Patients' Waiting Time in the Orthopaedic Outpatient Clinics of LAUTECH Teaching Hospital, Osogbo

By

AJIBADE Adesina

Matriculation Number: 50606

MBBS (Ibadan), FWACS

A Project Report submitted to the Department of):pidemiology and Medical Statistics (EMS), University of Ibadan, Ibadan, Nigeria, in Partial Fulftllment of the Requirement for the Award of the Degree of Masters of Science in Clinical Epidemiology

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Certification

We certify that this research work was carried out by Ajibade Adesina, a postgraduate student of the Department of-Epidemiology and Medical Statistics, Faculty of Public Health, College of Medicine, University of lbadan.

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Dedication

This book is dedicated to my wife, Ronke and my children, Seun, Damilola, Femi and Seyi, for bearing the inconveniences of my study absences.

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Finally, I acknowledge and praise the Alpha and Omega, robed in majesty, girded with strength, who made everything possible.

Abstract

In outpatient clinics in Nigeria, patients often wait a long time before they are called into the consulting rooms to see physicians. This is a problem in both general and specialty outpatient clinics but more so in the former. Studies on patients' waiting time have been conducted in both types of clinics in isolation or in combination. There is, however, no known Nigerian study carried out in an orthopaedic clinic. This study was conducted to estimate the patients' waiting time and identify predictors of access to consultation in the orthopaedic clinics of LAUTECH Teaching Hospital, Osogbo.

A cross-sectional study was conducted over three months. Data were collected on patients' waiting time lo consultation and possible clinic and patient-related predictors of access to consultation. Consultation rates were estimated with the actuarial method. Cox regression analysis was used to identify predictors of access to consultation.

Two hundred and forty one patients comprising 80(33.2%) new patients and 161(66.8%) old patients were seen during 30 clinic days with Wednesday clinic contributing 132(54.8%) patients. The consultation rate within I hour of patients' arrival at the clinics was 11%. The median patients' waiting time was 145 minutes. New patients [HR=0.558; 95% CI = 0.420-0.742; p<0.001] and patients seen during Wednesday clinic [HR=0.516; 95% CI=0.378-0.703; p<0.001] were less likely to be seen early. Furthermore, for every patient arriving 1 minute earlier than the first doctor to arrive at the clinic, there was a statistically significant decrease in access to consultation by 1.3% [HR=0.987; 95% CI= 0.985-0.990; p<0.00 I].

Patients' waiting time was long in the orthopaedic clinics of LTH, Osogbo. The cumulative proportion of patients seen within I hour of arrival at the clinics was low. New patients and patients seen on Wednesday clinics with the highest patient load had more delay in access to consultation. Time scheduling is recommended to reduce patients' waiting time in the clinics.

Keywords: outpatient clinic, specialty outpatient clinic, patients' waiting time, access delay, time scheduling

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List of Abbreviations

CI	Confidence interval
GOPC	General Outpatient Clinic
HR	Hazard ratio
LTH	LAUTECH Teaching Hospital
SE	Standard error
SOPC	Specialty Outpatient Clinic
-21ogL	-21oglikelihood

Chapter One

Introduction

1.1 Background

Patient's waiting time can be defined as the amount of time a patient spends before being served (Obamiro, 2013); that is, before being provided with a healthcare service. It is a major part of the overall time patients spend in the outpatient clinic (Rohleder et al., 2011; Ogunfowokan and Mora, 2012; Ho, 2014). In 1991, the National Health Service's Patient's Charter in the UK set the standard that at least 90% of patients should be seen within 30 minutes of their appointment time (Hart, 1995). In Nigeria, where scheduling (assigning a specific time when the patient will start to receive care) is usually not a feature of the outpatient clinic appointment system, much longer patients' waiting time is common in general outpatient and specialty clinics (Ajayi, 2002; Thatcher, 2005; Umar et al., 201 I).

Studies of waiting time in outpatient clinics have shown that long patients' waiting time results in decreased patient satisfaction (Camacho et al., 2006), patients not showing up for their appointment (McCarthy et al., 2000), and job dissatisfaction among healthcare providers because of the anxiety and pressure arising from overcrowded clinics (Shute and Marcus, 200 l; Rohleder et al., 2011). It may, as the case is with patients waiting in the emergency room (Shaik et al., 2012), also cause patients to leave without being seen. On the economic front, long patients' waiting time reduces the ability of a clinic to attract new patients (McCarthy et al., 2000); in other words, short patients' waiting time is a competitive advantage (Rohleder et al., 2011).

Considering the inevitability of waiting and its negative effects, it is important to study clinic-specific factors that are associated with long waiting time in order to develop and execute measures to minimize waiting time with a view to improving the level of satisfaction of patients with the waiting time they experience and the services they access in outpatient clinics.

1.2 Statement of the Problem

Patients spend most of their overall time in outpatient clinics waiting to be seen by physicians. In a quality improvement study in a tertiary diabetic centre with multidisciplinary clinics the average baseline patient turn-around time ranged from 103minutes to 189 minutes over a six-month period, depending on the number of appointments the patient had for the day (Ho, 2014). The median patients' waiting time to doctor's consultation over the same six-month period was 26.5 minutes and it was recognized as a major contributor to the long patient turn-around time. In the study by Ogunfowokan and Mora (2012), the median patient-clinic encounter time was 2.7 hours and it was mainly due to the waiting time (median = 1 hour) to see the doctor. The average total patient clinic time in an orthopaedic outpatient clinic was 85 minutes (Rohleder et al., 2011), largely accounted for by waiting. In that study, the average initial waiting, average waiting time for X-rays and average waiting time for the surgeon were 34.5 minutes, 35.55 minutes and 38.46 minutes respectively.

The UK's National Health Service's Patient's Charter set a 30 minute target for patient's waiting time in 1991 (Hart, 1995). Huang (1994) reported that patients who arrived early for their scheduled appointments were satisfied with a waiting time of 37 minutes or less. Similarly, 78% of patients in the general outpatient clinic and four specialty clinics of a teaching hospital in Northern Nigeria believed that patients' waiting time should not exceed

30 minutes (Umar et al., 2011). However, patients' waiting time is often long in Nigeria, largely due to the lack of an appointment system or an appointment system in which time scheduling is not practiced (Ajayi, 2002; Thatcher, 2005; Umar et al., 2011). For instance, the mean waiting time in the general outpatient clinic of Jos University Teaching Hospital was 152 minutes (Thatcher, 2005), about 13 times the mean patients' waiting time in a clinic with time-specific appointment system reported by Camacho et al. (2006).

A major problem with long waiting time is its association with patient dissatisfaction with services. Of all variables studied by Maitra and Chikani (1992), short waiting time was most significantly associated ($p = 0.003$) with greater patient satisfaction. An analysis of 2, 444 cases in a cross-sectional study showed that the longer the patients' waiting time, the lower the satisfaction of patients with providers and office practice (Camacho et al., 2006). In another cross-sectional survey conducted by Anderson et al. (2007) on a sample of 5 030 patients, long waiting time was associated with lower patient satisfaction ($p<0.05$).

Another problem is that some patients fail to attend the clinic (the so-called "no show") because, based on previous experience, they expect a long waiting time (McCarthy et al., 2000). Camacho et al. (2006) reported an odds decrease in willingness to return of 2% with increase of 1 minute in waiting time.

Studies conducted in emergency departments have shown that there are patients who leave the department without being seen (dos Santos et al., 1994; Fernandes et al., 1994; Shaik et al., 2012). In the survey conducted by Shaik et al. (2012), 51% of 340 patients were willing to wait up to 2 hours; 17%, up to 2-8 hours; and 32% would wait indefinitely to see a doctor. While similar studies on willingness to wait in outpatient clinics are unknown and there is no

known study reporting that patients leave outpatient clinics without being seen, it is possible for patients to leave outpatient clinics without being seen if waiting time is too long.

Long waiting time also has negative effects on clinic staff. It leads to congestion in the clinic with consequent pressure on clinic staff (Shute and Marcus, 2011). This can decrease the morale of staff and cause absenteeism (Rohleder et al., 2011).

1.3 Justification

In Nigeria, there are reports of studies on patients' waiting time conducted in general outpatient clinics or a combination of general outpatient and specialty clinics (Ajayi, 2002; Thatcher, 2005; Umar et al., 2011; Ogunfowokan and Mora, 2012; Oche and Adamu, 2013). Other waiting time studies have been conducted on patients attending specific specialty clinics (Esimai and Omoniyi-Esan, 2009; Onifade et al., 201 O; Megbelayin et al., 2013). There is, however, no known Nigerian study on patients' waiting time in an orthopaedic clinic; yet orthopaedic clinics have their own operational peculiarities like cast removal, manipulation and casting of club feet, and joint aspiration during clinic sessions, which may extend patients' waiting time. The study would help to fill this gap.

In the orthopaedic outpatient clinics of LAUTECH Teaching Hospital (LTH), Osogbo, there is an appointment system but time scheduling is not practiced. Most of the patients arrive at the clinic in the same time block before the clinic starts. It is therefore likely that patients' waiting time may be long. Neither the duration of patients' waiting time nor factors which may prolong patients' waiting time have been previously studied in these clinics. The study would help in understanding the scope of the problem with patients' waiting time in the orthopaedic outpatient clinics of LTH, Osogbo.

Irrespective of the method employed in conducting studies aimed at improving waiting time, an analysis of patients' waiting time and factors which influence it in the clinic under study is the initial step that is taken (Rauf et al., 2008; Santibanez et al., 2009; Rohleder et al., 2011; Dinesh et al., 2013; Michael et al., 2013). An assessment of patients' waiting time in the three orthopaedic clinics of LTH, Osogbo, would, therefore, provide data that could serve as baseline for a future quality improvement study. Thus, the study would help hospital administrators in instituting measures that could help in reducing patients' waiting time in the orthopaedic clinics of LTH, Osogbo.

1.4 Objectives of the Study

1.4.1 General Objective

To estimate patients' waiting time and assess factors which are predictive of access to consultation in the orthopaedic outpatient clinics of LTH, Osogbo.

1.4.2 Specific Objectives

1. To estimate the median patients' waiting time in the orthopaedic outpatient clinics of LTH, Osogbo
2. To estimate the proportion of patients who are seen within 1 hour of arrival at the orthopaedic outpatient clinics of LTH, Osogbo
3. To identify clinic and patients' characteristics that are predictive of access to consultation in the orthopaedic outpatient clinics of LTH, Osogbo

1.5 Research Questions

I. What is the median patients' waiting time in the orthopaedic outpatient clinics of LTH, Osogbo?

2. What proportion of patients is seen within I hour of arrival at the outpatient orthopaedic clinics of LTH, Osogbo?

3. Are clinic day, type of patient, physician's status, walk-in status of patients, consulting room time and patient's lead time predictors of consultation delay?

1.6 Hypotheses

I. H_0: Clinic day, type of patient, physician's status, walk-in status of patients, consulting room time and patient's lead time are not predictors of access to consultation in LTH, Osogbo.

2. H_1: One or more of clinic day, type of patient, physician's status, walk-in status of patients, consulting room time and patient's lead time is or are predictors of access to consultation in LTH, Osogbo

1.7 Definition of terms

I. Patient - Any individual who experienced waiting time to consultation in the orthopaedic clinics of LTH, Osogbo, regarded as a unique patient on each day of clinic attendance because the waiting time experience was unique on each visit.

2. New patient - A patient that was seen for the first time in the clinic on a particular clinic day.

3. Old patient - A patient who had been seen on some other clinic day but subsequently presented for follow-up.

4. Type of patient - Classification of patients according to whether they were new or old patients.
5. Walk-in - A new or an old patient who came to the clinic on a day he or she had not been booked to attend.
6. Walk-out - A patient who was documented as having presented to the clinic but who was no longer available to see a physician when called to enter the consulting room.
7. Patient's waiting time - The duration, in minutes, from the time a patient arrived at the clinic to the time the patient was called into the consulting room. This time variable was the time-to-event.
8. Patient's lead time - The time interval, in minutes, between arrival of a particular patient at the clinic and arrival of the first doctor at the clinic. If a patient arrived at the clinic at the same time as or after the first doctor had arrived at the clinic, the patient's lead time was taken to be zero.
9. Second consultation - Return of a patient to the consulting room on the same clinic day after an initial consulting room experience.
10. Consulting room time - The duration, in minutes, between the time the patient was called into the consulting room and the time the patient left the consulting room at the end of consultation. If a patient had a second consultation, then the patient's consulting room time was the sum of the duration of the first and second consultations.
11. Clinic delay - The duration, in minutes, between the time of arrival of the first patient at the clinic and the time the first patient (who was not necessarily the first to arrive at the clinic) was called into the consulting room.

12. Clinic duration - The duration of time, in minutes, between the time the first patient was called into the consulting room and the time the last patient left consulting room.
13. Event - The experience by a patient of being called into the consulting room to see a physician and actually being seen by the physician.
14. Consultation rate - The cumulative proportion of patients that were called into the consulting room to be seen by physicians at a specific time (by the Kaplan-Meier method) or within a time interval (by the actuarial method). Since survival meant that a patient had not yet been called into the consulting room, consultation rate was given by the complement of the survival function.
15. Access to consultation - This is a function of waiting time which is given by the hazard function. The hazard ratio thus describes the access to consultation of a subject relative to the access to consultation of another subject regarded as the reference.
16. Delay in consultation - Interpretation of results of Cox regression analysis when hazard ratio is less than 1.

Chapter Two

Literature Review

2.1 Definitions of patient's waiting time

There are two types of access delay that patients experience in healthcare settings: indirect or virtual waiting time and direct or captive waiting time (Gupta and Denton, 2008). Indirect patient's waiting time is the difference between the time that a patient requests an appointment and the time the appointment actually takes place. Determined by the relationship between demand and supply, a long indirect waiting time implies delay in having access to the clinic for the first consultation. Direct patient's waiting time is the difference between a patient's appointment time or arrival time at the clinic (if the patient does not arrive at the scheduled time) and the time the patient is actually seen by medical personnel. It is thus the time a patient spends in the waiting area of the clinic. Murray and Berwick (2003) observed that direct waiting time is an inconvenience to the patient but a long indirect waiting time may pose a serious safety concern to the patient. This study is concerned with assessment of direct patient's waiting time. Consequently, in the rest of this review patient's waiting time refers to direct patient's waiting time.

There is lack of uniformity on the operational definition of patients' waiting time in outpatient clinics. One definition is the length of time from when a patient enters an outpatient clinic to the time the patient actually leaves the outpatient department (Dinesh et al., 2013). This definition is equivalent to patient's turn-around time, that is, the duration a patient spends at a centre or clinic for a visit (Ho, 2014). Total patient's waiting time was also similarly defined by Onifade et al (2010) as time from arrival at the medical record to exit from the clinic. Since the overall time patients spend in the clinic consists of periods of

waiting and periods when patients are seen by physicians, ascribing the entire duration to waiting app ars inappropriate.

Yeboah and Thomas (2009) adopted the 1992 definition by the UK Audit Office that patient's waiting time is the clock time from scheduled appointment time to consultation time on the date of an outpatient visit. Similarly, Ho (2014) defined waiting time to consultation as time difference between the appointment time given to the patient and the actual time the patient is called into the doctor's room. In these definitions the time the patient spends in the consultation room with the doctor has been excluded from the overall waiting time. Furthermore, emphasis has been placed on waiting before consultation which is the main reason for clinic visit. However, patients may arrive at the clinic earlier than, at the same time as, or after the scheduled appointment time. Consequently, time of arrival to the clinic is a better starting point and should be the natural starting point for the definition in appointment systems that are not time-specific. Patients' waiting period in the emergency department was defined in this manner as time from arrival of the patient in the unit until the start of the consultation by the medical practitioner (Rauf et al., 2008). Again, the above definitions include the periods spent on pre-consultation processes, like registration and recording of vital signs at nursing station, that, strictly speaking, are not waiting periods although it may be argued that patients may perceive the whole time they spend before consultation starts as period of waiting.

A wait or a waiting period is the time one stays in a place in the expectation that something will happen. In the setting of an outpatient clinic, any stage involving pure waiting is a non-value added part of the overall patient clinic time (Santibanez et al., 2009). In studies designed to improve patients' waiting time in outpatient clinics, it is usual to map patient

flow and work flow through the clinic (Rohleder et al., 2011; Ho, 2014). This will allow the identification of waiting time and actual service time for different processes. It follows therefore that another approach to defining patients' waiting time is to define key non-value added waiting periods. For instance, in a study on improving patients' waiting time and patient satisfaction in primary care setting, Michael et al. (2013) used two key process measures to evaluate waiting time - waiting room wait time and exam room wait time. Waiting room wait time was the time elapsed between requesting the patient be seated in the waiting room and the time he or she was called to be placed in the exam room. Exam room wait time was the amount of time elapsed from the time the patient was seated in an exam room and the time physician or advanced practice nurse entered the room. One reason why patients may have to wait in the exam room for the physicians is that the latter may have a different office where they dictate and prepare orders for tests and subsequent appointments (Santibanez et al., 2009). The patient would therefore have to wait in the exam room for the physician to return from his office in between consultations. In an outpatient clinic with multiple disciplines (a polyclinic), a patient attending for multiple consults also has to wait more than once in the exam room for the next physician to arrive (Santibanez et al., 2009). Hence, another approach to the definition of waiting time is to obtain the sum of all non-value added waiting times and report this as the patient waiting time.

Defining patients' waiting time as total wait time or patient turn-around time in the clinic is an over-estimation of actual wait time, especially because the time a patient spends with the physician is not a waiting period. Summing key non value-added times spent in the clinic to define patients' waiting time yields the actual waiting time but the method may be somewhat tedious and impractical. It appears, therefore, that waiting time to consultation can be

recommended as working definition of patients' waiting time. This is because patients might perceive the entire period before being called into the consulting room as a wait even though it contains some value-added processes.

2.2 Definition of Long Patients' Waiting Time

The waiting time that is acceptable to patients is important in determining if a patient's waiting time is long or not. Ho (2014) reported that 33 patients stated in a face-to-face interview that waiting time of 30-60 minutes was acceptable to see a doctor. In a survey, Huang (1994) showed that arrival time to clinic influenced patients' satisfaction with waiting time. Patients who arrived on time were satisfied if they waited no more than 37 minutes while those who arrived late were satisfied with waiting no more than 63 minutes. According to the National Health Service's Patient's Charter in the UK, at least 90% of patients should be seen within 30 minutes of their appointment time (Hart 1995). Considering this standard and the results of Huang's study, Rohleder et al. (2011) concluded that patients' waiting time of about 30 minutes appeared acceptable. It may therefore be stated that in clinics with time-specific appointment systems, patients' waiting time is long when it exceeds 30 minutes.

Patients' waiting time is usually long in outpatient clinics in Nigeria because of lack of appointment systems in general outpatient clinics or operations of appointment systems that are not time-specific in specialty outpatient clinics (Ajayi, 2002; Thatcher, 2005; Umar et al. , 2011; Ogunfowokan and Mora, 2012). If patients arrive within the same time block before the clinic begins, they can be considered as early arrivals, and extrapolating from the findings of Huang (1994) stated above, they might expect not to wait more than 37 minutes before seeing physicians. The findings of Umar et al., (2011) appear to corroborate this deduction. They performed a cross-sectional study in a general outpatient clinic and four specialty

clinics and reported that 78% of patients believed that their waiting time (from arrival in hospital to being seen) should not exceed 30 minutes. It would appear too demanding, however, in the absence of an appointment system or time scheduling or both to define long waiting time as a wait greater than 30 minutes. Consequently, in the setting of most outpatient clinics in Nigeria, a wait in the clinic greater than I hour before being called to see a physician may be considered as long patient's waiting time.

23 Appointment Systems

An outpatient clinic may or may not have an appointment system. An outpatient clinic that receives mainly 'walk-ins' does not have an appointment system. This is essentially the case with general outpatient clinics (GOPCs). Under-utilization or over-utilization of the clinic may occur according to whether few or far too many patients visit the clinic.

In clinics in which an appointment system exists, the system may either be time-specific or not. If no scheduling occurs, that is, patients are not booked to arrive at the clinic at different time slots; the appointment system is not time-specific. The patients therefore arrive within the same time block before the clinic begins. In Nigeria, most specialist outpatient clinics (SOPCs) have appointment systems that are not time-specific.

In a time-specific appointment system, patients are given different time slots to present in the clinic. Several time-scheduling rules have been advocated. Bailey (1952) gave the rule that two patients should be booked for the beginning of a session to provide an initial block that will ensure there would be no unused session if one patient failed to show up. Successive appointments are then booked at a fixed interval of mean consultation time. Other rules state that two patients (Soriano, 1966) or different number of patients (Liu L and Liu X, 1998) should be booked in each time slot. Some rules also emphasize the importance of intervals

between two successive time slots. Lau H and Lau AH (2000) recommended that patient types - for instance, whether a new or a follow-up patient - should determine intervals. Ho C and Lau H (1992) recommended that latter part of a clinic session should have longer intervals while earlier part with greater number of patients should have shorter intervals. The multiplicity of rules implies that there is no rule that is superior or generally applicable to all situations.

The existence or non-existence of an appointment system and the operation or non-operation of time scheduling in appointment systems have implications for patients' waiting time as discussed later in this review.

2.4 Causes of Long Patients' Waiting Time

2.4.1 Appointment Systems

One reason why patients' waiting time may be long is the non-existence of an appointment system. 'Walk-ins' are seen in clinics without an appointment system. If several patients arrive at about the same time, waiting becomes inevitable. Ogunfowokan and Mora (2012) compared the range of waiting time of 0-336 minutes in their study with 10-165 minutes reported by Umar et al., (2011). The former explained that they observed a wider range because their study was carried out solely in general outpatient clinics while the study by the latter was conducted in specialty and general outpatient clinics, implying that inclusion of specialty clinics (in which an appointment system exists) in the latter's study might have contributed to the lower patients' waiting time. Similarly, Bamgboye and Jarallah (1994) and Thatcher (2005) reported mean patients' waiting times of 148 minutes and 152 minutes respectively in general outpatient clinics compared to 85 minutes reported by Umar et al. (2011).

Patients' waiting time is also longer when an appointment system is not time-specific compared to time-specific appointment systems. This has been suggested as the reason for long patients' waiting time in outpatient clinics in Nigeria (Ajayi, 2002). The mean patients' waiting time of 85 minutes, in predominantly specialty clinics with appointment systems that are not time-specific, reported by Umar et al. (2011) is much longer than 12 minutes reported by Christopher et al. (2005). The existence of a time-specific appointment system in the clinic in which the latter study was carried out may explain the lower mean patients' waiting time.

2.4.2 Low Doctor-Patient Ratio

In the face of limited resources, with demand for health service greater than supply, there is bound to be overcrowding with consequent increase in patients' waiting time (Obamiro, 2013). In a report from Nigeria, Umar et al. (2011) found that the commonest cause perceived by patients for long waiting time was availability of few doctors to attend to a large number of patients. This is similar to the finding of Thatcher (2005), who also reported from Nigeria. In the 25 poorest countries, Nigeria inclusive, the doctor: patient ratio is 1:25 000; a far cry from the WHO's target of 1 per 1 000 (Labonte et al., 2004). Manpower instability may also create a low patient: doctor ratio in particular clinics during a specific period. During a quality improvement project in a tertiary diabetic centre in Singapore, Ho ET (2014) observed that departure of doctors and other allied health professionals from the centre during the project resulted in patient-manpower imbalance, leading to increased workload and longer patients' waiting time even though the best appointment schedules possible were implemented.

2.4.3 Medical Personnel-Related Factors

Physician-associated factors have also been identified as causes of long patients' waiting time. In the survey by Obamiro (2013), late arrival of doctors to clinic and long consultation time were stated as causes of long waiting time. However, this study only reported perceived causes by patients and actual waiting time measurement was not made. With the aid of simulation modeling Rohleder et al. (2011) found that doctors arrived 30-60 min after an orthopaedic clinic had opened, causing significant delay for patients who arrived early. The more time a physician spends with a patient, the longer other patients will have to wait before seeing the same physician (Anderson et al., 2007). More broadly, medical personnel contributed to other patients experiencing long waiting time by helping some to jump queues, especially in public hospitals (Obamiro, 2013).

2.4.4 Medical Record System Based on Manual Operations

Manual operations may contribute to longer patients' waiting time compared to computerized operations (Obamiro, 2013). In manual operations, considerable time is spent searching for patients' cards and moving them from one place to another. This hinders patient flow, prolonging waiting time. The use of manual operations remains widespread in most public hospitals in Nigeria. In the survey by Obamiro (2013) carried out in a General Hospital, a private University Health Centre and a private hospital, manual operations were a perceived cause of long queues (and therefore long patients' waiting time) in the general hospital compared to the other two hospitals in which information technology was in use.

2.5 Negative Effects of Long Patients' Waiting Time

2.5.1 Effects on Patients' Satisfaction

Despite its subjectivity, patient satisfaction survey is helpful in assessing the quality of care provided to patients (Turnbull and Hembree, 1996; Merkouris et al., 2013). Three main dimensions that are recommended for assessment are accessibility of services to clients, provider attributes and facility characteristics. Varying numbers of the components of these dimensions are measured in different studies. Overall satisfaction with services is often reported.

In a study by Maitra and Chikani (1992), 95% of patients were satisfied with the services provided in an Accident and Emergency department. Short patients' waiting time, explanation of management to patients by doctors and short total time spent in the department were associated with greater patient satisfaction but the most significant association was with short waiting time ($p=0.003$). Long waiting time was therefore associated with greater patient dissatisfaction.

Camacho et al. (2006) conducted a cross-sectional study in which data were collected at point of care in 18 primary care and special care clinics in order to study the relationship between patients' waiting time and satisfaction outcomes. The satisfaction outcomes were provider and office practice ratings. A scale that ranged from O to 10 was used, with increasing score indicating greater level of satisfaction. The study showed that waiting time was significantly predictive of provider ratings, that is, the longer patients waited the lower the satisfaction of patients with the provider. The finding was similar with office ratings. The odds decrease in willingness to return was 2% with increase of I minute in waiting time. More interestingly, Camacho and colleagues noted that when time spent with physician was

greater than 5 minutes, provider rating decreased by 0.1 rating points for every 10 minutes increase in patients' waiting time but by 0.3 rating points for every 10 minutes increase in patients' waiting time when time spent with physician was less than or equal to 5 minutes. This meant that time spent with the physician influenced the relationship between patients' waiting time and patient satisfaction. The workers concluded that reducing waiting time may improve patient satisfaction and willingness to return and the combination of long waiting time and reduced time spent with physician caused greater drop in patient satisfaction.

Anderson et al (2007) conducted an online survey in the US to investigate the effect of waiting time on patient satisfaction in the context of the time patients spent with the physician. The providers and practice were rated on a scale of 0 ("not at all satisfied") to 10 ("extremely satisfied") containing 9 and 5 items respectively. The summed scores were then scaled to 0 to 100 so that a score of 0 represented no satisfaction while a score of 100 represented complete satisfaction with all the characteristics measured. The time spent with physician had greater correlation with overall patient satisfaction than patients' waiting time (Spearman rank correlation coefficient: r= 0.51 versus r=0.31). Multivariable regression analysis showed that time spent with the physician was the strongest of all predictors of patient satisfaction; it explained 28% of the variance, approximately thrice the contribution of waiting time. Provider care score and practice care score also increased with increasing time spent with physician for different categories of waiting time. Among those who reported waiting 30-60 minutes the provider care score was 18.0 for those who spent less than 5 minutes with the physician while it rose to 78.7 for those who spent more than 10 minutes with the physician. The combination of short waiting time and longer time with physician produced the greatest satisfaction. Those who waited less than 15 minutes before seeing

physicians and had longer visits had the highest physician care score of 92.7 and this pattern was repeated with practice care score. This study suffered from the limitation of possible selection bias because those who are experienced in using the internet and completed the survey might have differed in important characteristics from those who did not take part in the survey. Furthermore, the response rate could not be ascertained. However, the results of the study are similar to those of Camacho et al. (2006) conducted at the point of care. Recall bias was another possible limitation since waiting time and time spent with physician were estimated by the patients. This meant that the association between time and satisfaction may be spurious because overall patient satisfaction with the visit may influence their perception of time spent waiting and time spent with physician. This recall bias may not be much important if perceived waiting time does not differ significantly from actual waiting time.

Patients do not actually measure their waiting time or time spent with the physician. Consequently, perception of time may well be more practical than actual time spent when waiting time studies are conducted. Dansky and Miles (1997) did not find any significant difference between actual waiting time and perceived waiting time of 323 patients who attended ambulatory healthcare services but noted that patients overestimated their waiting time. On the other hand, Bestvater et al. (1988) reported that patients underestimated their waiting time but did not compare it with actual waiting time to assess if there was any significant difference.

Dissatisfaction results when experience deviates greatly from expectations (Weinberger et al., 1981). The experience of waiting time is patient's perception of it. It follows that if patient's perception of waiting time is substantially different from their expectation, they become dissatisfied. According to the disconfirmation paradigm, satisfaction is a function of

the magnitude and direction of the difference between perceived service and expected service (Thompson and Yarnold, 1995). In a telephone survey conducted by Thompson and Yarnold (1995) within 2-4 weeks of attendance of a community hospital emergency department the level of satisfaction increased from least satisfied through relatively satisfied to highly satisfied according to whether waiting times were perceived to be longer than expected, equal to expectation or shorter than expected respectively. The researchers concluded that their studies confirmed the validity of the disconfirmation paradigm in relating patient satisfaction to waiting time perception and expectation.

Some studies have looked at patient satisfaction with waiting time rather than assess it as part of overall patient satisfaction. Bestvater et al. (1988) conducted a study in which patients were asked to estimate their waiting time and actual waiting time was also measured. They assessed satisfaction with waiting time by asking patients to indicate whether their waiting time was "About right", "Too long", or "Much too long" and they combined the last two options to define dissatisfaction with waiting time. The proportion of those that were dissatisfied with waiting time increased as perceived and actual waiting times increased but more patients expressed dissatisfaction with perceived waiting time when equivalent categories are compared. For instance, 65% of patients were dissatisfied with perceived waiting time of 46-60 minutes while 41 % were dissatisfied with actual waiting time of 46-60 minutes. This was attributed to underestimation of waiting time by patients. In the study by McCarthy et al. (2000), waiting time was rated unsatisfactory by 64% of patients. Out of items assessed in a questionnaire administered by Sholeye et al. (2013) to women accessing antenatal care, the greatest area of dissatisfaction was long waiting time. With respect to satisfaction with waiting time, 25.1 % were very satisfied, 44.5% were satisfied, 22.4% were

not satisfied and 8.0% were totally dissatisfied. Thus, about 30.4% of the respondents were not satisfied with the waiting time they experienced.

2.5.2 Other Negative Effects

Apart from its association with decrease in patient satisfaction, long patients' waiting time also affects utilization of health care services and has negative effects on clinic staff. As a result of long waiting time, some patients leave the emergency room without being seen by physicians (dos Santos et al., 1994; Fernandes et al., 1994; Shaik et al., 2012). This may also happen in outpatient clinics, especially those with long patients' waiting time; even though there are no known previous reports of patients leaving outpatient clinics without being seen. It has also been documented that some patients fail to attend the clinic, the so-called 'no shows', because of their expectation of long waiting time (McCarthy et al., 2000). The clinic's ability to attract patients is thus affected negatively, a situation that led Rohleder et al. (2011) to state that short waiting times are a competitive advantage. Long patients' waiting time also leads to congestion in the clinic with consequent pressure on clinic staff (Shute and Marcus, 2001; Rohleder et al., 2011). This can decrease the morale of clinic staff and cause absenteeism (Rohleder et al., 2011).

2.6 Reducing Patients' Waiting Time

2.6.1 Preamble

The negative effects of long patients' waiting time make it necessary to identify factors associated with prolongation of patients' waiting time and take appropriate measures to effect reduction. These factors and the required solutions differ between facilities. The six sigma approach, Plan-Do-Study-Act (PDSA), Quality improvement cycles (QI cycles) and

simulation modeling are some of the methods that are applied in studying how to reduce waiting time.

2.6.2 The Six Sigma Approach

Six sigma is a business management strategy which was developed in 1986 by Motorola, USA. In a six sigma process, 99.99966% of manufactured products are statistically expected to be defect-free, translating to 3.4 defects per million. The idea that underlies the concept of the six sigma process is that if there are six standard deviations between the process mean and the nearest specification limit, virtually all items will meet specification. In patients' waiting time studies long waiting time are equivalent to manufacturing defects. Applying the six sigma approach in improving waiting time means that we expect to practically eliminate long patients' waiting time after identifying and removing its causes. There are five steps in the six sigma approach, namely: Define, Measure, Analyze, Improve, Control (DMAIC). Dinesh et al. (2013) applied the approach in order to reduce waiting time in an outpatient cardiology office in India. Causes of long waiting time identified included availability of single registration counter, lengthy and difficult-to-fill registration form, and delay in starting clinic among others. The approach led to significant reduction in waiting time. In addition, the proportion of patients waiting less than I hour before consultation increased from 6% before the study to 49% during the study and 53% during the control phase. Furthermore, the proportion of patients waiting more than 2 hours before consultation fell from 24% before study to 6% and then to 4% during study and in the control phase respectively. The same pattern was recorded for those waiting for more than 3 hours before consultation; the proportion falling from 64% to 13% to 8% respectively.

2.6.3 Quality Improvement (QI) Cycle

The QI cycle is an analytic tool that is used in improving the quality and efficiency of healthcare services. It involves choosing a problem and assembling a team with the requisite knowledge, skills and experience to conduct the cycle. The team decides on a measurable parameter, sets target standards, and then plans and implements the changes. The effects of the changes are then measured after a set time. Several QI cycles are usually carried out until the set standards are achieved. Unresolved problems in previous cycles or new problems are addressed in subsequent QI cycles. Rauf et al. (2008) conducted two QI cycles aimed at reducing patients' waiting time in a district emergency department. The chosen team identified waiting time as the measurable parameter and defined it as the time from arrival to the unit until the start of consultation by the medical personnel. Data on waiting time was conducted at the beginning of QI cycle I, the end of QI cycle 1 and the end of QI cycle 2. The last two data collections were made to evaluate the effect of interventions. The standards were that stable patients should be seen within two hours of arrival while unstable patients should be seen in less than 1 minute. Problems were identified and appropriate interventions administered. There was decrease in the median waiting time for stable patients from 545 minutes (beginning of QI cycle 1) through 230 minutes (end of QI cycle 1) to 89 minutes (end of QI cycle 2). The median waiting times in minutes for unstable patients were 0, 0 and 0.5 minutes respectively. Kruskall-Wallis H test showed that there was significant difference in waiting times for stable patients ($p<0.001$) but this was not so for unstable patients ($p= 0.90$). Thus the QI improvement cycles helped to identify problems and plan interventions that led to decrease in emergency department waiting time in stable patients.

2.6.4 The Dartmouth Microsystem Improvement Curriculum and the Plan-Do-Study-Act Improvement Method

A quality improvement project was conducted by Michael et al. (2013) with the aim of increasing patient satisfaction by minimizing their waiting times in a Florida county health department Adult Primary Care Unit (APCU). They chose the Dartmouth Microsystem Improvement Curriculum (DMIC) framework for the project. Within the DMIC framework, the Plan-Do-Study-Act (PDSA) model for improvement is the method of choice for testing ideas that may lead to improvement. The causes of long waiting time were identified in the following categories: front-end operations, back-end operations, patient work-up and ancillary services. Using the PDSA model, APCU members chose to base interventions on front-end operations which included patient registration, reception duties, answering phones, and responding to inquiries from both patients and staff. Prior to intervention, targets of 20 minutes and 10 minutes were set respectively for waiting room **wait** time and exam room wait time. The mean pre- and post-intervention waiting room wait times were 28.38 minutes and 23.05 minutes respectively. For exam room wait times the figures were 14.45 minutes and 12.64 minutes respectively. There was statistically significant reduction in both waiting room wait time ($p = 0.001$) and exam room wait time ($p = 0.047$) even though wait time goals were not met. Surveys on patient satisfaction with waiting room wait time, exam room wait time and likelihood of referring friends or families to unit were also conducted pre- and post-intervention. The results were statistically significant for waiting room wait time ($x^2 = 10.77$, $p = 0.029$) but not for exam room wait time ($x2=8.06$, $p = 0.89$) and likelihood of referring families or friends ($x^2 = 1.69$, $p = 0.793$). It was concluded that DMIC framework and PDSA

improvement method were viable options for conducting quality improvement projects and achieving wait time process improvements.

2.6.5 Computer Simulation Method

Computer simulation of clinic processes is also applied to improve patients' waiting time. According to Law and Kelton (2000) computerized discrete event simulation is a useful analysis and improvement tool in industries characterized by considerable complexity and uncertainty. Cooper et al. (2007) also stated that computer simulation is useful in settings in which queuing for resources, resource constraints, or interactions between individuals are important. The healthcare industry exhibit the characteristic listed above and is therefore suited to computer simulation. The increasing emphasis on cost control and efficiency (Rohleder et al., 20 I I) and the need to explore alternative patient pathways (Cooper et al., 2007) are other reasons to justify the application of computer simulation to healthcare. Simulation modeling is a system approach to quality improvement that provides quantitative evidence that the interventions which are introduced should lead to improvement (Rohleder et al., 20 I 1).

Santibanez et al. (2009) applied computer simulation to evaluate the impact of changes to dimensions (physical configuration, scheduling policies, capacity allocations etc) that affect waiting time, clinic overtime and resource utilization in a British Columbia Cancer Agency ambulatory care unit. They were able to develop, by implementing multiple changes simultaneously, configurations that reduce patients' waiting time by 70% for the same appointment volume. Similarly, Rohleder et al. (2011) constructed a discrete event simulation to show how performance would improve if factors and uncertainties causing long patients' waiting time and overtime in an orthopaedic clinic are removed. Five primary

performance measures were used: the total time a patient spends in the clinic, patients' waiting time for X-rays, patients' waiting time before being attended to by a surgeon, percentage of patients whose clinic visits lasted 60 minutes or less and the time of day when all patients had completed their visits. Based on the problems identified the following three interventions were implemented: addition of a third X-ray technician, ensuring punctuality of surgeons and new appointment schedules. The performance measures were better in the implementation session than in the initial, pre-simulation session but the results of simulation were better than either. Discrete event simulation was therefore useful in identifying interventions for improving patient flow in the orthopaedic clinic.

27 Productive Use of Patients' Waiting Time

In healthcare setting, waiting is inevitable but should be kept to a minimum. In clinics that attend to 'walk-ins' and those in which appointment system is not time-specific, waiting time can be quite long. According to Obamiro (2013), in a developing country like Nigeria, it is assumed that waiting is part of healthcare delivery because it is often long. In such a setting it is important to make the period of waiting productive. Ajayi et al. (2005) reported that watching happenings in the clinic, reading and chatting were the three common activities patients engaged in while waiting. Umar et al. (201 l) reported that most patients either watched television or happenings in the outpatient departments. Reading is a productive activity and watching television may be productive if the contents being viewed are educative. Another productive use of waiting time is delivery of health education to the patients while waiting to be seen. In the study by Umar et al. (2011), 16% of the patients admitted to being educated on important health issues while waiting. While the activities that were commonly engaged in were similar to those reported by Ajayi et al. (2005), the

respondents in the study by Bamgboye and Jarallah (1994) preferred to be given health education on specific diseases.

Chapter Three

Methodology

3.1 Study Population

The study population consisted of all patients who presented to the three orthopaedic clinics of LTH, Osogbo during the study period. Some of the patients were sampled more than once. Such patients were part of the sample on every occasion that they came to the clinic, since the study was mainly about their waiting time, the experience of which was unique on each clinic visit.

3.2 Study Design

An analytic cross-sectional study design was conducted from 12th August to 4th November, 2015. The analysis involved testing the null hypothesis that certain patient and clinic characteristics were not predictors of access to physicians for consultation at the orthopaedic clinics of LTH, Osogbo.

3.3 Description of Study Area

The study was carried out in the three orthopaedic outpatient clinics of LTH, Osogbo, located in Olorunda Local Government Area of Osun State.

LTH has a storey building on the ground floor of which all surgical and paediatric SOPCs are located. The building is usually opened between 7:00 am and 7:30 a.m. Orthopaedic outpatient clinics are held on Mondays, Wednesdays and Fridays. Consulting rooms open into a wide passage that runs through the entire length of the specialty outpatient department. A part of the passage serves as the patient waiting area and the nursing station where

patients' vital signs are taken before they enter one of the consulting rooms. The Medical Record Department where patients' case folders are retrieved is physically separate from but directly Opposite the building where the clinics are located.

The clinics are headed by different consultants. Patients are referred to the clinics from other hospitals, the Accident and Emergency Department of LTH, Osogbo and other specialists in the hospital. Scheduling is not a feature of the appointment system in the clinics. Both new and old patients book appointment at the Medical Record Department before the day of the clinic.

On a typical clinic day, patients arrive at the clinic early in the morning in the same time block before the consultation begins. The nurses note that they have presented in the clinic for the day, and instruct them to pay consultation fee at a nearby pay-point. They come back to show evidence of payment. The nurses then take each patient's vital signs. A list of those who have paid is sent to the Medical Record from which the patients' case folders are then brought to the clinic. These case folders are sorted into new and old folders according to whether they belong to new or old patients respectively. The patients then wait to be called into the consulting room.

Some meetings of the department of surgery hold before commencement of the clinics. On Mondays, there is a meeting to review the cases that were admitted at the weekend. On Fridays, there is an academic meeting in which a house officer, a junior resident doctor, a senior resident doctor and a consultant give a fifteen-minute presentation each. There is a Wednesday meeting once every month. All meetings start at 8.00 a.m. These meetings may

delay arrival of doctors to the clinic and therefore commencement of consultation with possible prolongation of patients' waiting time.

The clinic begins once the first doctor arrives. A patient may be seen by a resident doctor or a consultant. Resident doctors seek clarification from the consultants when necessary. Being a teaching hospital, there are frequent discussions on the patients during clinic sessions. New patients are often seen in the latter part of the clinic. Usually, case folders of new patients are distributed to resident doctors, house officers, and medical students (when they are on orthopaedic posting) who take history of their problems and examine them. New cases are presented to and discussed with the consultants and decisions are taken on line of management. The house officer also performs clerical duties (filling investigation forms, writing prescriptions etc.).

Test results are reviewed during clinic sessions. These are results of previously requested investigations. Occasionally, X-rays are requested and the films are brought back to the clinic for evaluation during the same clinic visit. This means such patients will have to be seen twice on a clinic day. In order to reduce patient waiting time and minimize clinic overtime, however, the usual practice is to request X-rays meant for review at the next clinic during a current clinic session. Patients might also have a second consultation on a clinic day if they are sent to the plaster cast room to have a cast removed and have to re-visit the clinic for re-examination. The plaster cast room is in a separate building that is opposite the building where the clinics are located.

Some patients, the so-called walk-ins, come for consultation in the clinics without having been previously given appointment for that day. Such patients may be new or old patients

and often arrive at the clinic when the clinic has started. In order for these patients to be seen, the consultant writes or directs a note to be written by a resident doctor. The note is then sent to the Medical Record Department. This note authorizes the opening of a case folder for a new patient or retrieval of the case folder of an old patient.

Once a patient's clinic session is over, he or she is given a slip indicating, in weeks, when he or she is to be booked for follow-up visit. The patient then goes to the Medical Record Department where the next clinic date is written in his or her hospital card.

3.4 Sample Size Calculation

Sample size was calculated using the formula

$$N = [(Z_{1-\alpha/2})^2 (SD)^2]/d^2$$

Where,

N= sample size

$Z_{1-\alpha/2}$=standardized normal deviate at p=0.05

SD= standard deviation= 115 minutes (Thatcher, 2005)

D= precision= 15 minutes

Hence,

$$N = \{(1.96*115)/15\}^2$$

$$= 225.8$$

A minimum sample size of 230 was chosen. In reality the sample size was the number of patients' clinic episodes rather than the number of patients. It is however, regarded as the number of patients with the understanding that each time a particular patient presented at the clinic he or she had a clinic episode with a unique experience of waiting time to consultation.

3.5 Inclusion and Exclusion Criteria

Patients with orthopaedic conditions who presented to the outpatient orthopaedic clinics of LTH, Osogbo, were included in the study. Patients who presented in the clinics but were found to belong to other specialty clinics, presenting because they were wrongly referred, were excluded from the study.

3.6 Sampling Technique

All consecutive patients with orthopaedic conditions that were seen in the outpatient orthopaedic clinics of LTH, Osogbo, and who were not wrongly referred to the clinics were recruited into the study until the required sample size was reached.

3.7 Definition of Variables

1. Dependent or outcome variable - The outcome variable is the hazard function, a function of patient's waiting time.
2. Independent or explanatory variables - These are clinic and patient's characteristics, namely: clinic day, type of patient, walk-in status of patient, status of physician that attended to the patient, consulting room time and patient's lead time.

3.8 Ethical Considerations

Ethical approval to conduct the study was obtained from the Research Ethics Committee of Ladoke Akintola (Appendix I) University of Technology Teaching Hospital, Osogbo. Written informed consent (Appendix U) was obtained from the patients.

3.9 Data Collection

Two research assistants (House Officers) were trained to collect data. One or both research assistants were available in the vicinity of the SPOC building between 6:30 and 7:00 am in order not to miss recording the time of arrival of those who came to the clinic before the SPOC door was opened between 7:00 am and 7:30 am. The investigator was also available around 7:00 am as a check on the accuracy of recording of time of initial arrival of patients.

On each clinic day, a research assistant compiled a list of patients as they arrived, indicating the time of initial arrival and the hospital number of the patient. After this, the patients went to pay consultation fee, returned to the clinic to show evidence of payment and have their vital signs taken by a nurse. Thereafter, the patients waited for consultation.

A medical record officer then brought case folders as they were retrieved. Once a case folder was brought, the research assistant completed items 1 to 7 on the Patient Data Form (Appendix III) and placed the form in the patient's case folder. The rest of the Patient Data Form was completed in the consulting room by the physician who attended to the patients. Consequently, data collection activities did not affect the normal duties of the House Officers because their part in data collection was concluded before the

commencement of the clinic. At the end of each clinic session the Clinic Data Form (Appendix IV) was completed.

3.10 Data Management

A data editor was created using SPSS version 16. Data were de-identified and entered as soon as each clinic was over. Clarification on any unclear entry in the forms was immediately sought from research assistants. Data cleaning and editing were done regularly in other to detect and correct errors.

3.11 Data Analysis

Frequency and percentage were used to summarize distribution of types of patients and status of physicians who attended to the patients by clinic days. Reasons for being a walk-in and reasons for second consultation were presented in a frequency table. Absolute counts of walk-ins and patients who had second consultation were presented by clinic day. The time of arrival of first patient at the clinic, time of arrival of first doctor at the clinic and the time first patient was called into consulting room were presented as clustered bar charts by clinic days.

Measures of central tendency and dispersion were used to summarize clinic delay, patient's lead time, patients' waiting time, clinic duration and consulting room time. Overall measures and measures for each clinic day were obtained.

A Kaplan-Meier plot of the cumulative proportion of patient seen against patient's waiting time was obtained. Since survivorship meant that a particular patient had not been seen yet, the Kaplan-Meier curve was obtained by plotting the complement of the survival function against patients' waiting time.

Using the actuarial method with time interval of 30 minutes, the cumulative proportions of patients who were not seen within various time bands were obtained. This was equivalent to obtaining the survival function using the actuarial method. The complements of the cumulative proportions were the consultation rates within various time intervals from beginning of the clinics.

A null model of Cox regression was obtained. Each of the variables clinic day, type of patient, walk-in status of patient, status of physicians, patient's lead time and consulting room time was fitted separately. Any variable that significantly reduced the value of -2logL compared to the null model value at 10% significance level was included in multivariate analysis.

For multivariate analysis, the time origin was arrival at the clinic while the endpoint was entry of the patient into the consulting room. If a patient had a second consultation, the endpoint was the time the patient entered the consulting room a second time. The multivariate proportional model is given by:

$$h(t, X) = h_0(t) \exp \sum_{i=1}^{f} \beta_i X_i$$

where

$h_0(t)$=baseline hazard for an individual for whom all explanatory variables have a value of zero

p is the vector of coefficients of the independent variable X_i

$X=(X_1, X_2, \ldots, X_p)$ explanatory or predictor variables

The variables that were fitted to the general Cox proportional hazard model were clinic day, type of patients and patient's lead time. The proportional hazard model is:

$$h(t) = ho(t)\exp(P_1 \text{Clinic day} + P_2 \text{Type of patient} + p3\text{Patient's lead time}).$$

In the Cox proportional analysis, the reference category for Type of patient and Clinic day were Old patient and Friday clinic respectively. Hence the baseline hazard ho(t) represents the hazard (in this case access to physician) for an old patient who arrived at the same time as or after the first doctor had arrived at a Friday clinic.

Chapter Four

Results

4.1 Distribution of Patients by Clinic Days

A total of 241 patients were seen during 30 clinic days which held on Mondays, Wednesdays and Fridays over a period of three months. About 8 patients were thus seen on each clinic day. There were 12 (40%) Wednesday clinics, 9 (30%) Monday clinics, and 9 (30%) Friday clinics. Table 1 shows that about 55% of the patients were seen on Wednesdays and 161 (66.8%) patients were old patients while 80 (33.2%) were new patients. Of the 241 patients, 18 (7.5%) were walk-ins while 3 (1.2%) had a second consultation. There were no walk-outs. Four patients were wrongly referred to the clinics. The reasons for being a walk-in are listed in Table 2. The commonest reasons were missed previous appointments because of industrial strike in the hospital and because of illness in 6 (33.3%) and 4 (22.2%) patients respectively. With regards to patients that had second consultation, one went to retrieve test results, another went to have X-rays done and the third waited to have manipulation and cast application for an ankle deformity.

4.2 Status of the Doctors who Attended to the Patients

Table 3 is a cross tabulation of the status of the consulting doctor and clinic day. The proportion of patients that were seen by residents alone (48.9%) was similar to the proportion of patients that were seen by consultants alone (45.2%).

Table 1: Distribution of patients by clinic days

Variable	Monday	Wednesday	Friday	Total
New patients*	19 (23.8)	42 (52.5)	19 (23.8)	80 (100.0)
Old patients*	23 (14.3)	90 (55.9)	48 (29.8)	161 (100.0)
Total number of patients*	42(17.4)	132 (54.8)	67 (27.8)	241 (100.0)
Number of walk-ins†	3(1.2%)	12(5%)	3(1.2%)	18(7.5%)
Patients who had second consultation†	0(0.0%)	3(1.2%)	0(0.0%)	3(1.2%)

*Number (row%), †Number (% of total number of patients)

4.3 Doctor-Patient Ratio

Sixty-six doctors attended to patients over the 30 clinic days, giving an average of 2 doctors per clinic day. Twenty doctors attended to 42 patients on Monday clinics, 28 doctors attended to 132 patients on Wednesday clinic and 18 doctors attended to 67 patients on Friday clinics. The ratios of doctor to patients were 1:2.10, 1:4.71 and 1:3.72 respectively for Monday, Wednesday and Friday clinics. The overall ratio of doctors to patients was 1: 3.65.

4.4 Time of arrival of first patient, time of arrival of first doctor and time the first patient entered consulting room

The bar charts show frequency of time bands of arrival of first patient at the clinics (Figure 1), time of arrival of the first doctor at the clinics (Figure 2) as well as time of entry of the first patient into the consulting room (Figure 3). In all the three clinics, the most frequent time of arrival of the first patient was 7:30 to 8:00 am. On the other hand, the modal time band at which the first doctor arrived at the clinic was between 9:30 and 10:00 am, that is, 2 hours later. The first patient entered the consulting room on more clinic days on Wednesday in the time bands 9:00 to 9:30am and 10:00 to 10:30 am. The earliest time band that the first patient entered the consulting room was 9:00 to 9:30am and this occurred more frequently on Wednesdays. On some clinic days (Monday and Friday clinics only) the first patient was called into the consulting room between 11:00 and 11:30 am and between 11:30 am and 12:00 noon.

Table 2: Reasons for being walk-ins

Reason	Frequency	Percent
Staff relation	3	16.7
Missed last appointment because of illness	4	22.2
Missed last appointment because of strike in the hospital	6	33.3
Need for prescription drugs before actual appointment date	1	5.6
Personal communication with consultant	2	11.1
Old patient previously lost to follow-up	2	11.1
Total	18	100.0

Table 3: Status of doctors who attended to 241 patients in the three orthopaedic clinics

Physician's status	Monday	Wednesday	Friday	Total
Resident	21 (50)	60 (45.5)	34 (50.7)	115 (47.7)
Consultant	16 (38.1)	63 (47.7)	30 (44.8)	109 (45.2)
Resident and consultant	5 (11.9)	9 (6.8)	3 (4.5)	17 (7.1)
Total	42 (100)	132 (100)	67 (100)	241 (100)

Values are presented as number (column%)

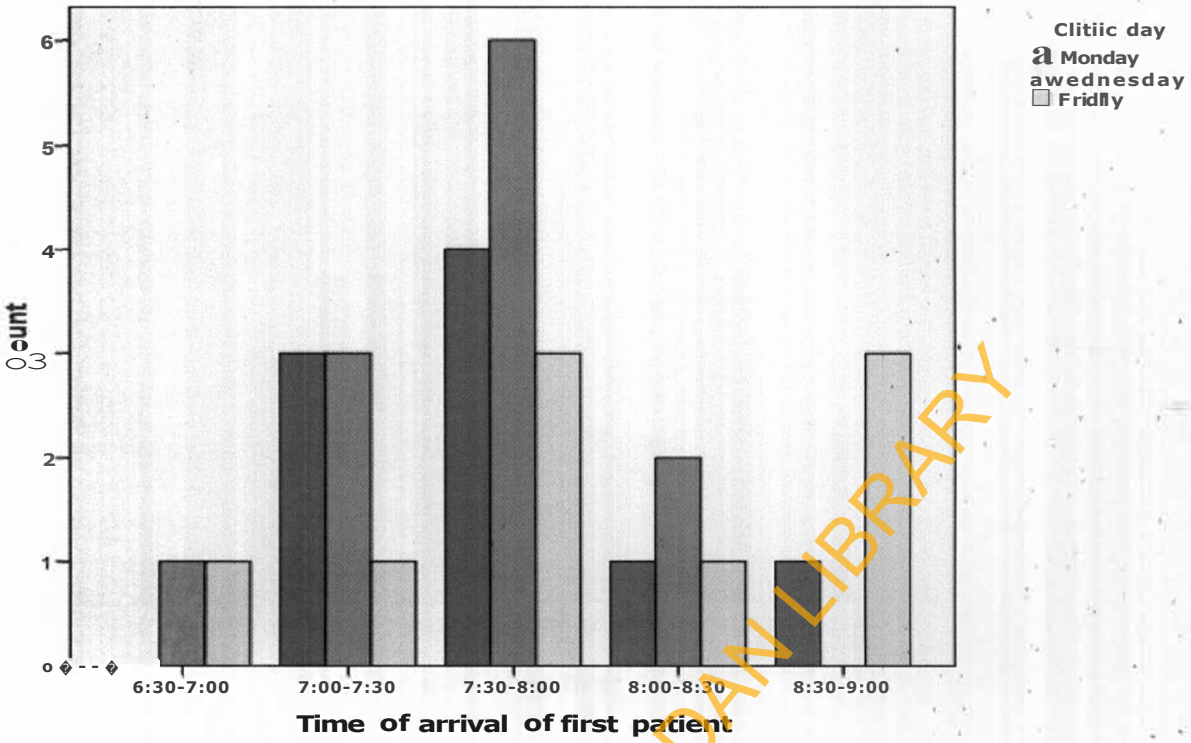

Figure 1: Time of arrival of first patient by clinic days

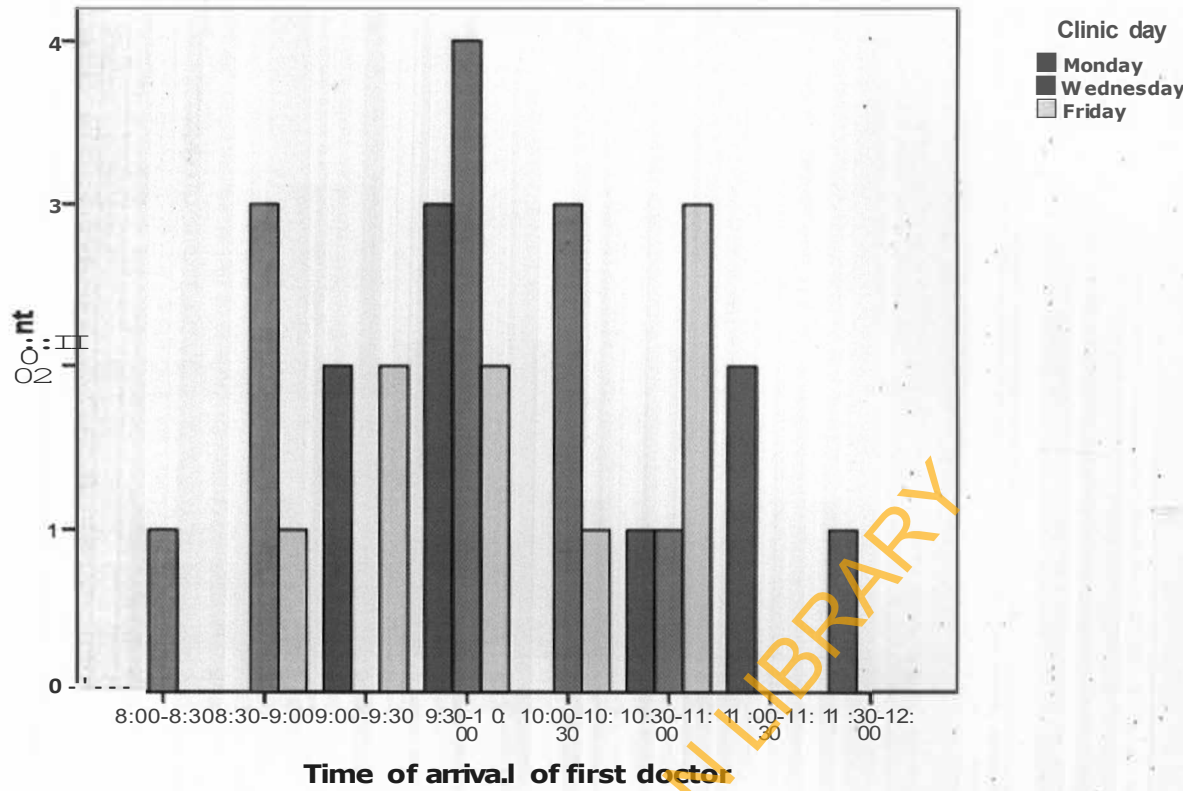

Figure 2: Time of arrival of first doctor by clinic days

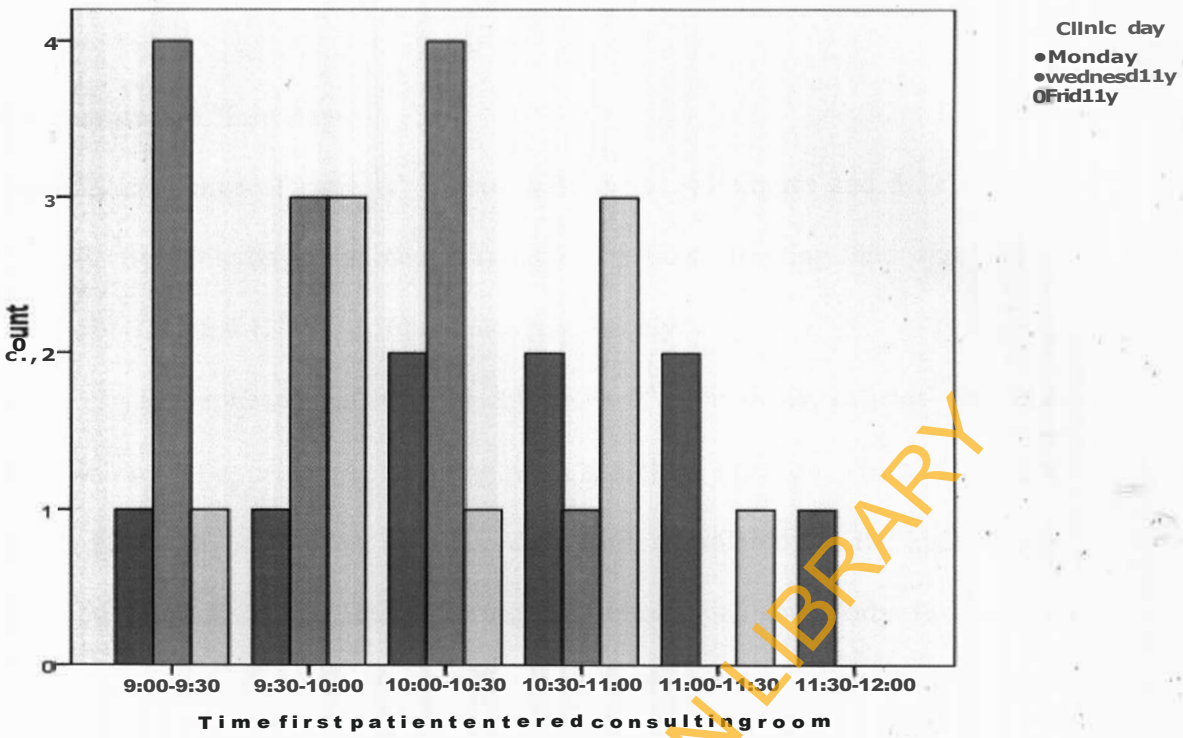

Figure 3: Time first patient entered consulting room by clinic days

4.5 Time Intervals by Clinic Days

The median and range of patients' waiting time were 145minutes and 5-321 minutes respectively. By clinic days, the median (range) of patients' waiting time were 162 (5-249), 148 (14-321) and 123 (10-256) minutes respectively.

Table 4 presents the means and standard deviations of clinic delay, patients' lead time, patients' waiting time, patients' consulting room and clinic duration. The average clinic delay was 146.93 minutes when all clinic days were considered but the highest delay occurred on Monday clinics, the lowest on Wednesday clinics. Forty two (17.4%) patients arrived after the first doctor had gotten to the clinic; each, therefore, had 0 patients' lead time. Of these 42 patients, 3 (7.1 %) attended Monday clinics, 21 (50%) attended Wednesday clinics and 18 (42.9%) attended Friday clinics. Taking all patients into consideration, the mean patient's lead time was 72.95 minutes for all clinics. The mean patients' lead time was highest for Monday clinics and lowest for Wednesday clinics.

Table 4: Descriptive statistics for clinic delay, patient's lead time, patient's waiting time, patient's consulting room time and clinic duration

Variable	Monday	Wednesday	Friday	All clinic days
Clinic delay	174.22 ± 40.72	129.92 ± 36.53	142.33 ± 76.66	146.93 ± 52.24
Patients' lead time	115.07 ± 56.64	60.50 ± 45.96	71.06 ± 68.05	72.95 ± 58.06
Patients' waiting time	158.52 ± 51.96	149.45 ± 67.78	128.34±64.41	145.16±65.04
Patients' consulting room time	21.31 ± 16.23	19.66± 13.55	16.79 ± 15.64	19.15 ± 14.66
Clinic duration	74.22 ± 29.40	171.58±55.80	94.11 ± 33.88	I 19.13 ± 60.79

The mean and median patients' waiting time showed a trend; they were highest for Monday clinics, followed by Wednesday clinics and least for Friday clinics. Patients' consulting room time showed a similar trend. However, the clinic duration was highest for Wednesday clinics, followed by Friday clinics and least for Monday clinics. The average clinic delay is about 55% of the sum of the average clinic delay and average clinic duration. Of the 241 patients, 199(82.6%) arrived at the clinic before the first doctor got to the clinic, and their mean lead time was more than an hour. There was problem finding the case folder of one patient whose lead time, waiting time and consulting room time were 45 minutes, 260 minutes and 17 minutes respectively.

4.6 Consultation rates

Figure 4 is the Kaplan Meier plot of cumulative proportion of patients that were seen against patient's waiting time.

Table 5 depicts the cumulative proportion of patients seen within various time intervals, each interval with a width of 30 minutes. The table shows that only 11% of patients were seen within 1 hour of arriving at the clinics. This was the 1-hour consultation rate.

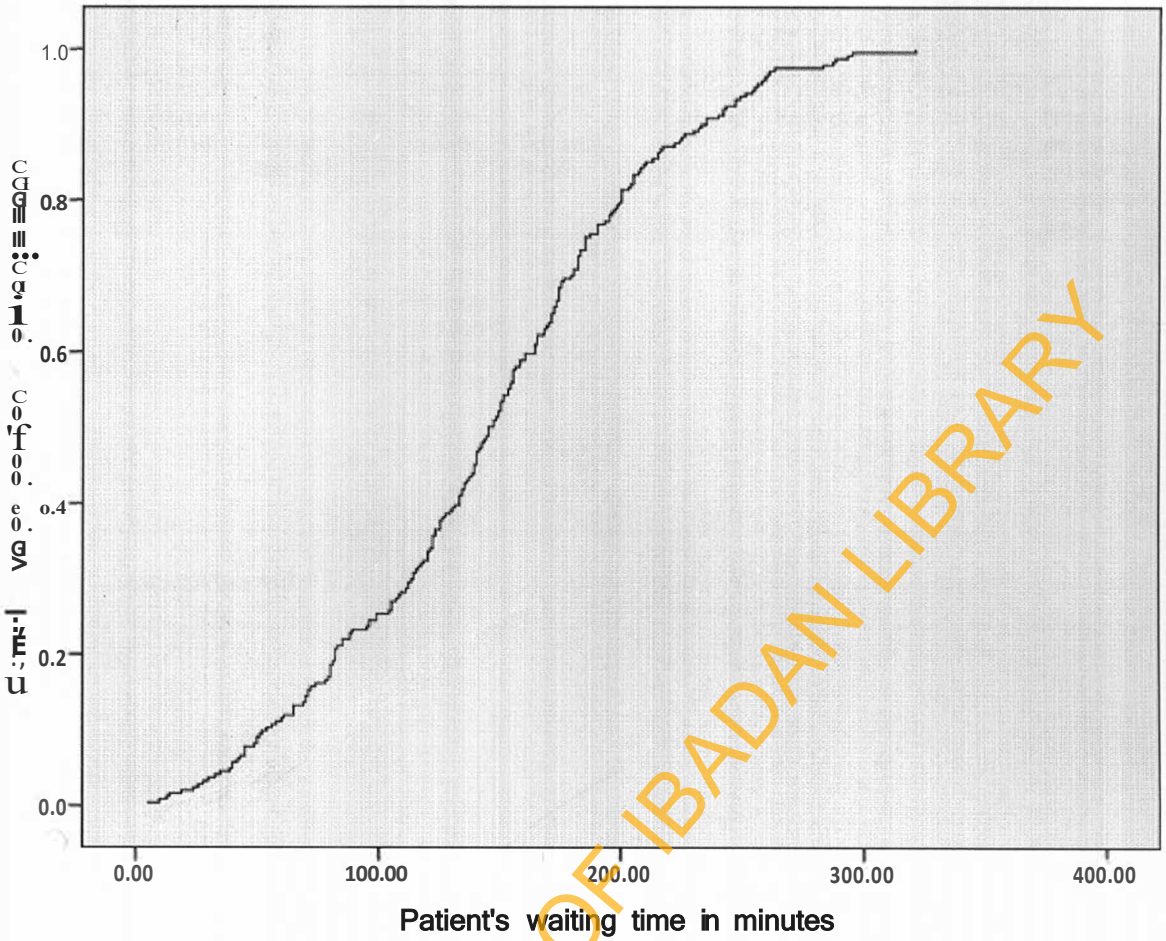

Figure 4: Cumulative proportion of patients seen at different time point from their time of arrival at the clinic

Table 5: Actuarial consultation rates among 241 orthopaedic patients

Interval at Start Time	Number Entering Interval	Number Withdrawing during Interval	Number Exposed to Risk	Number of Terminal Events	Proportion Terminating	Proportion Surviving	Cumulative Proportion Surviving at End of Interval	Cumulative Proportion seen at End of Interval (Consultation Rate)	SE Cumulative Proportion Surviving at End of Interval
0	241	0	241.000	8	.03	.97	.97	.03	.34
30	233	0	233.000	19	.08	.92	.89	.11	.37
60	214	0	214.000	29	.14	.86	.77	.23	.34
90	185	0	185.000	22	.12	.88	.68	.32	.33
120	163	0	163.000	48	.29	.71	.48	.52	.24
150	115	0	115.000	43	.37	.63	.30	.70	.15
180	72	0	72.000	35	.49	.51	.15	.85	.08
210	37	0	37.000	15	.41	.59	.09	.91	.05
240	22	0	22.000	16	.73	.27	.02	.98	.01
270	6	0	6.000	S	.83	.17	.00	1.00	.00
300	I	0	1.000	1	1.00	.00	.00	1.00	.00

SE - Standard error

4.7 Explanatory variables for model fitting

Three variables- type of patient, clinic day and patient's lead time - showed a significant decrease in the null model value of -21ogL at a significance level of 10% (Table 6) on univariate analysis. These variables were the explanatory variables in multivariate analysis using Cox proportional hazard model. The cumulative hazard curves with separate lines for the categories of the variables type of patients and clinic day (Figures 5 and 6) curves are not strictly parallel but do not cross. Hence, the assumption of proportional hazard is reasonably met

Table 6: Single variable model fitting to examine effect on null model value of -2logL

		Change from previous block	
Variable	-21ogL	Chi square	P value
None*	2171.801		
Clinic day	2168.785	3.016	0.082
Type of patient	2164.778	7.023	0.008
Walk-in status of patient	2171.209	0.592	0.442
Physician's status	2171.777	0.024	0.876
Consulting room time	2170.570	1231	0.267
Patient's lead time	2108.351	63.450	0.000

*Null model

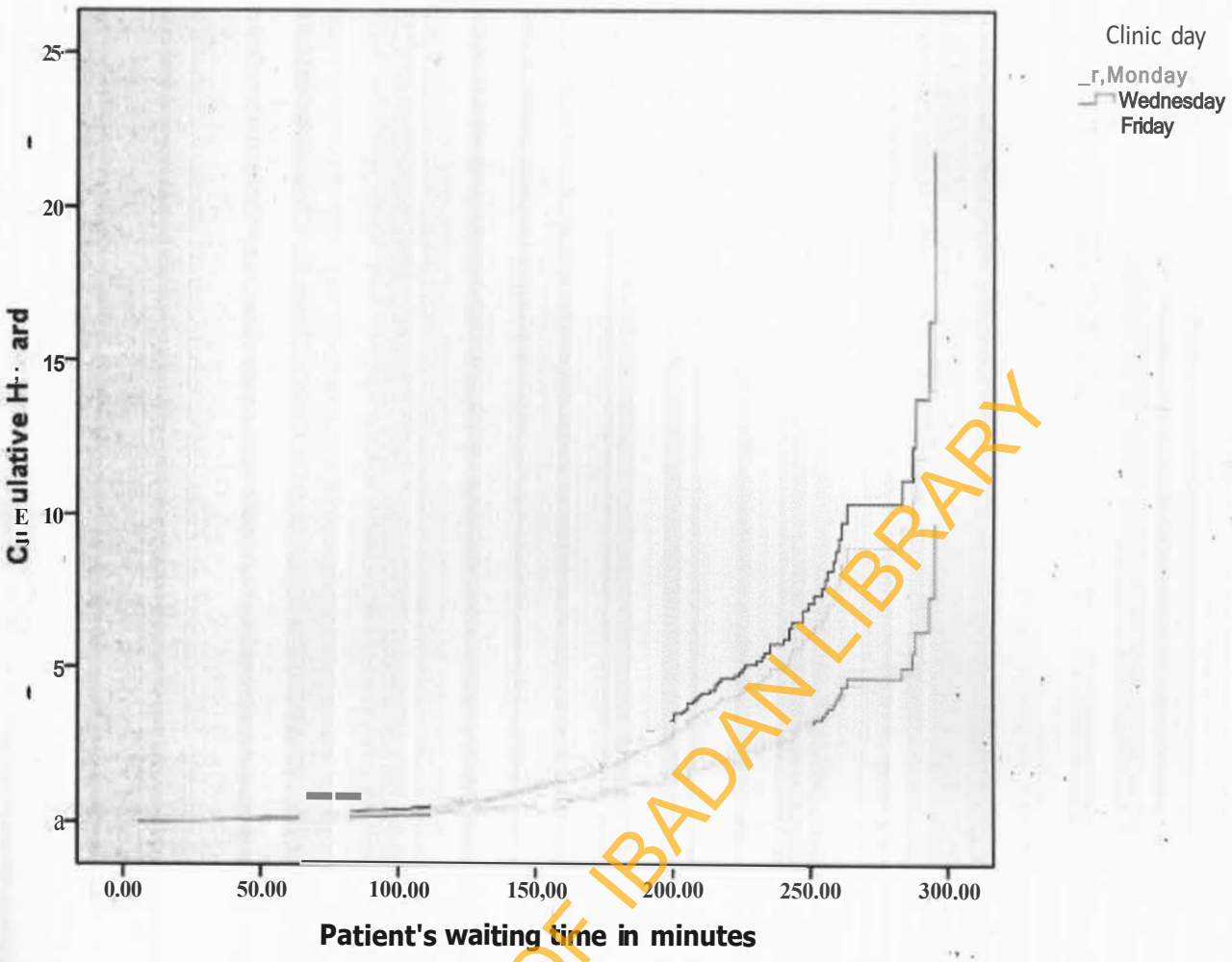

Figure 5: Cumulative hazard curves for the three clinic days.

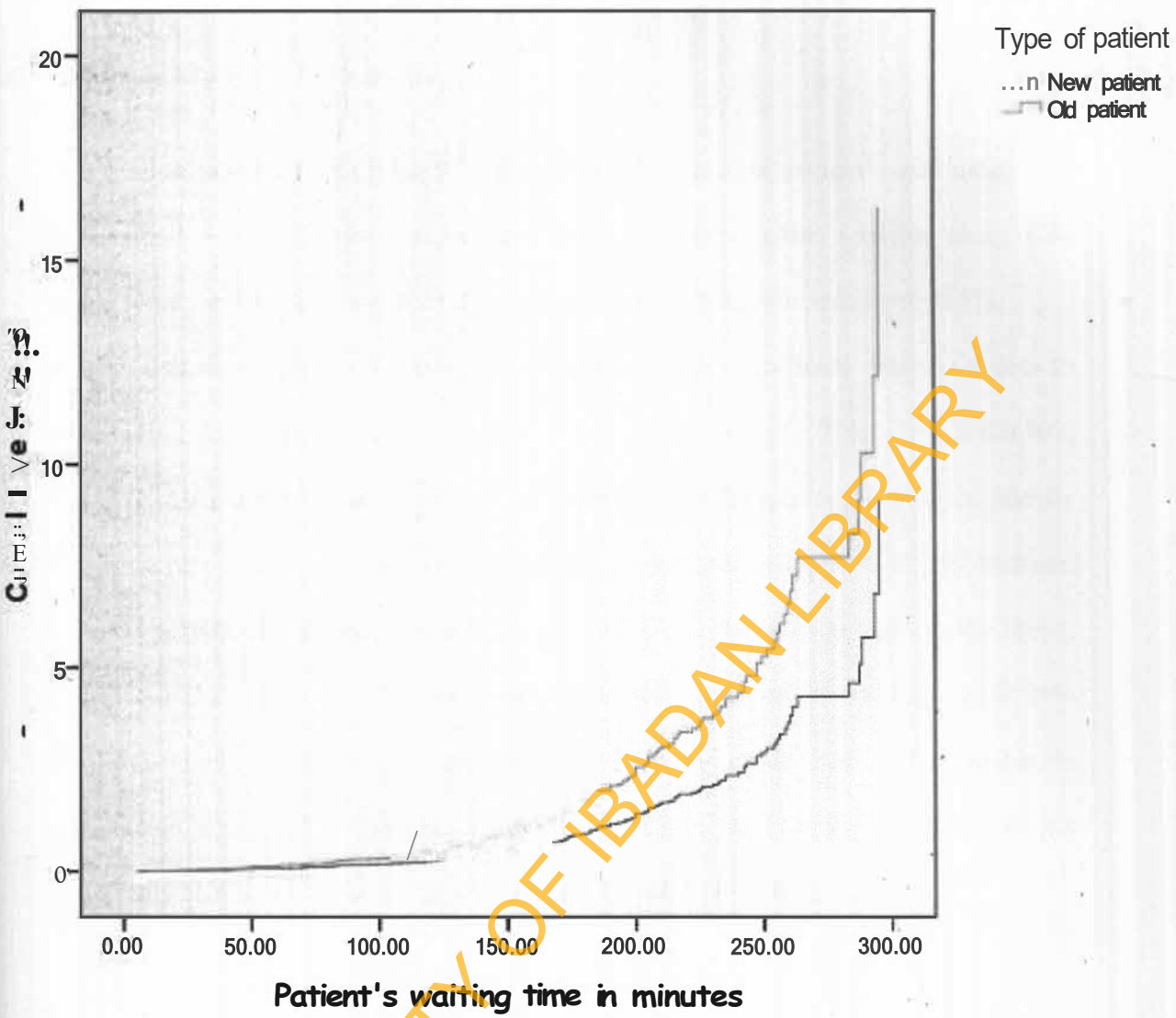

Figure 6: Cumulative hazard curves for new and old patients

4.8 Predictors of Access to Consultation

Two categorical variables (Table 7) and a continuous variable, patient's lead time, were in the final model. Table 8 shows the results of multivariate analysis using Cox proportional model which included the three variables at a significance level of 5%.

Patients that were seen on Wednesday had a statistically significant delay in access to consultation than those that were seen on Friday [HR= 0.516; 95% CI= 0.378-0.703; p<0.001]. Also, new patients were more likely than old patients to experience statistically delayed access to consultation [HR=0.558; 95% CI= 0.420-0.742; p<0.001]. Furthermore, for every arrival of a patient 1 minute earlier than the first doctor to arrive at the clinic, there was 1.3% statistically significant decrease in access to consulation [HR= 0.987; 95% CI= 0.985-0.990; p<0.001]. A patient on a Monday clinic had earlier access to consultation compared to patients attending the clinic on Fridays, but this was not statistically significant [HR= 1.162; 95% CI= 0.777-1.738; P= 0.465].

Table 7: Categorical Variable Codings[c,d]

		Frequency	(1)	(2)
ClinDAY[a]	1.000=Monday	42	1	0
	2.000=Wednesday	132	0	1
	3.000=Friday	67	0	0
TypePAT[3]	.00=New patient	80	1	
	1.00=Old patient	161	0	

a. Indicator Parameter Coding

b. The (0, 1) variable has been recoded, so its coefficients will not be the same as for indicator (0, 1) coding.

c. Category variable: ClinDAY (Clinic day)

d. Category variable: TypePAT (Type of patient)

Table 8: Results of Cox regression analysis of predictors of access to consultation

Variable	B	SE	Wald	P value	HR	95%CI
Clinic day						
Monday	0.150	0.205	0.534	0.465	1.162	0.777-1.738
Wednesday	-0.663	0.159	17.460	0.000	0.516	0.378-0.703
Friday					1.00	
Type of patient						
New patient	-0.013	0.145	16.072	0.000	0.558	0.420-0.742
Old patient					1.00	
Patient's lead time	-0.13	0.001	91.902	0.000	0.987	0.985-0.990

Chapter Five

Discussion

5.1 Interpretation of Results

In this study the median patients' waiting time was 145 minutes. This is more than twice the median patients' waiting time of 1 hour reported by Ogunfowokan and Mora (2012) from a study carried out in the general outpatient department of National Hospital, Abuja. In another study performed in the general outpatient department of Jos University Teaching Hospital, the mean patients' waiting time was 152 minutes (Thatcher, 2005), a finding that is similar to that of this study. It is noteworthy that the two studies were conducted in GOPCs unlike this study which took place in an SPOC.

Patients should experience longer waiting time in a GOPC compared to an SPOC because more walk-ins and a greater number of patients are seen in the former. For instance, Ogunfowokan and Mora (2012) reported that about 275 patients were seen daily in the outpatient clinics of the three units that provided the sample for their study. However, in the present study of patients in an SPOC about 8 patients were seen per clinic session. Sholeye et al. (2013) reported that the mean patient's waiting time in an antenatal clinic, an SPOC, was 69.03 minutes, less than half of the mean patient's waiting time obtained in the present study. Even in the study reported by Umar et al (2011), carried out in a combination of GOPC and SPOCs in Usmanu Danfodiyo University, Sokoto, the mean patients' waiting time was 85 minutes, about three-fifth of that of this study. The waiting time that patients experienced in this study was thus unnecessarily long.

A possible reason for long patients' waiting time is a low ratio of doctors to patients. The patient-doctor ratio found by this study was not low; suggesting that the long median

patients' waiting time could not have been due to clinic congestion arising from a low doctor-patient ratio.

The longer the time a physician spends with a patient in the consulting room, the longer other patients will have to wait to see the same physician (Anderson et al., 2007). This could be a reason for long patients' waiting time in a situation as the one in this study in which the mean number of patients seen per clinic was low. However, this study found that the consulting room time did not improve model fitting in univariate analysis. Thus the long patients' waiting time in this study could not be explained by long consulting room time

Walk-ins disturb the flow of the clinic since the patients were not originally on the list of patients to be seen in the clinic. This could contribute to long patients' waiting time. However, walk-ins were not a problem in this study because they constituted only a small percentage of the total patients seen. Furthermore, they did not improve model fitting in univariate analysis.

Obamiro (2013) observed that medical personnel contributed to other patients' experience of long waiting time by helping some patients jump the queue. Some of these patients could be walk-ins. Again, walk-ins brought by staff were not likely to be an important cause of long patients' waiting time because they constituted only a very small percentage of the total number of patients that were studied.

If a patient had a second consultation on the same clinic day that patient's waiting time was inevitably longer than that of a patient who did not have a second consultation. However, this was not a problem in this study because the clinics have a work flow designed to limit second consultations. Patients are usually instructed to have their tests, including X-rays, done and

the results collected one or two days before the clinic day. This was why only 3 (1.2%) of the patients had second consultation.

Long patients' waiting time may be due to delay in starting the clinic and delay results if doctors do not arrive at the clinic early (Rohleder et al., 2011; Obamiro, 2013). Rohleder et al (2011) found that doctors arrived 30-60 minutes after an orthopaedic clinic had opened, causing significant consultation delay for patients who arrived early. In this study, clinic delay was defined as the time interval between arrival of the first patient at the clinic and entry of the first patient that was called into the consulting room. The mean clinic delay exceeded 2 hours. Since patients could not be called into the consulting room until doctors arrived, the long delay in starting the clinic was due to late arrival of doctors. The late arrival of doctors was because academic programmes are held before the commencement of the clinics on most clinic days. It is thus important to reduce the time patients spend in the clinics before doctors arrive at the clinic. Time scheduling can help to achieve this.

According to the standard set by the UK National Health Service Patient's Charter in 1991, at least 90% of patients should be seen within 30 minutes of their appointment time (Hart, 1995). This standard was set for clinics where patients are given different time slots to see physicians. The standard may be a bit high for clinics in which an appointment system exists but time scheduling is not done, like the orthopaedic clinics where this study took place. Hence, long patient's waiting time in the orthopaedic clinics of LTH, Osogbo was defined in the current study as a wait exceeding 1 hour. The finding that only 11% of the patients in this study were seen within 1 hour of arrival at the clinic means that the consultation rate was unsatisfactory.

This study found that patients who attended Wednesday clinics were more likely than those who attended Friday clinics to experience delayed access to consultation. This was not likely to have been due to late arrival of doctors because the mean clinic delay and patient's lead time were least for Wednesday clinic. A possible explanation is the greater number of patients seen on Wednesdays. This might relatively increase patients' waiting time with consequent delay in access to consultation.

The type of patient was also predictive of access to consultation. New patients were more likely than old patients to experience consultation delay. This was most likely due to the existing practice of seeing old patients before new patients.

The finding that increased patient's lead time led to increased delay in access to physicians serves to emphasize that patients arrived at the clinics much earlier than doctors.

5.2 Limitations

This study was conducted in an SPOC with its own peculiar structure and workflow. Hence, generalization of its results to orthopaedic specialty clinics in other teaching hospitals, and more especially, specialty clinics other than orthopaedic clinics, is therefore limited.

It would have been useful to assess satisfaction of the patients with the long waiting time they experienced. This was not done because some patients were seen on more than one occasion during the study period and their responses to a survey on satisfaction with waiting time might be influenced by previous responses.

Despite the above limitations, the study has helped in demonstrating unacceptably long patients' waiting time in a specialty clinic where the patient load was not high and showing how the waiting time may be shortened. It is also, to the best of the knowledge of the

researcher at the time of writing this report, the only patients' waiting time study to have been conducted in an orthopaedic clinic in Nigeria.

53 Conclusions

Patients' waiting time was long in the orthoapedic clinics of LTH, Osogbo despite the fact that the number of patients seen during each clinic session was not too high for the number of available doctors. A large portion of the patients' waiting time was a consequence of delay in starting the clinics which was in turn due to delay in arrival of doctors at the clinic. It is thus important to reduce the time that patients wait in the clinic before the clinic starts.

The proportion of patients that were seen within 1 hour of the patients' arrivals at the clinic was low. This was a far cry from the recommendation that 90% of patients should be seen within 30 minutes of arrival, a standard set for clinics in which time scheduling operates.

Access to consultation in the orthopaedic clinics of LTH, Osogbo, was delayed if a patient was a new patient and if a patient attended a Wednesday clinic. Finally, patient's lead time was predictive of delay in access to physician, emphasizing the observation that patients arrived at the clinic much earlier than doctors.

5.4 Recommendations

A specific time for the clinic to start should be chosen, taking into consideration the fact that some academic activities take place before commencement of the clinics. It is recommended that the clinic should start at 10:00 a.m.

Time scheduling should be introduced into the appointment system. This would help in reducing patient's lead time. By ensuring that patients arrive at the clinic close to the time doctors arrived or even after doctors have arrived, considerable decrease in individual patient's waiting time can be achieved. In implementing time scheduling, the first patients

should arrive at the clinic around 9:30 a.m. to allow time for pre-consultation activities. Old patients should be given time slots in the earlier part of a clinic session, between 9:30 am and l 1:00 am.. New patients should be given time slots between 10:30am and 12:00 noon.

In order to assess adherence to the above measures when they are put in practice, the following standards are recommended for auditing, at least annually, or more frequently if possible: 90% of clinic sessions should start by 10:00 am, 90% of patients should be seen within I hour of arriving at the clinic, no second consultation in 90% of clinic sessions, less than 5% of walk-ins in 90% of the clinic sessions.

More generally, time scheduling is recommended for adoption by SPOCs in teaching hospitals in Nigeria. Its implementation is possible because the number of patients that will be seen in an SPOC can be controlled.

References

1. Ajayi I.O. (2002) Patients' waiting time at an outpatient clinic in Nigeria-can it be put to better use? *Patient Education and Counseling,* 47(2), 121-126.
2. Ajayi, 1.0., Olumide E.A. and Oyediran 0. (2005) Patient satisfaction with the services provided at a general outpatients clinic, Ibadan, Oyo State, Nigeria. *African Journal of Medicine and Medical Sciences,* 34(2), 133-140.
3. Anderson R.T., Camacho F.T. and Balkrishnan R. (2007) Willing to wait? The influence of patient wait time on satisfaction with primary care. *BioMed Central (BMC) Health Services Research,* 7, 31-35.
4. Bailey N.T.J. (1952) A study of queues and appointment systems in hospital outpatient departments with special reference to waiting times. *Journal of Royal Statistical Society A,* 14, 185-189.
5. Bamgboye E. and Jarallah J. (1994) Long waiting outpatients: target audience for health education. *Patient Education and Counseling,* 23(1), 49-54.
6. Bestvater D., Dunn M.D., Townsend C, and Nelson W. (1988) Satisfaction and wait time of patients visiting a family practice clinic. *Canadian Family Physician,* 34, 67-70.
7. Camacho F., Anderson R., Safrit A., Jones A.S. and Hoffmann P. (2006) The relationship between patients' perceived waiting time and office-based practice satisfaction. *North Carolina Medical Journal,* 67(6), 409-413.
8. Christopher A., Feddock A.R., Hoellein C.H., Griffith III J.F., Wilson J.L., Bowerman N.B. et al. (2005). Can physicians improve patient satisfaction with long waiting times? *Evaluation & the Health Professions,* 28(1), 40-52.

9. Cooper K., Bradford S.C. and Davies R. (2007) Choice of modeling technique for evaluating health care interventions. *Journal of the Operational Research Society,* 58, 168-176.

10. Dansky K.H. and Miles J. (I 997) Patient satisfaction with ambulatory healthcare services: waiting time and filling time. *Hospital & Health Services Administration,* 42(2), 165-177.

11. Dinesh T.A., Singh S., Nair P. and Remya T.R. (2013) Reducing waiting time in outpatient services of large university teaching hospital - a six sigma approach. *Management in Health,* 17(1), 31-37.

12. dos Santos L., Stewart G. and Rosenberg N. (1994) Paediatric emergency department walkouts. *Paediatric Emergency Care,* 10(2), 76-78.

13. Esimai O.A. and Omoniyi-Esan G.O. (2009) Wait time and service satisfaction at antenatal clinic, Obafemi Awolowo University, Ile-lfe. *East African Journal of Public Health,* 6(3), 309-11.

14. Fernandes C., Daya M., Barry S. and Palmer N. (1994) Emergency department patients who leave without seeing a physician. The Toronto hospital experience. *Annals of Emergency Medicine,* 24(6), 1092-1096.

15. Gupta D. and Denton B. (2008) Appointment scheduling in healthcare: challenges and opportunities. *IIE Transactions,* 40, 800-819.

16. Hart M. (1995) Improving outpatient clinic waiting times: methodological and substantive issues. *International Journal of Healthcare Quality Assurance,* 8(6), 14-22.

17. Ho C. and Lau H. (1992) Minimizing total cost in scheduling outpatient appointments. *Management Science,* 38(12), 1750-1764.

18. Ho ETL. (2014) Improving waiting time and operational clinic flow in a tertiary diabetic center. *British Medical Journal (BMJ) Quality Improvement Reports,* 2(2), 1-.5.

19. Huang X.M. (1994) Patient attitude towards waiting in an outpatient clinic and its applications. *Health Services Management Research,* 7(1), 2-8.

20. Labonte R., Schrecker T., Sanders D. and Meeus W. (2004) Fatal indifference: the G8, African and global health, University of Cape Town Press, Lansdowne, South Africa.

21. Lau H. and Lau A.H. (2000) A fast procedure for computing the total system cost of an appointment schedule for medical and kindred facilities. *IIE Transactions,* 32(9), 833-839.

22. Law A.M. and Kelton W.D. (2000) Simulation modeling and analysis 3rd ed., McGraw Hill Inc, New York.

23. Liu L. and Liu X. (I 998) Block appointment systems for outpatient clinics with multiple doctors. *Journal of the Operational Research Society,* 49(12), 1254-1259.

24. Maitra A. and Chikani C. (I 992) Patient satisfaction in an urban accident and emergency department. *British Journal of Clinical Practice,* 46(3), I82-184.

25. McCarthy K., McGee H.M. and O'Boyle C.A. (2000) Outpatient clinic waiting times and non-attendance as indicators of quality. *Psychology, Health and Medicine,* 5(3), 287-293.

26. Megbelayin E.U., Ibeinmo 0., Kurawa **M.S.,** Babalola **Y.O.** (2013) Pre-consultation waiting time in a Nigerian public eye facility - a source of patient dissatisfaction. *Standard Research Journal of Medicine,* 1, 1-5.

27. Merkouris. A, Andreadou A., Athini E., Hazimbasi M., Rovithis M. and Papastavrou (2013) Assessment of patient satisfaction in public hospitals in Cyprus: A descriptive study. *Health Science Journal,* 7(1), 28-40.

28. Michael M., Schaffer S.D., Egan P.L., Little B.B. and Pritchard P.S. Improving wait times and patient satisfaction in primary care. (2013) *Journal for Healthcare Quality,* 35(2), 50-59.

29. Murray M. and Berwick D.M. (2003) Advanced access: reducing waiting and delays in primary care; challenges and opportunities. *IIE Transactions,* 40, 800-819.

30. Obamiro J.K. (2013) Effects of waiting time on patient satisfaction: Nigerian hospitals experience. *The International Journal of Economic Behavior,* 3(1), 117-126.

31. Oche M., Adamu H. (2013) Waiting time in the general outpatient department of a tertiary health institution in North-Western Nigeria. *Annals of Medical and Health Sciences Research,* 3(4), 588-92.

32. Ogunfowokan 0. and Mora M. (2012) Time, expectation and satisfaction: patients' experience at National Hospital, Abuja, Nigeria. *African Journal of Primary Health Care & Family Medicine.,* 4(1), 1-6.

33. Onifade P.O., Somoye E.B. and Adamson T.A. (2010) Wait time and service satisfaction at the outpatient clinic of a Nigerian psychiatric hospital. *Nigerian Journal of Psychiatry,* 8(2), 42-46.

34. Rauf W., Blitz J.J., Geyser M.M. and Rauf A. (2008) Quality improvement cycles that reduced waiting times at Tshwane District Hospital Emergency Department. *South African Family Practice,* 50, 43-48.

35. Rohleder T.R., Lewkonia P., Bisehak D., Duffy P., Hendijani R. (2011) Using simulation modeling to improve patient flow at an outpatient orthopaedic clinic. *Health Care ManagementScience.,* 14, 135-145.

36. Santibanez P., Chow V.S., French J., Puterman M.L. and Tyldesley S. (2009) Reducing patient wait times and improving resource utilization at BCCA 's ambulatory care unit through simulation. *Healthcare Management Science.,* 12, 392-407.

37. Shaik S.B., Jerrard D.A., Witting M.D., Winters M.E. and Brodeur M.N. (2012) How long are patients willing to wait in the emergency department before leaving without being seen? *Western Journal of Emergency Medicine,* 13, 463-467.

38. Sholeye 0.0., Abosede O.A. and Jeminusi O.A. (2013) Three decades after Alma Ata: Are women satisfied with antenatal care services at primary health centers in Mushin, Lagos? *Journal of Medicine and Medical Science Research,* 2(3), 24-29.

39. Shute N. and Marcus M. (2001) Code blue crisis in the ER. *US New and World Report,* 131(9), 54-61.

40. Soriano A. (1966) Comparison of two scheduling systems, *Oper Res,* 14(3), 388-397.

41. Thatcher T.D. (2005) Outpatient waiting time in Jos University Teaching Hospital (JUTH). *Highland Med Research Journal,* 3(1), 36-42.

42. Thompson D.A. and Yarnold P.R. (1995) Relating patient satisfaction to waiting time perception and expectations: the disconfirmation paradigm. *Academic Emergency Medicine,* 2(12), 1057-62.

43. Turnbull J.E. and Hembree W.E. (I 996) Consumer information, patient satisfaction survey and public reports. *American Journal of Medical Quality,* 11(1), 42-47.

44. Umar I., Oche M.0. and Umar A.S. (2011) Patient waiting time in a tertiary health institution in Northern Nigeria. *Journal of Public Health and Epidemiology,* 3(2), 78-82.

45. Weinberger M., Greene J.Y. and Mamlin J.J. (1981) Patient perceptions of health care at a university-based ambulatory care clinic. *Journal of Ambulatory Care Management,* 4(I), 55-64.

46. Yeboah E.K. and Thomas M.E. (2009) A cost effective way of reducing outpatient clinic waiting times: How we did it. *The Internet Journal of Healthcare Administration,* 7(1). Available at: http://connection.ebscohost.com/c/articles/525853 10/cost-effective-way-reducing-outpatient-clinic-waiting-time-how-we-did-it

Appendix I

Ethical approval certificate

RESEARCH ETHICS COMMITTEE

LADOKE AKINTOLA UNIVERSITY OF TECHNOLOGY TEACHING HOSPITAL

OSOGBO, OSUN STATE, NIGERIA.

LTH/REC/2015/10/071226

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PROF, OLUWADIYA K.S · CHAIRMAN
MRS SAM-ASIEGBU Y.U · SECRETARY

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CLEARANCE CERTIFICATE

PROTOCOL NUMBER	LTH/EC/201S/10/226
PROJECT TITLE:	*Assessment of Patients' Wailing Time h tire Orthopaedic Outpatient Clinics of LA UTECH Teaching Hospital, Osogbo.*
INVESTIGATOR(S):	Dr. Adesina Ajibade.
DEPARTMENT/ INSTITUTION:	Department of Surgery, LAUTECH Teaching Hospital Osogbo, Osun State.
SUBMISSION OF PROTOCOL:	JULY,2015.
FINAL CONSTDERATION:	OCTOBER, 2015.
DECISION OF THE COMMITTEE:	APPROVED
CHAIRMAN:	Prof. Oluwadiya K. S (FMCS)
SIGNATURE & DATE:	

....

NOTE: TH.E COMMITTEE IS EX.EMPTED FROM LIABtLTY OF THt PROPOSAL AND THIS CERTIFICATE WILL BE REVOKED IF PROTOCOLS STATED IN THE PROPOSAL IS DEVIATED FROM.

DECLARATION flY INVESTIGATOR (S)

PROTOCOL NUMBER (Please quote in all enquiries): LTH/EC/2015/10/226

To be completed in/our and three copies returned to the secretary, Ethics and Research Committee, Ladolce Akinto/a University of Technology Teaching Hospital, Osogbo, Osun State, Nigeria,

I/We fully understand the conditions under which I am/we are authorized to conduct the above - mentioned research and UWe will ensure compliance with these conditions. Should any departure be contemplated from the research procedure as approved, I/We undertake to resubmit the protocol to the

:::::: . ...,,...,....... Date...... :. .. -:.-. .'. ....,,.....,...

Appendix II

Informed consent

I am a Consultant Orthopaedic Surgeon in the Department of Surgery, LAUTECH Teaching Hospital, Osogbo conducting a research on patients' waiting time before being seen by a doctor in the orthopaedic outpatient clinics of LAUTECH Teaching Hospital, Osogbo. I hereby solicit your participation in the study.

Participation in this research is voluntary and you will not be penalized if you decide not to participate. No information provided by you will be released to a third party except by your permission and you will not be identified by name. The research will not harm you in any way. Results of the study will be useful in making our clinic operations more efficient and have the potential to decrease the time you wait before a doctor sees you.

If you participate in this study no personal information will be collected from you. However, some observations will be made about your experience of waiting time in our clinics.

If you agree to participate in the study, kindly append your signature or thumbprint below.

....

Signature or thumbprint Date

Appendix III

Patient data form

1. Hospital Number ----------

2. Date----------

3. Clinic day *(tick)* Monday [ ] Wednesday [ ] Friday [ ]

4. Time of arrival ----------

5. Type of patient New [ ] Old [ ]

6. Is the patient a 'walk-in'? Yes [ ] No [ ]

7. *(If Yes' to (5)*) State reason(s) for being a 'walk-in'----------

---

---

8. Time patient entered consulting room ----------

9. Time patient left consulting room ----------

10. Did the patient have a second consultation? Yes [ ] No [ ]

11. *(If Yes' to (9)*) State reason(s) for second consultation----------

---

---

12. (Please complete 12(a) to 12(c) if patient had a second consultation):

a. Time patient arrived at clinic a second time .....

b. Time patient entered consulting room a second time .....

c. Time patient left consulting room a second time .....

13. Is the patient a 'walk-out'? Yes [ ] No [ ]

14. *(If 'Yes' to (11)):* State time when patient was called but found to be no longer in clinic-------

15. Problems with finding patient's case folder Yes [ ] No [ ]

16. (If *'Yes' to (13)):* What is the nature of the problem?

It took a long time to find case folder Yes [ ] No [ ]

Case folder was missing Yes [ ] No [ ]

Temporary case folder opened Yes [ ] No [ ]

17. Any other problem(s) observed that may prolong patient's waiting time *(specify)* ----------

---

---

18. Patient seen by:

Resident only [ ]

Consultant only [ ]

Resident and consultant [ ]

Appendix IV

Clinic data form

Date ……/……./……

Day of the week *(tick):* Monday [ ] Wednesday [ ] Friday [ ]

Time first patient arrived ----------

Time first doctor arrived----------

Time first patient was called into consulting room ----------

Time last patient left consulting room ----------

Number of doctors ----------

Number of new patients----------

Number of old patients----------

Total number of patients----------

Number of wrong referrals----------

Appendix V

Kaplan Meier survival table

	Time	Status	Cumulative Proportion Surviving at the Time		N of Cumulative Events	N of Remaining Cases
			Estimate	Std. Error		
1	5.000	Seen	.996	.004	1	240
2	10.000	Seen	.992	.006	2	239
3	13.000	Seen	.988	.007	3	238
4	14.000	Seen	.983	.008	4	237
5	19.000	Seen	.979	.009	5	236
6	24.000	Seen	.975	.010	6	235
7	26.000	Seen	.971	.011	7	234
8	28.000	Seen	.967	.012	8	233
9	30.000	Seen	.963	.012	9	232
10	33.000	Seen	.959	.013	10	231
11	35.000	Seen	.954	.013	11	230
12	39.000	Seen	.950	.014	12	229
13	40.000	Seen	.	.	13	228
14	40.000	Seen	.942	.015	14	227
15	42.000	Seen	.938	.016	15	226
16	43.000	Seen	.934	.016	16	225
17	45.000	Seen	.	.	17	224
18	45.000	Seen	.	.	18	223
19	45.000	Seen	.921	.017	19	222
20	49.000	Seen	.917	.018	20	221
21	50.000	Seen	.	.	21	220
22	50.000	Seen	.909	.019	22	219
23	51.000	Seen	.905	.019	23	218
24	52.000	Seen	.900	.019	24	217
25	54.000	Seen	.896	.020	25	216

26	56.000	Seen	.8921	.0201	261	2151
27	58.000	Seen	.888	.020	27	214
28	60.000	Seen	.884	.021	28	213
129	61.000	Seen	.880	.021	29	212
130	65.000	Seen	.	.	30	211
31	65.000	Seen	.	.	31	210
32	65.000	Seen	.867	.022	32	209
33	69.000	Seen	.863	.022	33	208
34	70.000	Seen	.	.	34	207
35	70.000	Seen	.855	.023	35	206
36	71.000	Seen	.	.	36	205
37	71.000	Seen	.846	.023	37	204
38	72.000	Seen	.842	.023	38	203
39	74.000	Seen	.838	.024	39	202
40	78.000	Seen	.834	.024	40	201
41	79.000	Seen	.830	.024	41	2001
42	80.000	Seen	.	.	42	199
43	80.000	Seen	.	.	43	198
44	80.000	Seen	.	.	44	197
45	80.000	Seen	.813	.025	45	196
46	81.000	Seen	.809	.025	46	195
47	82.000	Seen	.	.	47	194
48	82.000	Seen	.	.	48	193
49	82.000	Seen	.	.	49	192
50	82.000	Seen	.793	.026	50	191
51	83.000	Seen	.788	.026	51	190
52	85.000	Seen	.	.	52	189
53	85.000	Seen	.780	.027	53	188
154	88.000	Seen	.	.	54	187
is5	88.000	Seen	.772	.027	55	186
i56	89.000	Seen	.768	.027	56	185
[57	95.000	Seen	.763	.027	57	184
lsa	96.000	Seen	.	.	58	183
:s9	96.000	Seen	.755	.028	59	1821

60	99.000	Seen	.	.	60	181
61	99.000	Seen	.747	.028	61	180
62	104.000	Seen	.743	.028	62	179
63	105.000	Seen	.	.	63	178
64	105.000	Seen	.	.	64	177
65	105.000	Seen	.730	.029	65	176
66	107.000	Seen	.726	.029	66	175
67	108.000	Seen	.722	.029	67	174
68	109.000	Seen	.718	.029	68	173
69	111.000	Seen	.714	.029	69	172
70	112.000	Seen	.	.	70	171
71	112.000	Seen	.705	.029	71	170
72	113.000	Seen	.701	.029	72	169
73	114.000	Seen	.	.	73	168
74	114.000	Seen	.693	.030	74	167
75	115.000	Seen	.689	.030	75	1661
76	116.000	Seen	.685	.030	76	165
77	117.000	Seen	.680	.030	77	164
78	118.000	Seen	.676	.030	78	163
79	120.000	Seen	.	.	79	162
80	120.000	Seen	.	.	80	161
81	120.000	Seen	.664	.030	81	160
82	121.000	Seen	.660	.031	82	159
83	122.000	Seen	.	.	83	158
84	122.000	Seen	.	.	84	157
85	122.000	Seen	.	.	85	156
86	122.000	Seen	.643	.031	86	155
87	123.000	Seen	.	.	87	154
88	123.000	Seen	.635	.031	88	153
89	125.000	Seen	.	.	89	152
90	125.000	Seen	.	.	90	151:
91	125.000	Seen	.622	.031	91	1501
92	126.000	Seen	.618	.031	92	149
93	127.000	Seen	.614	.031	93	148

94	129.000	Seen	.610	.031	94	147
95	130.000	Seen	.606	.031	95	146
96	131.000	Seen	.602	.032	96	145
97	133.000	Seen	.	.	97	144
98	133.000	Seen	.	.	98	143
99	133.000	Seen	.589	.032	99	142
100	134.000	Seen	.	.	100	141
101	134.000	Seen	.581	.032	101	140
102	135.000	Seen	.	.	102	139
103	135.000	Seen	.573	.032	103	138
104	136.000	Seen	.568	.032	104	137
105	137.000	Seen	.564	.032	105	136
106	138.000	Seen	.560	.032	106	135
107	139.000	Seen	.	.	107	134
108	139.000	Seen	.	.	108	133
109	139.000	Seen	.548	.032	109	132
110	140.000	Seen	.	.	110	131
111	140.000	Seen	.	.	111	130
112	140.000	Seen	.	.	112	129
113	140.000	Seen	.531	.032	113	128
114	141.000	Seen	.527	.032	114	127
115	142.000	Seen	.	.	115	1261
116	142.000	Seen	.519	.032	116	125
117	143.000	Seen	.515	.032	117	124
118	144.000	Seen	.510	.032	118	123
119	145.000	Seen	.	.	119	122
120	145.000	Seen	.	.	120	121
121	145.000	Seen	.498	.032	121	120
122	147.000	Seen	.	.	122	119
123	147.000	Seen	.490	.032	123	118
124	148.000	Seen	.485	.032	124	117
125	149.000	Seen	.	.	125	116
126	149.000	Seen	.477	.032	126	115
127	150.000	Seen	.	.	127	114

128	150.000	Seen	.	.	128	113
129	150.000	Seen	.465	.032	129	112
130	151.000	Seen	.	.	130	111
131	151.000	Seen	.456	.032	131	110
132	153.000	Seen	.	.	132	109
133	153.000	Seen	.448	.032	133	108
134	154.000	Seen	.	.	134	107
135	154.000	Seen	.440	.032	135	106
136	155.000	Seen	.	.	136	105
137	155.000	Seen	.	.	137	104
138	155.000	Seen	.	.	138	103
139	155.000	Seen	.423	.032	139	102
140	156.000	Seen	.419	.032	140	101
141	158.000	Seen	.	.	141	100
142	158.000	Seen	.411	.032	142	99
143	160.000	Seen	.	.	143	98
144	160.000	Seen	.402	.032	144	97
145	164.000	Seen	.	.	145	96
146	164.000	Seen	.	.	146	95
147	164.000	Seen	.390	.031	147	94
148	165.000	Seen	.	.	148	93
149	165.000	Seen	.	.	149	92
150	165.000	Seen	.378	.031	150	91
151	168.000	Seen	.	.	151	90
152	168.000	Seen	.369	.031	152	89
153	169.000	Seen	.365	.031	153	88
154	170.000	Seen	.361	.031	154	87
155	171.000	Seen	.	.	155	86
156	171.000	Seen	.	.	156	85
157	171.000	Seen	.349	.031	157	84
158	172.000	Seen	.	.	158	83
159	172.000	Seen	.340	.031	159	82
160	173.000	Seen	.	.	160	81
161	173.000	Seen	.332	.030	161	80

162	174.000	Seen	.	.	162	79
163	174.000	Seen	.	.	163	78
164	174.000	Seen	.	.	164	77
165	174.000	Seen	.315	.030	165	76
166	175.000	Seen	.	.	166	75
167	175.000	Seen	.307	.030	167	74
168	176.000	Seen	.303	.030	168	73
169	179.000	Seen	.299	.029	169	72
170	180.000	Seen	.	.	170	71
171	180.000	Seen	.290	.029	171	70
172	182.000	Seen	.	.	172	69
173	182.000	Seen	.	.	173	68
174	182.000	Seen	.	.	174	67
175	182.000	Seen	.274	.029	175	66
176	183.000	Seen	.	.	176	65
177	183.000	Seen	.266	.028	177	64
178	185.000	Seen	.		178	63
179	185.000	Seen	.		179	62
180	185.000	Seen	.	.	180	61
181	185.000	Seen	.249	.028	181	60
182	187.000	Seen	.245	.028	182	59
183	190.000	Seen	.	.	183	58
184	190.000	Seen	.	.	184	57
185	190.000	Seen	.232	.027	185	56
186	193.000	Seen	.228	.027	186	55
187	195.000	Seen	.	.	187	54
188	195.000	Seen	.220	.027	188	53
189	196.000	Seen	.216	.026	189	52
190	197.000	Seen	.212	.026	190	51
191	198.000	Seen	.207	.026	191	50
192	199.000	Seen	.203	.026	192	49
193	200.000	Seen	.	.	1931	48
194	200.000	Seen	.	.	194	47
195	200.000	Seen	.	.	1951	46

230	256.000	Seen	.046	.013	230	11
231	258.000	Seen	.041	.013	231	10
232	259.000	Seen	.037	.012	232	9
233	260.000	Seen	.033	.012	233	8
234	261.000	Seen	.029	.011	234	7
235	263.000	Seen	.025	.010	235	6
236	283.000	Seen	.021	.009	236	5
237	287.000	Seen	.017	.008	237	4
238	288.000	Seen	.012	.007	238	3
239	293.000	Seen	.008	.006	239	2
240	295.000	Seen	.004	.004	240	1
241	321.000	Seen	.000	.000	241	0

196	200.000	Seen	.187	.025	196	45
197	203.000	Seen	.183	.025	197	44
198	204.000	Seen	.178	.025	198	43
199	205.000	Seen	.	.	199	42
200	205.000	Seen	.	.	200	41
201	205.000	Seen	.166	.024	201	40
202	207.000	Seen	.162	.024	202	39
203	208.000	Seen	.158	.023	203	38
204	209.000	Seen	.154	.023	204	37
205	210.000	Seen	.149	.023	205	36
206	213.000	Seen	.145	.023	206	35
207	215.000	Seen	.	.	207	34
208	215.000	Seen	.137	.022	208	33
209	216.000	Seen	.133	.022	209	32
210	217.000	Seen	.129	.022	210	31
211	222.000	Seen	.124	.021	211	30
212	224.000	Seen	.120	.021	212	29
213	225.000	Seen	.116	.021	213	28
214	226.000	Seen	.112	.020	214	27
215	230.000	Seen	.108	.020	215	26
216	232.000	Seen	.104	.020	216	25
217	233.000	Seen	.100	.019	217	24
218	235.000	Seen	.	.	218	23
219	235.000	Seen	.091	.019	219	22
220	240.000	Seen	.087	.018	220	21
221	242.000	Seen	.	.	221	20
222	242.000	Seen	.079	.017	222	19
223	243.000	Seen	.075	.017	223	18
224	247.000	Seen	.	.	224	17
225	247.000	Seen	.066	.016	225	16
226	249.000	Seen	.062	.016	226	15
227	251.000	Seen	.058	.015	227	14
228	254.000	Seen	.054	.015	228	13
229	255.000	Seen	.050	.014	229	12