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Resource utilization and admission trends in medical wards in a district hospital in South Africa

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RESOURCE UTILIZATION AND ADMISSION TRENDS IN MEDICAL WARDS IN A DISTRICT HOSPITAL IN SOUTH AFRICA

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A research report submitted to the Faculty of Health Sciences, University of the Witwatersrand, in partial fulfilment of the requirements for the degree of Master of Public Health in the field of Hospital Management

Johannesburg, 2011

DECLARATION

I, Maria Ntana Mautjana, 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 any degree or for any examination at this or any other University.

…….

January 2011

DEDICATION

I dedicate this work to:

My daughter, for the support and kind understanding, the motivation she gave me throughout my studies.

My brother and sisters, for supporting me throughout my studies, took care of my daughter and my property for the time I spent in Johannesburg at the University.

My supervisor and mentor, for the kind support, perseverance and the motivation he gave me throughout my study.

My late parents and grand-parents for shaping my future and made me what I am today.

ABSTRACT

Introduction: South Africa is currently facing a quadruple burden of diseases: poverty related conditions, emerging chronic diseases, injuries and HIV/AIDS. Increasing burden of these diseases is having a detrimental impact on service delivery particularly in rural areas, where the majority of the population are dependent on public health system. Although numerous epidemiological studies had been done in the past to determine the prevalence of these conditions, only a few studies have attempted to quantify the effect of these diseases on health facilities such as admission rate, bed occupancy rate and resource utilisation. More data is required to develop a better understanding of their impact and to guide development of appropriate response strategies.

Aim of the study: To `analyse trends of admissions and resource utilisation in adult medical wards of a rural district hospital in South Africa.

Methodology: This was a descriptive cross-sectional, retrospective study involving an analysis of data from adult medical wards in the George Masebe Hospital (a district hospital in Limpopo Province) for six months in 2009.

Results: The study found average number of admissions per month was 148, their length of stay varied from one day to more than a year. Their median age was 44 years. They were black, had no medical aid and unemployed and the majority of them were dependent on social welfare grant. The most common health problems diagnosed amongst the medical admissions were HIV related conditions such as gastro-enteritis, pneumonia, AIDS and tuberculosis as well as other chronic diseases such as diabetes mellitus. A striking discovery was the high incidence of mental illness amongst the admissions. The majority of them were discharged home. The crude death rate was 190 per 1000 admissions and the main cause of death was HIV related conditions. The average direct expenditure per month was R 1,040,579. The expenditure for salaries was the main expenditure (54%) followed by Allied health services (29%). The average expenditure per patient was R 7,039 (R 7,548 for female patients and R 6454 for male patients).

Conclusion: This was the first study on admission trends resource utilisation in this Hospital and in the Limpopo Province. The evidence from this study would hopefully steer the re-organisation of some of the Hospital services, more especially the establishment of a step-down ward facility within the Hospital. This study has recognised that the increased number of admissions in rural district hospitals often result from double burden of infectious and chronic diseases. More studies on the subject are needed to identify their impact on resource utilisation at these hospitals.

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TABLE OF CONTENTS

DECLARATION ii
DEDICATION iii
ABSTRACT iv
TABLE OF CONTENTS vii
LIST OF FIGURES x
LIST OF TABLES xi
GLOSSARY OF TERMS xii
LIST OF ABBREVIATIONS xiv
CHAPTER 1 1
INTRODUCTION 1
1.1 BACKGROUND 1
1.2 STATEMENT OF THE PROBLEM 2
1.3 JUSTIFICATION FOR THE STUDY 2
1.4 RESEARCH QUESTIONS 2
1.5 STUDY AIM AND OBJECTIVES 3
1.6 SUBSEQUENT CHAPTERS OF THE REPORT 3
CHAPTER 2 5
LITERATURE REVIEW 5
2.1 DISTRICT HOSPITALS 5
2.2 PERFORMANCE MEASUREMENT OF DISTRICT HOSPITALS 5
2.3 MEDICAL ADMISSIONS IN DISTRICT HOSPITALS 7
2.4 RESOURCE UTILISATION IN DISTRICT HOSPITALS 8
2.5 COST OF MEDICAL ADMISSIONS 10
CHAPTER 3 12
METHODOLOGY 12
3.1 STUDY DESIGN 12
3.2 STUDY SETTING 12
3.3 STUDY SCOPE 14
3.4 STUDY POPULATION 14

3.5 DATA MANAGEMENT....15
3.5.1 STUDY INSTRUMENTS....15
3.5.2 VARIABLES....15
3.5.3 DATA COLLECTION....16
3.5.4 DATA ANALYSIS....17
3.6 ETHICAL CONSIDERATION....18
CHAPTER 4....19
RESULTS....19
4.1 STUDY POPULATION....19
4.2 DEMOGRAPHY....20
4.2.1 AGE....20
4.2.2 ETHNICITY....21
4.2.3 MEDICAL AID....21
4.2.4 EMPLOYMENT....21
4.2.5 CLINICAL DIAGNOSIS....22
4.2.6 DISCHARGE OUTCOME....24
4.2.7 LENGTH OF STAY....25
4.3 RESOURCE UTILISATION....26
4.3.1 HUMAN RESOURCES....26
4.3.2 EXPENDITURE FOR ALLIED HEALTH SUPPORT SERVICES....26
4.3.3 EXPENDITURE FOR GENERAL STORES....27
4.3.4 TOTAL EXPENDITURE....28
CHAPTER 5....29
DISCUSSION....29
5.1 INTRODUCTION....29
5.2 PATIENTS' PROFILE....29
5.2.1 GENDER....29
5.2.2 AGE....29
5.2.3 SOCIO-ECONOMIC STATUS....30
5.2.4 CLINICAL DIAGNOSIS....30
5.2.5 CLINICAL OUTCOME....31

5.2.6 LENGTH OF STAY 31
5.3 RESOURCE UTILISATION 31
5.3.1 HUMAN RESOURCES 31
5.3.2 FINANCIAL RESOURCES 32
SALARY COSTS 32
COSTS FOR ALLIED HEALTH SERVICES 32
COST FOR STORES ITEMS 33
TOTAL EXPENDITURE 33
CHAPTER SIX 34
CONCLUSION AND RECOMMENDATIONS 34
6.1 CONCLUSIONS RELATED TO THE AIM OF THE STUDY 34
6.1.1 CASELOAD 34
6.1.2 PROFILE OF PATIENTS 34
6.1.3 RESOURCE UTILIZATION 35
6.2 LIMITATION OF THE STUDY 35
6.3 RECOMMENDATIONS 36
6.3.1 APPLICATION OF THE FINDINGS OF THIS STUDY 36
6.3.2 FURTHER RESEARCH 37
6.4 SUMMARY AND CONCLUSION 37
REFERENCES 39
APPENDICES 1
APPENDIX A: 2
ETHICS CLEARANCE CERTIFICATE AND APPROVAL OF TITLE 2
APPENDIX B: 5
DATA COLLECTION SHEET 5

LIST OF FIGURES

Figure 3.1 Waterberg District 13
Figure 4.1 Medical admissions during six-month period 20
Figure 4.2 Age distribution of the subjects 21
Figure 4.3 Length of stay 25

LIST OF TABLES

Table 2.1 List of Indicators for measuring hospital efficiency.....6
Table 3.1 Study Variables and data source 15
Table 3.2 Statistical tests 18
Table 4.1 Medical admissions during six months study period (n=885).....19
Table 4.2 Age distribution of subjects (n= 887).....20
Table 4.3 Clinical diagnoses of the patients (n= 887) 23
Table 4.4 Top five diagnoses.....24
Table 4.5 Discharge outcomes 24
Table 4.6 Length of Stay.....25
Table 4.7 Personnel expenditures in medical wards.....26
Table 4.8 Expenditure for Allied health support services 27
Table 4.9 Expenditure for general stores 28
Table 4.10 Total cost in the adult wards 28

GLOSSARY OF TERMS

Admission: It can be defined as acceptance of a patient into the hospital ward as an inpatient for a medical intervention or observation (Department of Health, 2002).

District Hospital: A component of the District Health system. It is a level-one care hospital providing Outpatients, Admissions and Rehabilitation health services for the district. It also provides health support to Community Health Centres, clinics and local schools through outreach programs. The hospital serves as a place of referral from Primary Health care. Patients in need of higher level/specialised care are referred from the district hospital to Regional and/or Provincial hospitals. The department of health in South Africa. (Department of Health, 2002).

District Health Information System (DHIS): District Health Information System is software used nationally within South Africa for the general collection and collation of all health related data and not just patient data. (Department of Health, 2002).

Inpatient admissions: The number of patients admitted to the hospital over a period as reflected in the District Information System in South Africa. (Department of Health, 2002).

ICD-10 coding: The 10^{th} revision of the International Statistical Class of Diseases and related Health Problems. It is a coding system developed by the World Health Organization (WHO) that translates the written description of medical and health information into codes in a standardized format e.g. A15.1 is an ICD-10 code for Tuberculosis of the lungs. (Department of Health, 2002).

MEDICOM: Patient administration system used for the registration of patients in various public hospitals within South Africa. (Department of Health, 2002).

Rural hospital: A rural hospital is a hospital situated outside the urban complex, providing health services for people residing in villages, which are headed by Traditional Leaders. Quiet often, the hospital becomes the first entry point into a

health service due either unavailability or inaccessibility clinic health services. Access is often restricted by geographic barriers (distance, transportation and travelling time). Unlike hospitals in urban areas, there are no municipal services provided for rural hospitals and therefore the waste removal and water supply remains the responsibility and the problem of the hospital. (Department of Health, 2002).

LIST OF ABBREVIATIONS

AIDS	Acquired Immunodeficiency Syndrome
DEA	Data Envelopment Analysis
DHIS	District Health Information System
DHS	District Health System
GMH	George Masebe Hospital
HIV	Human Immunodeficiency Virus
ICD-10 CODES	International Code of Diseases 10 Edition
NHLS	National Health Laboratory Services
OSD	Occupation Specific Dispensation
PDE	Patient Day Equivalent
PHC	Primary health care
RHT	Refused hospital treatment
SABTS	South African Blood Transfusion Services
WHO	World Health Organization

CHAPTER 1
INTRODUCTION

The purpose of this study was to analyze resource utilization and trends of admissions in adult medical wards of a rural district hospital in South Africa. This introductory chapter covers the background to this study, statement of the problem, its aims and objectives and an outline of subsequent chapters.

1.1 BACKGROUND

The World Health Organization (WHO) estimates that there are 21 million people living with Human immunodeficiency Virus (HIV) and Acquired Immunodeficiency Syndrome (AIDS) in sub-Sahara Africa, representing over two thirds of all people living with HIV in the world. Few studies have attempted to quantify the effect HIV/AIDS on the demand for health care in developing countries and few data exist on the effect of HIV on adult patients in rural areas. More data is required to improve the understanding of its impact and to guide development of appropriate response strategies.

South Africa is one of the countries severely affected by HIV/AIDS epidemic and the consequences of this growing epidemic for health services remain poorly defined (Floyd, Reid, Wilkinson, et al, 1999; Gilly, Bhatt, Muhundi et al., 2000; Reid, Dedicoat, Lallo et al, 2005). In addition to the HIV/AIDS, South Africa also has a high burden of diseases of the developed countries such as diabetes and hypertension. The burden of diseases study has listed the quadruple burden of diseases in South Africa: poverty related conditions, emerging chronic diseases, injuries and HIV, AIDS (Bradshaw, Groenwald, Laubscher, et al., 2003). This has led to increase burden on public health care system, which is never quantified at a health facility level.

1.2 STATEMENT OF THE PROBLEM

There is a high demand for adult medical admissions at the George Masebe Hospital. The factors that contribute to this increase admission have not been clearly defined, but it is believed that an increase in the number of chronic illnesses such as HIV/AIDS and Pulmonary tuberculosis may account to the current situation at the hospital. It should also be noted that lack of community-based care services for terminally ill and lack of admission criteria for medical patients may also contribute to the high demand of in-patient beds.

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1.3 JUSTIFICATION FOR THE STUDY

During 2004, George Masebe Hospital was one of the hospitals within the Limpopo Province with a low bed utilization rate (47%), while at the same time its cost per Patient Day Equivalent (PDE) was very high. Towards the end of 2007, the number of adult admissions started to rise in so much that by June 2008, the bed utilization rate in these wards was ranging between 96% and 102%. The overcrowding in these wards led to a situation where some patients had to sleep on floor due to lack of space to accommodate additional beds. While the increase in admissions may be associated with the increase in the number of chronic medical conditions, no study has so far been conducted to justify the argument. Against this background, the proposed study was planned to explore changes in the number and type of medical admissions at the Hospital and the impact of increased admission on resource utilisation.

1.4 RESEARCH QUESTIONS

What is the trend of admissions in adult medical wards of a rural district hospital in South Africa? What is their effect on resource utilisation in these wards?

1.5 STUDY AIM AND OBJECTIVES

1.5.1 STUDY AIM

To analyse trends of admissions and resource utilisation in adult medical wards of a rural district hospital in South Africa.

1.5.2 SPECIFIC OBJECTIVES

- To determine the case load of patients during the study period
- To determine the profile (socio-demography and clinical), length of stay of adult medical admissions during the study period.
- To determine the resource utilisation in the adult medical admission wards during the study period.

1.6 SUBSEQUENT CHAPTERS OF THE REPORT

The background to the research has been discussed and the objectives defined. The subsequent chapters will cover the following areas:

Chapter Two: Literature Review - The purpose of the literature review is to discuss concepts and similar researches done around the topic studied as well as searching for potential solutions for the research problem.

Chapter Three: Research Methodology - This chapter describes the methodology used to conduct this research. The study setting, study population as well as methods and tools used for collecting and analysing the data are explained in this chapter.

Chapter Four: Presentation of Results - In this chapter, the finding of the collected data based on the objectives is analysed. These have been presented

in tables and percentages

Chapter Five: Discussion - In this chapter, the findings of the reviewed literature are integrated with the results obtained from the analysis so as to address the aim and objectives.

Chapter Six: Conclusions and Recommendations - This is the final section of the report and conclusions are drawn based on the research related aim and objectives. Recommendations to address some of the problems identified in the results are made. Areas needing further research in resource utilization and admission trends in medical wards have been cited in this chapter.

CHAPTER 2
LITERATURE REVIEW

In this chapter, relevant reports into referral system, factors influencing resource utilization and admission trends in medical wards in hospitals are discussed.

2.1 DISTRICT HOSPITALS

Health care delivery system in South Africa is provided by both public and private sectors, with public sector hospitals organized according to central, tertiary, provincial and district hospitals. As part of the national policy, district hospitals form part of the District Health System (DHS). They support primary health care in the district and patients are referred from community health centres and clinics to district hospitals for level one (generalist) services to in-patients and outpatients. Medical officers (Generalists) from a range of clinical disciplines provide these services. In some circumstances, primary health care (PHC) services are rendered where there is no alternative source of this care within a reasonable distance (Department of Health, 2002).

2.2 PERFORMANCE MEASUREMENT OF DISTRICT HOSPITALS

Indicators are performance measures, which indicate the amount of output that is actually produced in relation to the desired output. Indicators for measuring technical efficiency are usually expressed as either percentages or counts (such as number of admissions, bed utilization rate). The output indicators for measuring hospital efficiency are listed in the Table 2.1 (Burn and Shongwe, 2004).

Table 2.1 List of Indicators for measuring hospital efficiency

Number of Admissions
Number of Discharges
Number of Transfers Out
Number of Patients Died
Bed occupancy Rate
Length of Stay

Public hospitals in South Africa before 1994 used a wide range of data collection systems and consequently a total absence of standard, nationally agreed data elements and indicators. No routine system existed for the nationwide (or even province-wide) collection of the most simple service data, such as the number of admissions. Subsequently a number of data set have been developed (Burn and Shongwe, 2004):

- Medium Term Expenditure Framework Strategic Plans at national, provincial and district levels
- Hospital Minimum Data Set
- Revitalisation Minimum Data Set
- National Tertiary Services Minimum Data Set
- Health Goals, Objectives and Indicators 2001-2005

However, the use of indicators to support the local management of hospital services still appears to be very limited. They are mostly related to routine reporting to provincial office. Potential for their use as a decision making tool is often neglected. The initiative to mainstream the use of indicators for health systems planning and as an early warning system for identification of performance problems needs to be sustained and implemented at the facility level (Burn and Shongwe, 2004).

2.3 MEDICAL ADMISSIONS IN DISTRICT HOSPITALS

There has been unsustainable growth in the adult medical admissions in developed countries such as New Zealand, the United States of America and countries in Western Europe. The reasons for this increase in admissions have not been explored sufficiently (Singh, 2008). No formal studies have been done in Africa to measure admission trends, except a few done in South Africa, which are discussed in the following section.

There were few studies done on admission trends in South Africa. The settings of all these studies were KwaZulu-Natal. A study conducted on trends of admissions at a hospital that serves Hlabisa district in Kwa-Zulu Natal, South Africa, indicated that the total hospital admissions increased by 81%, from 6562 to 11,872 from 1991 to 1998. The 'Adult Tuberculosis Ward' experienced the largest increase in admissions (360%). By 1998, tuberculosis cases accounted for 11% of total hospital admissions, 47% and 30% of male and female adult medical ward admissions respectively. Tuberculosis and non-tuberculosis clinical AIDS cases were the only types of admission to show a clear and consistent upward trend over the period studied (Floyd, et al, 1999).

A similar study conducted between 1991 and 2002 at a small rural hospital in Northern Kwa-Zulu Natal, indicated that the total number of admissions rose by 34% from 228 to 626 with no increase in hospital staff or capacity. The length of inpatient stay fell from 10.9 days to 7.9 days while the inpatient mortality rose from 8% to 20%. The HIV remained the contributory factor in the increase in the number of medical admissions. Primarily, infectious diseases such as tuberculosis, lower respiratory infections and diarrhoeal diseases were the most frequent diagnosis and the leading causes of death (Reid, Dedicoat, Lalloo et al., 2005). A study done in a tertiary hospital in Gauteng found average length of stay for HIV positive adults were 10.6 days and 9.8 days for male and female patients which was significantly higher than HIV negative patients (7.5 days and 8.2 days

for male and female patients respectively) (Thomas, Manning, Holmes, et al., 2007).

An analysis of the causes of admission of 4,867 adult admissions (1,536 were males and 3,331 females) in Murchison Hospital, Port Shepstone, Kwa-Zulu Natal indicated that the main causes of admissions were tuberculosis, congestive cardiac failure, hypertension and cerebro-vascular accidents. The other causes of admission were pneumonia and diabetes. The general pattern of admissions was similar to that in other rural hospitals in South Africa (Walker, 1994).

A study conducted in 1991-1998 at Hlabisa hospital, KwaZulu-Natal, indicated that HIV-attributable TB accounted for 1% of total admissions in adult medical wards and 10% adult TB ward costs respectively in 1991, and by 1998, the figures were 9% and 58% respectively. The AIDS-defining conditions other than TB accounted for 12% and 7% of adult male and female ward costs respectively in 1998 (Floyd, et al, 1999).

2.4 RESOURCE UTILISATION IN DISTRICT HOSPITALS

Lack of optimisation of resource utilization results in waste of resources and therefore inefficiency. Therefore, in order to improve hospital efficiency or to make inefficient hospitals efficient, the amount of inputs (such as labour, funds) has to be reduced while the level of output (such as improved patient care) must be increased. However, the collection of good quality and reliable data is essential prelude for measurement of hospital efficiency. There are only few studies done at district hospitals in South Africa and elsewhere which systematically review routinely collected data to measure Hospital efficiency.

The basic premise underlying the concept of efficiency is that no output can be produced without resources (inputs) and that these resources are limited in supply (Akazili, Adjuik, Jehu-Appiah et al., 2008). The two basic measures of

efficiency are the allocative and technical efficiencies. Allocative efficiency refers to how different resource inputs are combined to produce a mix of different outputs. Technical efficiency on the other hand is concerned with achieving maximum outputs with minimum cost. Identification of hospital inefficiencies is an essential step before action can be taken to improve efficiency, thereby reducing hospital costs (Akazili et al., 2008).

Three widely used techniques for measuring hospital efficiency are the Ratio analysis, Econometric regression technique and Data Envelopment Analysis (DEA) (Sherman, 1984; Rosko, 1990). Ratio Analysis uses various ratios to a group of comparable hospitals to locate the relationships. Regression technique on the other hand estimates hospital cost relationships and production relationships (Rosko, 1990). Data Envelopment Analysis (DEA) is a technique used to identify and to measure the extent of technical inefficiency in health care and public hospitals (Sherman, 1984). The technique accommodates multiple inputs and multiple outputs in a single measure of productive efficiency. It became a dominant approach to efficiency measurement in many sector economies. Although Data Envelopment Analysis has extensively and successfully been used in developed countries (such as North America and Western Europe), its application in the health sector in developing countries and particularly in Africa is quite limited due to lack of availability of good quality data. In South Africa, it was only used for some research in KwaZulu-Natal Province (Akazili et al., 2008).

In order to measure technical efficiency, a norm must be specified. The norm set for measuring technical efficiency is that the minimum amount of resources should be used for a given level of output. Alternatively, the maximum amount of output should be produced for a given level of resource use (Akazili et al., 2008). However, setting the norm is often difficult due to lack of reliable and accurate information.

A critical review of the Health Sector Reforms in Sub-Saharan Africa in 2002

revealed that, besides the problem of scarcity of resources to the health sector, poor quality of care was occasioned by technical inefficiencies, which lead to wastage of the available resources (Akazili et al., 2008). In 2002, a study of 155 primary health care centres in Kwazulu-Natal, South Africa, found that 70% of those health centres were technically inefficient (Kirigia, Sambo, Scheel, 2001). A study of 30 district hospitals in Namibia (Zere, Mbeeli, Shangula, 2002) had findings similar to those of public hospitals in Kenya, with the average technical efficiency of less than 75% (Akazili et al., 2008). The findings from these studies show that the technical inefficiency is prevalent in many countries in Africa and should be addressed for improvement of hospital services.

2.5 COST OF MEDICAL ADMISSIONS

HIV/AIDS pandemic has been creating a strain and unprecedented burden on health care service in the developing world. A study on the direct cost of AIDS case management conducted in 1993 at University Teaching Hospital in Zambia, revealed that the country spent $ 27.1 million annually in clinical care for an estimated 50,000 AIDS patients and $ 27.3 million for approximately 150,000 HIV related-diseases (Hira, Sunkutu, Wadhawan, et al., 1993). A similar study on the pattern of change in hospital provision in established market economy in Eastern Europe, the former Soviet Union and low-income countries discovered that despite the great differences between these areas, all hospitals have to deal with rising costs for medical care (Hensher, 1999). Thomas et al., (2007) found inpatient costs were greater for HIV-infected adults than HIV negative patients in a tertiary hospital setting and proposed that budget allocations should incorporate case mix by HIV and ARV status as a key determinant of hospital expenditure.
Unfortunately, no study was done in a district hospital setting and in improvised provinces such as Limpopo, which are more affected by the HIV/ AIDS epidemic.

There are few studies done on unit cost of medical admissions in Africa. A study done by Vander Plaetse, Hlatiwayo, Van Eygen, et al., (2005) in Zimbabwe found

the patients were charged US$ 3.4 (R 25) for of medical admissions in a district hospital in comparison to cost of USD$ 14.7 (R 100) to a district hospital, which was probably underestimation of the real cost. A study done in South Africa found cost of medical admissions for diabetic patients in a regional hospital varies between R3812 to R6350 based on levels of complications (Pepper, Levitt, Cleary, et al., 2007). A study done in a tertiary hospital in Gauteng found average cost for medical admissions for HIV positive adults were R 7300 and R 6129 for male female patients which were significantly higher than HIV negative patients (R 3699 and R 4815 for male and female patients respectively) (Thomas, et al., 2007).

This study is expected to analyse admission trends and cost of resources utilized in the adult medical wards of George Masebe hospital.

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CHAPTER 3
METHODOLOGY

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

3.1 STUDY DESIGN

This was a descriptive cross-sectional study involving retrospective analysis of data from adult medical wards in the George Masebe Hospital during a six month period in 2009 (January to June).

3.2 STUDY SETTING

The study was undertaken at the George Masebe Hospital, a rural public district hospital situated at Bakenberg village, Mokopane (formerly Potgietersrus) in the Waterberg District, Limpopo Province (Figure 3.1). It is situated approximately 62 km west of Mokopane and 25 km south of the N11 from Mokopane to Grobler's Bridge, boarder gate between South Africa and Botswana. The George Masebe Hospital is one of the 33 district hospitals (Level one hospital) within the Limpopo Province, South Africa.



Figure 3.1 Waterberg District

The Hospital serves more than 100 rural villages. The total catchment area is 15 000 square kilometre with a population of 179 060 (Statistic South Africa, 2004). The population speaks predominately Northern-Sotho while small patches of Tsonga speaking communities are scattered all over the villages. Unemployment is very high. The main source of income in the area is social grants. A small proportion of the male population works at the nearby platinum

mine. There are only 13 clinics available in the area. Therefore, all the villages located less than 10 km from the hospital, use the hospital for primary health care services. This is one of the causes of massive overcrowding at the Outpatient department, resulting in long waiting times. Few private patients, mostly hospital employees consult at the Hospital. From 2008, the number of admissions in both adult wards started to increase. Various factors such as lack of community-based services, HIV and AIDS were thought to be responsible for the increase but there was never any concrete evidence

3.3 STUDY SCOPE

Medical records of patients admitted during a six-month period in 2009 (January to June) from the female and male wards of the Hospital were analysed. In addition, expenditure reports for both wards were also analysed for the same study period using existing financial reports. There was no primary data collected specifically for this study.

3.4 STUDY POPULATION

The study population consisted of all adult patients admitted to the male and female wards during the study period. For the purpose of hospital admissions, patients were regarded as adult if they were 13 years and older. Approximately 140 (70 male and 70 female) patients were admitted on average per month in this Hospital. During the study period, 887 patients (474 females and 413 males) were admitted to these two wards. The entire study population was included in the study. Therefore, no sampling was done.

Inclusion Criteria: All adult medical patients who were admitted during the study period.

Exclusion Criteria: Patients admitted with diagnosis other than medical conditions.

3.5 DATA MANAGEMENT

3.5.1 STUDY INSTRUMENTS

MS Excel based data collection tools were used for data capturing (Appendix B).

3.5.2 VARIABLES

The variables used for the study were listed in Table 3.1.

Table 3.1 Study Variables and data source

Objective	Variables		Type	Source
1	Case load	Number of patients	Numerical	Admission register
	Patient profile	Age	Numerical	HIS/ Patients Files
		Gender	Categorical	HIS/Patients Files
		Ethnicity	Categorical	HIS/ Patients Files
		Employment	Categorical	HIS/ Patients Files
		Medical Aid	Categorical	HIS/ Patients Files
		Final diagnosis	Categorical	HIS/ Discharge report
		Discharge outcome	Categorical	HIS/ Discharge report
		Length of stay	Numerical	HIS/ Discharge report
2	Staff	Cost per category	Numerical	Payroll
	Allied Health services (Blood, Pharmaceuticals X-ray, NHLS	Cost per item	Numerical	▪ Price list from SABTS ▪ Pharmaceutical cost tables ▪ X-ray standard rates ▪ Costs from NHLS
	Stores (Stationery and Toiletries)	Cost per item	Numerical	Expenditure report

Personnel cost was calculated from a list of personnel established based on the payroll.

The total cost of pharmaceuticals (intravenous fluids, medication) was calculated using standard pharmaceutical products cost tables reflecting the latest government tender prices.

The cost of blood products was determined using the most recent price list issued by the South African Blood Transfusion Service (SABTS).

The cost of Laboratory Services was calculated using standard cost schedules published annually by the National Health Laboratory Services (NHLS).

X-ray (Diagnostic imaging study) costs were calculated using standard rates quoted for state health care services.

Total expenditure was calculated based on direct expenditure for personnel, allied health services and stores.

$$\text{Total expenditure} = \sum \text{Personnel expenditure + Allied health services Expenditure + Stores expenditure}$$

Cost per patient was calculated as follows:

Cost per patient = Total expenditure/ Number of patients.

3.5.3 DATA COLLECTION

The Hospital Information was based on an electronic record keeping system (MEDICOM) for routine data collection. Data was primarily extracted from this system to MS EXCEL based spreadsheet designed for the study (Appendix B). When information was missing, other data sources (such as Ward registers, Patients' files and Discharge summaries) were used to extract missing information. Patients' information (name and hospital number were not captured

to maintain confidentiality). All information entered for each individual patient was linked to a study number allocated to each patient.

The following information was extracted from the Hospital Information system: age, sex, final diagnosis, length of stay and discharge destination. A standardized coding and diagnostic criteria (ICD 10) was used for recording of diagnosis (Tool 1).

For resource utilisation, MS EXCEL based tool (Tool 2) was used to collect data on cost of services rendered to the patients admitted in the adult medical wards. It included costs of Pharmaceuticals, National Health Laboratory Services (NHLS), Radiology, Blood bank (South African Blood Transfusion Services), Stores (goods and services), and employee compensation. These information were collected from budgets and financial statements for both male and female wards. The costs for overhead (water, electricity and telephones) were excluded as they were centrally managed from the Finance division of the Hospital.

3.5.4 DATA ANALYSIS

Data was captured on to MS EXCEL spreadsheet by the researcher and a team of two assistants. Before any processing was undertaken, data was checked for any missing or strange values. Data was then exported and analysed with NCSS statistical software (NCSS, 2007).

Descriptive statistics were used to analyse the data.

- Numerical variables were presented as mean and spread for normally distributed data and median and inter-quartile range (IQR) for others.
- Categorical data was presented as proportions.
- Analytical statistics used for the study included comparison between male and female patients

- Continuous variables: T-test or Mann Whitney's U test based on the distribution of the data) and
- Categorical variables: Chi-square test

Statistical tests used for the study are listed in Table 3.2.

Table 3.2 Statistical tests

	Parametric data	Non-parametric data
Central tendency and spread	Mean and Median Standard deviation, and Inter-quartile range	Proportion

3.6 ETHICAL CONSIDERATION

Ethical clearance for this research study has been obtained from the Human Research Ethics Committee of the University of Witwatersrand (M090675) (Appendix A). In addition, permission to conduct the study in the Hospital was granted by Head of Department of Health, the Limpopo Province. The researcher observed the principle of confidentiality throughout the study.

CHAPTER 4
RESULTS

The results obtained from data analysis are described in this chapter.

4.1 STUDY POPULATION

There were about 887 medical admissions in the adult general wards during the six-month period (January to June 2009) (Table 4.1). About 53% of the total admissions were females and 47% were males. The mean number of admissions per month was 148 (Female= 79 and Male = 69).

Table 4.1 Medical admissions during six months study period (n=885)

Months	**Total** n (%)	**Female** n (%)	**Male** n (%)
January	173 (19.5%)	76 (16.0%)	97 (23.5%)
February	156 (17.6%)	84 (17.7%)	72 (17.4%)
March	172 (19.4%)	113 (23.8%)	59 (14.3%)
April	123 (13.9%)	68 (14.3%)	55 (13.3%)
May	150 (16.9%)	75 (15.8%)	75 (18.2%)
June	113 (12.7%)	58 (12.2%)	55 (13.3%)
Total	887 (100%)	474 (100%)	413 (100%)

Highest numbers of female and male patients were admitted in March and January respectively (Figure 4.1).

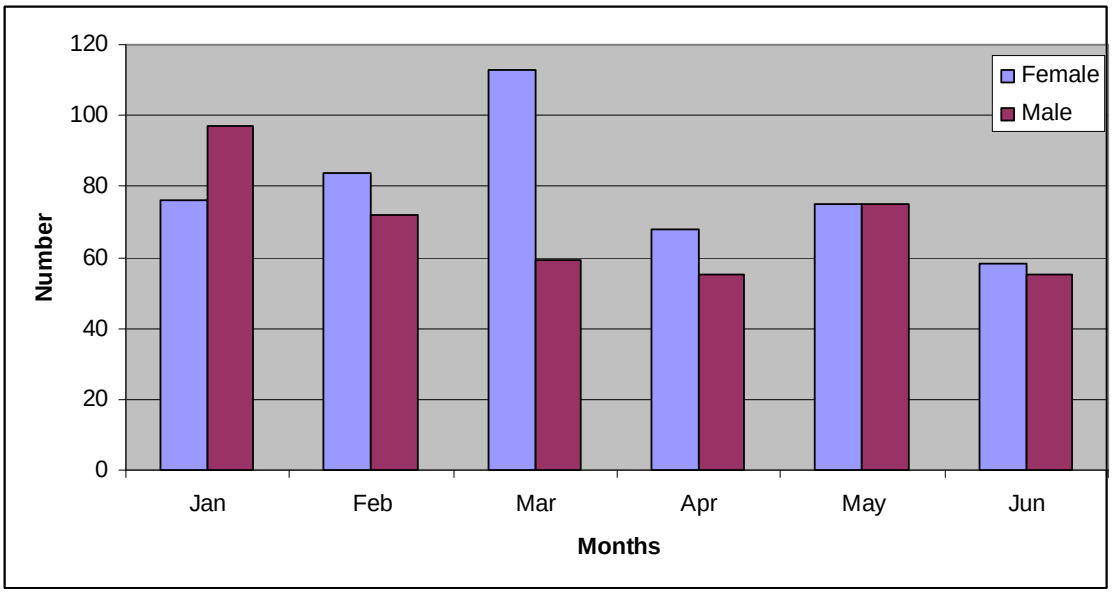


Figure 4.1 Medical admissions during six-month period

4.2 DEMOGRAPHY

4.2.1 AGE

Age of the subjects was not normally distributed. The median age of female patients (43.5) was not significantly different from male patients (45) (Mann Whitney's U test, p=0.94) (Table 4.2 and Figure 4.2).

Table 4.2 Age distribution of subjects (n= 887)

Age (in years)	**Total** (n=887)	**Female** (n=474)	**Male** (n =413)
Median (IQR)	44 (30 -62)	43.5 (30- 65)	45 (30 -60)
Range	13- 96	13-96	13-96

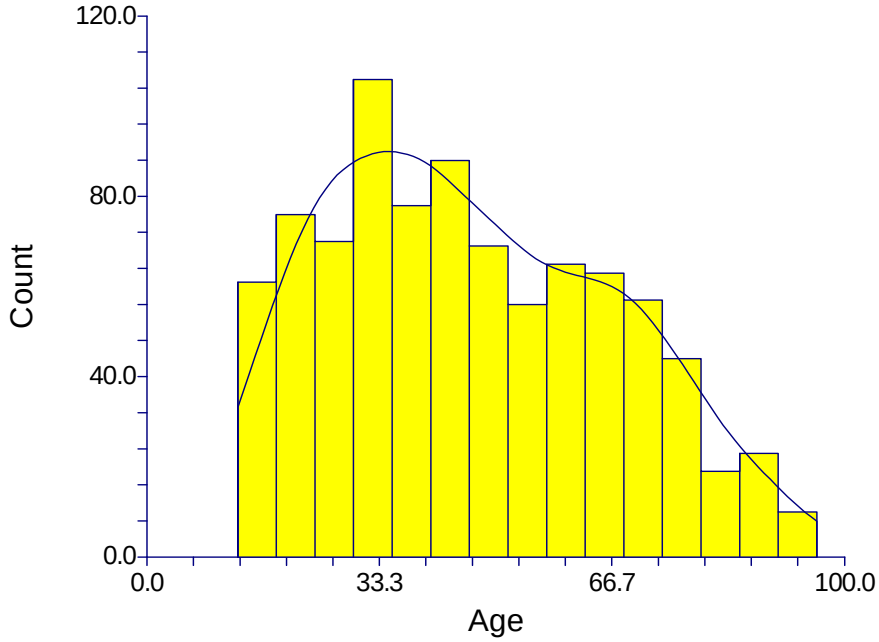


Figure 4.2 Age distribution of the subjects

4.2.2 ETHNICITY

All medical patients admitted during the study period were Africans. This is because the population served by the Hospital is predominately African.

4.2.3 MEDICAL AID

None of the patients admitted during the study period had a medical aid or medical insurance.

4.2.4 EMPLOYMENT

All patients were unemployed. The majority of them were dependent on social grant and food parcels given as a program for poverty alleviation.

4.2.5 CLINICAL DIAGNOSIS

The clinical diagnoses of the subjects are described in Table 4.3. The leading diagnoses in adult medical admissions were the diseases of the respiratory system followed by disorders of the digestive system, the immune system, infections and parasitic diseases, cardiovascular and mental disorders.

Table 4.3 Clinical diagnoses of the patients (n= 887)

ICD-10 codes	**Total** n (%)	**Female** n (%)	**Male** n (%)
Infections and Parasitic disorders A00-A86	94 (10.6%)	43 (9.1%)	51 (12.3%)
Immune system Diseases B01-B97.4	104 (11.7%)	70 (14.8%)	34 (8.2%)
Neoplasm C00-D48	2 (0.2%)	0	2 (0.5%)
Diseases of blood and blood forming organs D50-D89	18 (2%)	11 (2.3%)	7 (1.7%)
Endocrine nutrition and Metabolic disorders E05.0-E88.2	51 (5.7%)	31 (6.5%)	20 (4.8%)
Mental and behavioural disorders F03-F99	77 (8.7%)	26 (5.5%)	51 (12.3%)
Diseases of the Nervous System G01-G99	59 (6.7%)	30 (6.3%)	29 (7%)
Diseases of Eye, Ear and Mastoid H00 -H95	26 (2.9%)	18 (3.8%)	8 (1.9%)
Diseases of Circulatory system I01-I99	110 (12.4%)	76 (16%)	34 (8.2%)
Diseases of Respiratory system J01-J99	146 (16.5%)	62 (13.1%)	84 (20.3%)
Diseases of Digestive system K00-K93	133 (15%)	69 (14.6%)	64 (15.5%)
Diseases of Skin and Subcutaneous tissue L00-L99	2 (0.2%)	1 (0.2%)	1 (0.2%)
Diseases of Muscular-skeletal system and connective tissue M00-M99	14 (1.6%)	8 (1.7%)	6 (1.6%)
Diseases of Genitor-Urinary system N00-N99	9 (1%)	6 (1.3%)	3 (0.7%)
Pregnancy, Child birth and Puerparium O00-O99	3 (0.3%)	3 (0.6%)	0
Congenital malformations, deformities Q00-Q99	3 (0.3%)	3 (0.6%)	0
Injury, poisoning and certain consequences of external causes S00-T99	26 (2.9%)	13 (2.7%)	13 (3.1%)
External causes of morbidity and mortality V01- Y98	8 (0.8%)	3 (0.6%)	5 (1.2%)
Factor influencing health status and contact with health services Z00- Z99	2 (0.2%)	1 (0.2%)	1 (0.2%)
Total	887 (100%)	474 (100%)	413 (100%)

The leading medical conditions are shown in Table 4.4. Pneumonia accounted for 78 of the 146 admissions for respiratory diseases while 120 patients were admitted with gastroenteritis among 133 admissions for digestive disorders. Of the 94 admissions for infections and parasitic diseases, tuberculosis accounted for 80 cases. Patients with immunodeficiency diseases were 91 out of 104 admissions for immune system disorders. Lastly, 48 patients were admitted with diabetes mellitus.

Table 4.4 Top five diagnoses

ICD-10 codes	**Total** n (%)	**Female** n (%)	**Male** n(%)
Gastroenteritis	120 (13.5%)	65 (13.7%)	55 (13.3%)
Immune-deficiency disorders	91 (10.2%)	63 (13.2%)	28 (6.8%)
Tuberculosis	80 (9%)	31 (6.5%)	49 (11.9%)
Pneumonia	78 (8.8%)	27 (5.7%)	51 (12.3%)
Diabetes Mellitus	48 (5.4%)	34(7%)	14 (3.4%)

4.2.6 DISCHARGE OUTCOME

Discharge outcomes of the patients are described in Table 4.5. The majority of patients (76.9%) were discharged, 18.6% died, 3% were transferred out and 1.5% refused hospital treatment. There was no significant difference between female and male patients in terms of final outcome (Fisher's exact test, p = 0.07).

Table 4.5 Discharge outcomes

Outcome	**Total**	**Female**	**Male**
Discharged	682 (76.9%)	366 (77.2%)	316 (76.5%)
Death	165 (18.6%)	86 (18.1%)	79 (19.1%)
Transferred	27 (3%)	11 (2.3%)	16 (3.9%)
Refused hospital treatment	13 (1.5%)	11 (2.3%)	2 (0.5%)
Total	**887 (100%)**	**474 (100%)**	**413 (100%)**

4.2.7 LENGTH OF STAY

The length of stay in each medical ward was not normally distributed (Table 4.6 and Figure 4.3). The median length of stay was 5 days. There was no significant differences in length of stay between female (median 5 days) and male patients (4 days) (Mann Whitney's U test, p = 0.94). The shortest period spent in both wards was a day and the longest periods were 429 days for females and 114 days for males. Three patients [2 female (HIV and TB) and 1 male (Psychosis)] patients stayed more than 100 days.

Table 4.6 Length of Stay

Length of stay	Total	Female	Male
Median (IQR)	5 (3 -9)	5 (3-9)	4 (2-8)
Range	1 to 429	1 to 429	1 to 114

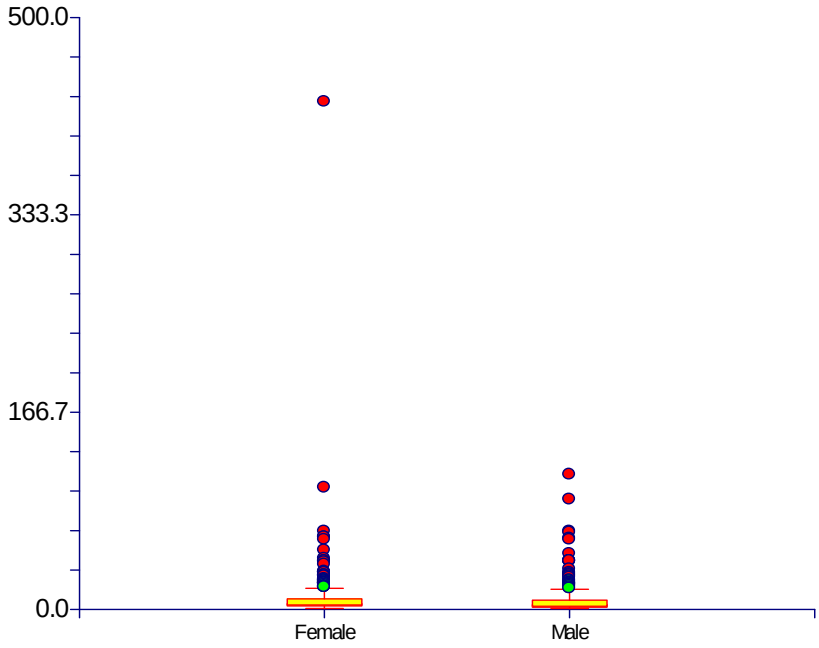


Figure 4.3 Length of stay

4.3 RESOURCE UTILISATION

4.3.1 HUMAN RESOURCES

The personnel expenditures of each medical ward are presented in Tables 4.7. Salaries of the nursing personnel accounted for 68% and 66% for female and male medical wards respectively and salaries of doctors made 24% of the total expenditure in each medical ward. Payments for the support staff was only 8% and 11% of the total expenditures for female and male medical wards.

Table 4.7 Personnel expenditures in medical wards

Staff category	**Total**		**Female ward**		**Male ward**	
Doctors	No	Amount	No	Amount	No	Amount
Medical officer: Senior	2	R 436,675	1	R 218,338	1	R 218,338
Medical officer	2	R 365,240	1	R 182,620	1	R 182,620
Total for Doctors	2	R 801,915	2	R 400,958	2	R 400,958
Nurses						
Operational manager	2	R 227,148	1	R 113,574	1	R 113,574
Senior professional nurse	6	R 453,424	3	R 226,712	3	R 226,712
Professional nurse	6	R 444,573	3	R 227,708	3	R 216,865
Staff nurse	12	R 491,895	7	R 267,649	5	R 224,246
Assistant nurse	18	R 654,734	8	R 313,531	10	R 341,204
Total for Nurses		R 2,271,775	20	R 1,149,174	22	R 1,122,601
Support Staff						
Ward clerk	1	R 36,803	0		1	R 36,803
Cleaner	11	R 285,778	5	R 142,894	6	R 142,884
Total for Support Staff	12	R 322,581	5	R 142,894	7	R 179,687
GRAND TOTAL		**R 3,396,271**		**R 1,693,025**		**R 1,703,245**

4.3.2 EXPENDITURE FOR ALLIED HEALTH SUPPORT SERVICES

The Female ward accounted for 70% of the total cost for Allied health support.
Strikingly was the high proportion of the cost for blood for the Female ward,

which accounted for 37% of the total Allied health support expenditure and 93% of the total expenditure for the female ward. The price of blood was R650.00 per unit and the female ward used 82 units during the study period, while 38 units were used in the Male ward.

Expenditure for NHLS was comparatively lower at 16% while the cost for pharmaceuticals was 27% of the total Allied health support expenditure. X-ray cost accounted to 17% of the total Allied health expenditure and 49.5% and 50.4% respectively for Female and Male wards. Table 4.8.3 present a percentage breakdown of cost of Allied health support services

Table 4.8 Expenditure for Allied health support services

Description	Total	Female ward	Male ward
NHLS	R 295,245	R 171,943	R 123,302
Blood	R 736,387	R 683,087	R 53,300
Pharmacy	R 486,093	R 268,998	R 217,095
Radiology	R 311,000	R 154,000	R 157,000
Grand Total	**R 1,828,725**	**R 1,278,028**	**R 550,697**

4.3.3 EXPENDITURE FOR GENERAL STORES

The expenditure for stationery and toiletry for the Female ward was comparatively higher than that of the Male ward and accounted for 60% of the overall expenditure for stores. The Male ward used less stationery and fewer toiletries and accounted for only 15% and 49% for stationery and toiletry costs. Meanwhile the Female ward was responsible for 85% of expenditure on stationery. Table 4.9 indicates percentage costs on stationery and toiletry.

Table 4.9 Expenditure for general stores

Items	Total	Female ward	Male ward
Stationery	R 254,706	R 216,678	R 38,028
Toiletry	R 763,770	R 390,172	R 373,598
Grand Total	R 1,018,476	R 606,851	R 411,626

4.3.4 TOTAL EXPENDITURE

The total expenditure during the study period is described in Table 4.7. The overall cost salaries of staff working fulltime in the two medical wards accounted to 54% of the total expenditure. Allied health services cost 29% while stores items were responsible for 17% of the total expenditure. Table 4.10 shows expenditure according to three above mentioned items.

Table 4.10 Total cost in the adult wards

Items	Total	Female ward	Male ward
Salaries	R 3,396,271 (54%)	R 1,693,025 (47%)	R 1,703,245 (64%)
Allied Health Services	R 1,828,725 (29%)	R 1,278,028 (36%)	R 550,697 (21%)
Stores	R 1,018,476 (16%)	R 606,851 (17%)	R 411,626 (15%)
Total Expenditure	**R 6,243,472 (100%)**	**R 3,577,904 (100%)**	**R 2,665,568 (100%)**
Number of patients	887	474	413
Average cost per patient	R 7,038.86	R 7,548.32	R 6,454.16

CHAPTER 5
DISCUSSION

In this chapter, the results emanating from data analysis are discussed and compared with those from other published studies.

5.1 INTRODUCTION

This study was the first scientific evaluation of data collected at George Masebe Hospital, a rural hospital in the Waterberg district, Limpopo Province, South Africa. The aim of the study was to assess the resource utilization and admission trends in the medical wards. The study summarized the number and the type of hospital admissions to the medical wards at the GMH in 2009 between January and June.

5.2 PATIENTS' PROFILE

5.2.1 GENDER

The study indicated that there were more females admitted than males during the study period, which was similar to the findings of the study conducted by Thomas et al. (2007).

5.2.2 AGE

The median age of female patients was 43.5 years, and for 45 years for male patients, which were high in comparison to the median age of patients reported in the study conducted by Thomas et al. (2007). The youngest patients between both wards were 13 years and the oldest 96 years. A similar study on the analysis of causes of admission of black patients conducted at Murchison Hospital, Port Shepstone indicated the median age of female patients being 34,

male patients, 39 and the youngest patients 12 years and younger (Walker, Walker, Dunn, et al., 1994).

5.2.3 SOCIO-ECONOMIC STATUS

George Masebe Hospital is predominately used by unemployed patients. Few patients were receiving social grants, some because of old age, and others due to ill-health. Those seen during the study period were all unemployed. Patient admitted to both adult male and female wards during the study period had no medical aids.

5.2.4 CLINICAL DIAGNOSIS

The results show that the leading diagnoses for adult medical admissions were gastroenteritis, pneumonia, immunodeficiency diseases, tuberculosis, mental illness and diabetes mellitus. Most notably was a high proportion of patients presenting with cardiac conditions and psychiatric conditions. Studies from urban tertiary referral hospitals in Africa have documented the effect of HIV on medical admissions: in the University Hospital Blantyre, Malawi, 70% of medical patients were found to be HIV infected (Lewis, Callaghan, Phiri, et al., 2003). In South Africa, a number of studies have addressed the impact of HIV on admissions to public hospitals. In Pietermaritzburg, Kwa-Zulu Natal, 28% of medical admissions were diagnosed with tuberculosis, many were also HIV infected (Alvarez, Thembela, Muller, et al., 2004) and in a large tertiary hospital in Durban, 54% of medical inpatients were found to be HIV infected and 56% of these patients had tuberculosis (Colvin, Dawood, Kleinschmidt, et al., 2001). A study conducted in Hlabisa Hospital, a government hospital situated in the rural district of Hlabisa, Kwa-Zulu Natal, found that adult tuberculosis ward admissions grew by 360%, accounting for 47% and 30% of female medical ward admissions and for 11% of total hospital admissions (Floyd, et al, 1999) The Tuberculosis and HIV/AIDS accounts for approximately 10% in this study.

5.2.5 CLINICAL OUTCOME

The study revealed that 77% out of 887 patients were discharged. Only 3% were transferred to higher level of care while 18.6% died. Although there were more females medical patients than males, the numbers of discharges, transfers and deaths from both wards were equal. The high mortality rate amongst medical patients is a concern and needs medical professionals and the hospital management to seriously look into the matter, investigate the problem and come with new strategies to improve the situation.

5.2.6 LENGTH OF STAY

The results show that female patients spent for more days in hospital than the males, which was similar to the findings of a study conducted by Thomas, et al., (2007). The problem of patients not often being discharged electronically probably explained abnormal length of stays discovered during the study period.

5.3 RESOURCE UTILISATION

5.3.1 HUMAN RESOURCES

The study revealed a high vacancy rate amongst doctors. Out of a total of six doctor's post created for each medical ward, only two were filled. There was also shortage of the nursing and support staff. The unavailability of the ward clerk in the female ward seriously affected data management and data quality in that ward and the whole hospital. The study suggest that shortage of staff do compromise clinical care and is the major cause of staff –turnover amongst the existing personnel, especially doctors as they don't have time to rest. There is a need for the hospital and the department of health in Limpopo province to recruit more doctors.

5.3.2 FINANCIAL RESOURCES

The expenditure for this study did not include the depreciation costs of equipments, furniture and buildings and overhead cost for administration (such as rates and taxes). The expenditure was not broken down as per services provided but according to the two main categories being male and female wards.

SALARY COSTS

The study found that payment of salaries accounted for 54% of the total expenditure of both medical wards. A study by Mills of the economics of hospitals in developing countries indicated that the share of hospital expenditure consumed for salaries and wages was 40-50% (Mills, 1990a; Mills, 1990b). This is in line with our own findings. A similar cost study conducted in a rural Zimbabwean district of Tsholotso indicated that salaries comprised 54% of the total costs for the district. (Vander Plaetse, et al., 2005).

COSTS FOR ALLIED HEALTH SERVICES

Blood transfusion services are one of the most expensive elements of health care systems. The results shows that the blood cost was responsible for 40% of the total expenditure for Allied Health Services and the cost of blood for the female ward was one of the most striking findings of the entire exercise and accounted for 93% of the total allocation for blood for the two general wards. The study revealed that the cost of drugs constituted 7% of the total overall cost for allied health.

In the case of Tsholotsho study in Zimbabwe, the cost of blood services was almost 5% of the cost of the entire district public health care delivery system. Drug expenditures constituted 20% and the price of blood was 25% of the total district expenditure for drugs and almost 5% of the cost of the entire district public

health care delivery system (Vander Plaetse, et al., 2005).

COST FOR STORES ITEMS

The study shows that there was more demand for stationery and toiletry in the female than the male ward. Striking was the high proportion of stationery cost for female ward (85%) compared with the male ward (15%). The female ward spent relatively more on toiletry (51%) than the male ward (2%).

TOTAL EXPENDITURE

A study done in a tertiary hospital in Gauteng found that the average cost for medical admissions for HIV positive adults were R 7300 and R 6129 for male and female patients respectively(Thomas, et al., 2007). Similar findings were found in this study where the cost for admissions was R7548 and R6454 for female and male patients respectively. But it should be noted that the hospital does not have dedicated wards for medical patients and therefore the costs included costs surgical and mental patients as well. There is therefore a need for the hospital to shift away from bulk costing to itemise billing in order to improve their financial management system.

CHAPTER SIX
CONCLUSION AND RECOMMENDATIONS

In this chapter, the results are assessed in relation to the aim of the study, so that appropriate conclusions can be drawn. The limitations of the study are also articulated. Appropriate recommendations are made within the context of the findings of the study. Finally, suggestions for further research are presented.

6.1 CONCLUSIONS RELATED TO THE AIM OF THE STUDY

This was a retrospective descriptive study involving record analysis of medical admissions in a public hospital. The aim of the study was to assess resource utilizations and admission trends in medical wards in a rural district hospital in South Africa.

6.1.1 CASELOAD

Eight hundred and eighty seven patients were admitted during the study period. Average number of admissions per month was 148. More female patients were admitted than male patients.

6.1.2 PROFILE OF PATIENTS

The age of patients admitted ranged between 13 years and 96 years. The median age was 44 years. The patients were black, had no medical aid and unemployed and the majority of them were dependent on social welfare grant.

The most common health problems diagnosed amongst the medical admissions were respiratory diseases, gastro-intestinal disorders, infections and other parasitic disorders, immunodeficiency diseases, cardio-vascular disorders, mental illness and metabolic disorders. Specific disease problems included HIV

related conditions such as gastro-enteritis, HIV/AIDS, pneumonia and tuberculosis and diabetes mellitus. A striking discovery was the high incidence of mental illness amongst the admissions. Out of the total number of medical admissions, 77% were discharged and 19% died. Those who died were mostly because of HIV related conditions. The length of stay varied from one day to more than a year. One of the factors identified was lack of sufficient administration staff to discharge patients from the hospital information system.

6.1.3 RESOURCE UTILIZATION

The study identified shortage of health professionals particularly medical doctors in these two wards.

The direct expenditure during this period was R 6,243,472 (R 3,577,904 for Female ward and R 2,665,568 for Male ward). The average expenditure per month was R 1,040,579. The expenditure for salaries was the main expenditure (54%) followed by Allied health services (29%). The average expenditure per patient was R 7,039 (R 7,548 for female patients and R 6,454 for male patients).

6.2 LIMITATION OF THE STUDY

The following limitations were experienced with regard to this research:

1. The accuracy and completeness of the information was a big challenge.
2. Information Bias: Patients registered as unemployed could not justify their unemployment status. The hospital too did not have a policy to control misrepresentation.
3. The costing methodology was also biased. Bulk costing instead of itemised billing method was used, so that made it difficult to know as to how much resources were used per admission.
4. There were few studies available, which regard to the topic; hence, there was no sufficient literature on the subject.

6.3 RECOMMENDATIONS

The recommendations made below are based on the findings from this study and suggestions from the George Masebe Hospital management including the staff from both the female and male wards.

6.3.1 APPLICATION OF THE FINDINGS OF THIS STUDY

Information from this study was presented to the management and health professionals of George Masebe Hospital for the future management of services including the management of beds as well as the allocation of resources. The Hospital management used the findings of this study to establish a cost centre in the medical wards in terms of the policy of the Limpopo Department of Health and Social Development.

The study identified prolonged length of stay for patients, the reasons for which should be explored. Establishment of a step-down facility within the hospital should be explored. Detailed socio-economic information should be collected from patients to identify patients who have ability to pay. The study found that there is a demand for blood especially in the female ward. This information will assist the hospital to motivate for the opening of the blood bank within the local town as currently the blood bank is situated 260 km from the Hospital.

Information was also presented to the Limpopo Department of Health and Social Development, to develop a better understanding of utilization of resources in district hospital in the Province.

6.3.2 FURTHER RESEARCH

The researcher would like to propose following research to be conducted in future:

- Similar studies should be conducted in other district hospitals to establish norms and standards (such as length of stay, expenditure, resource utilisation)
- Detailed costing study for establishment of cost per admission.
- An economic study linking clinical outcome and expenditure in public hospitals

6.4 SUMMARY AND CONCLUSION

This was the first study on admission trends in the Hospital and in the Limpopo Province. The information from the study provided valuable information to the Hospital management for improvement of service delivery.

The study found average number of admissions per month was 148, their length of stay varied from one day to more than a year. Their median age was 44 years. They were black, had no medical aid and unemployed and the majority of them were dependent on social welfare grant. The most common health problems diagnosed amongst the medical admissions were HIV related conditions such as gastro-enteritis, HIV/AIDS, pneumonia and tuberculosis and diabetes mellitus. A striking discovery was the high incidence of mental illness amongst the admissions. The majority of them discharged home. The crude death rate was 190 per thousand and the main cause of death was HIV related conditions.

The average direct expenditure per month was R 1,040,579. The expenditure for salaries was the main expenditure (54%) followed by Allied health services

(29%). The average expenditure per patient was R 7,039 (R 7,548 for female patients and R 6454 for male patients).

This study has recognised that the double burden of infectious and chronic diseases resulting in increased numbers of sick patients seeking formal health care in rural district hospitals. More studies on the subject are needed to identify their impact on resource utilisation at these hospitals. The study provides more insight into the demands of providing in-patient care to the hospital and to the provincial Departments of health. The evidence from this study would hopefully steer the re-organisation of some of the services, more especially the establishment of a step-down ward facility within the Hospital.

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APPENDICES

APPENDIX A:

ETHICS CLEARANCE CERTIFICATE AND APPROVAL OF TITLE

APPENDIX B:

DATA COLLECTION SHEET