

UTILISATION OF OPERATION THEATRES AT GENERAL DE LA REY HOSPITAL IN THE NORTH WEST PROVINCE

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Master of Public Health in the field of Hospital Management

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DECLARATION

I, Maria Eleanor Lobelo declare that this research report is my own work. It is being submitted for the degree of Master Public Health in the field of Hospital Management at the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or for any examination at this or any other University.

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April 2011

DEDICATION

I dedicate this to my children and my sisters who have always supported me. They have been there for me during my time of need and I am also grateful for their encouragement when I felt ready to quit.

Lastly I dedicate this to my late father and mother who played a major role in shaping the woman in me.

My love for you is beyond measure

ABSTRACT

BACKGROUND: Operating theatres in any hospital consume a large amount of resources. A well-functioning theatre complex is an important and essential component of a well functioning hospital. .

The analysis is based on the socio-economic profile of patients and the time spent in theatre.

METHODOLOGY: A cross-sectional study design was used involving a retrospective record review over a one year period (April 2009 to March 2010) was conducted. The variables for the study included, type of operations and their indications, profiles of patients and turn-around time in the theatre. In addition, a comparison between those who had elective and emergency surgery was done with regard to some variables such as profile of patients and turn-around time. The project was initiated after obtaining approval from the head of the department of the North West Provincial Department of Health and University of the Witwatersrand Human Research Ethics Committee (Medical). Confidentiality and anonymity were maintained all the time during collection, capturing, and reporting of the information

RESULT: A total of 447 cases were performed during this period including 5.6% (25) elective cases and 94.4% (422) emergency cases. The majority of the operations performed at this Hospital included caesarean section and evacuation of uterus. In addition to that there were other procedures such as laparotomy, labial incision, perineorrhaphy, and dilatation and curettage. The type of procedures (elective or emergency) was significantly associated with ethnicity, employment and medical aid status and referral source of the subjects. The majority of the caesarean sections were performed due to maternal indications. More elective caesarean sections were performed for maternal indications (79%) than fetal indications (21%). There was one maternal complication (ruptured uterus) but no maternal mortality during this period. Whereas all the babies were alive after elective CS, there were seven stillbirths after emergency CS. An average of 110 minutes were spent by patients in theatre and at least 33% of the time was spend on the actual operation although there is no significant difference between elective and

emergency patients with regard to time spent in the operating room ($p = 0.46$). Emergency patients took more time (25 minutes) before they were wheeled to theatre which is an area for improvement. The operating theatre was utilised only 5.9% of available time. This suggests that is opportunity to utilise the operating theatre for other cases.

CONCLUSION: This is first formal study performed at a district hospital operating theatre in the North West Province. This study assisted in development of understanding of the function of the operating theatre at the General de la Rey Hospital. The findings of this would assist the hospital management to improve its function such as reduction of latent time for emergency patients and conducting more elective procedures.

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GLOSSARY OF TERMS

Caesarean section rate: Proportion of caesarean sections to total number of deliveries within a time period in a health facility

District Hospital a hospital that provides level one health care service through general medical practitioners

District Health System: A government model that seeks to integrate health services through decentralization within the district and includes all primary health care clinics, community health centres and district hospitals.

Health Sub-district: A small division which is demarcated by different municipal localities that forms part of the district

Levels of care (level 1, 2, 3): Different levels of hospital care with level one (primary) offering general medical care, followed by level two (secondary) which is specialist led, and level three (tertiary), comprising highly specialised, complex and expensive clinical services.

Operating time: This is calculated as the difference between the time when a patient enters the operating room and the time when s/he leaves the operating room (see Figure 2).

Theatre utilisation rate: Proportion of actual operating time to total operating theatre time available in a health facility

LIST OF ABBREVIATIONS

CHC	Community Health Centre
CPD	Cephalo-pelvic disproportion
CS	Caesarean section
D and C	Dilatation and curettage
DHIS	District Health Information System
GDLR	General de la Rey Hospital
HOD	Head of the Department
MAF/BOP	Mafikeng/ Bophelong Hospital
WHO	World Health Organization

CHAPTER 1

INTRODUCTION

The purpose of this study was to determine the utilisation of operation theatres of a district hospital in the North West Province in South Africa. This introductory chapter will cover the background to the study, statement of the problem, its aims and objectives.

1.1 BACKGROUND INFORMATION

The Thusong/ General de La Rey Hospital complex comprises two level one hospitals in the Ditsobotla Municipality which is one of the five sub-districts in the Ngaka Modiri Molema District in the North West Province. The Thusong Hospital (120 usable beds) operates as a complex with the General de La Rey Hospital (60 beds including four private general wards). These private beds are utilised by private practitioners in Lichtenburg, as there is no private hospital in this town.

In 2006, hospital management decided to rationalize services to prevent duplication and, as a result, theatre and maternity services were transferred to the General de La Rey (GDLR) Hospital because of the reliability of the infrastructure and also as a measure of decreasing perinatal mortality. Currently, most of the maternity theatre cases are performed in the GDLR Hospital. Currently, there are two fully equipped and functional operating theatres in GDLR Hospital which are exclusively used for obstetrics and gynaecology cases.

Although the Hospital has forged an agreement with private doctors to improve the utilisation of the GDLR Hospital operating theatres, the theatre utilisation rate has remained less than 25% for last three years. In view of this, the Hospital decided to collect data related to theatre utilisation with effect from 1 April 2009. The purpose of this study was to systematically analyse this information and then to provide the Hospital management with a report based

on the utilisation of the operating theatre.

1.2 RESEARCH QUESTION

How were the operating theatres of the GDLR Hospital utilised during the one year study period from 01 April 2009 to 31 March 2010? What were the procedures done and what were the profiles of patients who had emergency and elective operations during that study period?

1.3 OBJECTIVES

1.3.1 BROAD OBJECTIVE

The objective of the study was to determine the different types of procedures conducted at the operating theatres of the GDLR Hospital, the profile of patients undergoing operations and the utilisation of the operating theatres.

1.3.2 SPECIFIC OBJECTIVES

1. To determine the different types of procedures conducted at the operation theatre of the GDLR Hospital during the study period
2. To describe the profiles of patients with regards to socio-demographic (age, gender, ethnicity, occupation, medical aid) and clinical (type of operation, patient's diagnosis and operative outcome) profiles of the patients
3. To determine the theatre utilisation rate during the study period
4. To determine the association between theatre operating time and (a) type of procedure and (b) patients' profile and (c) operative outcome

1.4 SUBSEQUENT CHAPTERS

So far, the background to the research has been discussed. Then, research question and objectives were defined in this first chapter. A brief outline of

following chapters is described below.

Chapter Two Literature Review: The purpose of the literature review is to review pertinent literature and to discuss concepts related to the utilisation of operation theatres of General de La Rey Hospital in the North West Province at district hospitals in South Africa and elsewhere.

Chapter Three Research Methodology: The chapter describes the research methodology, study design, setting and scope and data management techniques used in this study.

Chapter Four: Results: This chapter deals with an analysis of the data collected for this study relating to its aims and objectives.

Chapter Five: Discussion: The findings from the review of the literature are incorporated in this chapter with the results obtained from the analysis in order to address the aims and objectives of the study.

Chapter Six: Conclusions and Recommendations: This constitutes the last chapter of the report and derives conclusions from the research related to the objectives of this study, makes recommendations and advocates areas for future research in the field of antenatal booking in a district hospital setting.

CHAPTER 2

LITERATURE REVIEW

In this chapter, relevant reports into to utilisation of operation theatres with particular reference to maternity theatres are discussed. In addition to published literature, information from various unpublished sources is also reviewed.

2.1 HOSPITAL OPERATION THEATRES

The provision of different public health services relies on the efficient use of operating theatres, medical equipment, consumables and drugs. The operating theatres generally require a significant amount of resources (Shah, Ansari, and Bhattacharyya, 2006). Therefore, operating theatres should be closely monitored for efficiency and quality of care. Monitoring and evaluation of a unit such as an operating theatre requires good quality data (Littlejohns, Watt and Garvican, 2003) which is seldom available in developing countries. Presently, the hospital information system in South African public hospitals addresses only patient administration and billing, and the district health information system (DHIS) concentrate on only a few clinical indicators (such as anaesthetic deaths).

In developed countries, hospitals are encouraged to use integrated, computerized theatre management systems to generate theatre schedules and lists, and to manage resources (Dowdall, 2003). Although an electronic health information system is identified as crucial to clinical care (Knublauch, 2002), theatre information is still manually collected in the majority of public hospitals in South Africa.

2.2 PLANNING AND ORGANIZATION OF OPERATION THEATRE

Different authors namely Festin, Laopaiboon, Pattanittum, et al (2009)have sited that the performance of theatres and their utilization largely depends on interdepartmental coordination of activities and availability of resources (Adonis, 2006). Inefficient theatres can be explained by two factors: (a) “hospital-wide” problems which can only be resolved if other departments change the way they work and (b) “Theatre practicalities”, which are faults which can be addressed by changing arrangements made immediately before, during and after operations take place (Audit Commission, 2002).

Implementation of efficient and effective managerial, administrative and clinical processes is required to ensure smooth functioning of operation theatres (Littlejohns, Watt and Rawlinson, 1999). For example, planning of theatre time-tables and scheduling of procedures is expected to assist in optimum utilisation of theatre facilities for elective as well as emergency cases (Earl, 1998).

2.3 THEATRE UTILISATION AND TURN AROUND TIME

Many medical centers within the United States operate surgical services at around 50% to 60% utilization rate, the ideal being 80% (Strum, Vargas, May, 1997). Adonis (2006) found in Johannesburg Hospital, operation theatres had been greatly under-utilized with the average utilization rate being 39%, which could be due to availability of the number of surgeons, anaesthetists and nurses, poor doctor practices and incorrect resource allocation. She found much variation between the number of actual cases operated on and the planned operations. She reported the turn-around time in the theatre for emergency cases (Table 2.1).

Table 2.1 Average turn-around time in the Johannesburg Hospital Theatre for emergency cases

Activities	Median time (minutes)
To arrive at the Theatre Reception after a decision has been made that an emergency operation is required.	28 minutes
Waiting to be anaesthetized once they have arrived at the Theatre Reception.	75 minutes
After arriving at the operation room to the start of the operation	22 minutes
Actual operating time	50 minutes
Completion of the operation to arriving at the Recovery room	4 minutes
Arriving at the recovery room to leaving the operation theatre	27 minutes

Source: Adonis (2006)

2.4 OPERATION THEATRE RESOURCE UTILISATION

In the modern practice of medicine, the issue of the costs of the medical treatments that physicians provide to patients is constantly influencing medical treatment decisions (Eddy, 1992). Gardner (1998) suggested that evidence-based resource allocation was not only fiscally responsible, but also morally correct. This allows matching the resource allocation to caseloads as well as to clinical outcomes. The Audit Commission of the United Kingdom also suggested that the expenditure on theatre resources must match the changes in the case-load pattern of that theatre (Audit Commission, 2002).

Baker and Boyd (1997) suggested activity-based costing should be used in theatres to review theatre performance and to accomplish cost efficiency in four areas, namely performance management and evaluation, strategic planning, managed care contract negotiation and managed care contract

management. However, this would require reliable information related to theatre utilisation.

There are no dedicated standard indicators to measure utilisation of resources in operating theatres in South Africa. McAleer, Turner, Lismore, et al (1995) proposed different visual interactive and simulation models that can be used to assist management to reach a decision as to what intervention can be put in place to improve performance of operating theatres and to reduce the wastage of resources. These models allowed personnel to participate actively and got their support for changes to the systems. In addition, these models assisted in identifying 'quiet time' which was then discussed with other stakeholders, such as private practitioners, to optimum utilisation of theatre time. However, these models require availability of timely and accurate information for proper review of the performance of these theatres.

One of the challenges in improving theatre utilisation is emergency cases. An emergency theatre remains idle waiting for cases, which may or may not happen, thereby affecting the utilisation rate. Basso (2009) discussed the feasibility of organizing a system of emergency theatre lists with its costs and gains which can be agreed upon with stakeholders.

The implementation of any model requires reliable information. Information management in a hospital operation theatre is an essential element of the management process. However, collection and usage of information in the operation theatre setting is a complex and arduous task that requires dedication and understanding of the principles behind it, as well as the actual ability to see the impact it has. Decision-making, which requires integrated information from various sources, is often aggravated by the highly heterogeneous and distributed nature of the current clinical data and information repositories (Knublauch, Rose and Sedlmayr, 2000).

A centralized hospital- based medical informatics system that can produce current reports for monitoring and controlling critical processes can assist

theatre managers to take appropriate decisions (Schlimpert, 2004). However, public hospitals in South Africa face major challenges as they do not always have reliable and readily available information for decision making. Therefore, decisions are often made without any evidence which, in turn, affect the functions of public hospital operations theatres in South Africa. The GDLR Hospital operating theatre complex had experienced similar problems due to a lack of understanding of its low theatre utilisation rate in spite of public-private partnerships to improve the utilisation. This study was undertaken to assist the hospital management in developing a better understanding of the current situation.

CHAPTER 3

METHODOLOGY

The methodology for this study was selected on the basis of its aims and objectives. In this chapter the following were discussed: setting, scope, study design and research tools.

3.1 STUDY DESIGN

This was a cross-sectional study based on a retrospective record review.

3.2 STUDY SETTING

The study setting was the Operation Theatre at the General de La Rey Hospital in the Ngaka Modiri Molema Municipality in the North West Province.

3.2.1 NGAKA MODIRI MOLEMA DISTRICT MUNICIPALITY

The Ngaka Modiri Molema District Municipality (DC38) is situated centrally within the North West Province. The principal towns in the region include Mafikeng- Mmabatho, Zeerust and Lichtenberg. It consists of five local municipalities, namely Ditsobotla, Mafikeng, Ramotshere Moilwa, Ratlou and Tswaing. The population (719,017) is mainly Black Africans, and the majority are females (378,434). There is a high level of Illiteracy (22%, 156,693) and unemployment (15%, 105,721); very few have access to medical aid and therefore use public health facilities.

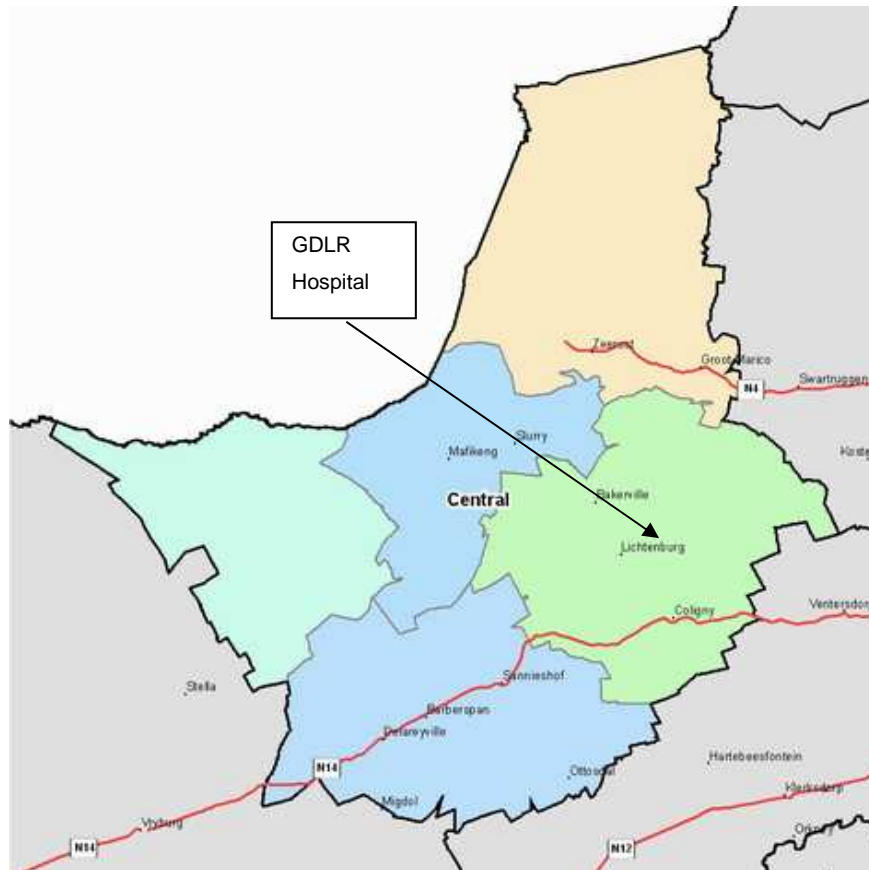


Figure 3.1 Ngaka Modiri Molema Health District

3.2.2 GENERAL DE LA REY HOSPITAL

The General de La Rey Hospital (GDLR) is a District Hospital situated in Ngaka Modiri Molema District Municipal area in Lichtenburg. It is 60 kilometres from Mafikeng town. The GDLR and Thusong Hospitals are managed as a complex. The two hospitals are 25 kilometres apart.

3.3 STUDY SCOPE

The study involved a retrospective review of hospital records from the Hospital Information system. No primary data was collected for the study. No intervention was done.

3.4 STUDY PERIOD

The study period was from 01 April 2009 to 31 March 2010.

3.5 STUDY POPULATION AND SAMPLING

The study population comprised patients who had undergone surgery at the GDLR Hospital Operating theatre complex. The entire study population was included. Therefore, no sampling was done.

3.6 MEASUREMENT AND DATA SOURCES

3.6.1 DATA COLLECTION

The data used for this study was routinely collected in the Operating theatre. This information was extracted from the Hospital Information system. In case of missing information, attempts were made to retrieve this from the patients' records.

3.6.2 STUDY INSTRUMENT

The extracted data was captured in MS Excel based spreadsheet designed for this study (Annexure B). The extracted data was analysed with NCSS statistical software (NCSS, 2007).

3.6.3 VARIABLES

Variables for this study are listed below:

1. Types of procedure: Total number of procedures and Number per types of procedure
2. Patient profile: Age, Ethnicity, Occupation, and Medical aid
3. Referral:
4. Operation: Name of Operation (Procedure code) and Emergency or

Elective

5. Patients' diagnosis:
6. Operative complications
7. Theatre Operating Time: Time spent in the theatre, Time spent in the operating room, Duration of theatre time utilised per day: (\sum time spent in operating room/per patient)/ 24 hours

The operating time calculation was based on the process flow described in Figure 3.2.

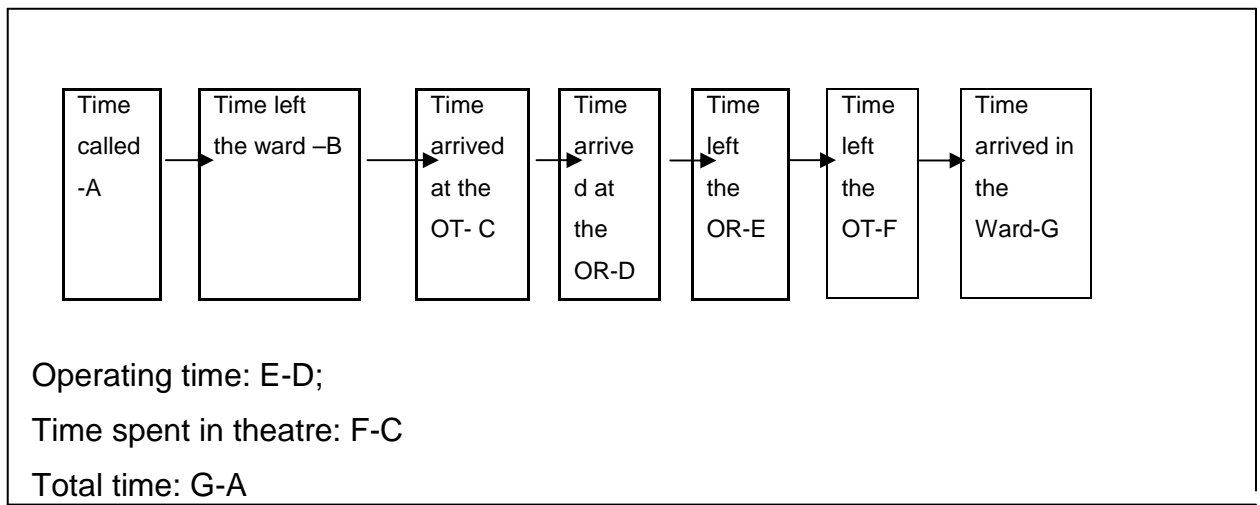


Figure 3.2 Process flow in the operating theatre

8. Theatre utilisation rate: Theatre utilisation rate was calculated based on the following formula:
 - Total number of minutes available in a year=
 \sum Total operating hours available (minutes)
 - Total number of minutes spent in operations theatre (in minutes) (from time of arrival in the theatre to the time left the theatre) =
 \sum Total operating hours spent (minutes)

Theatre utilisation rate:
$$\frac{\sum \text{Total operating hours spent (minutes)}}{\sum \text{Total operating hours available (minutes)}}$$

3.7 DATA ANALYSIS

The following descriptive statistics were reported:

- Continuous variables (such as age, operating time): Continuous variables with normal distributions: mean and standard deviation. Median and inter-quartile range are used for other continuous variables.
- Categorical variables (such as type of procedures, employment status): Proportions.

Analytical statistics (such as Pearson's and Spearman's correlations) were used to determine the association between operating time and (a) type of procedure and (b) patients' profile.

3.8 ETHICAL CONSIDERATIONS

Permission for conducting research and accessing documents was obtained from the head of the department of the North West Provincial Department of Health. In addition, the project was also approved by the University of the Witwatersrand Human Research Ethics Committee (Medical). Confidentiality and anonymity were maintained all the time during collection, capturing, and reporting of the information

CHAPTER 4

RESULTS

The results obtained from the analysis of data were described in this chapter.

4.1 STUDY POPULATION

Data were extracted from a total of 447 patients' records, who had elective and emergency surgeries during the period of 1st April 2009 and March 2010.

4.2 OPERATING PROCEDURE

The operating procedure performed during this period is listed in Table 4.1.

Table 4.1 Operating procedures

	TOTAL n (%)	ELECTIVE n (%)	EMERGENCY n (%)
CAESAREAN SECTION	310 (69.35%)	24 (96%)	286 (67.8%)
EVACUATION	127 (28.21%)	0	127 (29.9%)
LAPAROTOMY	7 (1.5%)	0	7 (1.7%)
LABIAL INCISION	1 (0.2%)	0	1 (0.2%)
PERINEORRHAPHY	1 (0.2%)	0	1 (0.2%)
DILATATION AND CURETTAGE (D and C)	1 (0.2%)	1 (4%)	0
TOTAL	447 (100%)	25 (100%)	422 (100%)

A total of 447 cases were performed during this period including 5.6% (25) elective cases and 94.4% (422) emergency cases. The most common procedure for both types of patients was caesarean section (CS) (310, 69.35 %) followed by evacuation (127, 28.41%).

4.3 SOCIO-DEMOGRAPHIC PROFILE OF PATIENT

4.3.1 AGE

The age of the subjects are described in Table 4.2. There was no significant difference in age between the elective and emergency patients ($p = 0.37$).

Table 4.2 Age of patients

AGE (years)	TOTAL (n=447)	ELECTIVE (n=25)	EMERGENCY (n=422)
Median (IQR)	26 (21-32)	27 (23- 32)	26 (21- 32)
Range	13 to 54	17 to 45	13 to 54

4.3.2 ETHNICITY

The ethnicity of the subjects is described in Table 4.3. There were significant differences in different ethnic group in terms of the procedures (Chi-square test, $p < 0.0001$). It implies that Black patients had more emergency procedures whereas white patients had more elective procedures.

Table 4.3 Ethnicity of the subjects

ETHNICITY	TOTAL (n=447)	ELECTIVE (n=25)	EMERGENCY (n=422)
BLACK	418 (93.5%)	15 (60%)	403 (95.5%)
INDIAN	1 (0.2%)	1 (4%)	0 (0%)
WHITE	28 (6.3%)	9 (36%)	19 (4.5%)
TOTAL	447 (100%)	25 (100%)	422 (100%)

4.3.3 OCCUPATION

The occupation of the subjects is described in Table 4.4. There was significant association between employment status and types of procedures (Chi-square

test, $p < 0.001$). It implies that employed patients had more elective procedures. The study also found that the employment rate (8.9%) is lower among the black patients in comparison to white patients (25%).

Table 4.4 Occupation of the subjects

EMPLOYMENT	TOTAL	ELECTIVE	EMERGENCY
EMPLOYED	44 (9.8%)	9 (36%)	35 (8.3%)
PRISONER	1 (1.8%)	0 (0%)	1(1.9%)
MINOR	8 (0.2%)	0 (0%)	8(0.2%)
UNEMPLOYED	394 (88.1%)	16 (64%)	378(88.1%)
TOTAL	447 (100%)	25 (100%)	422 (100%)

4.3.4 MEDICAL AID

The medical aid status of the subject is described in Table 4.5. There is significant association between patients with medical aid and types of procedures (Chi-square test, $p < 0.001$). It implies that patients with medical aid had more elective procedures.

Table 4.5 Medical aid status of the subjects

Medical aid	TOTAL	ELECTIVE	EMERGENCY
Yes	50 (11.2%)	18 (72%)	32 (7.6%)
No	397 (88.8%)	7 (28%)	390 (92.4%)
TOTAL	447 (100%)	25 (100%)	422 (100%)

The study found that white patients (13, 46%) had medical aid in comparison to black patients (36, 9%). The majority (33, 75%) employed patients had medical aid.

4.3.5 REFERRAL SOURCE

The referral source is described in Table 4.6.

Table 4.6 Referral source

Medical aid	TOTAL	ELECTIVE	EMERGENCY
Clinic	396 (88.6%)	7 (28%)	389 (92.2%)
Private	44 (9.9%)	17 (68%)	27 (6.4%)
Self	7 (1.6%)	1 (4%)	6 (1.4%)
TOTAL	447 (100%)	25 (100%)	422 (100%)

There is significant association between patients' referral unit and types of procedures (Chi-square test, $p < 0.001$). It implies that patients referred from private doctors had more elective procedures.

4.4 OPERATIONS

4.4.1 OPERATIVE INDICATIONS

Operative indications for caesarean sections (CS) are described in Table 4.7. The majority of CSs were performed due to maternal indications (66%). More elective CSs were done for maternal indications (79%) than fetal indications (21%). However, there was no significant association between the type of CS and indications (Chi-square test, $p = 0.18$).

Table 4.7 Operative indications for caesarean section

	TOTAL	ELECTIVE	EMERGENCY
MATERNAL			
Antepartum haemorrhage	2	0	2
Cephalo Pelvic Disproportion	61	5	54
Failed induction	4	0	4
Pregnancy Induced Hypertension	12	1	11
Psychosis	1	0	1
Post date	2	0	2
Previous C/S	77	12	65
Poor progress	45	1	44
Prolonged 2 nd stage	3	0	3
Sub-total	205 (66%)	19 (79%)	186 (65%)
FETAL			
Twin	9	1	8
Abnormal lie	16	2	14
Big baby	31	2	29
Cord prolapse	2	0	2
Fetal distress	46	0	46
Hydrocephalus	1	0	1
Sub-total	105 (34%)	5 (31%)	100 (35%)
Total	310 (100%)	24 (100%)	286 (100%)

Indications for other procedures are described in Table 4.8. There were three types of gynaecological procedure performed during entire period:

- (a) Laparotomy for ectopic pregnancy, (b) Diagnostic D and C and (c) Drainage of labial abscess.

Table 4.8 Operative indications for other procedures

PLACENTA	TOTAL	ELECTIVE	EMERGENCY
EVACUATION			
PPH	1	0	1
Retained placenta	4	0	4
Retained products	122	0	122
SUB-TOTAL	127	0	127
PERINEORRHAPHY			
3 rd degree tear	1	0	1
D and C			
Diagnostic D and C	1	1	0
LAPAROTOMY			
Ectopic	7	0	7
LABIAL INCISION			
Labial abscess	1	0	1
TOTAL	137	1	136

4.4.2 OPERATIVE COMPLICATIONS

There was only one complication (ruptured uterus) during the entire study period. There was maternal death. .

4.4.3 FETAL OUTCOME AFTER CAESAREAN SECTION

The fetal outcome after CS is described in Table 4.9. Whereas all the babies were alive after elective CS, there were seven stillbirths after emergency CS.

Table 4.9 Fetal outcomes after caesarean section

	TOTAL	ELECTIVE	EMERGENCY
Alive	303 (97.7%)	24 (100%)	279 (97.6%)
Fresh still birth	4 (1.3%)	0	4 (1.4%)
Macerated still birth	3 (1%)	0	3 (1%)
TOTAL	310 (100%)	24 (100%)	286 (100%)

4.5 TURN AROUND TIME AND THEATRE UTILISATION RATE

The turnaround time at the operating theatre is described in Table 4.10. An average of 110 minutes per patient was spent in operating theatre and at least 32.7% of the time was spent on the actual operation. There was no significant difference between elective and emergency patients in terms of the time spent in operating theatre (Mann Whitney's U test, $p= 0.31$).

Table 4.10 Operating theatre turn-around time

Duration	Total	Elective	Emergency	p value
Time called to time left the ward	25 (10-45)	5 (15-36.5)	25 (10-48)	<0.04
Time left the ward to arrived at the Theatre	5 (4-5)	5 (2.5 -5)	4 (5-5)	0.50
Time arrived at the Theatre to arrived at the operating room	10 (5- 28.7)	10 (5-23.5)	10 (5-30)	0.10
Time arrive at the operating room to left the operating room	36 (20-59.7)	40 (30-95)	35 (20-57)	0.46
Time left the operating room to left the operating theatre	10 (5-15)	5 (5-15)	10 (5-15)	<0.05
Time left the operating theatre to arrive at the Ward	5 (4-5)	5 (2-7)	5 (4-5)	0.32
Total time	110 (82.2-150)	95 (73.5- 156)	110 (83-150)	0.31

4.5.1 TIME PERIOD BEFORE REACHING OPERATING THEATRE

There was a significant difference in terms of time period ‘when a patient was called’ and ‘when she left the ward’ (Mann Whitney’s U test, $p < 0.04$). For emergency patients, the median time period was 25 minutes, whereas for the elective patients, it was 5 minutes.

4.5.2 TIME SPENT IN THE OPERATING ROOM

There is no significant difference between elective and emergency patients in terms of time spent in the operating room ($p= 0.46$). The median operation time was 36 minutes (Elective patients 35 minutes and emergency patients 40 minutes).The operating time constitutes 32.7% of the total time spent in theatre. There is no significant difference between the time spend to prepare the patient

4.5.3 TIME PERIOD AFTER THE OPERATIONS

There was a significant difference between emergency and elective cases in terms of time spent in the recovery room (from the time a patient left the operating room to the time when she left the operating theatre) (Mann Whitney's U test, $p < 0.04$). For emergency patients, the median time period was 25 minutes, whereas for the elective patients, it was 5 minutes.

4.5.4 THEATRE UTILISATION RATE

Theatre utilisation rate was calculated based on following formula:

$$\text{Theatre utilisation rate: } \frac{\sum \text{Total operating hours spent (minutes)}}{\sum \text{Total operating hours available (minutes)}}$$

Total operating time available =	525,600 minutes
Total time spent for elective cases=	1694 minutes (6%)
Total amount of time spent for emergency cases=	29,717 minutes (94%)
Total time spent for all cases=	31,411 minutes

$$\text{Theatre utilisation rate} = \frac{31,411 \text{ minutes}}{525,600 \text{ minutes}} = 5.9\%$$

CHAPTER 5

DISCUSSION

In this chapter, the results obtained from the analysis of the data were discussed and compared with those from other published studies.

5.1 INTRODUCTION

This study was done in order to determine the different types of procedures conducted at the operating theatres of a district hospital (GDLR Hospital), the profile of patients undergoing operations and the utilisation of the operating theatres during one year study period (1st April 2008 to 31st March 2009). No study had been conducted at the level of a district hospital in the North West Province to look at the theatre utilisation rate.

5.2 OPERATING PROCEDURES

The study found 447 cases were performed during the study period. Most of the procedure conducted for this level 1 district hospital was caesarean section (69.35%) followed by evacuation (28.41%). There were few gynaecological procedures performed during this period such as laparotomy for ectopic pregnancy, labial incision and Diagnostic D and C. This is probably due to unavailability of specialist obstetrician and gynaecologist in the hospital. The doctors working in the Hospital are general practitioners are not trained to do complicated procedure such as hysterectomy and laparoscopy. It might be necessary to send the doctors to Klerkdorp-Tshepong Hospital Complex (tertiary hospital in the province attached to the University of the Witwatersrand) to train them in basic obstetrics and gynaecological practice so that perform these surgeries at this Hospital.

The majority of the cases performed during this period were emergency operations (94.4%). This has serious implications on resource planning and optimal utilisation of resources. The majority of the operations are CS, 95% of

which were performed as an emergency. There is a need to improve clinical decision making that can reduce emergency cases. It is well-known that emergency operations have higher complications than elective operations (Cronje and Grobler, 2003).

5.3 SOCIO-DEMOGRAPHIC PROFILES OF PATIENTS

The median age of patients who had surgery during this period was 26 years. This was probably due to the fact that the majority of cases were caesarean section and evacuation.

The type of procedures (elective or emergency) was significantly associated with ethnicity, employment and medical aid status and referral source of the subjects. The study found that black patients, those who were unemployed and without medical aid, had significant more chance of having emergency procedures than white patients those who were employed and had medical aid. There were significant association between ethnicity and employment status as well as medical aid. This implies that white patients had more chance of being employed and having medical aid suggesting the confounding effect of ethnicity. However, this raises question about clinical practice at the hospital where indigent patients had lower chance of having elective procedures. This has not been reported at institutional level and would require further investigation.

The majority of the patients were referred either from clinics (88.6%) or from the private doctors (9.9%). This means the referral system from the clinics was effective as their screening had identified most of those who need surgical intervention for maternal and/ or fetal problems. This is substantiated by very few maternal and fetal complications. We all know that the fundamental aim of healthcare system is to maximise health. Gardner (1998) suggested appropriate referral could optimise resource utilization and improve clinical outcome. This study suggested that the referral system in the area is probably working as appropriate patients were referred but probably too late

due to higher number of emergency cases. There is a need to identify the at-risk patients during their antenatal period than during labour so that their surgeries if necessary can be planned as elective. This study found a significant association between patients' referral unit and types of procedures. Patients referred from private doctors had more elective procedures. This collaborates with earlier assumption that socio-economic status of the patients might have influence on clinical decision making at this hospital.

5.4 CLINICAL PROFILES OF PATIENTS

The majority of CSs were performed due to maternal indications (66%). More elective CSs were done for maternal indications (79%) than fetal indications (21%). The most common maternal indications were previous CS and cephalo-pelvic disproportion (CPD). This raises question about the clinical practice at the Hospital. There is probability that women in the area have narrower pelvis resulting in CS performed in the first pregnancy followed by repeat CS in the subsequent pregnancies. This is further supported by presence of big baby as one of the common fetal indications. Further study is required to document how the pelvimetry is performed at this Hospital. Common fetal indications include big baby and fetal distress. It was not clear how fetal distress was diagnosed. The Hospital should purchase few cardio-tocograph machines which might improve diagnostic accuracy of fetal distress. .

A large number of evacuation cases were done at the operation theatre for incomplete abortions. These cases could easily be managed by manual vacuum aspiration techniques in the wards which are more efficient and less resource incentive (Cronje and Grobler, 2003).

During this period, there was only one maternal complication (ruptured uterus), in addition to seven still births.

5.5 THEATRE UTILISATION RATE AND TURN AROUND TIME

Various authors had suggested the need for close monitoring of operations theatres for efficiency and quality of care (Littlejohns, et al., 2003; Shah, et al., 2006). This study showed that sub-optimal utilisation of the operation theatre (5.9%), which was far below than reported by 50% to 60% (Strum, et al., 1997 and locally 39% (Adonis, 2006) found in Johannesburg Hospital. Based on these findings Turner, Lismore et al (1995) recommends use of models to identify “quite time” which be discussed with other stakeholders to improve performance and reduce wastage of resources.

The differences in time for pre-operative preparation of patients between the elective (5 minutes) and emergency patients (25 minutes) could be attributed to the fact that emergency patients require more pre-operative preparation time in comparison to elective cases. An elective patient is booked and therefore, the ward is prepared to accept her, which is usually early in the morning giving opportunity to nurses to prepare them adequately and well in advance even before the theatre calls for the patient. In comparison, emergency cases are required to be prepared without any prior notice. However, labour wards should always be in the state of readiness to prepare emergency cases.

For the time of operation itself, there was no significant difference between elective and emergency procedures, which means the surgeons had necessary skills and were able to perform these operations within the standard time. The same proposition can be made for the anaesthetists working at the Hospital especially because they were not only responsible for maintaining patient safety but for peri-operative planning (Knublauch and Rose, 2002).

Elective patients spent on average 5 minutes in the recovery room before being transported to the wards. In comparison, the emergency patients spent on average 10 minutes in the recovery room. This might be due to the fact

that emergency cases took more time to recover.

In a comparative analysis between this study and the study conducted by Adonis (2006) showed that this hospital spent less time for non-operating time than Johannesburg Hospital. However, Johannesburg Hospital is much bigger and performs more complex surgeries.

Table 5.1 Turn-around time for emergency cases

Duration (minutes)	This study	Adonis (2006)
Time called to time arrived at the Theatre	29	28
Time arrived at the Theatre to arrived at the operating room	10 (5-30)	75
Time arrive at the operating room to left the operating room	50	50
Time left the operating room to left the operating theatre	10	31
Time left the operating theatre to arrive at the Ward	5	Not collected

This study was able to identify the slack in the system and areas where improvement could be done (such as preparation for theatre cases).

CHAPTER 6

CONCLUSION AND RECOMMENDATIONS

In this chapter, the results obtained from this study were assessed in relation to the aims and objectives of the study, so that appropriate conclusions can be drawn. The limitations of the study were listed. Based on the findings of the study, appropriate recommendations and suggestions for future research were included.

6.1 CONCLUSIONS RELATED TO THE AIMS OF THE STUDY

This was a cross-sectional study that looked at broad issues pertaining to the theatre utilisation in a district hospital (GDLR Hospital) in a rural district in the North West Province.

6.1.1 DETERMINATION OF THE DIFFERENT TYPES OF OPERATING PROCEDURES

Four hundred and forty seven cases were performed during the study period, and the majority of them were performed as emergency operations. Two commonest procedures were caesarean section and evacuation of uterus. There were few gynaecological procedures performed during this period (such as laparotomy for ectopic pregnancy, labial incision and Diagnostic D and C). This is probably due to shortage of skills among the medical practitioners working at the Hospital.

6.1.2 DETERMINATION OF THE PROFILES OF PATIENTS

Most of the patients were black, unemployed and had no medical aid, and have therefore resorted to a free service of a public facility for delivery. The type of procedures (elective or emergency) was significantly associated with ethnicity, employment and medical aid status and referral source of the subjects. Patients who had elective surgery were mostly white patients who

were employed and had medical aid and were ready to pay for admission in the private ward. In comparison, black patients, unemployed and patients without medical aid had higher probability of emergency procedures.

However, there were no differences in operative outcomes between the elective and emergency cases.

The majority of the patients were referred either from clinics (88.6%) or from the private doctors (9.9%). Those who were referred by private doctors had higher probability of elective procedures.

6.1.3 ASSESSMENT OF THE THEATRE UTILISATION RATE

An average of 110 minutes per patient was spent in operating theatre and less than third of the time was spent for actual operations. Significantly more time was required for preparation of emergency cases and they spent more time in the recovery room after surgery. There was sub-optimal utilisation of the operation theatre (5.9%).

6.2 LIMITATIONS OF THE STUDY

The major limitations of the study were incomplete records from the Hospital information system. In these cases researchers used the theatre records and patients' files to find missing information.

The operating theatre is only used for obstetric and gynaecological cases. Therefore, the findings from this study may not be used for hospitals which performed surgery for other cases.

6.3 RECOMMENDATIONS

The recommendations made below are based on the findings from this study as well as from the suggestions from operating theatre staff.

- Improvement of referral system

The clinic staff should be trained so that they refer more at-risk patients during ante-partum period. This would reduction in emergency cases and more elective cases could be planned thereby further reduction in operative complications.

- Improvement of theatre turn-around time

Multi-skilled nursing professionals should be allocated on night duty so that whilst waiting for theatre nurses on standby, these nurses can prepare the theatre and can receive patients from wards.

- Improvement of theatre utilisation

Although the most common type of procedure performed was caesarean sections and evacuations, other procedures could be considered. These can be discussed during Theatre User committee meeting with the doctors including private doctors so that 'quite time' could be used for extra lists. For example, the theatre could be used for cataract surgery by inviting ophthalmologists from nearby tertiary hospitals (such as Klersdorp-Tshepong Hospital). This might eventually improve the utilisation rate to the international target of 80%.

- Further research

- A prospective cohort study to develop a better understanding of the association between profiles of patients and type of procedures.
- A qualitative study involving interviewing patients to develop an understanding of the patients' perspectives.
- A cost analysis in theatre to estimate the resource utilization in the theatre.

6.4 SUMMARY AND CONCLUSIONS

This cross-sectional study was based on retrospective review of records of patients who had surgeries at the GDLR Hospital operation theatre a district hospital in the North West Province. This is probably the first study conducted in this setting. This study found 447 cases were performed. The majority of them were emergency cases. Two commonest procedures were caesarean section and evacuation of uterus. Patients who had medical aid consulted as private patients and had more elective surgery for delivery. Black patients, who were mostly unemployed and had no medical aid, had more emergency procedures. .

There was sub-optimal utilisation of the operation theatre (5.9%). An average of 110 minutes per patient was spent in operating theatre and less than third of the time was spent for actual operations. Significantly more time was required for preparation of emergency cases and they spent more time in the recovery room after surgery.

Further study would assist in development of better understanding of the performance of the operations theatre at a district hospital like the GDLR Hospital.

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APPENDICES

**APPENDIX A: ETHICS CLEARANCE CERTIFICATE AND
LETTERS OF PERMISSION**

APPENDIX B: DATA COLLECTION TOOLS