease to decrease the number of patients ending up with morbidity and bringing a higher burden to the health system.

vii) Human resource management

- Staff allocation to the different service areas based on service need and not a historical and/or personal preference should be instituted.
- Duty rosters should be implemented to ensure that services are delivered continuously while some staff members are on tea or lunch breaks, commence immediately according to the operational hours of that unit, and staff training and meetings should always take cognizance of service needs and should not compromise patient care.

2.6.4. Compile a Quality Improvement Plan (QIP)

Step 16: The QIP should include the following

- Summary of PWT results.
- Update the existing facility QIP
- Ensure that the QIP highlights the identified bottle necks and suggests interventions with time frames for implementation.

2.7. LEAN AS AN APPROPRIATE TOOL FOR ADRESSING PATIENT WAITING TIME

Although Lean was originally created by the Toyota car manufacturing company to eliminate waste and inefficiency in its manufacturing operations, it has been widely and successfully employed in other manufacturing sectors around the world including the healthcare care sector (Bicheno & Holweg 2016; Liker, 2004, Womack & Jones, 2003). The five key principles of Lean of creating value, value stream mapping, continuous flow, pull and perfection assures desirable and sustainable outcomes. Lean's focus on eliminating waste / non-value adding activities means the team can apply more focus to those that add value thus giving more value to the customer. A lean organization understands customer value and focuses its key processes to continuously increase it. Continuous improvement and

respect for people, thus empowering the staff, are the pillars of Lean (Bicheno & Holweg, 2016) that creates a good environment for creativity, ownership, teamwork, motivation and success. Most of the elements that form the basis of other quality improvement tools such as six sigma, theory of constraints, failure demand, PDSA cycle are incorporated within Lean management which makes Lean comprehensive. The manager only needs to select the suitable one depending on the issue at hand.

Studies shows that the lean principles could be applied to virtually any manufacturing system, other than car production, and can also improve how a team works together, inventory management, efficient healthcare services and even client interaction (ASME, 2016; IHI, 2005, Womack and Jones, 1996). The Lean approach seeks improvements within the framework of an organization's existing processes. Lean does not focus on substantial reorganization requiring large-scale investments, but it gives healthcare organizations an alternative methodology for achieving improvements without high investments (Bahensky et. al, 2005). This therefore becomes an added benefit considering that most government facilities are operating with constrained resources (National Treasury, 2022).

There is growing agreement among health care leaders that lean principles can reduce the waste that is prevalent in the health care system. The Institute for Healthcare Improvement believes that adoption of lean management strategies, can help health care organizations improve processes and outcomes, reduce cost, and increase satisfaction among patients, providers and staff (IHI, 2005). Courageous, forward-thinking health care organizations such as Virginia Mason and ThedaCare are leading the way by demonstrating that lean management can reduce waste in health care with results comparable to other industries. Leaders of these organizations emphasize the importance of creating an organizational culture that is ready and willing to accept lean thinking. A receptive culture is needed for the success of lean principles (IHI, 2005).

2.8. THE MOST SUITABLE LEAN ASPECT TO ADDRESS PATIENT WAITING TIME

With the many tools that Lean has; it can be difficult to decide on the appropriate one to apply and when to apply them in specific organizations. It may be wiser to first implement simpler methods with the view of engagement and acceptance of staff as opposed to attempting to immediately introduce the more complex lean tools. These become small wins that build momentum and staff confidence. Even though certain lean tools may hold the promise of high returns, they may also be risky to implement. Failure could ruin future chances of success and engagement. An organization can match its waste with the appropriate lean tool.

For example; the 5S, 5why's and Visual systems aspects of Lean are associated with the small wins (sometimes called "low hanging fruit") to increase chances of sustainability. They have high likelihood, low difficulty, low resource needs, readily give early results and builds a culture in readiness for future lean activities. In contrast the tools for fine improvement of production efficiency, for example, six sigma and JIT are more difficult to implement with a low likelihood. They can be tried when the culture of lean has been developed and accepted in the organization. Kanban may be relevant and useful for ordering consumables and inventory management. A focus on Lean's key principles of creating value, value stream mapping, continuous flow, pull and perfection assures desirable and sustainable outcomes.

2.9. LEAN SOLUTIONS IN PHARMACIES

The Toyota Production System (TPS), a continuous improvement methodology that addresses process re-engineering, was used to improve a pharmacy in a medical center servicing 500 inpatient orders per day and an ad hoc retail window for the public. Sobek and Jimmerson (2003) started by creating a value stream map, focusing on the medication order (prescription) filling process. Through observation they found that the pharmacy was in violation of the third TPS rule, that states that the pathway for a service must be well specified. During high volume times orders could be handled by one or two pharmacists, have varying filling sequences and be interrupted by phone calls. Changing this in a pilot study by assigning one pharmacist to work solely on fulfilling orders in a streamlined manner while another saw to phone calls and ad hoc queries, the pharmacy's orders-in-system and order-to-delivery time decreased by 32%.

The pharmacy department at the University of North Carolina (UNC) Hospitals has benefited significantly from applying Lean Six Sigma (LSS) techniques to its inpatient pharmacy as follows (Mann et. al, 2014):

- They managed to efficiently arrange the code trays for the medication. As a result of the LSS project, a chart containing the layout of the code tray was placed in the code tray production area. Code drugs were placed in small bins within arm's reach to fill the unfilled tray, eliminating 40 walking steps between the code tray area and carousel machines.
- Prior to the LSS projects, returned medications from the patient units sat in the pharmacy, waiting to be placed back in the medication bins. The unnecessary clutter and disorganization resulted in expired medications and increased inventory on hand. To decrease clutter, a shelf with bins for each item was constructed. When technicians return from delivering medications to patient floors, they sort the

medications and place them in the corresponding bins. Stock is returned to the shelf on a daily basis.

- Kanban cards that describe when to order an item, how much to order, and the item's order number were created.
- During an LSS event, the team reached out to their nursing "customers" to determine what type of telephone interactions were desired in the event of a missing dose or when an intravenous (IV) compatibility question came up. This led to the creation of a triage technician position to independently assist nurses in locating missing doses, filtering compatibility questions to the IV room pharmacist, or deferring more complicated non-sterile medication questions to the inpatient pharmacists. This position eliminated inefficiencies caused by various employees interrupting their work flow to answer a telephone call.

UNC's experience with LSS has increased employee satisfaction, breeding excitement for future improvements. With LSS as a tool, UNC is constantly striving to promote the culture of continuous quality improvement (Mann et. al, 2014).

Ortega and Gilchrist (2017), also recorded another success story where Lean was implemented in the department of pharmacy's improvement project. The 5S tools were used to organize their intravenous (IV) storage area, Ishikawa diagram was used to find and address the root causes of medicine stock outs and PDSA cycle to address inefficiencies with their automated dispensing cabinets (ADC's) in the hospital (Ortega and Gillchrist, 2017).

A study conducted at the Birmingham Free clinic showed that pharmacists spend 21% of their time on necessary administrative tasks that they can delegate to other personnel. The largest workflow challenges were as a result of the hybrid paper/electronic system: handwritten medication labelling, triple documenting, and lack of inventory control (Fisher et. al., 2016). The study shows that pharmacists spent the majority of their time on non–value-added tasks. They perceived spending 40% of their time dispensing as indicative of waste. Pharmacists cannot eliminate dispensing from the pharmacy workflow no matter how non–value-added it may be. The pharmacists wanted to spend more time on tasks they considered value-added, such as education and counselling. The clinical pharmacists valued collaborative practice and direct patient–pharmacist communication—tasks drawing from medication expertise (Fisher et.al., 2016).

The University of Utah researchers used Lean methodology to identify patient education waste at two clinics in their regional system. The family medicine clinic providers were much more likely to complete patient education than their internal medicine and family planning colleagues. The family medicine clinicians delegated materials compilation and electronic

documentation to nonclinical support staff members. Pharmacists can delegate many tasks to technicians (depending on state laws) to free up time for pharmacist-exclusive services. Further, the printers at the family medicine clinic were conveniently located. One-time investments of time and energy (e.g., moving a printer or changing default print settings) prevent repeated, small, wasteful activities (Pharmacy Times, 2016).

In a study conducted by Shiu and Mysak (2017), it was revealed that 39% of the processes in the pharmacy activities were non–value-added. These included: pharmacists redoing medication history because histories taken by medical students or residents were often incomplete or inaccurate (fixing defects), pharmacists reviewing the same information in multiple sources (overprocessing), there was duplicate documentation of information already charted by other team members (overprocessing) and pharmacists were completing patient monitoring forms that were not retained as part of the patient record. They therefore managed to reduce and, in some cases, eliminate duplication and to standardize the work using Lean methodology.

A kaizen (continuous flow processing Lean tool) initiative using root cause analysis tools was successfully implemented at the Mitchell's Plain Community Health Centre in the Western Cape to address the overcrowded triage area (Isaacs and Hellenberg, 2009). The implementation team used Pareto analysis to group patients entering the triage area and found that those requiring reissuing of prescriptions contributed the most to overcrowding. A fishbone diagram was then drawn up to identify reasons for this issue, and surveys were then completed to quantify the contributing factors. Finally, the 5 why's method was used to determine countermeasures for the identified factors. The initiative resulted in a decrease from 46 to 22 reissues per day within three months after implementation.

Unlike in the manufacturing sector, it may be difficult in the service sector using Lean methodology to identify some of the waste areas such as the non-added value activities that creates waste (Alwan F, 2012). The table below shows barriers in lean health care implementation as identified by Amran et al., (2020).

Table 2.1 Barriers in Lean Healthcare Implementation (Amran et al., 2020).

CONCEPT	**ITEM**	**BARRIERS**
Concept 1: Management Roles and Responsibility	A1	Hierarchy and management resistance
	A2	Variation of organizational culture and style
	A3	Organizational silos
	A4	Lack of managerial skills
	A5	Lack of clear focus on customer stakeholder value
Concept 2: Leadership Empowerment	B1	Lack of leadership team involvement
	B2	Lack of commitment and support from top managers
	B3	Lack of qualified people in healthcare to guide the lean transition
Concept 3:	C1	Inadequate training and education

People Management	C2	Attribute of professional skills in healthcare
	C3	Lack of facilitator who are expert in lean
Concept 4: Employee Empowerment and Involvement	D1	Lack of involvement (commitment & participation of the staff
	D2	Lack of engagement
	D3	Poor communication
Concept 5: Resources Management	E1	Lack of human and technical resources
	E2	Financial resources constraints
	E3	Absence of specific time allocate for this lean transition project
Concept 6: Strategy & Planning	F1	Strategy and Purposes
	F1	Resistance to change
	F3	Unclear vision
	F4	Numerous targets
	F5	High process variability
	F6	Lack of data collection and performance management
	F7	Cross departmental
	F8	Regulation in healthcare Construct
Concept 7: Information & Knowledge about Lean	G1	Perception (Lack of lean philosophy)
	G2	Terminology
	G3	Variation in defining waste

In their study about barriers in lean healthcare implementation conducted at Sultan Ismail Johor Bahru hospital in Malaysia, Amran et al., (2020) identified the following to be contributory factors towards failure in lean project implementation and lean transition in healthcare:

- lack of qualified people in healthcare service to teach or guide about lean transition,
- lack of outside facilitator who is expert in lean to guide the lean transition in healthcare service,
- lack of philosophy and knowledge in lean in healthcare,
- absence of leadership empowerment in healthcare environment,
- lack of employee empowerment and involvement, and
- lack of information and knowledge about lean.

The following are tips for Reducing Pharmacy Wait Times according to AlphaScrip, 2017:

- Standardized Process: If you operate in multiple locations, having standardized processes, procedures and computer programs saves a lot of time and frustration, both for pharmacists who may work shifts in multiple stores and for the customers.
- Proper Labeling: Labeling a bottle so it doesn't cover the barcode saves time - when multiplied by all the prescriptions processed per day, it can save a lot of time.

- Automated Counts: For commonly prescribed medications, automating counts can save a lot of time. You still have to double-check manually, but automation cuts down the time it takes to count individual pills and may even improve accuracy.
- Managing Stock: Keep inventory organized and up-to-date, making sure to order medications and supplies well before you run out.
- Timing of Refills: There's definitely a balance to strike between the convenience of automatic refills and the inconvenience of having to re-shelve medications that patients never pick up. Whether you send notifications to customers regarding their prescription status, or wait to fill prescriptions on demand, assess how your current practices affect efficiency and customer satisfaction.
- Transparency: When you do have a wait time, letting your customers know makes a world of difference. Apologizing for a wait has also been shown to increase patient satisfaction in clinical settings, and the same principle applies in pharmacies.

2.10. CONCEPTUAL FRAMEWORK

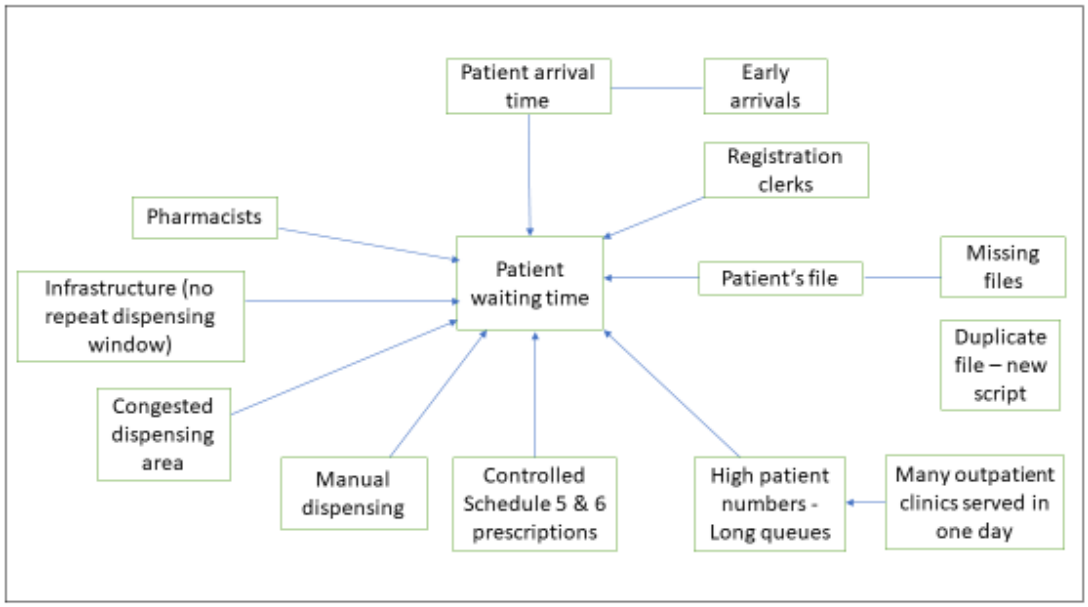

Figure 2.1 Factors affecting waiting time for patients collecting repeat prescriptions

Patient arrival time, with some patients arriving before operating hours impacts on the total hours that the patient waits. The patient file is needed in order for the patient to be registered into the hospital system, to pay and to access medication from the pharmacy. Often the patient file can be missing and the patient has to get a new file and start by seeing a medical doctor in order to get a new prescription. Patients collecting repeat medication are serviced

together with other acute patients form outpatients' clinics in the pharmacy. Dispensing is performed manually by the pharmacists and pharmacist assistants.

2.11. SUMMARY

Chapter two dealt with a detailed literature demonstrating the relationship between patient waiting times and quality, how waiting time was addressed in other studies, the various tools to address patient waiting time as well as the rationale behind the selection of Lean as the most appropriate tool to address patient waiting time.

The above literature clearly shows the need for continuous improvement in service delivery in order to fulfil the vision of quality pharmaceutical services to the people of South Africa as outlined by the South African Pharmacy Council (SAPC) (GPP, 2010).

The next chapter describes the methodology used in this research to investigate factors contributing to long waiting of patients collecting chronic medication in a hospital pharmacy.

CHAPTER 3

RESEARCH METHODOLOGY

3.1. RESEARCH DESIGN

A non-participant structured observational method was employed to carry out this study (see Appendix G - study protocol). Observation is a qualitative type of research where researchers use all of their senses to examine people in their natural settings or naturally occurring situations (Robert Wood Johnson Foundation, 2008). According to Robert Wood Johnson foundation, the reasons for collecting observational data include:

- When the nature of the research question to be answered is focused on answering at how- or what-type question
- When the topic is relatively unexplored and little is known to explain the behaviors of people in a particular setting
- When understanding the meaning of a setting in a detailed way is valuable
- When it is important to study a phenomenon in its natural setting
- When self-report data (asking people what they do) is likely to be different from actual behavior (what people actually do).

Non-participant observation involves a passive role for the researcher, who does not directly influence events, but observes interaction, which it is assumed, is unaffected by the researcher's presence (Grix, 2010).

Structured observation involves the development of an observation template, taking into consideration a clear and specific definition of the components to be observed and data to be recorded (Bryant, 2016).

Structured observation was therefore selected as a method for data collection in order to be able to study the processes that happen when patients come to collect medication in their natural settings so as to answer the research question "How can the waiting period for receiving medication at the hospital pharmacy be improved?"

3.2. INSTRUMENTATION

Creswell (2014) states that decisions about choice of a research approach are influenced by the research problem or issue being studied and the personal experiences of the researcher. The choice of methods to be employed depends on whether the researcher has a specific type of information to be collected in advance of the study or to allow it to emerge from

participants in the project (Cresswell, 2014). The type of data may be numeric information or text information. In some forms of research, both quantitative and qualitative data are collected, analyzed, and interpreted. Instrument data may be augmented with open-ended observations, or census data may be followed by in-depth exploratory interviews (Cresswell, 2014).

From the literature review value stream mapping (VSM), one of the principles of Lean Thinking, emerged as a useful element to observe in order to identify non-value adding activities that could be causing waste in the process of collecting repeat medication from the pharmacy. VSM, is a method of improvement that allows an entire process (the series of steps that occur to provide the customer the product or service that they want) to be visualized. The technique identifies all actions necessary to bring a product or service to customers and finding sources of waste in an attempt to improve a process (Womack and Jones, 2003, AHRQ & Plutora, 2022).

During the mapping process, areas of inefficiencies (non-value-added activities) or those that needs improvement, which according to Lean are classified as waste, were identified. Common sources of waste according to Lean, include (Boi, 2019):

- Defects: In health care this could be time and material spent doing something wrong and later, fixing it. .
- Overproduction: Producing more than is needed. Producing too soon.
- Waiting: For example, when patients or their information sits in a queue.
- Transportation: For example, Moving patients or materials between work centers.
- Inventory: can expire, get damaged, and become obsolete.
- Motion: Unnecessary movement within a work station.
- Overprocessing: Doing more work than needed.
- Under-utilized talent: For example, the amount of time health care professionals spends on tasks that are not directly related to their scope in providing patient care. This can include manually running processes, creating proposals, and looking for information.

A structured observation template (see Appendix B) which included the recording of the time waited by the patient in all the stations until medication was collected, was used to guide the researcher in observing processes taking place during the patient's journey of collecting repeat medication, with a critical eye of identifying possible areas of waste. A spaghetti diagram, which a visual representation using a continuous flow line tracing the path of an item or activity through a process (Roser, 2015) was also used to augment VSM in mapping the processes.

3.3. DATA COLLECTION PROCEDURES

According to Robert Wood Johnson foundation (2008), observation of the processes should take place in natural settings or naturally occurring situations where researchers use all of their senses to examine people.

From the literature review in Chapter 2, the conceptual framework review depicted variables involved during the process of collection of repeat medication in the hospital pharmacy. This therefore provided guidance to the researcher in terms of focus areas to observe in this research.

Observation of the processes related to the collection of repeat prescriptions took place at the patient waiting area, at the patient registration points and, in the pharmacy of a tertiary hospital in Gauteng Province SA, where prescriptions were filled. Approximately 100 repeat patients wait in the waiting area for registration, payments and collection of medication between 8am to 1pm. The pharmacy staffing comprised of 77 pharmacy professionals (35 pharmacists, 7 interns and 33 pharmacist assistants) and 14 other support staff. The pharmacy provides pharmaceutical services to outpatients from 15 outpatient clinics located within the hospital, inpatients from 41 wards and down referred patients. Although it is a tertiary and teaching hospital, it also renders primary and secondary level health care (often from self-referrals) services because of its location where there is no level one or level two hospital within its 13km radius. The pharmacy dispenses on average 800 outpatients from the various outpatient clinics and 230 inpatient prescriptions per day. The observations were performed on different days of the week until saturation (same information obtained repeatedly) was reached. A total of 31 patients were observed from the arrival point at waiting area, to registration points and to pharmacy from Monday to Friday (10/06/2019 - 14/06/2019 and 27/06/2019). Waiting time forms were attached to the patient's prescription for recording at each service station. Patients were selected randomly as and when they arrived at the waiting area for collection of medication. Participation was voluntarily. The researcher presented the study topic and its benefits to a group of patients as they were waiting to register their files in the waiting area. The researcher then requested permission to attach waiting time forms (Appendix C) on their files in order to monitor the time the patients waited to receive their medication and to observe the processes that unfolded.

3.4. ANALYSIS PROCEDURES

Value stream or process mapping was used to analyze the processes involved internally from registration point to the dispensing of medication. VSM provides a structured

visualization of the key steps and corresponding data needed to understand and intelligently make improvements that optimize the entire process (Plutora, 2022).

A spaghetti diagram was used to analyze the stepwise process from the point the prescription is handed to the pharmacist until when the patient receives medication.

A spaghetti diagram is defined as a visual representation using a continuous flow line tracing the path of an item or activity through a process. As a process analysis tool, the continuous flow line enables process teams to identify redundancies in the work flow and opportunities to optimize process flow. A spaghetti diagram can help to reduce the distance travelled by either parts or people. The benefit can be either faster delivery or the same delivery with less effort (Roser, 2015).

A waiting time report was used to calculate the amount of value-added time and non-value added time. In order to establish the amount of time spent in the various stages of collecting repeat medication a mini patient waiting time study was performed. According to NDoH (2020) waiting time monitoring tool; the patient waiting time is calculated by subtracting the arrival time at the current service area from the departure time from the previous service area.

3.5. RELIABILITY AND VALIDITY

Good reliability in an observation protocol certifies that observations will be consistent across time or observers (DeMonbrun et.al, 2015). Observations were made over and over again with similar setting, until saturation (where the same findings were observed over time) was reached.

Validation by the individuals being observed, ensures that the conclusions of the observer match what is actually happening during the observation (DeMonbrun et.al, 2015). The researcher checked validity by confirming the conclusions of the observations with the officials involved in the two departments (patient records and pharmacy). This was done through conducting focus groups meetings with the involved officials to validate the accuracy of the observations.

3.6. ETHICAL CLEARANCE

Ethical clearance was obtained from the University of Witwatersrand Human Research Ethics Committee (Medical) and also from the Chief Executive Officer of the participating tertiary hospital prior to commencement of data collection. The ethics clearance number is M190286 (see attached, approval certificate, Appendix A).

CHAPTER 4

RESULTS

4.1. INTRODUCTION

This chapter presents the research findings based on the data collected during the study period. The data is presented in the form of numerical data (waiting time report), process and value stream maps and descriptive information that emerged from the observations.

4.2. WAITING TIME REPORT

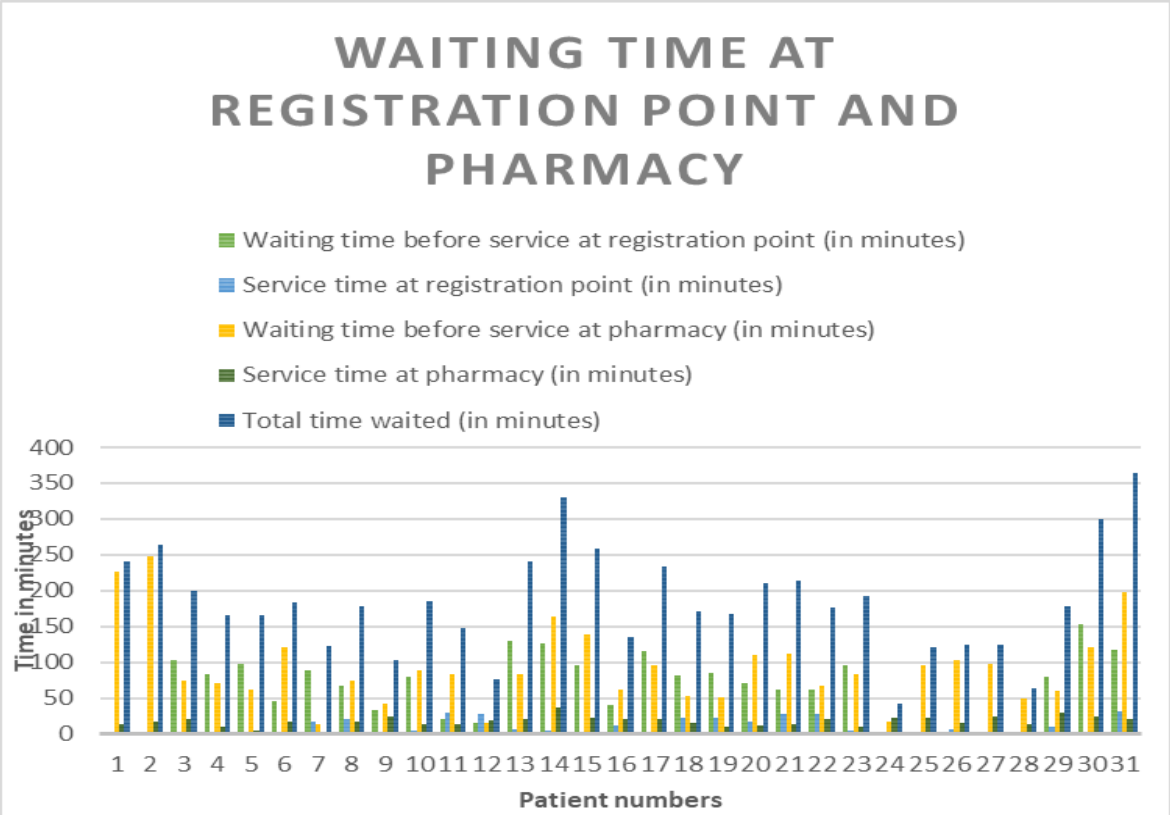

Figure 4.1. Graph showing patient waiting time in minutes at both registration point and pharmacy (n=31). Refer to Appendix E.

The total average time waited by the patients collecting repeat medication was 188 minutes with 29 minutes being the average service time. For patients who had to renew their classification and confirm availability of medical aid funds at the confirmation office, the waiting was increased with extra 45minutes on average. Service time is defined as the time taken by the system to process a particulate service request (System Performance Engineering, 2018). The 159 minutes average wait time before service resulted from 67 minutes mean queuing time to register the patient and 92 minutes mean queuing time to

reach the dispensing window for collection of medication from the pharmacy. It took on average 11 minutes service time at the registration point and an average of 18 minutes at pharmacy. The service time is considered value adding to the patient while the queuing time is waste or non-value adding (Boi, 2019).

4.3. PROCESS MAPPING AT REGISTRATION POINT AND PHARMACY

Process mapping is an exercise to identify all the steps and decisions of an existing process in a diagrammatic form, which helps organizations identify improvement opportunities so that they can improve efficiency within an organization. It describes the flow of materials, information and documents, shows the various tasks contained within the process, that the tasks transform inputs into outputs, indicates the decisions that need to be made along the chain, demonstrates the essential inter-relationships and interdependence between the process steps (Harris, 2021)**.** The process map in this context shows the journey travelled by the patients collecting repeat medication, and the various steps involved, from their arrival in the hospital to the last step when they receive the medication from pharmacy and departs.

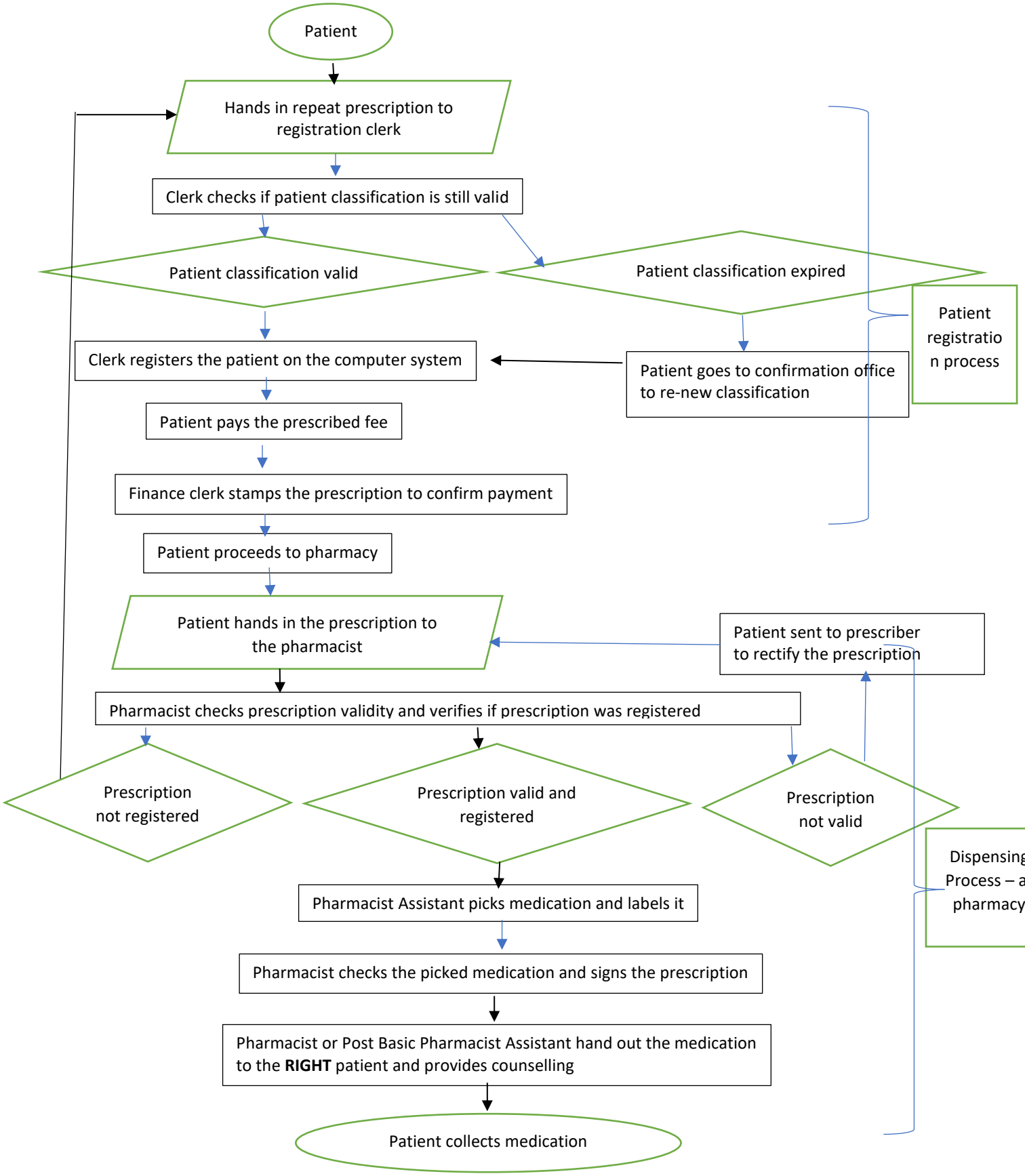

Figure 4.2 depicts the journey of the patient collecting repeat medication in the hospital.

4.4. VALUE STREAM MAP

An analysis of the data collected through observation (Refer to Appendix E for the observation notes) is presented in the form of value stream map as shown in Figure 4.3. and 4.4.

The purpose of creating a value stream map is to document how an organization manages everyday processes. This information can be used to determine if steps within those processes can be improved or made more efficient (UNC Eshelman University School of Pharmacy, 2021). Harris (2021) states that the strength of a chain depends upon its weakest link, hence the need to identify and attend to the weakest link in the operating system.

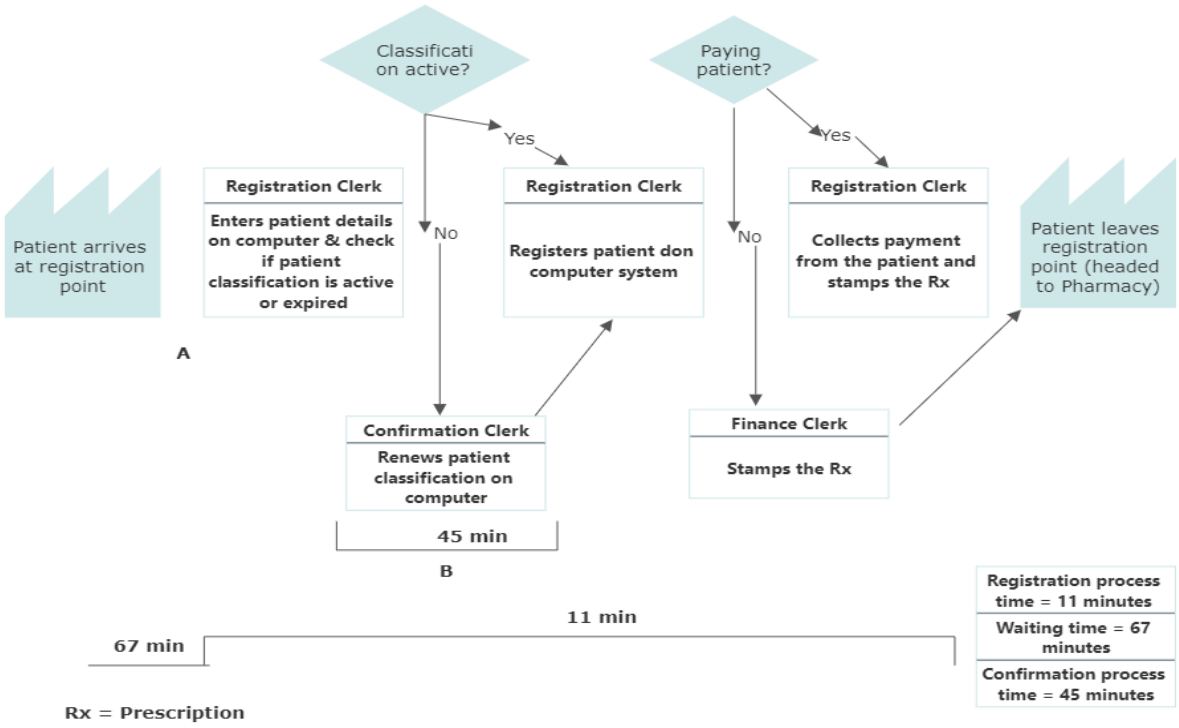

Figure 4.3: Value stream map at the registration point

The medical repeats clinic starts operating from 7:30am Monday to Friday (A). There are usually approximately 100 patients waiting on the queue to be served when the clinic opens for business. On Thursdays the number is doubled or more while on Fridays it is half or less. Two registration clerks are stationed to register the patients and one finance clerk to process payments.

Patients whose classification has expired and those on medical aid wait the longest (additional 45 minutes) (B) as they have to go to confirmation office to re-new their classification and confirm availability of funds. To re-new a classification the patient has to

present a social grant card or a proof of income. To confirm availability of funds for those on medical aid, the confirmation clerk will phone the medical aid and confirm if funds are available. The patient has to queue at least three different queues (registration, confirmation and pharmacy) before receiving treatment.

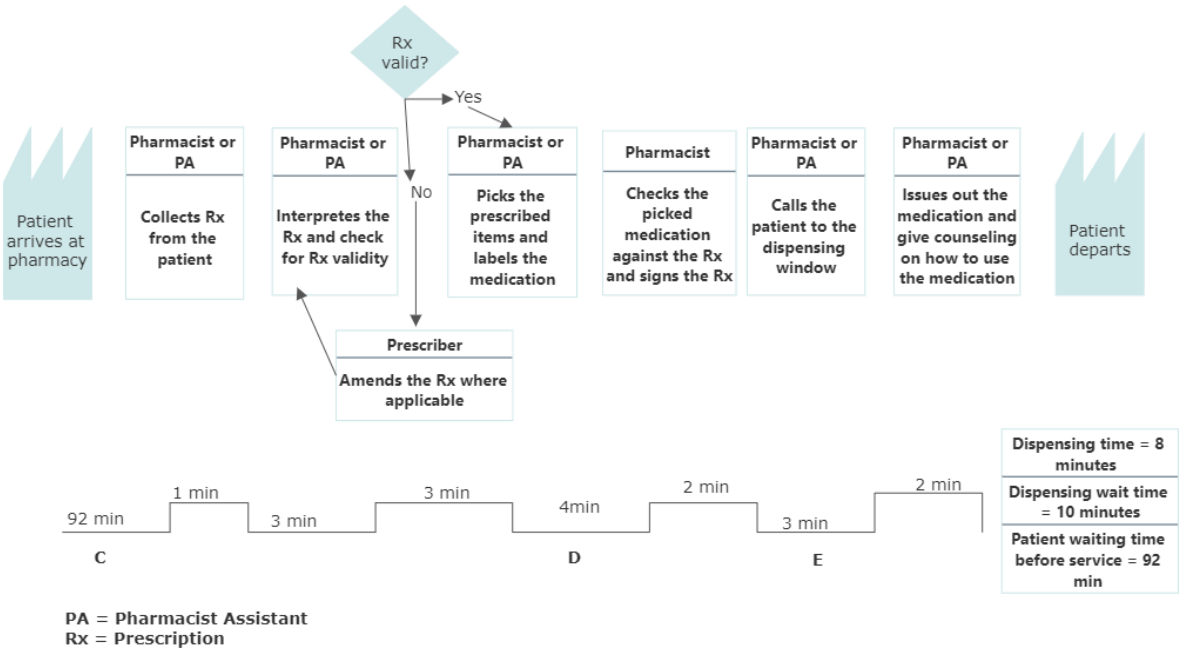

Figure 4.4: Value stream map at pharmacy.

In the pharmacy the patient has to wait approximately 92 minutes (C) before they can hand in their prescription to the pharmacist. The queue is usually long with about a hundred patients waiting for medication. This is worsened by the fact that the pharmacy is also servicing patients from outpatient clinics such as diabetics, medical, gynecology, and others. The total amount of time to dispense a prescription was on average 18 minutes with 8 minutes being value added time and 10 minutes of non-value-adding time. There is usually a waiting of four minutes (D) on average before the pharmacist can sign the prescription after the medication were picked by the pharmacist assistant. After the prescriptions were signed there is also some more waiting (average of 3 minutes) (E) before the medication is issued out to the patient.

Table 4.1. Summary of non-value-adding and value-adding activities at registration point and pharmacy

Non-value-adding activities	Time	Value-adding activities	Time
Patient waiting service at registration point	67 minutes	Registration process service time	11 minutes
Confirmation at registration (not all patients were affected)	45 minutes		
Patient waiting to hand in prescription to pharmacy	92 minutes	Receiving and validating the prescription	1 minute
Prescription lined up on dispensing bench (waiting for items to be picked)	3 minutes	Picking and labelling medication	3 minutes
Waiting for pharmacist to sign the prescription (the picked items)	4 minutes	Checking the picked items against prescription and signing the prescription	2 minutes
Waiting to issue out the prepared medication to the patient	3 minutes	Issuing out the medication and giving patient counselling	2 minutes

4.5. OBSERVATIONS

All patients from the various clinics were serviced from the same dispending windows.

The pharmacy employs mainly a manual system during the process of dispensing medication. Prescriptions from the prescribers are hand written with some of the handwritings being illegible. On two occasions it was observed where the pharmacist had to go to dermatology clinic because of an illegible prescription. It took the pharmacist at bench one about 3 minutes to correct the medication dosage on one of the prescriptions. All medication labels were written by hand by either the pharmacist or the pharmacist assistant for the dispensed medication.

While assigned to dispensing prescriptions one of the pharmacists had to check and sign the learner pharmacist assistant manual / booklet.

A patient's file which was tracked, as it was part of the study, was abandoned and medication not collected because the queue was long.

Not all assigned dispensary staff were present at their workstation most of the times despite the tea and lunch breaks. Tea, lunch breaks schedule and starting time were also not strictly

adhered to. Only few individuals were present at starting time which often resulted in them being strained and discouraged. There was improved productivity whenever the manager was present on the floor. Excessive chatting which negatively affected team performance was also observed.

There was no sense of urgency to do the work especially when the queue was shorter like on Fridays. The staff were slowing down on less busy days until the queue builds up and patients started complaining.

A 13 minutes meeting from 9:47-10:00 on Friday with the outpatients dispensing staff and pharmacy manager was held during which dispensing was withheld. Patients were informed about the delay due to the meeting.

Some of the prescribed medicines were not available in the main pharmacy and thus the affected patients were sent to dermatology pharmacy where they were also not assisted and were returned back to the main pharmacy.

A Post Basic Pharmacist Assistant (PBPA) was observed cleaning shelves and packing stock while patients were waiting to be served and while there was a Learner Basic Pharmacist Assistant (LBPA).

There was assistance from staff members from other sections. Two PBPA from the pharmacy bulk store room joined the dispensing team in the morning to help, even though most of the dispensary staff were not yet at their workstations.

The first dispensing workstation (Bench 1) comprising of five officials seemed to be more productive. All the five officials were busy with a file and there was no unnecessary chatting during the process. There was always a person at the window to issue out the completed files. The flow of work was continuous.

Patients collecting repeat medication and other patients from outpatient clinics were all queuing on the same queue and were assisted from the same dispensing windows. Some prescriptions were having many items (more than 10 items) to dispense while other prescriptions required the pharmacist to contact the prescriber to clarify or correct medicine interactions. These kinds of prescriptions took long to conclude (more than 15 minutes per prescription) and affected other prescriptions on the queue, causing more delays.

4.6. SPAGHETTI DIAGRAM

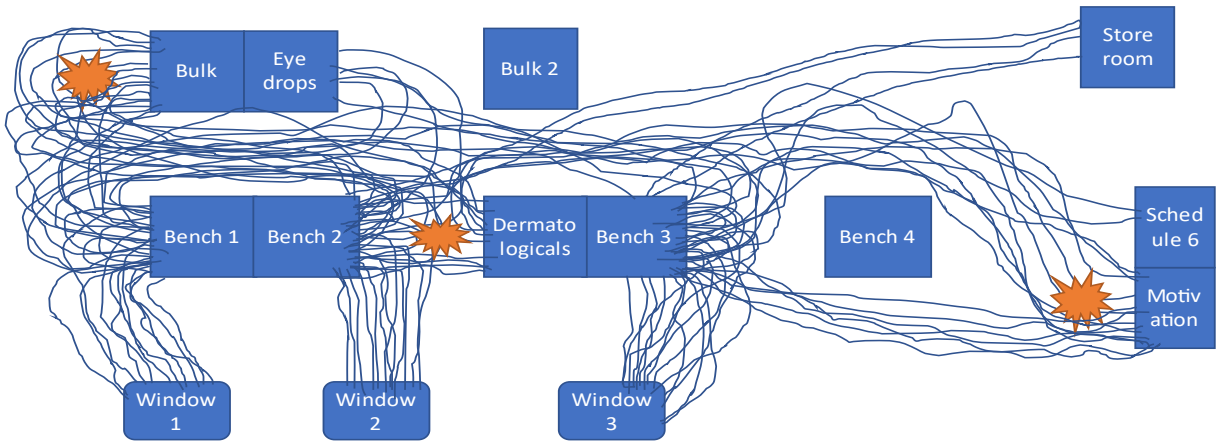

Figure 4.5: Spaghetti diagram showing steps walked by pharmacy staff in the dispensing area.

The diagram above shows that there are many trips taken by the dispensing staff to the motivation, dermatological and bulk sections (as reflected by the three orange stars). These sections are distant from where the dispensing is taking place (bench 1, bench 2 and bench 3). There were also trips taken to the store room to get some of the medication not available in the dispensing area which took an average of four minutes as there was some waiting in the store room in order to be assisted by store room officials.

4.7. SUMMARY

The chapter presented the results and analysis of the data collected over the two weeks' study period. The discussions of the results will follow in the next chapter.

CHAPTER 5

DISCUSSION

5.1. INTRODUCTION

The results presented in Chapter four will be discussed in this chapter. The discussion is presented according to the three main objectives of the study, as presented in Chapter one in conjunction with the literature reviewed in Chapter 2. Recommendations to address the issues identified in the study are also presented in this chapter, as well as to answer the critical research question: how can the waiting period for collection of chronic medication at a hospital pharmacy be improved?

The objectives of this research were to:

- Identify the factors that contribute to long waiting in the registration of chronic repeat patients and dispensing of a prescription.
- Investigate ways of eliminating or reducing wasteful practices in these processes.
- Evaluate opportunities for improvement using a benefit matrix.

OBJECTIVE 1

5.2. FACTORS THAT CONTRIBUTE TO LONG WAITING IN THE REGISTRATION OF CHRONIC REPEAT PATIENTS AND DISPENSING OF A PRESCRIPTION.

5.2.1. Patient arrival time

Although the registration station's business hours were from 7:30am, patients were arriving way before operating hours mainly because they wanted to be first on the queue and be assisted quicker. This exacerbates the problem of long waiting period. There are usually approximately 100 patients waiting on the queue to be served when the clinic opens for business, which already reflects a possibility of a bottle neck from the start. By the time these patients are serviced from the registration point, congestion (overcrowding) is created at the pharmacy because patients from other clinics have already started arriving at pharmacy. A similar occurrence was mentioned by Tegabu (2008) whereby it was found that long waiting times at public health facilities was primarily due to mismatch of patient arrival (arrived too early) and service commencement.

5.2.2. Registration processes (multiple steps – registration, confirmation and finance)

There are multiple steps (registration, confirmation and finance for payments) that patients have to go through before completing the registration process, especially those whose classification has expired or those on medical aid. These patients are required to go to the confirmation office to renew their classification or confirm availability of funds. In the confirmation office there is also some waiting that takes place. Patients having to walk to the confirmation office and back to registration point is considered a motion and a waiting time waste. Motion and transportation waste occurs when people, equipment, products, and information, move around without creating value (Musica, 2019).

5.2.3. Demand and Capacity

It is important to match capacity with demand and ensure that you have the right quantity of people, with the right skills, to meet demand (Chetty, 2010). Figure 4.1. indicates that patients wait on average 67 minutes before being assisted by the registration clerk. The number of patients (about 100 patients) waiting to be served at the registration point during the first two hours after opening time, and the two clerks allocated to register them did not seem to match (demand was more than the capacity) and as a result the system became congested with long queues and a waiting time of 67 minutes was experienced. According to Hartman and Sunjka (2013) long queues are caused either by poor planning or by variation in load. In the event where the capacity is poorly planned, and the system is incapable of serving the demand that it regularly sees, it is viewed as system failure which is a strong driver of failure demand (Hartman and Sunjka, 2013). The fact that patients arrive early (before the clinic opens) at registration points also compounds the problem of long waiting. This trend was also picked up in a study conducted by Tegabu (2008).

5.2.4. Patient categorization at pharmacy

It was observed that in the pharmacy, all categories of patients were serviced from the same service points. There was no grouping of patients according to classification. Having repeat medications patients and patients from various outpatient clinics (such as diabetics, medical OPD, gynecology, orthopedics, endocrinology etc.) queuing on the same line resulted in long queues and bottlenecks. Each type of patient consumes the pharmacist's time differently. Patients with new prescriptions, special needs & low immunity require more time since the pharmacists needs to explain thoroughly the prescription while dispensing repeat

prescription is faster because the patients already know their medication and how to use them (Alodan et.al, 2020).

5.2.5. Manual dispensing system and handwritten prescriptions from prescribers

Having to write each label by hand, as mentioned in the results, can be time consuming and leaves room for dispensing errors. The results of a study conducted in Birmingham Free and Charitable clinic by Fisher and colleagues shows that pharmacists spend a large portion of their time (21%) preparing prescriptions, primarily the handwritten labelling of medication bottles and documentation tasks, which is not an optimal utilization of pharmacist expertise (Fisher et. al, 2016). For the pharmacists to spend time manually writing labels results in a waste of underutilized talent and prolongs service time. Furthermore, some of the important information that should appear on the label may be omitted when labelling manually which is not the case with electronic dispensing and labelling because labels are generated by the system.

5.2.6. Staff commitment and team work

The results revealed a lack of commitment and/or team work from the pharmacy dispensary staff whereby some of the dispensary staff were not present at their workstation with no valid explanation. This puts a burden on the system resulting in reduced productivity and delays in service delivery as the workload will seem too much for the few available personnel. Excessive chatting by the workers was also negatively affecting team performance. According to Frye (2018), an American workplace survey conducted by The Harris Poll on behalf of CareerBuilder uncovered that the overly chatty employee is among the leading culprits for lack of workplace productivity. Even though some socializing and networking can be generally helpful in building relationships and team work, employees need to be aware to balance their socializing with the needs of others in the workplace who might be distracted by too much conversation (Frye, 2018).

5.2.7. Accessibility of prescribed medication

Some of the prescribed medicines were not available in the main pharmacy and thus the affected patients were sent to dermatology pharmacy to collect their medication but they were also not assisted and were returned back to the main pharmacy. For the patient this becomes wasteful (motion waste).

5.2.8. Clear definition of roles and responsibilities

Post Basic Pharmacist Assistant (PBPA) cleaning shelves and packing stock while patients were waiting to be served was also observed. While this activity is essential to ensuring proper arrangement of stock, an organized work space and efficient workflow, it can be performed by a less qualified official such as a Learner Basic Pharmacist Assistant (LBPA). The scope of practice of the PBPA permits the PBPA to perform all phases of dispensing prescriptions under the supervision of the pharmacist (SAPC, 2010). It becomes a waste (underutilized staff) or non-value adding activity to assign a more qualified employee (PBPA) to perform a duty that could be performed by a less qualified employee one (LPBA) (Fisher et.al., 2016). It is also costly while at the same time it suffers service delivery because more important tasks that needs the qualified employee are put on hold. Thus, the PBPA should prioritize dispensing prescriptions while the LPBA is assigned packing of stock especially when patients are waiting to be served.

OBJECTIVE 2

5.3. WAYS OF ELIMINATING OR REDUCING WASTEFUL PRACTICES

5.3.1. Patient arrival time

Patients do not have to come an hour before to book a queue if they know the system is reliable and there will be no congestions and they will be assisted quicker. Traditionally queues are managed on a first come first served basis or according to FIFO (first in first out) system as the system is seen as a fair method to everyone. However, the LIFO (last in last out) system introduced by Professor Lars Peter Osterdal of the University of Southern Denmark, forces people to come at staggered times, resulting in shorter queues (Tšernov, 2023). Improvement of the entire patient registration and pharmacy dispensing systems could automatically improve patient arrival time as the system becomes more reliable. Employing a queue management system in the pharmacy that will prioritize patients according to services they require and those with special needs may be worthwhile (Tšernov, 2023).

5.3.2. Registration processes

To reduce process complexity, it is necessary to streamline the processes. Bringing the confirmation function to the registration point by incorporating the function into the electronic system (MEDICOM) that is used during registration could ease the burden on the patient's side and thus alleviate both the motion and waiting wastes. Medical aid funds confirmation

can be performed online through the linking of the patient registration system with electronic health records systems that will confirm medical aids benefit online rather than making phone calls manually (Senapati, 2022). By incorporating medical aid checks into registration process, Hospitals can determine the patient's coverage up front (Senapati, 2022).

5.3.3. Demand and capacity

The results showed a mismatch of capacity with demand when the patient registration section starts operating which increased patient waiting time. Phoenix Ortho (2021) advises that if the bottleneck delaying patient flow is caused by a lack of labor for a critical process, it may be necessary to add more staff to that process. This statement is also supported by Tegabu (2008), in a study on assessment of waiting and service times in public and private health care facilities, that suggests that a more efficient staff utilization such as redistribution of staff to registration point during peak hours could ease the burden and a study by Robinson et.al. (2020) that suggests adequate staffing at the beginning of clinic. Increasing the number of patient registration clerks during peak hours (between 7am to 10am) could ease the morning congestion at registration point and at pharmacy. This will also ensure that when pharmacy opens at 7:30 am, they service all repeat patients before pharmacy peak time which was usually around 11am when patients from other outpatient clinics arrive.

5.3.4. Patient categorization at pharmacy

Patient collecting repeat medication should have a separate fast queue from the other patients at the pharmacy because their do not require a lot of interaction with the pharmacist. New prescriptions, the special needs & low immunity patients require more time since the pharmacists needs to explain thoroughly the prescription (Alodan et.al, 2020). Creating a fast lane for the repeats and helping them in the early hours before other patients from the outpatient clinics arrive will alleviate the bottlenecks at pharmacy waiting area.

5.3.5. Manual dispensing system and handwritten prescriptions from prescribers

There is a need to employ technology in the pharmacy dispensing system especially with the printing of dispensing labels from the computer rather than writing by hand. This is supported by a paper published by Mafarafara and colleagues on Re-engineering Pharmaceutical Service Towards NHI, where they indicated that most hospital pharmacies in Limpopo province serve thousands of patients but still use handwritten dispensing labels, which may compromise the quality of information included on the labels. Electronic

dispensing was recommended as a way to address the inefficiencies (Fisher et.al, 2016 and Mafarafara et al, 2018).

Employing electronic prescribing by the doctors could improve prescription legibility and minimize dispensing errors – this will also alleviate time wasted trying to figure out what is written on the prescription, calling the doctor for clarity or sending back the patient to the doctor to rectify a prescription (Alodan et.al.,2020).

5.3.6. Staff commitment and team work

Employee engagement is important for maintaining productivity in the workplace and achieving organizational goals. Keeping employees engaged is a process that requires ongoing evaluation and encouragement. By identifying barriers to employee engagement and improving communication, team leaders and managers can ensure their employees stay engaged (Indeed, 2022). Goetsch and Davis (2016) explains that the key to establishing a customer focus is to put employees in touch with customers so that customer needs are known and understood. Customer needs are not static. Therefore, constant contact with customers is essential in ensuring total quality.

Engaging the pharmacy team in employing some of the Lean tools such as the A3 problem solving methodology where the team will go through the model's different steps (process mapping, root cause analysis, counter measures, implementation plan, effect confirmation and follow up) until there is a proper solution to be implemented could lead to desired outcomes as it was attained in Mitchell's Plain Community Health Centre in the Western Cape and on a university hospital inpatient pharmacy department of pharmacy's improvement project (Isaacs and Hellenberg, 2009; Ortega and Gilchrist (2017).

Management's role in staff empowerment is best described as commitment, leadership and facilitation. The kinds of support managers can provide include having a supportive attitude, role modelling, training, facilitating, employing management by walk about (MBWA), taking quick action on recommendations, and recognizing the accomplishment of employees. Managers should take on leadership role and inspire their people to make a total, willing, and voluntary commitment to accomplishing or exceeding organizational goals (Goetsch and Davis, 2016).

5.3.7. Accessibility of prescribed medication

In the case where an item is not available in one pharmacy outlet while it is available in the other outlet, communication telephonically could be used between the workers in order to

assist the patient and minimize the walking from one place to the other, thus eliminating the motion waste. Attempts to bring all medication required to the dispensary can be explored.

5.3.8. Clear definition of roles and responsibilities

The PBPA could focus on the dispensing aspect according to their scope of practice while the LBPA takes care of the packing and cleaning the shelves. In their study Fisher et.al. (2016) found that Pharmacists spend a lot of time on administrative tasks that could be assigned to junior staff and free their hands to handle direct patient care like dispensing and patient counselling. The university of Utah family medicine clinicians used Lean methodology to identify patient education waste at their clinics and thus delegated materials compilation and electronic documentation to nonclinical support staff members (Pharmacy Times, 2016). It is therefore necessary to revise the job functions of the dispensing team in order to improve efficiency. Pharmacists can delegate many tasks to technicians (depending on state laws) to free up time for pharmacist-exclusive services. (Pharmacy Times, 2016).

OBJECTIVE 3

5.4. RECOMMENDATIONS AND ANSWER TO THE CRITICAL RESEARCH QUESTION

The following are recommendations to address the issues identified in the study in terms of long waiting of repeat patients and to answer the critical research question; how can the waiting period for collection of chronic medication at a hospital pharmacy be improved?

5.4.1. Redistribution of staff to busy areas (medical repeat registration point) during peak times to clear the congestion (Tegabu, 2008). Medical repeat registration point is mainly busy in the early mornings. The results showed a mismatch of capacity with demand when the section starts operating which increased waiting time. An allocation of two additional clerks between 7am to 10am will ensure that all patients are serviced before 10am, thus reducing waiting times. This will also ensure that when pharmacy opens at 7:30 am, they service all repeat patients before pharmacy peak time which is usually around 11am.

5.4.2. Patient categorization - there should be a separate fast lane service point for chronic repeat patients in the pharmacy. This is supported by the study performed by Alodan et.al. (2020) on the efficiency of waiting time in an outpatient pharmacy.

5.4.3. Introduce electronic dispensing to do away with handwritten medication labelling (Supported by Fisher et.al, 2016 and Mafarafara, 2018).

5.4.4. Bringing the confirmation function of checking patient classification and medical aid funds availability to the registration point could ease the burden on the patient's side.

5.4.5. Allocate dispensary staff duties according to their skills or expertise. E.g., basic pharmacist assistant to perform basic or general duties and the direct handling of the prescription be reserved for the pharmacist.

5.4.6. Introduce electronic prescribing by the doctors to improve prescription legibility and minimize errors – this will also alleviate time wasted trying to figure out what is written on the prescription, calling the doctor for clarity or sending back the patient to the doctor to rectify a prescription (Supported by Alodan et.al.,2020).

5.4.7. Staff engagement - involve staff in resolving the barriers to reducing waiting times. Lean tools such as A3 problem solving method can be considered. This will make the staff take ownership in their work (Supported by Altema et.al.,2020).

5.4.8. Put employees in touch with customers so that customer needs are known and understood and challenges are communicated well in advance to the customers by employees. Establish strategies for communicating with customers about what they can expect from your business. Delays are unfortunately inevitable during peak season, but a thoughtful customer communication strategy can reduce the frequency and intensity of complaints (Wills, 2021).

5.4.9. An ongoing training program for staff emphasizing customer service to be put in place.

5.4.10. Automation of the queuing system - with an automated self-sign-in process, clients can sign up for a waiting line at the pharmacy.

5.5. OPPORTUNITIES FOR IMPROVEMENT USING A BENEFIT MATRIX

The Benefit matrix is a simple tool which helps with prioritizing actions. It works by comparing how easy a set of actions are, and how much benefit they each yield. Those with the highest benefit and lowest effort are prioritized (World of Work Projects, 2021). To use the Benefit Matrix, one must go through each of the options or courses of action that have been identified as things that might be done, and place each option on the matrix. The easier an option is to do, the further to the right it is placed. The more benefit it will bring by addressing it, the further up it is placed. Once all the options are placed in the matrix, it will be easy to see which ones provide the highest return on effort as they will all be to the upper right of the matrix. These are the ones should be started with and then progressively moving diagonally down and left through the matrix, tackling further options (World of Work Projects, 2021).

Table 5.1: Benefit Matrix

Benefit		
	High benefit but hard: 1. Electronic dispensing 2. Electronic prescribing by the doctors 3. Automation of the queuing system	**High benefit and easy:** 1. A3 Lean Problem Solving. 2. Redistribution of staff to busy areas (repeat registration point). 3. Separate fast lane service for chronic repeat patients in the pharmacy. 4. Staff engagement, empowerment & training. 5. Role clarification
	Hard and low benefit: 1. Incorporating the confirmation and medical aid check to the patients' registration system.	**Easy but low benefit:**
		Ease

Table 5.1. Shows the benefit matrix based on information derived from addressing objective one (5.2) and two (5.3) above.

Employing activities such as: A3 Lean problem-solving technique that will involve the whole team working together in solving the problem and tracking the progress, redistribution of staff to busy areas (repeat registration point), separate fast lane service for chronic repeat patients in the pharmacy, staff engagement, empowerment, training and role clarification will be less costly while could yield positive outcomes. Investing in automation (electronic dispensing, electronic prescribing and queue management) will cost the pharmacy more but will ensure a more permanent or long-lasting solution.

5.6. VALIDITY AND RELIABILITY

Good reliability in an observation study confirms that observations will be consistent across time or observers (DeMonbrun et.al, 2015). To ensure validity of the study the observations were performed repeatedly within similar setting, until comparable findings were observed over time. Validation by the individuals being observed, ensures that the conclusions of the

observer match what is actually happening during the observation (DeMonbrun et.al, 2015). The researcher checked validity by confirming the accuracy of the data collected through observations with the officials involved in the two sections (patient registration and pharmacy) where the research was conducted. In future research, the validity can be improved through the employment of a skilled moderator to analyze the data collected to minimize personal bias and triangulation (where multiple individuals analyze the same data) while reliability can be improved by employing refutational analysis which involves exploring and explaining contradictions between individual studies to support the claim of reliability) (Thakur & Chetty, 2020). The reliability of the patient waiting time can also be improved by increasing the patient waiting time sample size to ensure a 95% confidence level as per National Department of Health guidelines (NdoH, 2019).

CHAPTER 6

CONCLUSIONS AND RECOMMENDATIONS

6.1. CONCLUSIONS

The purpose of this study was to investigate the factors that contributed to the long waiting of chronic repeat patients before receiving medication in a hospital pharmacy. Therefore, the waiting time was observed as well as value adding and non-value adding activities through the use of one of the Lean principles which is value stream mapping.

The total average time waited by the patients collecting repeat medication was 188 minutes with 28 minutes being service time. At the registration points, patients arrive way earlier than the operating hours. There was a mismatch of capacity and demand at the registration points which compounded to long waiting time at that service point in the morning hours. Medical aid patients and those that need to go to confirmation office wait the longest at the registration points. Lack of a dedicated service points exclusively for chronic repeat patients in the pharmacy compounds the long waiting time for these patients, as they are mixed with other new patients whose cases may be more complex. Manual dispensing whereby medication labels have to be hand written and illegible doctor's prescriptions were found to prolong the time it takes the pharmacist to complete a prescription. Some of the medication that are frequently used were located far from the dispensing stations resulting in frequent trips by pharmacists to the motivation cupboard and store room to collect the prescribed items. An underutilization of qualified staff where post basic pharmacist assistants were performing duties that could be performed by a less qualified personnel (e.g., cleaning the shelves) during peak hours was not value adding and thus decreases productivity. There is a need for staff engagement in addressing issues of quality where the pharmacy and hospital goals or objectives can be well communicated in order to improve the level of staff commitment. Tools such as A3 problem solving for addressing the long waiting time can be employed together with the team.

6.2. RECOMMENDATIONS FOR FURTHER RESEARCH

Within the scope of the research gaps identified for this research, potential research opportunities still exist that have only been partially addressed by this study.

- A study that focuses primarily on the internal pharmacy dispensing processes to identify value adding and non-value adding practices to be carried out. Clear

guidelines of what constitute value adding and non-value adding according to GPP to guide the study.

- Holistically studying hospital pharmacy efficiencies and inefficiencies through value stream mapping, in more than one pharmacy.
- Application of lean methodology and principles to improve efficiency in a hospital pharmacy.
- Employing value stream mapping to identify areas of improvement in pharmacy inventory management.
- Improving pharmacy efficiencies through automation and / or studying the impact of automation to improving pharmacy processes.
- Assessing the impact or effectiveness of lean tools in hospital pharmacies.

6.3. LIMITATIONS OF THE STUDY

- The scope of the study was only limited to one tertiary hospital
- Observation at the registration point was more focused on the time to complete the task rather than on the internal processes.
- Time constraints - data was collected over a six days period and therefore it could be a reflection of an instant as opposed to an overall trend and may not be a representative sample in the context of full-year trends.

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APPENDICES

Appendix A: Ethics Clearance Certificate

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG	HUMAN RESEARCH ETHICS COMMITTEE (MEDICAL)

Office of the Deputy Vice-Chancellor (Research & Post Graduate Affairs)

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DATE: 2019/06/06

REF: *R14/49*

PROTOCOL NO: **M190286** *(This is your ethics application study reference number. Please quote this reference number in all correspondence relating to this study)*

PROJECT TITLE: *An investigation of factors contributing to long waiting of patients collecting repeat medication in a tertiary hospital pharmacy*

Please find attached the Clearance Certificate for the above project. I hope it goes well and that an article in a recognized publication comes out of it. This will reflect well on your professional standing and contribute to the Government funding of the University.

MSWorks2000/Iain0007/Clearscan.wps

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG

R14/49 Ms RV Oladipupo

HUMAN RESEARCH ETHICS COMMITTEE (MEDICAL)
CLEARANCE CERTIFICATE NO. M190286

NAME: (Principal Investigator)	Ms RV Oladipupo
DEPARTMENT:	School of Mechanical,Industrial & Aeronautical Engineering University
PROJECT TITLE:	An investigation of factors contributing to long waiting of patients collecting repeat medication in a tertiary hospital pharmacy
DATE CONSIDERED:	2019/02/22
DECISION:	Approved unconditionally
CONDITIONS:	
SUPERVISOR:	Ms T Hattingh
APPROVED BY:	CB Penny Dr CB Penny, Chairperson, HREC (Medical)
DATE OF APPROVAL:	2019/06/06

This clearance certificate is valid for 5 years from date of approval. Extension may be applied for.

DECLARATION OF INVESTIGATORS

To be completed in duplicate and **ONE COPY** returned to the Research Office Secretary on the 3rd Floor, Phillip Tobias Building, Parktown, University of the Witwatersrand, Johannesburg.

I/we fully understand the conditions under which I am/we are authorized to carry out the above-mentioned research and I/we undertake to ensure compliance with these conditions. Should any departure be contemplated, from the research protocol as approved, I/we undertake to submit details to the Committee. I **agree to submit a yearly progress report**. When a funder requires annual re-certification, the application date will be one year after the date when the study was initially reviewed. In this case, the study was initially reviewed in **February** and will therefore reports and re-certification will be due early in the month of **February** each year. Unreported changes to the application may invalidate the clearance given by the HREC (Medical).

Principal Investigator Signature _____ Date _____

PLEASE QUOTE THE CLEARANCE CERTIFICATE NUMBER IN ALL ENQUIRIES

Appendix B: Data collection tool - Observation

Study title: An investigation of factors contributing to long waiting of patients collecting repeat medication in a tertiary hospital pharmacy

1. At waiting area before registration point:

1.1. Identify a patient to observe through the entire system. Explain the purpose and benefit of the study to them.

1.2. Record the time at the waiting area

1.3. Record any activity and engagement between staff and the patients (if any) e.g. blue card collected at 8am to filling room, brought back to the patient at 9am

1.4. Record the time the patient leaves the waiting area to the registration point.

2. At the registration point:

2.1. Record the arrival time

2.2. Record the activities takes place between patient and the clerk (e.g capturing data in computer, discussions)

2.3. Record departure time

3. At the payment point:

3.1. Record arrival time

3.2. Record the activities that takes place between the patient and the clerk (e.g. collection of money and printing of receipts)

3.3. Record departure time

4. Follow the patient to the pharmacy waiting area

4.1. Record arrival time

4.2. Record any activity or engagement with staff that happens at pharmacy waiting area

4.3. Record the time when the patient gives in the file at the dispensing window

4.4. Record the activities that happens inside the pharmacy

4.4.1. The reading of the prescription (how long, who perform this activity)

4.4.2. The picking of items (how long, who perform this activity)

4.4.3. The signing of the prescription (how long, who perform this activity)

4.4.4. The counselling (how long, who perform this activity)

4.4.5. Movement of dispensing staff to other places in order to perform the activity e.g. collecting medicine from another office / station

4.4.6. Capture any other activity

4.5. Record departure time

Appendix C: Waiting time recording for medical repeat patients

DATE: _____FORM NUMBER_____

ENTRY	TIME :
1. Arrival time (before registration – from 7H30am)	
2. Departure time (to registration point)	
3. Arrival time (at registration point)	
4. Departure time (at registration and pay point)	
5. Arrival time (at pharmacy waiting area)	
6. Time prescription was handed at the window	
7. Time medication was issued to the patient	

Appendix D: Waiting time – Completed forms

Victoria

WAITING TIME RECORDING FOR MEDICAL REPEAT PATIENTS

DATE: 11/06/2019 **FORM NUMBER** A

ENTRY	TIME :
1. Arrival time (before registration – from 7H30am)	8:15
2. Departure time (to registration point)	
3. Arrival time (at registration point)	9:58
4. Departure time (at registration and pay point)	10.00
5. Arrival time (at pharmacy waiting area)	11:19
6. Time prescription was handed at the window	12:34
7. Time medication was issued to the patient	12:54

wait

Reg : 105 min

Plg : ~~45~~ 79 min 75min

Tot : 200 min

Service time Reg : 2min

20min Plg

Connie

WAITING TIME RECORDING FOR MEDICAL REPEAT PATIENTS

DATE: 11/6/19 **FORM NUMBER** B

ENTRY	TIME :
1. Arrival time (before registration – from 7H30am)	8h42
2. Departure time (to registration point)	09H55
3. Arrival time (at registration point)	10 H06
4. Departure time (at registration and pay point)	10 H07
5. Arrival time (at pharmacy waiting area)	11 H33 *??
6. Time prescription was handed at the window	12 H 44
7. Time medication was issued to the patient	12h53

Wait time:

Reg : ~~85~~ 84 min

Ply ; ~~80~~ 71 min.

Tot : 165 min

Service time 12h53 — medicine given

1min

9min

how to analyze quantitative data

Victoria / Connie

WAITING TIME RECORDING FOR MEDICAL REPEAT PATIENTS

DATE: 11/06/19 **FORM NUMBER** C

ENTRY	TIME :
1. Arrival time (before registration – from 7H30am)	8:15
2. Departure time (to registration point)	9h 45
3. Arrival time (at registration point)	9h 53
4. Departure time (at registration and pay point)	9h 54
5. Arrival time (at pharmacy waiting area)	11h00
6. Time prescription was handed at the window	12h02
7. Time medication was issued to the patient	12h07

	Wait time	Service time
Reg:	~~99~~ 98 min	1 min
Pay:	~~131~~ 62 min *	5 min
Tot:	~~230~~ (166)	

Connie

WAITING TIME RECORDING FOR MEDICAL REPEAT PATIENTS

DATE: 11/6/19 **FORM NUMBER** D

ENTRY	TIME :
1. Arrival time (before registration – from 7H30am)	08h53
2. Departure time (to registration point)	09h24
3. Arrival time (at registration point)	09h26
4. Departure time (at registration and pay point)	09h38
5. Arrival time (at pharmacy waiting area)	09h40
6. Time prescription was handed at the window	11h48
7. Time medication was issued to the patient	~~11h42~~ 11h59

	wait time	service time
Reg	45	1
Pay	120	17
TOT =	(183)	

Victoria

WAITING TIME RECORDING FOR MEDICAL REPEAT PATIENTS

DATE: 11/06/19 **FORM NUMBER** E

ENTRY	TIME :
1. Arrival time (before registration – from 7H30am)	9am
2. Departure time (to registration point)	10:15
3. Arrival time (at registration point)	10:29 (10 CASUALTY) 10:32 until 10:4
4. Departure time (at registration and pay point)	10:46
5. Arrival time (at pharmacy waiting area)	11:00
6. Time prescription was handed at the window	11:00
7. Time medication was issued to the patient	11:02

wait time

Reg : ~~10~~ 89 min

Plg : ~~18~~ 14 min

Tot : 1~~2~~2 min

service time

15

2

Coume

WAITING TIME RECORDING FOR MEDICAL REPEAT PATIENTS

DATE: 11/6/19 **FORM NUMBER** F

ENTRY	TIME :
1. Arrival time (before registration – from 7H30am)	9h03 (7:30)
2. Departure time (to registration point)	@9:30
3. Arrival time (at registration point)	09:10 ? 10:10
4. Departure time (at registration and pay point)	9:30 ? 10:30
5. Arrival time (at pharmacy waiting area)	09:31 ? 10:31
6. Time prescription was handed at the window	11:25 11:45
7. Time medication was issued to the patient	~~11:45~~ 12h02

	Wait	Service
Reg	67	20
Plcy	74	17

Tot : 178

Connie

WAITING TIME RECORDING FOR MEDICAL REPEAT PATIENTS

DATE: 11/6/19 **FORM NUMBER** G

ENTRY	TIME :
1. Arrival time (before registration – from 7H30am)	09h05 (07h40)
2. Departure time (to registration point)	09h25
3. Arrival time (at registration point)	09h38
4. Departure time (at registration and pay point)	09h40
5. Arrival time (at pharmacy waiting area)	10h50 ?
6. Time prescription was handed at the window	11h32
7. Time medication was issued to the patient	11h57

	Wait	Service
Reg	33	2
Plg	42	25
Tot	102	

Connie

WAITING TIME RECORDING FOR MEDICAL REPEAT PATIENTS

DATE: 12/06/2019 **FORM NUMBER** A

ENTRY	TIME :
1. Arrival time (before registration – from 7H30am)	08h42
2. Departure time (to registration point)	09h42
3. Arrival time (at registration point)	10H06
4. Departure time (at registration and pay point)	10H10
5. Arrival time (at pharmacy waiting area)	10H12
6. Time prescription was handed at the window	11:40
7. Time medication was issued to the patient	11:53

Total = 3H11min = 191

Reg = 1H28min = 88

P/y = 1H41min = 101

	Wait	Serv
Reg	80	4
P/y	88	13
Tot :	185	

Connie

WAITING TIME RECORDING FOR MEDICAL REPEAT PATIENTS

DATE: 12/06/2019 **FORM NUMBER** B

ENTRY	TIME :
1. Arrival time (before registration – from 7H30am)	08h50
2. Departure time (to registration point)	9h11
3. Arrival time (at registration point)	9h11
4. Departure time (at registration and pay point)	9h41
5. Arrival time (at pharmacy waiting area)	9h41
6. Time prescription was handed at the window	11h04
7. Time medication was issued to the patient	11h17

Reg = 51 min

Phy = 96 min

Tot = 147 min

	Wait	Service
Reg	21	30
Phy	83	13

Tot : 147.

Connie

WAITING TIME RECORDING FOR MEDICAL REPEAT PATIENTS

DATE: 12/06/2019 **FORM NUMBER** C

ENTRY	TIME :
1. Arrival time (before registration – from 7H30am)	08h57 ± 7h20
2. Departure time (to registration point)	09h12
3. Arrival time (at registration point)	09h12
4. Departure time (at registration and pay point)	09h39
5. Arrival time (at pharmacy waiting area)	09h41
6. Time prescription was handed at the window	09h56 Because of 70+ years.
7. Time medication was issued to the patient	10h15

Reg: 42 min
Phy: 34 min
Tot: 76 min

	Wait	service
Reg	15	27
Phy	15	19
	Tot: 76	

Study title: An investigation of factors contributing to long waiting of patients collecting repeat medication in a tertiary hospital pharmacy

Victoria / Connie

WAITING TIME RECORDING FOR MEDICAL REPEAT PATIENTS

DATE: 12/06/2019 **FORM NUMBER** D

ENTRY	TIME :
1. Arrival time (before registration – from 7H30am)	8H 45
2. Departure time (to registration point)	10:35
3. Arrival time (at registration point)	10:55
4. Departure time (at registration and pay point)	11:02
5. Arrival time (at pharmacy waiting area)	11:52
6. Time prescription was handed at the window	13:15
7. Time medication was issued to the patient	13:35

Reg : 137 min

Pay : 103 min

Tot : 240 min

	Wait	Service
Reg	130	7
		20
Pay	83	
	Tot : 240	

Victoria / Connie — 0832650650.

WAITING TIME RECORDING FOR MEDICAL REPEAT PATIENTS

DATE: 12/06/2019 **FORM NUMBER** E

ENTRY	TIME :
1. Arrival time (before registration – from 7H30am)	8H54
2. Departure time (to registration point)	10:35
3. Arrival time (at registration point)	11:00
4. Departure time (at registration and pay point)	11:05
5. Arrival time (at pharmacy waiting area)	~~12:25~~ 11:10
6. Time prescription was handed at the window	13:54
7. Time medication was issued to the patient	14:30

Reg: 129 minutes

Ply: 200 minutes

Tot: 329 min

	Wait	Service
Reg	126	5
Ply	164	36
	Tot 331	

Study title: An investigation of factors contributing to long waiting of patients collecting repeat medication in a tertiary hospital pharmacy

Victoria / Connie – 0832653650

WAITING TIME RECORDING FOR MEDICAL REPEAT PATIENTS

DATE: 12/06/2019 **FORM NUMBER** F

ENTRY	TIME :
1. Arrival time (before registration – from 7H30am)	9am
2. Departure time (to registration point)	10H34
3. Arrival time (at registration point)	10H36
4. Departure time (at registration and pay point)	10H37
5. Arrival time (at pharmacy waiting area)	10H38
6. Time prescription was handed at the window	12H56
7. Time medication was issued to the patient	13H19

Reg: 97 min

Plg: 161 min

Tot: 258 min

	Wait	Service
Reg	96	1
Plg	138	23

Tot: 258

Connie

WAITING TIME RECORDING FOR MEDICAL REPEAT PATIENTS

DATE: 13/6/19 **FORM NUMBER** A

ENTRY	TIME :
1. Arrival time (before registration – from 7H30am)	7h35
2. Departure time (to registration point)	8h15
3. Arrival time (at registration point)	8h16
4. Departure time (at registration and pay point)	8h27
5. Arrival time (at pharmacy waiting area)	8h28
6. Time prescription was handed at the window	9h30
7. Time medication was issued to the patient	09h51

	wait	Service
Reg	41	11
P/cy	62	21

Connie

WAITING TIME RECORDING FOR MEDICAL REPEAT PATIENTS

DATE: 13/6/19 **FORM NUMBER** C

ENTRY	TIME :
1. Arrival time (before registration – from 7H30am)	07:30 am
2. Departure time (to registration point)	09:18
3. Arrival time (at registration point)	09:25
4. Departure time (at registration and pay point)	09:28
5. Arrival time (at pharmacy waiting area)	09:30
6. Time prescription was handed at the window	11:05
7. Time medication was issued to the patient	11:25

	Wait	Service
		3
Reg	115	20
Phy	95	
	Tot: 233	

Victoria

WAITING TIME RECORDING FOR MEDICAL REPEAT PATIENTS

DATE: 13/06/2019 **FORM NUMBER** D

ENTRY	TIME :
1. Arrival time (before registration – from 7H30am)	7:30
2. Departure time (to registration point)	08:50
3. Arrival time (at registration point)	08:51
4. Departure time (at registration and pay point)	09:13
5. Arrival time (at pharmacy waiting area)	09:45
6. Time prescription was handed at the window	10:37
7. Time medication was issued to the patient	10:53

Reg : 103 min
Pay : 68 min
Tot : 171 min

	Wait	Service
Reg	81	22
Pay	52	16
	Tot :	

Victoria

WAITING TIME RECORDING FOR MEDICAL REPEAT PATIENTS

DATE: 13/06/2019 **FORM NUMBER** E

ENTRY	TIME :
1. Arrival time (before registration – from 7H30am)	7:30
2. Departure time (to registration point)	08:54
3. Arrival time (at registration point)	08:55
4. Departure time (at registration and pay point)	09:17
5. Arrival time (at pharmacy waiting area)	09.53
6. Time prescription was handed at the window	10:40
7. Time medication was issued to the patient	10 53

Reg : 107 min

Plg : 60 min

Tot : 167 min

	went	serv
Reg	85	22
Plg	51	9
	Tot: 167	

Christina / Victoria / Corne

0647565053

WAITING TIME RECORDING FOR MEDICAL REPEAT PATIENTS

DATE: 13/06/2019 **FORM NUMBER** 9

ENTRY	TIME :
1. Arrival time (before registration – from 7H30am)	8h55
2. Departure time (to registration point)	10h06
3. Arrival time (at registration point)	10h06
4. Departure time (at registration and pay point)	10h23
5. Arrival time (at pharmacy waiting area)	10h31
6. Time prescription was handed at the window	12h20
7. Time medication was issued to the patient	12h32

Reg : 89min

Phy : 121 min

Tot : 209 min

	wait	service
Reg	71	17
Phy	110	12

Tot : 210

Christina / Victoria / Connie
064 756 5053

WAITING TIME RECORDING FOR MEDICAL REPEAT PATIENTS

DATE: 13/06/2019 **FORM NUMBER** H

ENTRY	TIME :
1. Arrival time (before registration – from 7H30am)	8h59
2. Departure time (to registration point)	10h03
3. Arrival time (at registration point)	10h03
4. Departure time (at registration and pay point)	10h30
5. Arrival time (at pharmacy waiting area)	10h31
6. Time prescription was handed at the window	12h22
7. Time medication was issued to the patient	12h35

Reg : 89 min

Plq : 124 min

Tot : 213 min

	Wait	Serv
Reg	62	27
Plq	111	13
	Tot: 213	

Please hand form to
Chrstina / Victoria / Connie
~~07~~ 0647565053

WAITING TIME RECORDING FOR MEDICAL REPEAT PATIENTS

DATE: 13/06/2019 **FORM NUMBER** I

ENTRY	TIME :
1. Arrival time (before registration – from 7H30am)	9h01
2. Departure time (to registration point)	10:03
3. Arrival time (at registration point)	10:03
4. Departure time (at registration and pay point)	10:30 Salapare
5. Arrival time (at pharmacy waiting area)	11:14
6. Time prescription was handed at the window	12:21
7. Time medication was issued to the patient	12h42

Reg : 91 min

Plg : 132 min

Tot : 223 min

	Wait	Service
Reg	62	27
Plg	67	21

TOT : 177

Victoria

WAITING TIME RECORDING FOR MEDICAL REPEAT PATIENTS

DATE: 13/06/2019 **FORM NUMBER** F

ENTRY	TIME :
1. Arrival time (before registration – from 7H30am)	7 H 40
2. Departure time (to registration point)	09 H 15
3. Arrival time (at registration point)	09 H 15
4. Departure time (at registration and pay point)	09 H 20
5. Arrival time (at pharmacy waiting area)	09 H 23
6. Time prescription was handed at the window	10 H 47
7. Time medication was issued to the patient	10 H 56

10 h 58 → when finished counselling

Reg : 100 min

Plg : 95 min

Tot : 195 min

	wait	service
Reg	95	5
Plg	84	9
	Tot : 193	

Please return form to
Christina / Connie Vrefora
Thank you!

WAITING TIME RECORDING FOR MEDICAL REPEAT PATIENTS

DATE: 14/06/2019 **FORM NUMBER** F

ENTRY	TIME :
1. Arrival time (before registration – from 7H30am)	
2. Departure time (to registration point)	NO Que
3. Arrival time (at registration point)	9h46
4. Departure time (at registration and pay point)	9h48
5. Arrival time (at pharmacy waiting area)	9h50
6. Time prescription was handed at the window	11h26
7. Time medication was issued to the patient	11h49

	wait	serv
Reg	0	2
Plg	96	23

Tot: 121

Please return form to!
Christina | Connie | Victoria
Thank you!.

WAITING TIME RECORDING FOR MEDICAL REPEAT PATIENTS

DATE: 14/06/19 **FORM NUMBER** E

ENTRY	TIME :
1. Arrival time (before registration – from 7H30am)	9h33
2. Departure time (to registration point)	9h40
3. Arrival time (at registration point)	9h 33
4. Departure time (at registration and pay point)	9h40
5. Arrival time (at pharmacy waiting area)	9h41
6. Time prescription was handed at the window	11h23
7. Time medication was issued to the patient	11h39

	Want	Serv
Reg	0	7
Phy	102	16
	Tot:	

Makhofane

Please return form to:
Christina / connie / Victoria
Thank you!

Christina

WAITING TIME RECORDING FOR MEDICAL REPEAT PATIENTS

DATE: 14/06/19 **FORM NUMBER** D

ENTRY	TIME :
1. Arrival time (before registration – from 7H30am)	~~9h27~~ No Que
2. Departure time (to registration point)	~~9h30~~ ha
3. Arrival time (at registration point)	9h27
4. Departure time (at registration and pay point)	9h30
5. Arrival time (at pharmacy waiting area)	9h40
6. Time prescription was handed at the window	11h17
7. Time medication was issued to the patient	11h42

	wait	ser
Reg	0	3
P/cy	97	25

Tot: 125

Please return form to!

Victoria / connie / Christina

Thank you!

WAITING TIME RECORDING FOR MEDICAL REPEAT PATIENTS

DATE: 14/06/19 **FORM NUMBER** C

ENTRY	TIME :
1. Arrival time (before registration – from 7H30am)	
2. Departure time (to registration point)	
3. Arrival time (at registration point)	
4. Departure time (at registration and pay point)	
5. Arrival time (at pharmacy waiting area)	11:22
6. Time prescription was handed at the window	12:11
7. Time medication was issued to the patient	12:25

	Wait	Serv
Reg	~~49~~	~~49~~
Pay	49	14

Please return form to:

Connie / Victoria / Christine

Thank you!

WAITING TIME RECORDING FOR MEDICAL REPEAT PATIENTS

DATE: 27/06/19 **FORM NUMBER** A

ENTRY	TIME :
1. Arrival time (before registration – from 7H30am)	7h55
2. Departure time (to registration point)	9h00
3. Arrival time (at registration point)	9h14
4. Departure time (at registration and pay point)	9h23
5. Arrival time (at pharmacy waiting area)	10h00
6. Time prescription was handed at the window	11h00
7. Time medication was issued to the patient	11h30

wait

Reg. 79

60

Tot: 178

serv

9

30

Please return form to Victoria / Connie at Pharmacy security - Thank you.

WAITING TIME RECORDING FOR MEDICAL REPEAT PATIENTS

DATE: 27/06/2019 **FORM NUMBER** B

ENTRY	TIME :
1. Arrival time (before registration – from 7H30am)	8:30
2. Departure time (to registration point)	10:57
3. Arrival time (at registration point)	11:03
4. Departure time (at registration and pay point)	11:04 ??
5. Arrival time (at pharmacy waiting area)	12:20
6. Time prescription was handed at the window	14:20
7. Time medication was issued to the patient	14:45

	wait	serv
Reg	153	1
Plcy	120	25
	Tot: 299	

Tot = 6hrs, 15min = 375min

Please return form to Victoria / Connie at the pharmacy security

WAITING TIME RECORDING FOR MEDICAL REPEAT PATIENTS

DATE: 27/06/2019 **FORM NUMBER** A

ENTRY	TIME :
1. Arrival time (before registration – from 7H30am)	8:25
2. Departure time (to registration point)	10:30
3. Arrival time (at registration point)	10:32
4. Departure time (at registration and pay point)	11:03
5. Arrival time (at pharmacy waiting area)	11:03
6. Time prescription was handed at the window	14:20
7. Time medication was issued to the patient	14:40

	Wait	Serv
Reg	117	31
Pky	(9)	20

Tot 365

6hrs +

Appendix E: Calcuations/ Patient waiting time data

Date	Patient numbers	Waiting time before service at registration point (in minutes)	Service time at registration point (in minutes)	Waiting time before service at pharmacy (in minutes)	Service time at pharmacy (in minutes)	Total time waited (in minutes)
10/6/2019	P1	-	-	227	14	241
10/6/2019	P2	-	-	247	17	264
11/06/2019	P3	103	2	75	20	200
11/06/2019	P4	84	1	71	9	165
11/06/2019	P5	98	1	62	5	166
11/06/2019	P6	45	1	120	17	183
11/06/2019	P7	89	17	14	2	122
11/06/2019	P8	67	20	74	17	178
11/06/2019	P9	33	2	42	25	102
12/06/2019	P10	80	4	88	13	185
12/06/2019	P11	21	30	83	13	147
12/06/2019	P12	15	27	15	19	76
12/06/2019	P13	130	7	83	20	240
12/06/2019	P14	126	5	164	36	331
12/06/2019	P15	96	1	138	23	258
13/6/2019	P16	41	11	62	21	135
13/6/2019	P17	115	3	95	20	233
13/6/2019	P18	81	22	52	16	171
13/6/2019	P19	85	22	51	9	167
13/6/2019	P20	71	17	110	12	210
13/6/2019	P21	62	27	111	13	213
13/6/2019	P22	62	27	67	21	177
13/6/2019	P23	95	5	84	9	193
14/6/2019	P24	0	3	17	22	42
14/6/2019	P25	0	2	96	23	121
14/6/2019	P26	0	7	102	16	125
14/6/2019	P27	0	3	97	25	125
14/6/2019	P28	0	0	49	14	63
27/6/2019	P29	79	9	60	30	178
27/6/2019	P30	153	1	120	25	299
27/6/2019	P31	117	31	197	20	365

avg tot wait	178 min	67	10.6	92.7	17.6	187.9
avg tot service	28 min					

Appendix F: Observation data

10/06/19

(A)

DATA COLLECTION TOOL - OBSERVATION

Study title: An investigation of factors contributing to long waiting of patients collecting repeat medication in a tertiary hospital pharmacy

1. At waiting area before registration point:

1.1. Identify a patient to observe through the entire system. Explain the purpose and benefit of the study to them.

1.2. Record the time at the waiting area 10h45

1.3. Record any activity and engagement between staff and the patients (if any) e.g. blue card collected at 8am to filling room, brought back to the patient at 9am 19 - Repeat scripts are collected by the clerk to queue-up for reg's together this is done to control the queue

1.4. Record the time the patient leaves the waiting area to the registration point. 10:52

2. At the registration point:

2.1. Record the arrival time 10:56

2.2. Record the activities takes place between patient and the clerk (e.g capturing data in computer, discussions) The clerk signs all prescriptions on the reverse side and pass them on

2.3. Record departure time 11h07

3. At the payment point:

3.1. Record arrival time Non-paying patient (H°)

3.2. Record the activities that takes place between the patient and the clerk (e.g. collection of money and printing of receipts)

3.3. Record departure time

4. Follow the patient to the pharmacy waiting area

4.1. Record arrival time 11h08

4.2. Record any activity or engagement with staff that happens at pharmacy waiting area patient complaining about long waiting time

4.3. Record the time when the patient gives in the file at the dispensing window 13h10 14h55

4.4. Record the activities that happens inside the pharmacy

4.4.1. The reading of the prescription (how long) 14h55

4.4.2. The picking of items (how long) 14h58

4.4.3. The signing of the prescription (how long) 15h05

Issuing & Counselling 15h09

(A)

4.4.4. The counselling (how long)

4.4.5. Capture any other activity (how long)

4.5. Record departure time

10/6/19

(1) P.A receives file at Window at 14h50
Interprets Rx 14:h50
starts picking 14h51
number of items picked amounts to five (readily prepacked) and works directions 14h56
Lines file up for issuing (~~four~~ (4 files already in the queue) 14:59
In what happened to the PA in the 10min in btwn; did she pick another file or what?
Issuing and counselling at 15:09

10/6/19

P.A Receives file at 15h10
Interprets Rx 15h10
* Complains that the lack of express queue delays patients with few items 15h11 (holding Rx with too items)
Then realises that there are two Rx 15h11 (the second with 6 items)
Proceeds to store-room to collect motivation items 15h13
Returns at 15h17
Labels and writes directions to as 15h19
Lines it up for the pharmacist to check and sign 15:25
Pharmacist signs at 15h27
Places Rx on trolley for issuing & Counselling 15h28
Rx issued and Counselling done at 15h30

PA receives file at 15h25 10/6/19 (A)
Interprets and pick Rx 15h25
Writes instructions/directions 15h29
Chats with colleague while writing
Lines Rx up for P/cist to check and sign 15h30
P/cist signs 15h30
Lines it up for issuing & Counselling 15h31

10/6/19

P/cist receives file 15h32
Interprets Rx and starts picking 15h32
Labels and writes-out directions 15h33 while chatting to colleague about work-related issues. Signs Rx at 15h34
Lines Rx up for issuing and Counselling 15h34 (following four files)
Issuing and Counselling at 15h40

10/06/19

(B)

4.4.4. The counselling (how long)

4.4.5. Capture any other activity (how long)

4.5. Record departure time

File arrival (≈ student) 13:14
Picking item; writing labels (1,5 min). 4 items
Hands over file to p/cist 13:16
p/cist signs the file ± 15s, then puts the file to wait
" " another file while above file is waiting
File called out @ wind 2 13:23 — 13:24 issues out.

bench 1
P/cist busy resolving the problem of duplicate issue
±13:00 → 13:25

[redacted] B1
collects file — 13:27
interrupted by a file ≈ insulin dosage error?? (P/cist, issuer I PB together on the file) ± 3 min
Proceeds ≈ the file 13:34, picks
Corrects the previous file (I) —
write the labels for the picked items (4 items)
" complete the course → 13:39
Issuing the Rx 13:46 — 13:50 (pt asked a lot of questions)

13:53 — Receives files
Picks the items; writes the labels; 14:00; sign the prescription 14:03
Issues the file (P/cist issues as no PB on bench) 14:12.

eceive file/Arrival [redacted] 14:02 —
cks items from shelf, writes the label; 6 items (14:09)

NB: [redacted] = Names hidden for confidentiality purpose

12:49 — arrival (B) 10/06

Collect the Rx

In between signs another prescription from Gladys

Picks the item from bulk ± 2 min

writes/label & sign Rx (± 30 s)

Record stats (± 2 s).

Hands over file to PBA

Issues out Meds 12H56

— Collect blue card from pts } 1 min
gives counselling

Collects white Rx 12H:56

Picks item from shelf

write a label on plastic bag — methotrexate

label the medication (tear off label from roll), writes instructions

Counts Prednisone — writes quantity — packs item into bag

label

Completes the Rx @ 13:00

6 items

file lines up to be issued — other 3 files on the queue.

* P/list signs the students book. (I) interruptions

→ Calls the file of the pts @ 13:10

Pt presents blue card.

Gives counselling — Completed by 13:12.

waiting for a file (30's, P/list & one PA) (I)

NB: [redacted] = Names hidden for confidentiality purpose

10/06/19 C

(1)

DATA COLLECTION TOOL - OBSERVATION

Study title: An investigation of factors contributing to long waiting of patients collecting repeat medication in a tertiary hospital pharmacy

1. At waiting area before registration point:

1.1. Identify a patient to observe through the entire system. Explain the purpose and benefit of the study to them.

1.2. Record the time at the waiting area 10:45

1.3. Record any activity and engagement between staff and the patients (if any) e.g. blue card collected at 8am to filling room, brought back to the patient at 9am

pt has a triplicate pt.

1.4. Record the time the patient leaves the waiting area to the registration point.

10:52 — collects the prescription from pts from two rows. (19 prescript

2. At the registration point:

2.1. Record the arrival time 10:55

2.2. Record the activities takes place between patient and the clerk (e.g capturing data in computer, discussions) Collected Rx prescription clerks signs all Rx @ the back clerks captures the Rx on medicom syst

2.3. Record departure time

3. At the payment point:

3.1. Record arrival time 11:08

3.2. Record the activities that takes place between the patient and the clerk (e.g. collection of money and printing of receipts) — Rx stamped

3.3. Record departure time 11:10

4. Follow the patient to the pharmacy waiting area

4.1. Record arrival time 11:11

4.2. Record any activity or engagement with staff that happens at pharmacy waiting area

4.3. Record the time when the patient gives in the file at the dispensing window

4.4. Record the activities that happens inside the pharmacy

4.4.1. The reading of the prescription (how long)

4.4.2. The picking of items (how long)

4.4.3. The signing of the prescription (how long)

NB [redacted] = names hidden for confidentility purpose.

Z 15 (81/142289)

11/6/19 Patients selected for the study

moloto 0711795342 Form G

11/6/19

[redacted] 0839966958 Form F

[redacted] 0725752728 Form D

Form B.

Form G

Received by P.A at 11:33 specify ≈ bench!

Interpreted and picked at 11:35

Labelled and written at 11h36

Completed at 11:38 (five items)

queued-up for checking & signing by P/cist 11:39

signed at 11:40

Issued at 11:45

Form D P/cist

received at 11h42

Picked at 11:46

Collect motivation item 11:48

Returns at 11:50, chats with colleague while working

Labels and writes directions 11:54.

Completes Rx by signing and lining-up for issuing 11:59

Form F

Received at 11:45 by PA.

Picked all 11:46 only two items.

Labeled at 11:47

Signed at 11:56

Issued at 12:02.

here (3) places vault, stores, chairs, office

?

Counseling ??

G.P.-S. 06/02

11/06

Form C.
Received by P/ast at 12h02.
Interprets Rx and starts picking at 12h04
Labels and writes directions 12h06
Completes Rx signing and issues at 12h07
Pharmacist impressed about the study, wishing a solution to be found to deal with long waiting time.

11/06/19

Z 15 (81/142289)

(1).

13:44 [redacted]

Picking items from shelf

went to vault to get furosemide 20mg

write labels on the meds

9 items — Complete signing @ 13:48.

Counselling starts @ 13:55 → 13:57

---

(2) 13:48 [redacted]

Picks items ; ~~[redacted]~~ Prepacts ibuprofen, throws empty packs in bin

labels the items (writes on the labels).

Signs the Rx & enter stats 13:51 — 3 items

counselling starts @ 13:59 → 13:59 (20ss).

[redacted] B1.

(3) 14:15

goes to get the green copy — 1.5min

picks items, counts sulphasalazine, writes labels

adds special labels - may cause drowsiness

writes instructions → 14:24.

Signing — 14:26

Counselling — 14:28

NB: [redacted] = names hidden for confidentiality purpose

12/6/19

Z 15 (81/142289)

Form A

This patients' file is received by a student (P.A) at 11:40. There are two presonptions to be filled.
Picking starts at 11h44 for both scripts. Labelling and writting completed at 11:49
The pharmacist checks and signs at 11:50
The patient is called at 11:50 (There are no files lined-up at the window for issuing.
Counselling completed at 11h53

12/6

Form B.

Patient submits prescription at 11h04, received by a P.A Interprets and starts picking at 11h05, before labeling, a patient appears at the window from a satelite pharmacy. The P.A attends to the patient, redirecting him to the special queue. Returns to the bench at 11h10 and continues to label and corite directio Lines-up the file for checking and signing. at 11h12 the pharmacist checks and signs and calls the patient at the window, but there was no response. The meds were put-aside at 11 hr 15 the patient inquires at the window and explains that he had to go to the rest room. At 11h17 the medicatio is issued and counselling occured for 3 minutes (11h20)

12/6/2019

Z 15 (81/142289)

Form C.

Patients' name: [redacted]

Age: 72yrs.

At 09h42 the patient joins the 'special queue' at the pharmacy wait area. This patient is semi-blind accompanied by his wife.

at 09h56 the prescription is received by a p/cist
09h57 Interpretation of script and picking starts.
the pharmacist leaves the bench to collect motivation items (2) at 09:59, returns at 10h02 and continues with labelling and writing
at 10h07 lines the prescription-up for issuing and counselling
at 10h15 the patient is given medicines and counselling.
counselling occured for 2min. (10h17)
19 minutes

NB [redacted] = names hidden for confidentiality purpose

G.P.-S. 06/02

NB. [redacted] = Names hidden for confidentility purpose

Z 15 (81/142289)

12/06/19

Bench 2 10:20 staff [redacted]; [redacted], [redacted] on [redacted], [redacted], [redacted] (on leave); [redacted] @ vaniliters
* [redacted] helping for a while
[redacted] packing paracetamol on the shelf (±6 mi

File in 10H27 [redacted] (learner basic) → picking; writing labelling, prepacking ut bco Caco3
completes picking (8 items) 10H37. File waits for p/cist to sign. 10H35 P/cist check & sign Rx ± 1 minute. Records st
(PA moves to pick another file).
file waits on the queue to be issued. P/cist sign other f
on queue. (There are 2 PA on bench).
file called out @ window 10H40.
[redacted] still on tea @ 10:45 – refered matter to [redacted]

Bench 3 staff [redacted]; [redacted]; [redacted]; [redacted]
PC [redacted]; school [redacted]; [redacted]; [redacted]
P/cist on tea 11:13 → 11H30.

10H50 Bench 4 Staff [redacted]; [redacted], [redacted], [redacted]
[redacted] on tea; [redacted] consulting;
File in 10:56 ([redacted]) picks the file; goes to fetch
Arthrexin – 1.5 min; completes waiting time form (10 s)
completes writing the file @ 10H58. file waits for
p/cist signature (2 other files in front).
10:05 ([redacted] arrives from tea) – signs the Rx. file waits
to be issued. 11H08 calls out the file – completes the
waiting time form – completes counselling 11H09

G.P.-S. 06/02

13/06

[redacted] Form A.
0720263081

P.A receives file at 09h30 at window,
interprets prescription 09h30
leaves bench at 09h31
returns at 09:41 with motivation item.
Labels and writes all six items 09h42 and completes this
excersize at 09h50
09h52 pharmacist checks and signs file
takes to pile awaiting issuing 09h54
issuing & counselling 09h56

* 10 minutes to fetch not. item?
total = 26 min

NB [redacted] = Names hidden for confidentiality purposes

Z 15 (81/142289)

13/06

Form B

[redacted]

072 441 4689

I called this patient at 10h14 to trace her on the queue she said she abandoned Main pharmacy due to long queue and went to Tshepang for collection of meds.

MB [redacted] = Names hidden for confidentiality purpose

G.P.-S. 06/02

13/06

Z 15 (81/142289)

[redacted] [redacted] – [redacted] – picking; talking c̄ [redacted].
Pharmacist [redacted] left 10450. Asked [redacted] to attend bench 3.
3 Assistants left on b3. < 1 at the window, 2 busy c̄ Rx.

Finished writing it a 10458 out.

The form waited long for counselling (it found others on the Q.).

NB [redacted] = names hidden for confidentiality purpose

G.P.-S. 06/02

13/06

(2)

Z 15 (81/142289)

[redacted] came back 11h17.

11h35

b1 - 5 people (2 ph). No noise, just working smoothly

b2 - 4 people - 1 P;

13h33 Observation

b4 — empty [redacted] e [redacted] came

b3 - empty [redacted] came.

b2

b1

NB: [redacted] Names hidden for confidentiality purpose

G.P.-S. 06/02

NB: [redacted] Names hidden for confidentiality purpose

Z 15 (81/142289)

13/06/2019

08h15 OBSERVATION

b4 : [redacted] + [redacted] packing shelves

b3 : [redacted] + [redacted]

b2 : [redacted]

b1 : [redacted] + 1 (Mischeke = DR).

Availability.

All these people had files. Left 8h20 from OPD.

8h30

Patients only in the waiting area in front of our windows.

bench 1 – 3 files at the window; A, F + M working + talking on bench.

bench 2 – [redacted] + [redacted] → 3 files, one file on the bench, working 1 + 1 file each

bench 3 – [redacted] alone, issued 2 files. [redacted] also doing a file. [redacted] signing also on bench 3

bench 4 – cleaning happening; no one. [redacted] continued issuing / calling files.

8h36.

9h10

Patient waiting on window 1, I attended him → was sent for 50/50 UE/LQ at SOPD but then returned. Called [redacted] to assist him instead – to phone SOPD herself & find out if they have stock. * Rec: P/cist to talk (communicate) ≥ each other before sending pts.

10h00

b1 = 4; Andrew at windo, 3 c̄ Rx. Only [redacted] on tea. [redacted] = sick, [redacted] = sick, Khanyi = sick

b2 = 4; R student [redacted] all c̄ Rx.

b3 = 3 [redacted] S + G + Sentle; then the 3 doing Rx. packing tramal.

b4 = 2 P + J. both c̄ Rx.

OPD → Pts waiting – up to 3 benches the other side

Generally the Q is moving very slow.

11h06.

b1 = 4; everyone c̄ a file. Workflow = great

b2 = 2 assist, Ellen out; files = 4 (line up). The assistants otherwise working.

b3. Glad + Sara like talking. Mbongeni working.

b4. [redacted] + [redacted]

↳ was not there in the morning – the 1st file I saw her doing. [redacted] went out.

G.P.-S. 06/02

Z 15 (81/142289)

13/6/2019

Form C

[redacted]

0646025321

File received at window by P/cist at 11h05
Picking at 11h08
Labelling and writing completed at 11:20
Pens given to OPD staff, chats about quality of the pens for 30 seconds.
Checks the medicines, adds an omitted item 11:21 writes and labels.
Signs at 11h21
calls patient at the window at 11h22 (No response)
at 11h24 patient is called again, appears and medication is issued and counselling provided at 11:25 for 2minutes (11:27)

NB [redacted] staff Names hidden for confidentiality purpose

G.P.-S. 06/02

13/06

Z 15 (81/142289)

Challenges

B3 & B4 – Problem of labels all over the place
no specific place to keep labels + untic labels in each bin on the table

(not clear)
faint Rx's (as per individual reports); [redacted] had to go to dema to fix one (9H20 →

* Place (OPD) not neatly packed
– B3 & B4 ; the bins on the table have labels mixed/ old stock – untidy · also counting trays in the bins · waiting time forms, triplicate Rx; & other papers in the boxes next to dispensing windows → very untidy, dust collecting ; papers/docs not arranged systemically

55

NB [redacted] staff names hidden to ensure confidentiality

NB [redacted] staff Names hidden to ensure confidentiality

Z 15 (81/142289)

13/06/2019

B4 • At waiting area the place is already full

7H 50 – B4

P = [redacted] A =

Packing stock on shelves. No dispensing yet.

[redacted] arrives 7H56

8:19 ~~4 staff (2P, 2PA) busy ē Rx~~. still 2 staff

[redacted] joins the calling of files.

• B3 – [redacted], [redacted], [redacted] – busy dispensing

7H55 – no one stationed @ this bench

↳ [redacted], [redacted], leaves to the store room. Bench empty.

2nd staff [redacted] 8:55

8:15 2 staff (~~P/ust~~ PA's) busy ē Rx; one packing ~~busy ē Rx. bench not tidy!~~ paracetamol

7H55 B2 – Present = [redacted]. busy ē prescription

↳ only one @ bench.

8:15 One staf (P/ust) busy ē Rx. bench untidy!

8:17 2nd staff arrives (PA – [redacted]).

9:27 [redacted], [redacted] (joined by B1 staff [redacted], student)

[redacted] (student packing Aq cr on shelf.

7H57 B1 Present: [redacted], [redacted], [redacted], [redacted]

Each one having their script

8:15 4 staff (2P, 2PA) busy ē Rx.

9:19 Cleaning @ bench 1 – [redacted] @ bench 2 dispensing

[redacted] to dermatology as he cant see on the Rx (white copy)

what is prescribed (too faint)

[redacted] said the people are drinking tea, because they'll not take tea @ 10 am

3 staff (1P; 1PB; 1LB) 13/06

@B2
Form D 2 [redacted] 10'45 → Picking done by 10H47
Plust checks the Rx (8 items) records the stats 10.
2 files on the queue to be listed
Counselling starts @ 10H51 → 10H52.

11:05

MB [redacted] Names hidden to ensure staff confidentiality

13/06

Bench 3

Z 15 (81/142289)

9H40 5 staff members (1P; 2PA; 1LPB; [redacted])
Absent: 2 students ([redacted] - child sick); [redacted] (rel. em @ P

10H40 staff [redacted], staff [redacted], staff [redacted]; staff [redacted] went ~~out~~ to get item 4.
4 files on the bench

Form F [redacted] 2 [redacted] 10H46 @ B3

11:05 staff: [redacted] (sgn-s), + 4 files to be sig
[redacted] on tea.

NB [redacted] = staff members. Names hidden to protect their identity.
To (ensure) maintain confidentiality.

13/06

Z 15 (81/142289)

Bench 4

Absent: [redacted] (sick); [redacted] (sick); [redacted] not yet arrived

9 H 35 2 staff ([redacted] & [redacted]). dispensing

— floor damaged !!

stock packed nicely! (1 3 5)

10 H 39 [redacted] & [redacted] → ~~2~~ 3 files on the desk which they're

11 H 05 [redacted] comes to relief. [redacted] & [redacted] on tea?

↓ went to HR to f o/time

12:00 [redacted] back @ bench from tea

↳ saying was not out for 1hr?

NB [redacted] Staff Names hidden to ensure / maintain confidentiality.

G.P.-S. 06/02

13/6/19

Z 15 (81/142289)

OPD

[redacted]

B3

08h33

Two P.A's picking. working with one P/cist.
08h35 P/cist 2nd appears with motivation items from the cupboard.

08:37 P.A ① now packing stock (PB)
08h48 2nd P/A reappears and still packs stock.

B4.

08h38 Cleaning in progress. no one at the bench for now
08h46 Only 1 pharmacist busy at the moment. No PA. This pharmacist has a dual function of signing at her bench and at TTO interchangably. 08h49 the P.A returns apparently she was in the rest-room. 08

B2

08h40 ① pharmacist and ① PB PA picking (dispensing) both calling seperate files and continuing with routine
08h59 cleaning starts at the bench.

bench 1.

08h50 ① PBPA dispensing, approaching me to confirm an item on the prescription.

08h52 ① Pharmacist busy signing and issuing. also providing One patient counselled for 2 minutes

observation suspended at 09h00

G.P.-S. 06/02

13106

NB: [redacted] Names hidden for confidentiality purpose

Z 15 (81/142289)

G [redacted]

H [redacted]

I [redacted]

→ Phoned I at 10h00 — not yet registered.

Form G.

Rx Received at the window by P.A at 12h20
Interpreted and picked at 12h21
Labeling and writing at 12h22 (3 items)
Checked and signed by P/dist at 12h26
Placed at the window for issuing at 12h29
Issued at 12h30. Counselled for two minutes 12h32

Form H.

Patient did not submit form at the window.
Medication issued at 12h35 in conjunction with counselling
The form was fully completed by the patient & given in thereafter.

Form I

Patients file received at 12h21, by a P/dist
Picking starts at 12h22
Labeling and writing occurs at 12h24
Another patient calls for assistance at the window, P/dist leave the bench, attends to patient who was send back earlier. 12h26
at 12h32 prescription is checked and Signed. At 12h42 medication issued, complied with counselling.

14/6/2019 (Friday – @ month end for staff)

D [redacted]

E [redacted]

F [redacted]

At ~~10h~~ 11h00, I checked them, they were still waiting outside (2nd line the 1st one).

E 11h40 Handed in (at [redacted]). She worked on it. She was [redacted]. The file had few items (5).

F Only identified her when they called her for medication at bench 1 (was done on bench 2)

General Observation.

The queue was not long but the pharmacy staff was not energetic. Bench 1, [redacted] was doing stats, [redacted] = short dated report → found many expired items. [redacted] was working at his pace, but he did a lot of files. [redacted] was assisting at the window. Bench 2; the workflow was not as bench [redacted] was there, but not working fast, the [redacted]. On B3, the young student on maroon tracksuit was working hard, she went several time to the window calling in files.

But was [redacted] = just working.

I remembered again

NB [redacted] = names hidden for confidentiality purposes

14/06/19

Z 15 (81/14228

9h50 Observation

Meeting in OPD chaired by [redacted]. Only [illegible] the window.

Back to working stations at 10h00

b1 = 4; [redacted] (SDS

b2 = 4

b3 = 3 [redacted] (SDS)

b4 = 2

Outside, [illegible] in the whole front of the pharmacy. But it is 10h30

b1 - 4 Rxs waiting on the table. Only [redacted]

b2 - 3 Rxs c̄ 3 people. Each c̄ a Rx.

b3 - 1 Rx attended by student; [redacted] at the green Rx tal to [redacted] & checking Rxs. 10h40 [redacted] was back.

b4 - [redacted] working alone - still alone 10h40. [redacted] was working on the computer all the while

10h41 - Rx not y attended to. [illegible] the pts saying they [illegible] us.

Generally the case is not moving as was moving yesterday only bench 2.

(i) Patient [redacted]

Taken by ~~window~~ bench 1 ([redacted]) at 11h17. The file had (11) items. Finished at 11h25 [Picking & labelling (writing)]. It waited on the table for signature of the Pharmacist. It was [redacted] - picking & [redacted] - counselling at the window. [redacted] started checking it at 11h30. Finished signing at 11h34; waiting for issuing as there were other files too c̄ [redacted]. He is taking out for both bench 1 & 2. Called at the window at 11h39; finished at [redacted]. Patient also had some questions c̄ the ph & [redacted] went to [redacted] c̄ the Rx. One item was short, then it was replaced (aspirin) at 11h42.

G.P.-S. 06/02

NB: Names hidden for confidentiality purpose [redacted]

14/06/19

Z 15 (81/142289)

since after meeting

10:55 B1 → [redacted] busy Σ staff Σ the learner from B1 lo

10:55 B4 → [redacted] ordering since after meeting 10a

10:55→11:09 staff @ B4 → [redacted]

B3 → [redacted] →

B2 → [redacted] busy Σ file, [redacted] since arrival checking shortdated

[redacted] — on lunch, tea respectively

B1 → [redacted] (helping)

Most people having other activities!

Pt complained @ 9H30 that queue not moving su

7:30. Meeting held @ 9:47–10:00 (feedback gu

MB [redacted] = Names hidden for confidentiality purpose

Thank u God for support from team ([redacted]) they encourage

G.P.S. 06/02 me today to finish strong!

Bench 1

9H45 4 staff (2P; 1LB; 1PB; maseko?).

Appendix G: Study Protocol



Title

An investigation of factors contributing to long waiting of patients collecting repeat medication in a tertiary hospital pharmacy

Student Name

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A Investigational Project **proposal** submitted to the Faculty of Engineering and the Built Environment, University of the Witwatersrand, in fulfilment of the requirements for the degree of Masters in Engineering in Engineering.

Date 27/03/18

1. RESEARCH BACKGROUND/CONTEXT

Patients on chronic medication usually visit a hospital, a clinic or a pharmacy on a monthly basis to collect their repeatable chronic medication. Upon arrival in a hospital there are processes that are followed before the patient can be issued with medication from the hospital pharmacy. For example the patient must first queue to get a file, then register the file and pay before they can join the queue at the pharmacy for collection of medication. At the pharmacy patients are allocated numbers while waiting and they are called sequentially to the available window for dispensing. Inside the pharmacy there are processes that unfold before a prescription is filled and issued.
This study is conducted in a tertiary academic hospital in Gauteng Province South Africa (SA). Approximately 500 chronic patients visit the hospital daily to collect repeat medication. The waiting period from the arrival of the patient in the hospital to the time he or she collects medication ranges from 2hours to 8hours.

The purpose of this study is therefore to study the various processes involved before the patient receives medication and identify those steps which are value adding and non-value adding in the system and to provide suitable recommendations.

2. PROBLEM STATEMENT/MOTIVATION

Patients collecting repeat medication have been found to wait long before receiving their medication. They usually arrive as early as 6am only to leave the hospital at 4pm or later. Most of these patients are stable and live productive lives. However a full day that could have been fruitful economically or otherwise is wasted in various queues in the hospital just to collect medication. In a year this amounts to 12 days of absent from work as the patients have to collect repeat medication monthly. Numerous complaints from patients and staff have been submitted to the hospital complaints desk related to long waiting times. Long waiting for services result in dissatisfied clients and it is regarded as poor service delivery. The Minister of Health, Dr Aaron Motsoaledi, has identified waiting times as one of the key priorities to improving the quality of health care services in SA (National Department of Health, 2011).

3. RESEARCH QUESTIONS

How can the waiting period for receiving medication at the hospital pharmacy be improved?

4. RESEARCH OBJECTIVES

The objectives of this research are to:

a. Identify the steps involved in the registration of patients collecting repeat medication.
b. Identify the steps involved in the filling of a prescription.
c. Identify wasteful and value adding practices in these processes.
d. Provide suitable recommendations

5. LITERATURE REVIEW

5.1. Waiting time definition

Patient waiting time refers to the time a patient waits in the waiting area before being seen by the medical staff for consultation or treatment (Afolabi & Erhun, 2003) According to the World Health Organisation patient waiting time is identified as a key measurement to a responsive healthcare services. Patient waiting time is an important indicator of quality of services offered by hospitals (NDoH, 2011). Studies shows that patient waiting time affects the patient's responsiveness to the services received. The more the waiting the less likely the patient will comply with the medical treatment or provide relevant information to their health care provider and continue using medical services (WHO). A survey conducted by Statistics Canada on healthcare services revealed that 20% of those who required healthcare services had difficulties assessing care, and they indicated that waiting for care was the main problem (Sanmartan, 2002).

According to a study conducted at Tshwane District Hospital, no one likes to wait. Yet, patients have to wait in most hospitals. Waiting time varies depending on the service capacity of the particular hospital. Waiting time is also called 'customer sacrifice'. Customer must sacrifice their time and other opportunities in order to obtain desired health services (SA FAM PRAC, 2008).

5.2. Waiting time and quality

The Policy on Quality in Health Care for South Africa, National Department of Health, April 2007 defines Quality as getting the best results possible within the available resources while the World Health Organisation defines Quality as the level of attainment of health systems' intrinsic goals for health improvement and responsiveness to legitimate expectations of the population. The National Core Standards which are aimed at setting the benchmark standards of quality care against which delivery of services can be monitored identifies waiting times as an indicator of quality health services (National

Department of Health, 2011). Patient waiting times is actually listed among the six key priorities for improving health services by the Minister of Health, Dr Motsoaledi. A patient's experience of waiting can influence the patient's perceptions of service quality. In a study carried out at the University of Southern California, Los Angeles, USA, it was shown that the overall satisfaction of patients with pharmaceutical services is closely related to their satisfaction with waiting time (Afolabi & Erhun, 2003).

Lengthy waiting time has long been considered frustrating to patients and thus appears to be a consistent and significant potential cause of patient dissatisfaction. A strong relationship between patient satisfaction and long waiting time has been demonstrated by many studies.

The outstanding waiting time problem in the Chinese health systems lies in two aspects, one is long waiting time at the registration and admission windows. This is mainly due to that most Chinese hospitals used not to schedule the appointment, patients get registered upon arrival to hospitals at the service window, thus the unplanned patient flow clogged in hospitals. A straightforward and easy appointment-scheduling process is the first step for patients' timely access to healthcare services. Multiple appointment-scheduling methods (including web-, landline-, smart phone-, and automatic teller machine "ATM"-based methods) have been used to replace the traditional process where patients were asked to make the appointment physically inside hospitals (Sun et, al. 2017).

The Patient's Charter of the United Kingdom (UK) Government sets a series of standards which state that all patients must be seen within 30 min of their appointment time. Studies also reveals that a waiting time of more than 30 minutes for a service is unacceptable to the client (Tegabu, 2008; Pandit et, al. 2016). By considering the actual waiting times and patient and staff opinion about the duration of "acceptable" waiting times, a waiting times norm of 30 and 6 minutes is suggested for public and private facilities respectively (Tegabu, 2008).

Excessive waiting times undermines pharmacy efficiency and according to a study by Afolabi & Erhun excessive waiting time may result in poor patient compliance of the instruction given at the pharmacy.

A study by Tegabu, 2008 found that long waiting times at public health facilities was primarily due to mismatch of patient arrival (arrived too early) and service commencement, and staff inefficiencies in prioritizing and attending to patients. Most government facilities tend to address long waiting times and overcrowding by assigning more staff rather than investigating the causes for long waiting times and

possibly providing inexpensive and simple solutions to the long wait (Tegabu, 2008). Such solutions may include designing appointment systems, more efficient staff utilization, avoidance of „traffic jams" and arrival of large batches (Tegabu, 2008).
There is therefore a need to carry out a systematic study on patient waiting time in order to address quality gaps in the system. One of the quality improvement methods that will be explored in this study is the lean management system for eliminating waste.

5.3. Lean Management as a Tool to Improving Quality

Lean was originally created by the Toyota car manufacturing company to eliminate waste and inefficiency in its manufacturing operations. The process became so successful that it has been embraced in manufacturing sectors around the world. Lean is an improvement approach that consists of eliminating waste (steps that do not add value to the customer e.g. interruptions, delays, mistakes. . .) to improve the flow of processes, information or goods. Although lean concepts were initially developed to improve car production, studies showed that the lean principles could be applied to virtually any manufacturing system and can also improve how a team works together, inventory management, efficient healthcare services and even client interaction (ASME, 2016; Womack and Jones, 1996). Nowadays, lean principles are known around the world and applications reach well beyond the production of goods to service and healthcare delivery.
Professor Norman Faull from the Lean Institute in Africa (2016), defines lean as a management system for eliminating waste, for creating thinking people and is focused on knowing normal from abnormal and responding immediately, thus creating more value for customers with fewer resources (Faull, 2016). A lean organization understands customer value and focuses its key processes to continuously increase it. The ultimate goal is to provide perfect value to the customer through a perfect value creation process that has zero waste (ASME, 2016). Therefore Lean thinking begins with **driving out waste** so that all work adds value and serves the customer's needs. Identifying value-added and non-value-added steps in every process is the beginning of the journey toward lean operations (IHI, 2005).

To maximize value and eliminate waste, leaders in health care, as in other organizations, must evaluate processes by accurately specifying the value desired by the user; identifying every step in the process (or "value stream," in the language of lean) and eliminating non-value-added steps; and making value flow from beginning to end based on the pull — the expressed needs — of the customer/patient (IHI, 2005).

A value adding activity can be defined as an activity that physically changes the shape or character of a product or assembly while an activity that does not change the product or assembly is waste (Lean manufacturing tools). Every activity should be considered to be waste unless it meets an explicit customer requirement and cannot be shown to be performed more economically. From the customer's point of view value is having everything that the customer expects or needs in the most economical way, when they want it (less or no waiting) (Lean manufacturing tools).

Eliminating Non-Value Adding Processes

The following questions should be asked when examining each step of a process:

- Is this step changing the form or character of the product?
- Does this step meet an explicit customer requirement?
- If the answer is "yes" then we should ask ourselves if there is a more economic way to perform this step.

Agreement is growing among health care leaders that lean principles can reduce the waste that is prevalent in the US health care system. The Institute for Healthcare Improvement believes that adoption of lean management strategies, while not a simple task, can help health care organizations improve processes and outcomes, reduce cost, and increase satisfaction among patients, providers and staff (IHI). Courageous, forward-thinking health care organizations such as Virginia Mason and ThedaCare, along with others, are leading the way by demonstrating that lean management can reduce waste in health care with results comparable to other industries. Leaders of these organizations emphasize the importance of creating an organizational culture that is ready and willing to accept lean thinking. Without a receptive culture the principles of lean will fail (IHI).

The following are some of the lean principles identified to eliminate waste and maximize value:

1. Identify and eliminate **the seven wastes** - Waste is defined as any product or activity that does not add value for the patient.
    1.1. Transport. Inefficient layouts and facility design results in transporting parts, materials and people more than is necessary. Material should progress from one cell or position to the next as quickly as possible without stopping at any intermediate storage place. Shipping areas should be close to the end of the process. Work teams and support units should be located close together.
    1.2. Inventory. Inventory ties up assets such as cash and real estate. Inventory often requires additional handling which requires additional labor equipment and stock control systems.

1.3. Motion. Wasted motion occupies time and energy. Ideally all unnecessary movements or actions should be eliminated from the work process. Much of this wasted motion is often overlooked because it has become such a part of the process. Work processes should be designed so that items are positioned close to each other. Unnecessary amounts of turning, lifting and reaching should be eliminated.

1.4. Waiting. Time is a limited resource. Any waiting due to breakdowns, changeovers, delays, poor layout or work sequence needs to be eliminated.

1.5. Overproduction. There are two types of overproduction - producing too much and producing too early. Over production invites more waste because it hides problems beneath a veil of inventory.

1.6. Over processing. Employees must learn to identify over processing waste, and perform the appropriate amount of processing on parts without spending more time or effort than is necessary.

1.7. Defects - The waste of correction and scrap is a result of poor internal quality.

2. **Just in Time (JIT)**

This is one of the tools used in lean practice that aims at reducing buffers between steps. In healthcare it can be seen as reducing internal queues of patients to smooth a process (Liker, 2004). The JIT philosophy advocates producing and/or delivering only the necessary parts, within the necessary time in the necessary quantity using the minimum necessary resources.

3. The 5S

5S is a lean tool that provides a structured technique that results in a well-organised workplace complete with visual controls and order. It consists in ensuring that an environment has a place for everything and everything is in its place, when you need it.

Table 1: The five steps of Japanese 5 S

Step	**Corresponding action**
Seiri (Sort)	Distinguish between necessary and unnecessary items. Remove the latter.
Seiton (Set in order)	Enforce the dictum ‘a place for everything and everything in its place’
Seiso (Shine)	Clean up the workplace and look for ways to keep it clean.
Seiketsu (Standardize)	Maintain and monitor adherence to the first three Ss.
Shitsuke (Sustain)	Follow the rule to keep the workplace 5S-right. Hold the gain.

Among the main benefits of implementing 5S are:

• the workplace becomes cleaner, safer, well-organized and more pleasant

• floor space utilization is improved

• workflow becomes smoother and more systematic and non-value added activities are reduced;

• time for searching tools, materials and document is minimized;

• machine breakdowns are reduced since clean and well-maintained equipment breaks down less frequently and it also becomes easier to diagnose and repair before breakdowns occur, therefore extending equipment life;

• errors are minimized leading to making defect-free products;

• consumables and material wastage are minimized;

• the morale and satisfaction of employees improves; and

• the productivity of the organization improves together with the quality of products and services

4. Takt Time

Takt time is the rate at which a task (products or services) must be completed in order to meet customer demand, the customer's pull. Includes the identification of the demand capacity gap and failure demand. Failure demand is a systems concept used in service organizations first discovered and articulated by Professor John Seddon as 'demand caused by a failure to do something or do something right for the customer'. Failure demand represents a common type of waste found in service organizations.

In their study, Hartman and Sunjka (2013) identified the following issues as failure demand in the healthcare systems which occur as a result of system failure.

Medical Errors

Medical errors can range from wrong diagnosis, incorrect scripts written, administering incorrect drugs or incorrect dosages, incorrect site surgeries or infection arising from poor practice. Toussaint and Gerard (2010) state that American clinicians make as many as 15 million medical errors. In the UK, the government reported that a million patients are "put in hospitals "annually due to medical errors (Smyth, 2017). Attention to reducing medical errors in a systematic way can have dramatic results, as was famously shown at Allegheny General hospital, where the prevalence of central line infections was virtually eliminated (Shannon et al., 2006) by using the principles of the Toyota Production System (Liker, 2004). Similar improvements were made at Virginia Mason Hospital.

Patient Errors

This includes patients arriving at the wrong site, or at the wrong time, patients who disobey pre-treatment instructions, or those who arrive with the incorrect paperwork. All these patient errors are a reflection of a system failure. The health system should adequately inform patients of their duties, obligations and functions so that they do not make a mistake. According to Deming (1986) a system should be designed in such a way that people cannot make mistakes. A system wide intervention to inform patients, familiarise them with the operational modes of the health system and encouraging compliance is a systemic intervention that could reduce failure demand. Simultaneously the health system should be reengineered to make it more difficult to make errors.

Long Queues

Queues are caused either by poor planning in terms of adequate capacity to handle the standard workload or by variation in load due to the unpredictable nature of disease requiring that patients of critical triage levels are prioritised higher than those needing less critical care.

Operational Environment

This includes patients who have insufficient financial means for treatment, poor inventory management, staff unavailability, support and diagnostic service delays and lack of infrastructure

Hartman and Sunjika suggests the causal relationship between system failures as the root cause and failure demand as the symptom. Events that are system failure are identified, which upon a patient's return, becomes failure demand.

5. **Continuous flow processing (The Kaizen)**

Eliminating the congestion of parts within a process or between processes and achieving sequential flow production, ideally one piece from station to station, is called "continuous flow processing"(Basic TPS Handbook). Those places in the production process where a flow has not been established produce considerable waste. Continuous Flow Processing decreases work in process (WIP) requirements, decreases floor space required, often improves labor efficiency, shorter lead times, fewer defects and can easily shift production among different types.

6. **Kanban and Andon**

Signalling tools like information cards and status boards that visually display what is needed to keep a process moving and how well it is progressing

7. **Process mapping or value stream mapping**

8. **Root cause analysis**

9. The A3 Problem Solving Tool

6. RESEARCH METHODS

6.1. Research Design

The qualitative observational method will be employed to carry out this study. According to Strauss and Corbin (1990), qualitative research method is an effective and efficient approach to adopt in medical care research.

Observation is defined as a systematic data collection approach where researchers use all of their senses to examine people in natural settings or naturally occurring situations (Robert Wood Johnson Foundation).

The rationale behind choosing this method of data collection was to be able to study the processes that happen when patients come to collect medication in their natural settings so as to answer the research question "How can the waiting period for receiving medication at the hospital pharmacy be improved?"

6.2. Sampling

Observation of the processes will take place at the patient waiting area, in the filling room where files are retrieved and in the pharmacy where prescriptions are filled. The observations will be performed on different days of the week to cover five working days.

6.3. Instrumentation

The instruments that will be employed will include Observation, the Spaghetti diagrams and Value stream mapping.

6.4. Data Collection and Analysis Procedures

- An observation of the stepwise process from the point the patient arrives at registration point until when the patient receives medication. This will be outlined by the use of spaghetti diagram.

- An observation of processes involved internally when a file is issued to the patient, registration process. This will be outlined by the use of value stream or process mapping.
- An observation of processes involved to fill up a prescription inside the pharmacy before dispensing the medication to the patient. This will be outlined through the use of value stream or process mapping.
- A checklist will be used to look out for the different types of wastes, visual management boards and employment of the 5S lean tools.
- The analysis of the data will be in a narrative form.

7. ETHICAL ISSUES/CLEARANCE

Ethical clearance will be sought from the Chief Executive Officer of the participating tertiary hospital and also from the Wits School Ethics Committee.

8. PROJECT SCHEDULE

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Task	Description Months	4/18	5/18	6/18	7/18	8/18	9/18	10/18	11/18
1.	Writing Protocol								
2.	Ethical Approval								
3.	Data Collection and Analysis								
4.	Report Writing								
5.	Submission of Written report								

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