Strategies for Enhancing Productivity in Healthcare Institutions

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ABSTRACT

This project was undertaken to explore the journey to productivity improvement by a local hospital. The hospital recently implemented two process improvement tools, 5S and TQM. The project assessed the company's adoption level for the two lean tools they implemented, as well as assessing how the implementation impacted productivity and service delivery at the hospital. Current performance levels were also established in an endeavor to find if indeed what is reported is actually what is happening at the hospital. Results indicate that the implemented process improvement tools, 5S and TQM, did not produce the desired results.

KEYWORDS: 5S, Lean in healthcare, Lean waste, Productivity improvement, Total Quality Management.

INTRODUCTION

For more than twenty years, the health care systems of most western countries have been faced with the challenge of dealing with massive increases in healthcare costs in real terms and as a percentage of their gross national products [1]. The problems of aging population, complicated chronic diseases and the pressures of frequent disease outbreaks triggered a swift response from healthcare managers to find ways to increase productivity in an effort to serve a larger population in a cost effective manner.

The challenges facing healthcare systems did not spare African countries, including Botswana, where this research study was conducted. Problems of drugs expiring and becoming obsolete were widely documented and stimulated a national debate about whether the inventory control management systems at Botswana's Central Medical Store were effective [2]. The Central Medical Store is responsible for distributing pharmaceuticals to all government health facilities. The government resorted to burning the expired medicine. Immediately after tones and tons of these drugs were burnt, another crisis followed; there was an acute shortage of drugs and medicines in the country. All these problems did not spare ABC Hospital, a hospital where this study was undertaken (Name withheld due to confidentiality).

ABC is a public healthcare facility that also serves as a referral hospital for the other health facilities in the country. The hospital experiences a number of problems, including, long queues for patients, shortage of drugs, shortage of medical personnel (especially specialized doctors), lengthy waiting periods for medical tests, shortage of bed spaces for admitted patients, and unsafe working conditions. Even with increases in healthcare spending, it seems there is a need to improved healthcare delivery, and lean methods may be one way to achieve this [3]. In the past, several productivity improvement measures and other remedial actions were taken to ensure the timely delivery of healthcare to patients. In 2008, the Health Hub was created by the Government of Botswana, which functions within the Ministry of Health, to identify strategic initiatives and innovations to drive sustainable transformation and service delivery improvement throughout the health sector [4].

Problem Statement

Productivity has been a major concern for ABC Hospital for a very along time. A serious shortage of drugs and medicines at the hospital, shortage of medical personnel, shortage of bed spaces, and long waiting periods for medical examinations had been some of the major problems besieging the hospital. The Hospital management and its partners have implemented numerous productivity strategies, including Total Quality Management (TQM) and lean tools (5S) and all this seemed not to work, or rather their success was insignificant. 5S is a management philosophy that aims to embed the values of organization, neatness, cleaning and standardization into the workplace. The study focuses on evaluating the impact of TQM and lean (5S) implemented at ABC.

Aim of Study

The main purpose of this study is to evaluate productivity improvement measures, TQM and 5S, that were implemented by ABC hospital.

Significance of the Project

The goal of this project is to evaluate the success of the implemented productivity improvement measures and develop insights that could be used to improve performance at the hospital, as well as provide a guide for future implementation of productivity improvement measures. Recommendations from the project can set the rapport or rather a blue print as to what needs to be done for productivity improvement initiatives to be more efficient and sustainable in the future. It can help save millions of dollars of drugs that become obsolete each year, and also save lives through the provision of quality medical care at the right time (Just-in-time).

LITERATURE REVIEW

This section provides a review of productivity improvement initiatives that were implemented at ABC Hospital. In a broader perceptive, it will deal with TQM and lean tools (mostly 5S). The literature provides an insight to the implementation of these improvement strategies; their successes and challenges in healthcare.

Background to Lean

Originating from the Toyota Motor Corporation in Japan, Lean (also referred to as the Toyota Production System) was initially conceived as a radical alternative to the traditional mass [5]. The term "Lean production" (or "Lean manufacturing") was first coined in 1988 by Krafcik [6], a student at the Massachusetts Institute of Technology (MIT). It was then popularised by the bestselling book by Womack, Jones and Roos, The Machine that Changed the World, published in 1990 [7].

Lean is an improvement approach aimed at eliminating waste in order to improve the flow of patients, information or goods [3]. Waste refers to process steps that do not add value to the customer/patient, examples being delays, interruptions, mistakes, etc. According to Womack and Jones [8], the critical starting point in Lean thinking is value, and value can only be defined by the ultimate customer. Womack and Jones [8] further stated that Lean thinking is lean because it provides a way to do more and more with less and less-less human effort, less equipment, less time, and less space, while coming closer and closer to providing customers with exactly what they want. According to Monden [9], the primary goal of Toyota Production System is cost reduction, or improvement of productivity. The cost reduction and improvement of productivity are attained through the elimination of various wastes. As espoused by Mr. Akio Toyoda, President and CEO of Toyota Motor Corporation, continuous improvement is key to making quality products [10];

"At Toyota, we believe the key to making quality products is to develop people. Each employee thinks about what he/she should do continuously making improvement and by doing so, makes even better cars"

In essence, Toyota believes that no system is perfect, which gives rise to the need to continuously improve systems. Lean is depended upon participation of employees to make improvements. Ohno [7] argued that if workers failed to anticipate problems before they occurred and failed to take the initiative to devise solutions, the work of the whole factory could easily come to a halt. The Institute for Healthcare Improvement believes that lean principles can be — indeed, already are being — successfully applied to the delivery of healthcare[11].

Lean in Healthcare

Taiichi Ohno, Chief Engineer at Toyota, defined seven different types of waste in a manufacturing system [12], shown in Table 1. This led to the development of the 'service wastes' that are related to the original manufacturing wastes (see Table 1) [13]. The National Health Service Institute for improvement and Innovation [14] adapted these wastes further and gave examples of healthcare wastes, as shown in Table 1.

A historical perspective on the implementation of lean into healthcare was provided by de Souza [3]. He suggested that the use of lean in the healthcare sector in the UK first appeared in 2001 and in the USA in 2002. The goal of a public healthcare organization is to maximize quality medical services provided to its customers, subject to budgetary constraints [1]. Patient satisfaction and quality care are important indicators for the success of any healthcare enterprise.

Table 1: The Original Seven Wastes, Service Wastes and Healthcare Wastes

Original Wastes	Service Wastes	Healthcare wastes
1. Transportation	• Delay on the part of customers waiting for service, for delivery, in queues, for response, not arriving as promised.	• Staff walking to the other end of ward to pick up notes • Central equipment stores for commonly used items instead of items located where they are used

2. Inventory	• Duplication: Having to re-enter data, repeat details on forms, copy information across, answer queries from several sources within the same organization.	• Excess stock in storerooms that is not being used by patients waiting to be discharged. • Waiting lists
3. Motion	• Unnecessary movement: Queuing several times, lack of one-stop, poor ergonomics in the service encounter.	• Unnecessary staff movement looking for paperwork, e.g. drug sheets not put back in the correct place, storing syringes and needles at opposites ends of the room. • Not having basic equipment in every examination room.
4. Waiting (Delay)	• Unclear communication and the waste of seeking clarification, confusion over product or service use, wasting time finding a location that may result in misuse or duplication.	Waiting for; • Patients' theatre staff results, prescriptions and medicines. • Doctors to discharge patients.
5. Overproduction	• Incorrect Inventory: Out-of-stock, unable to get exactly what was required, substitute products or services	• Requesting unnecessary tests from pathology • Keeping investigation slots 'just in case'
6. Over Processing	• Opportunity lost to retain or win customers, failure to establish rapport, ignoring customers, unfriendliness and rudeness.	• Duplication of information asking for patients' details several times. • Repeated clerking of patients
7. Defects	• Errors in the service transaction, products defects in the product service bundle lost or damaged goods	• Readmission because of failed discharge adverse drug reactions • Repeated tests because correct information was not provided

Challenges of lean in healthcare

One challenge in front of 'total care process' of hospitals is to ensure better quality of treatment and faster service at low cost [15]. As observed by Grove, et. al., [16], recent focus on efficiency gains have led to a number of partial implementations of lean as healthcare managers have attempted to replicate the success of others without understanding the underlying principles of Lean. Poor understanding of lean principles by the implementation project team is a barrier to success [16].

Most lean initiatives fail because they are implemented to quench the imminent pressures facing the organization rather than a strategy for long term improvement [17]. This approach reflects the perception of Lean implementation in healthcare as fragmented, focusing on Lean's visible elements – tools and technology – but fails to address its less-visible strategic elements and enabling factors relating to leadership and organizational readiness [18].

Lean in Botswana

After the concerns over productivity, the Botswana government established Botswana National Productivity Center (BNPC) through an Act of Parliament in December 1993 [19]. This was to become a vehicle with which awareness campaigns about productivity, training and consultative roles will be carried out. Despite these efforts, Botswana continues to be ranked low in terms of her productivity, ranking 71 out of 144 countries [20]. Health is one of the performance indicators and Botswana was ranked at a disappointing position of 119. There are serious problem that hinders the implementation of Lean in Botswana, and these challenges indicate that most companies have not been able to implement the Lean change programme properly [21].

5S

5S is one of Lean tools implemented by ABC Hospital to improve their productivity. 5S, initially based on the Japanese acronyms of seiri (organisation), seiton (neatness), seiso (cleaning), seiketsu (standardisation) and shitsuke (discipline), is used as a platform for developing an integrated management system [22]. A common definition of 5S in the West is "housekeeping" [23]. The practice of 5S aims to embed the values of organisation, neatness, cleaning, standardization, and discipline into the workplace [24]. The Toyota Production

System provides a well-known example of 5S principles in practice [12]. Within Japan, it is endeavoured that the practice of 5S be integrated with another Japanese life wisdom "kaizen" (change for the better) and "me-de-miru" (visual) methods [25]. The numbers, 2S, 4S and 5S, indicate the order of elements in 5S respectively (for example, 2S stands for seiri and seiton) [26].

Total Quality Management

Another area of study that has also been in the forefront of academic research is Total Quality Management (TQM). TQM is an integrative management philosophy aimed at continuously improving the quality and process to achieve customer satisfaction [27]. It has emerged as a potential solution to improve the efficiency and effectiveness of health care provision and is becoming increasingly important for the successful operation of public hospitals [28].

TQM adoption and implementation requires changes in structure, system, and process as a necessary prerequisite to achieve improved business performance and changes in employee behavior [29]. Instilling quality-oriented culture requires change of attitudes, value systems, and beliefs [30]. Awuor and Kinuthia [30] posited that increased employees' participation in the overall quality strategy brings an increased flow of information and knowledge and contributes to the wellness of the organization for resolving problems. TQM also makes customer satisfaction the number one organization priority, where an emphasis is placed on meeting or exceeding external customer expectations in every transaction [31].

Teamwork is a critical factor in TQM as it is essential in having a fully functioning process management and improvement, especially in medical treatment; it requires cooperation among all related departments [32]. In addition to teamwork, organizations need to have a set of well-defined and well-designed processes for meeting the organization's quality and performance requirements [28]. Furthermore, employees need to be trained as training is a very important tool for promoting and developing skills related to an organization's beliefs and values to change to a culture that places high value on quality [28].

METHODOLOGY

This chapter provides the methodology used to carry out the study. The study relied on data collected from the hospital. Several data collection methods were used; Document analysis, interview and observation.

Document Analysis: A critical review and analysis of documents about the implementation of productivity improvement was carried out. An understanding into what validated the productivity measures was sought. Investigation was carried out on how the productivity improvement tools were used as well as their success or failure analysis.

A content-context and process (CCP) model was used in this study [5]. Content; a crucial factor in any evaluation study is an understanding of what is being measured, Context; the organizational context will determine the reason for an evaluation and affect the influences of the stakeholders and requires the why and who of evaluation to be considered within the context section, Process; guidance on the process of evaluation requires information to explain the how of evaluation.

Semi-structured Interview: A sample of hospital managers, medical practitioners and patients were interviewed about the state of productivity in the hospital as they perceive it. A sample size of 5 medical personnel and 20 patients was used. The numbers are skewed in favor of patients (customer) because they are at the receiving end of the process's performance. Patients were requested to explain what they viewed as value in the hospital, and if they were getting it in a timely manner. An understanding about whether there had been improvements in service delivery was also sought from both parties (patients and medical personnel.)

Observation: During the data collection phase of the project, 8 hours/week was spent in the facility observing patients moving from one service point to another. This was done to identify bottleneck processes and gaps in processes.

Questionnaire: 2 sets of questionnaires were prepared for the medical personnel and patients. A total of 80 questionnaires were given out to patients, and medical personnel were given 20 sets. Both qualitative and quantitative data were captured through the questionnaires. Quantitative data was based on patients providing the time that they spent in the facility seeking service, and the amount of time they spent at different service terminals (Examination room, Pharmacy, Registration).

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RESULTS AND DISCUSSION

Results from the study and results discussion are presented in this chapter.

Data Collection Response Rate

The section provides results from the study and a discussion of the results. Results are summarized in Tables and graphs.

Table 2: Data Collection Response Rate

	Questionnaire (Patients)	Questionnaire (Medical Personnel)	Interview (Patients)	Interview (Medical Personnel)
Target Participants	80	20	20	5
Responded	69	16	20	4
Response rate (%)	86.25	80	100	80

Table 2 shows the number of participants for the study and the response rate. The response rate for the questionnaire (patients) was 86.25 %. The high response rate was due to the fact that the forms were collected the same day they were given out to patients. With regards to the patients who did not respond or complete the questionnaire, there was a communication breakdown with some patients, and some targeted participants were semi-literate and found it difficult to understand what was required of them. Despite all efforts to reassure the participants that their identities will never be disclosed to any third party, some desisted from answering certain questions for fear of being victimized. Response rate for questionnaire (medical personnel) was 80%. Response rate for the patient interviews was 100%. The response rate for medical personnel was 80%. The medical personnel who didn't participate in the interview had some emergency professional commitments and due to time constraints, a re-schedule was not possible.

Time Patients Spent in the Hospital System

Table 3 summarises the results of the survey indicating the time a patient spends in the hospital at different stages. Patients who visit the hospital go through a number of stages from arrival to departing the hospital; that is, waiting for registration, registration, queuing for consultation, consultation with the doctor, waiting for medicine at the dispensary, and being served at the dispensary. The stages were no value is being added to the patient, and value adding stages are indicated on the Table. Non value-adding stages, in this case, represents the time when the patient is waiting for service. As shown in the table, patients spend the bulk of their time waiting for services. On average patients spend 246.65 minutes of their time in the hospital system (Table 3) and they spent 86% of this time (Figure 1) waiting or moving from one place to another, when no value-added work is being done. The stages where actual value is added account for, on average, 14% of the total time patients spend in the hospital system. It is during this time that something is being done to or for patients. Less time is therefore spent on value adding activities. From Table 3 customers spent most of their time waiting for consultation and dispensing of medicine, with a mean time of 110.6 minutes and 97.7 minutes respectively.

Table 3 Time Patients Spent in the Hospital System (in Minutes)

Patient No.	Time waiting for registration	Registration Time	Time in queue to consultation	Consultation Time	Waiting time at Dispensary	Dispensary service time	TOTAL
	Non Value-Adding	Value Adding	Non Value-Adding	Value Adding	Non Value-Adding	Value Adding	
1	20	2	76	10	120	5	**233**
2	13	1.5	200	7	88	6	**315.5**
3	40	3	128	6	33	4	**214**
4	35	1	69	9	90	3	**207**
5	15	3.1	150	9	20	7	**204.1**
6	15	2.5	104	15	112	3	**251.5**
7	43	1.2	33	13	130	5	**225.2**
8	10	2.2	130	14	148	6	**310.2**
9	5	4	160	8	160	9	**346**
10	14	1	56	5	76	8	**160**
Total	**210**	**21.5**	**1106**	**96**	**977**	**56**	
Mean	**21**	**2.15**	**110.6**	**9.6**	**97.7**	**5.6**	**246.65**
Variance	**178**	**1.02**	**2737.6**	**11.16**	**2111.57**	**4.04**	
SD	**13.3**	**1.01**	**52.3**	**3.34**	**45.95**	**2.01**	

Standard deviation (SD) was calculated to establish the dispersion of the times. All the Non Value adding activities show a huge standard deviation (see Table 3). Logical explanations from these deviations are that resource availability is sporadic and spontaneous. The value adding activities have small SD, and this shows that when resources are available, task time variations are not too huge, even though they are far from an ideal situation. It is also of paramount importance to note that standardizing processes in the hospital will not eliminate variations, but will rather set a standard to be followed when dealing with any kind of medical assistance patients might need. The significance of using a standard deviation is that it shows how the times vary from the mean. Even though the processes are not standardized, it seeks to establish where the huge variations are and what could have been the causes of those large deviations. It has been observed that the large deviations in the non-value adding activities are caused largely because of the sporadic and spontaneous availability of resources (medical personnel). Patients tend to be in long queues whilst doctors are attending to some duties somewhere else where they might be urgently needed e.g. Accident and Emergency, ICU. So in fact, most of the time customers are waiting for service when there is no one to serve them.

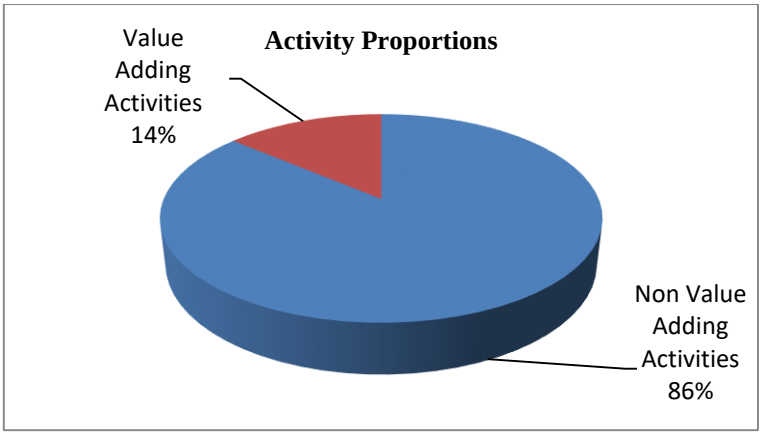


Figure 1: Activity proportions for value adding and non-value adding activities

Customer (Patient) Satisfaction

Figure 2 shows the level of patient satisfaction with the quality of service they get from ABC Hospital. As shown in Figure 2, 80 % of the patients (not satisfied + least satisfied) are not satisfied by the service delivery. The majority of this group has complained of long waiting times, shortage of drugs, and generally poor service quality from the medical staff. 13% are just fine and 7% are satisfied with the service delivery, meaning that in total, only 20% of customers are happy with the service they receive.

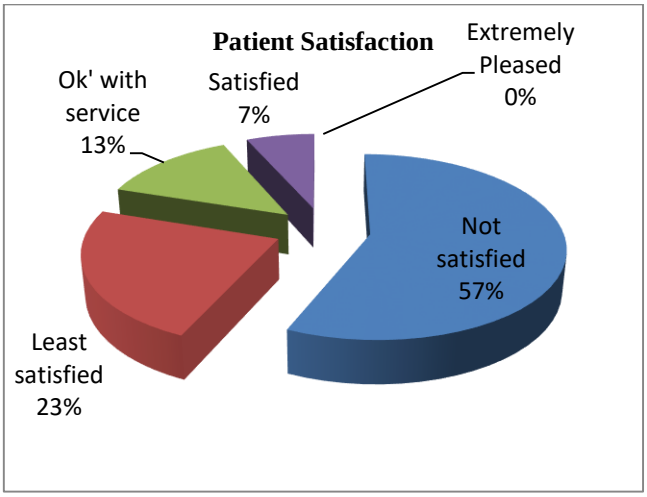


Figure 2: Patient satisfaction

Quality Problems Experienced by Customers

Figure 3 lists quality problems in descending order as seen by customers (patients). As evidenced in Figure 3, four factors (Long waiting time, shortage of drugs, test results taking long and unfriendliness of staff) contributed 79% of the service delivery problems that patients had associated with ABC Hospital. Although this

is about 40% of the documented problems in this report, their effect is more critical, and has been listed by patients (customers) as the most problematic of service problems in ABC. Figure 4 presents the quality problems with their relative percentages. A discussion of the two most critical quality problems is provided below.

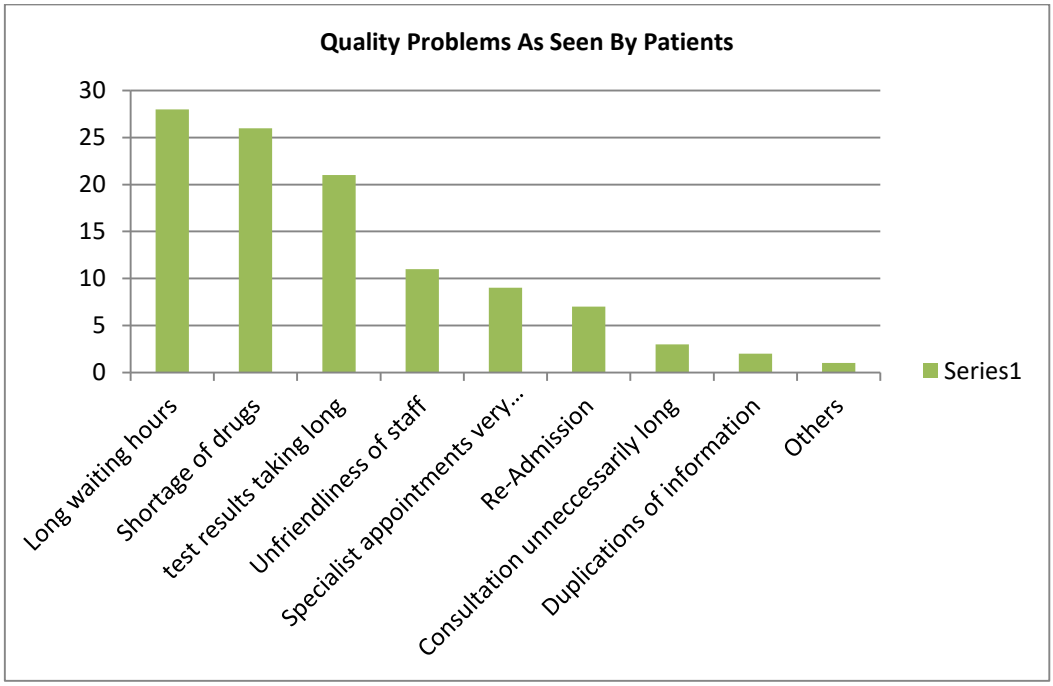


Figure 3: Quality problems as seen by patients

Long waiting time

Long waiting time has manifested itself in the form of queues at the hospital, and left both the medical staff and patients disgruntled. The time spent in the hospital has adverse effects for patients, socially and economically. Social implications may arise from the simple reality that patients may seem to victimize themselves as being helpless and hopeless when medical assistance take a long time to arrive at them. There are also economic implications to the long waiting time problem. One of the economic impact is the foregone economic opportunities during the hours spent in the hospital. Critical personnel also lose productive hours whilst waiting in long queues at the hospital. This scenario has over the years presented catastrophic results for Botswana's economy and competitiveness. According to the Global Competitiveness Report 2015-16, it is clear that by far the biggest obstacle facing Botswana in its efforts to improve its competitiveness remains its health situation [20]. From a customer's perspective, long waiting times affect them, not only for the duration they spend waiting for a service or in a queue, the consequences are far more severe, when you consider missed opportunity cost. 26% of the patients said long waiting times was a critical service delivery problem (Figure 4).

Shortages of drugs

Shortage of drugs has been identified as the second most critical service delivery problem at the hospital. According to Figure 4, 24% of the patients said shortage of drugs is a major performance problem. For example, the average waiting time at the pharmacy for outpatient dispensary unit is 97.7 minutes (Table 3). Drugs and medicines are stored and labelled according to their type (primary) and alphabetic order. It takes, on average, 5.6 minutes (see Table 3) for pharmacies to serve patients with prescribed drugs, but customers have to endure on average, 97.7 minutes of waiting to be served. The research has also indicated that pharmacist sometimes spend time looking for drugs that are not available in the pharmacy. It is only when at the dispensary unit (pharmacy) that the patients can find out if drugs that have been prescribed to them are available or not. This indicates that the inventory management system at ABC Hospital is not adequate.

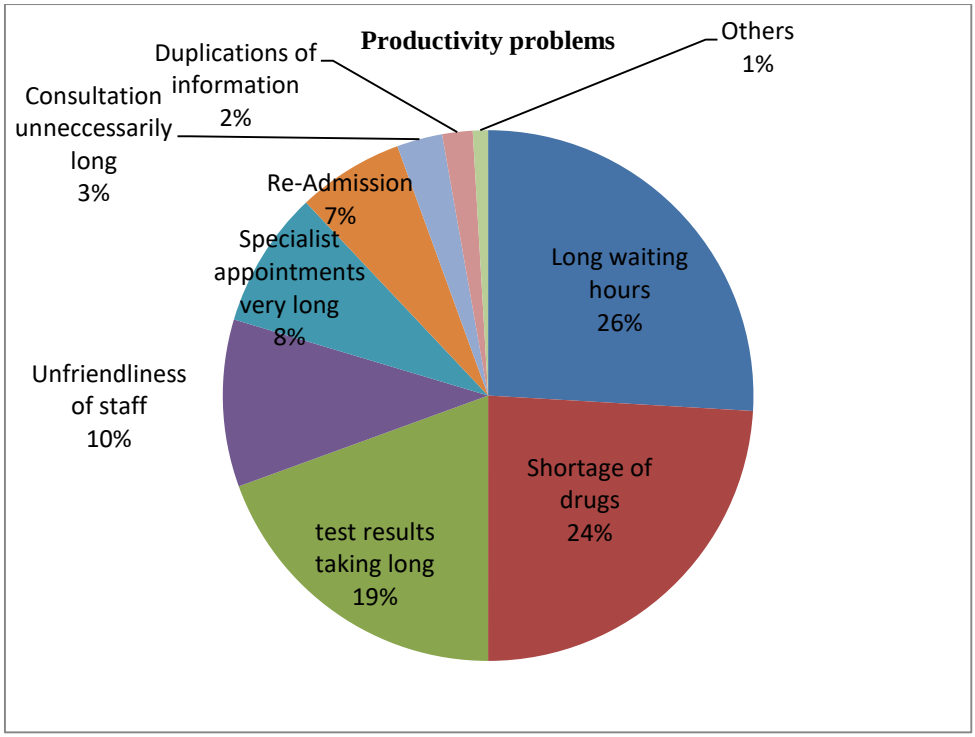


Figure 4: Productivity Problems at ABC Hospital

Adoption Level of 5S and TQM

Concepts of productivity, 5S and TQM, that the institution introduced at the outpatient dispensary unit seemed alien to the pharmacist. Even though efforts were made to equip pharmacist with principles of TQM prior to undertaking TQM to address performance issues at the outpatient dispensary unit, the practical application of the philosophy was not convincing. It was found that these performance improvement measures were implemented in a piece-meal fashion, targeted at addressing symptoms rather that the real performance problems. There was poor documentation of these initiatives, and only TQM files were retrieved from the company's intranet. Among the recommendations from the 'TQM implementation' was that patients should collect their medicines at clinics in their proximity, and that patients will be educated to explore this option. However, patients are not aware of this. Even if implemented, this recommendation will not address the underlying service problems but rather help hide them further.

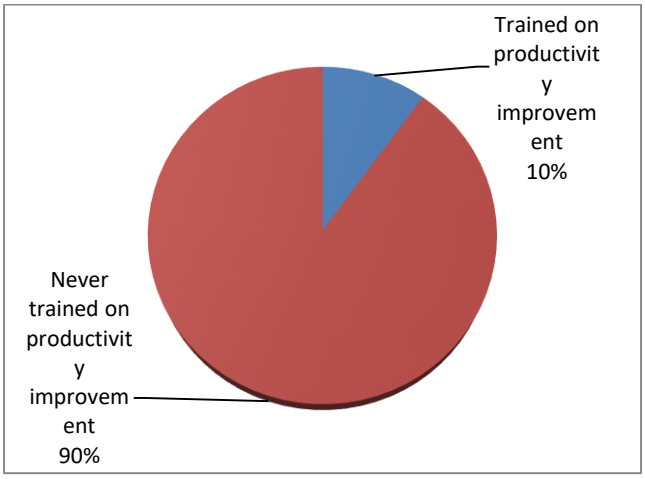
Quality

In a hospital environment, it is inherently difficult to measure quality. In this report Key Performance Indicators (KPI's) were chosen to determine the level of quality or lack thereof. In this case, average length of stay in the hospital was used as a measure of quality. Average Length of Stay is the average time patients admitted in the hospital stay at the wards, that is, time during which patients are under the watchful eye of the medical staff. Average length of stay can provide a hint as to the recovery rate of patients [33]. Patients at ABC hospital spent on average, 12 days at the hospital. In a hospital that boosts 156% occupancy rate, managing patients in the hospital will only compound performance problems. It is difficult to care for patients in a crowded place, and managing infectious diseases is extremely difficult. In some instances, patients get new infections whilst in the hospital. More hospital resources are dedicated to an individual for extended periods if they spend too much time in the hospital. This also ties up bed spaces that could be used for new patients. Doctors, as a result, spend too much time in wards than consultations with new patients. Queues are also long, whilst patients are waiting for a resource (doctor) to be available. At the heart of TQM is the development of well-defined and well-designed processes for meeting an organisation's quality and performance requirements [28]. The long average length of stay indicates the inadequacy of the TQM implementation at the hospital.

Lack of training

From the data gathered, medical employees are not being trained on the most basic performance improvement measures (Figure 5). These are highly technically skilled personnel and are very good at performing their core jobs, but they come short as to how they can improve their efficiency. Only 10% of employees in ABC Hospital are send for further training on performance improvement, and most of these are senior managers. This seems like a culture where hospital managers believe that they cannot send doctors and nurses for training on

performance improvement measures, in fear of creating a shortage of medical personnel, is prevailing at ABC.



Figureure 5: Staff training

The effects of lack of training were manifested in the TQM implementation project at the outpatient dispensary. Inadequate training showed how catastrophic performance can be when tools and techniques of improvement are not well understood. Also, a huge variation (18 mins) in the amount of time that Doctors spend consulting with patients is a clear indication that there is no guidelines as to what standard processes should be followed during consultation. Even though variations are inherent in consultations due to differences in the nature of medical assistance patients seek, it should be kept to a minimum.

CONCLUSION

It has been observed in this study that ABC Hospital is engulfed by a plethora of problems, most of which can be fixed using lean principles. Even though the hospital implemented some process improvement initiatives, due largely to lack of training and effective change management, the initiatives did not yield the desired results. The results also shed some light that the full benefits of lean could have been reaped if the hospital had deployed the tools across the hospital, as opposed to their piece-meal solutions (TQM in outpatient dispensary unit only). For a lean project to be successful, all the stakeholders need to be taken on board and understand what is happening and how best they can contribute towards productivity and quality improvement. Effective change management is essential to ensure that all the stakeholders are clear of the change, and the role they are expected to play in the changed organization.

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