Trends in Adult Medical Admissions at Tambo Memorial Hospital, Gauteng, between 2005 and 2007

Aroomugam Naidoo

A Research Report submitted to the Faculty of Health Sciences, University of the Witwatersrand, Johannesburg, in partial fulfilment of the requirements for the Degree of Master of Public Health.

Johannesburg, November, 2009.

DECLARATION

I, Aroomugam Naidoo, declare that this research report is my own work. It is being submitted in partial fulfilment of the requirements for the Degree of Master of Public Health at the University of the Witwatersrand, Johannesburg. It has not been submitted before, for degree or examination at this or any other University.

Signature:

Date:

At:

DEDICATION

This study is dedicated to my wife Rajini, my children Nerishini, Vivendra and Devveena and to my mother.

ABSTRACT

Introduction: The study analysed the admission trends at six adult medical wards in a regional hospital in Gauteng over 2005 and 2007.

Methods: This was a retrospective analysis of data from admission ward registers and patient case notes. Information obtained included age, gender, duration of stay, clinical outcomes and disease profile. The study population comprised of all patients admitted to the adult medical wards at Tambo Memorial Hospital for the period 1 January 2005 to 31 December 2005 and 1 January 2007 to 31 December 2007.

Results: The number of medical admissions increased by 2.07% during the years of study. The male admissions were slightly higher than the female admissions. The mean age of male patients decreased from 42.30 years to 40.41 years. In contrast the mean age for female patients increased from 38.00 years to 40.50 years. The average length of stay decreased from 6.16 days to 5.33 days. The younger age groups (15-34 years of age) accounted for the majority of admissions. Based on the ICD 10 coding, infectious and parasitic diseases accounted for the majority of the admissions followed by respiratory disorders. Tuberculosis became the most frequent diagnosis and was prevalent in the younger age groups followed by pneumonia. Hypertension was a common diagnosis in the older age groups (55 years and older). As was expected the majority of patients (86-95% in 2005 and 80.24% in 2007) were discharged home but a considerable number of patients were transferred to other institutions. Importantly, a decrease in the mortality rate from 4.02% to 0.03% was also demonstrated.

Conclusions: An increase in the number of patient's admissions, a decrease in the average length of stay and a decrease in mortality rate were noted during the study period. Changing trends with regards to gender, age and disease profile were also observed. The challenges and recommendations identified by the study will provide valid information that would be meaningful to hospital management as well as potential users such as budget planners, resource allocators and efficient referral pathways designers.

ACKNOWLEDGEMENT

This is an opportunity for me to show my gratitude to all who have in any way been of assistance to me in the course of completing this research report.

A special thank you to the following people:

- My supervisor, Professor Shan Naidoo who provided expert guidance and encouragement throughout my study and has always been available when needed.
- My wife and children for their unconditional support and encouragement throughout the period of this study.
- The Chief Director of Hospital Services at the Gauteng Department of Health for granting me permission to conduct the study at TMH.
- Mrs Johanna Fourier and Mr Jan Nkopodi Nkadimeng for assisting in the retrieval of patient records.
- My son, Vivendra for his computer support.
- Dr. A. Christoforou, the Senior Clinical Manager at TMH, for her valuable inputs.
- Dr. J. Mwinyoglee and Dr. R.T. Khonje, Heads of Clinical Departments at TMH for their assistance.
- Mrs. B. Naidoo for her assistance.
- Mr. T. Chirwa, for his assistance with the statistical analysis.

TABLE OF CONTENTS

LISTS OF FIGURES

Page

LISTS OF TABLES

Page

NOMENCLATURES

Admission Date	is the day of admission to the adult medical ward and is regarded as day 1
Clinical Diagnosis	is the diagnosis at the time of separation
95% CI	95% confidence interval
LOS	length of stay is the number of days from the date of Admission to the date of separation
Outcomes	is defined as discharged home, transferred out, refused treatment, absconded or died
TMH	Tambo Memorial Hospital
TB	Tuberculosis
Separation Date	is the day of discharge or transferred to other institutions or leaving the hospital without completion of treatment or death
Level One Hospital (District Hospital)	entail that care is provided by General Practitioners, Medical Officers and Primary Health Care Nurses. The hospital has betwwen30 and 300 beds.
Level Two Hospital (Regional Hospital)	receives referrals from and provide specialist services to a number of level 1 hospitals. Most care requires the expertise of teams led by specialists. They may also be some level one services provided
Level Three Hospital (Tertiary Hospital)	entails specialised consultative care, usually on referral from primary or secondary hospitals, by specialists working in a centre that has personnel and facilities for special investigation and treatment

CHAPTER 1

INTRODUCTION

1.1 BACKGROUND

Tambo Memorial Hospital (TMH), an urban regional hospital under study, is one of the 38 hospitals in the Gauteng Province, South Africa's most densely populated province. It is situated in the Ekurhuleni Metropolitan District. The hospital is functioning both as a regional and a district hospital. The hospital has 540 functional beds and a staff establishment of 1308. Tambo Memorial Hospital is one of the oldest hospitals in Gauteng. It began as a joint venture between the state and the East Rand Property Mines on August 1905. The state assumed full control over the hospital in 1948 and named it the Boksburg-Benoni Hospital.[1]

The hospital's name changed to Tambo Memorial Hospital on April 1997 in honour of the late Mr Oliver Tambo (the tenth president of the African National Congress).
TMH has a service package appropriate for a Regional Hospital. These include amongst others Internal Medicine, Surgery, Obstetrics and Gynaecology, Paediatrics, Orthopaedics, Accident and Emergency and Anaesthetics. These clinical services are supported by Allied Medical services.

TMH deals with a wide range of diseases related to poverty, malnutrition, emerging communicable diseases, trauma and violence, chronic diseases of lifestyle and mental illness.

1.1.1 Ekurhuleni Metropolitan District

Ekurhuleni Metropolitan District is a metropolitan municipality that forms part of the local government of the East Rand Region of Gauteng, South Africa. The population is 2 480 260 people with the largest language group being Zulu people. The black African ethnic group makes up 76.26% of the local population. The gender distribution is 50.47% males to 49.26% females. The age group 25 years to 34 years is the largest local age group at 21.92%, whereas the age group 65 years and older is 3.76%. TMH provides medical services to 850 000 of the local population. The diseases being TB, HIV/AIDS hypertension, diabetes and violence.[35]

1.1.2 Relationship with other Health Facilities

Patients are encouraged to enter the health system through the District Health System at the primary health care clinics in the community. Depending on the level of health care needed

they are referred up the system to Community Health Centres and then to District Hospital or Regional Hospital. Similarly, patients needing non-specialised care can be down referred.

Currently, many patients in Gauteng are bypassing the District Health System and have access directly to District and Regional Health Facilities. Redefining and promoting strong referral procedures between primary, secondary and tertiary facilities will help to ensure patients have equal access to appropriate level of care.[2]
To further strengthen the referral chain, service packages at various levels have been implemented. Good progress has been made since 2002/2003 when utilization rate for Primary Health Care were 1.56 visits which increased to 1.7 visits in 2007/2008.[3]

TMH is one of the six regional hospitals in the Ekurhuleni Metropolitan District. There is one District Hospital, two Community Health Centres and twelve primary health care clinics in the surrounding area, which utilises TMH as a referral centre.

1.1.3 The Admission Medical Ward

The Admission Medical Ward is a 28 bedded ward. It was established in 2005. The aim was to improve the quality of care offered to patients, by having all new admissions in one area, to ensure close monitoring and stabilisation of patients. The admission ward has 17 beds for male patients and 11 beds for female patients. All patients are admitted to the general medical wards via this ward.

This ward is staffed by a senior medical officer and assisted by a junior medical officer. A daily post-intake ward round is done and a final decision is made regarding the clinical management of these patients. The majority of them are transferred to the general wards for further management; some are discharged home, or transferred out to other institutions for the appropriate level of care.

1.1.4 Internal Medicine Department

The Internal Medicine Department is the largest department in the hospital. It has six (6) wards, three (3) male and three (3) female wards. A total number of 174 beds are allocated to these wards which make up 32.2% of all functional beds in the hospital.

1.2 JUSTIFICATION FOR THE STUDY

In keeping with current trends nationally, there is a huge demand for hospital admissions to the adult medical wards at TMH. Current knowledge of the trends in adult medical admissions to regional hospitals in South Africa is not well documented. This hospital based study, which was conducted at TMH, will provide valid information that would be meaningful to potential users such as budget planners, resource allocators and efficient referral pathways designers.

The study will serve as a point of reference regarding trends of adult medical admissions in regional hospitals in South Africa and Gauteng Province in particular and add to the existing body of knowledge.

1.3 STUDY AIM AND OBJECTIVE

1.3.1 Study Aim

The aim was to determine the admission trends of patients admitted to the adult medical wards at TMH for a period 1 January 2005 to 31 December 2005 and 1 January 2007 to 31 December 2007.

1.3.2 Study Objectives

- To describe the number, age and gender distribution of adult medical admission during the study period.
- To determine the disease profile of medical admissions during the study period.
- To determine the average length of stay of adult medical admissions during the study period.
- To describe the outcomes of adult medical admissions during the study period.

CHAPTER 2
LITERATURE REVIEW

2.1 INTRODUCTION

Regional hospitals play an important, yet overlooked, role in reflecting public health status both locally and nationally. Relatively few reports, analysing the trends and causes of regional hospital admissions exist which is especially important in the case of developing countries considering the huge number of admissions and people at risk that seek health care or are referred.[4,5,6,7,8]

Also compounding this problem is that in developing countries like South Africa, the quality of records varies among institutions making analysis difficult. Some hospital data are fully computerised, others are less so, or nonexistent. Thorough documentation is essential in providing an invaluable database for researchers, but morbidity statistics are scarce. [4,5,7]

2.2 PATTERN OF CHANGE IN HOSPITAL PROVISION AND UTILIZATION OF SERVICES

Hospitals in all health systems have to deal with rising demands expectations on the one hand and a need to contain costs of health care on the other hand. While financial pressure has played a part in the development in the provision of secondary care, the influence of technology and the ability to treat large proportions of patients on a day care basis have also shaped patterns in the provision of services and the use of hospitals.[9]

2.2.1 Trends in the established market economies

Admission rates for both acute and all inpatients to hospitals have increased in most countries. In tandem with this increase however, both average length of stay and number of beds per 1000 population have shown a consistent reduction across nearly all countries with a particularly notable reduction in number of beds per 1000 population for inpatients in Scandinavia.[9] However, the occupancy rates have remained fairly steady at 75-85% for most countries.[9] These trends indicate large increases in the throughput of hospitals: i.e. the bed occupancy rate is shorter.[9]

2.2.2 Trends in the former soviet economies

Many central and eastern European countries have modified their healthcare systems with the intention of reducing hospital care. This is in contrast to the past, where emphasis was on hospital infrastructural development which resulted in high admission rates. However, the average duration of stay has substantially reduced in line with trends in the established market economies .[9]

2.2.3 Trends in developing countries

The data in developing countries regarding trends over time in admission rate, length of stay or other dimensions of regional hospital activities are limited. Generally, the problems facing hospitals in developing countries are:

a) Lack of drugs and supplies, especially at primary healthcare level.
b) Difficulties in recruiting and retaining professional staff especially in rural areas.
c) Dominance of tertiary hospitals in large cities at the expense of primary and secondary care services.[9]

2.2.4 Trends in South Africa

South Africa is one of the countries most severely affected by the global HIV/AIDS pandemic. A study by Reid, Dedicoat, *et al* [6] in a small rural hospital in Northern Kwa-Zulu Natal, between 1991 and 2002, demonstrated that total admissions rose from 228 to 626 patients over a two month period with no increase in hospital staff and capacity. Length of stay fell from 10.9 to 7.9 days and inpatient mortality rose from 8% to 20%. The median age of female patients fell from 50 to 34 years, and the median male patient's age fell from 45 to 39 years over the study period. After 1991, tuberculosis became the most frequent diagnosis, and in 2002 it was the leading cause of death. The HIV/AIDS epidemic has increased the number of medical hospital admissions, primarily through infectious diseases such as tuberculosis, lower respiratory tract infection and diarrhoeal disease. The epidemic has thus had an important impact on the demand for adult general medical care in rural South African district hospitals.[10] The data presented in studies at Hlabisa Hospital, a rural hospital in South Africa, showed a 275% increase of adult medical admissions over a 12 year period[6] and at G F Jousted Hospital, in Manenburg, Cape Town, showed a 44% increase over an 11 year period.[7]

In South Africa a number of studies have addressed the impact of HIV on admissions to tertiary institutions: in Pietermaritzburg, KwaZulu/Natal, 28% of medical admissions were diagnosed with tuberculosis, many were also HIV infected 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.[74,75]

In line with trends in many countries, admissions have increased and at the same time, there has been a progressive shortening of the median length of stay and this may reflect the need for earlier discharge to accommodate the increased patient load.[9]

2.2.5 Trends in the rest of Africa

Studies from urban tertiary referral hospitals in Africa have also documented the effect of HIV on medical admissions. In Kenya admissions to Kenyatta National Hospital rose greatly between 1988/1989 and 1997 as well as bed occupancy; and in the University Hospital Blantyre, Malawi, 70% of medical patients were found to be HIV infected and 8% of patients were classified as having AIDS.[11, 12] In a community hospital in Israel there was no significant change in the admission rate in the period examined. The yearly admission rate was 10 482 ± 386.[62]

These studies were consistent with grim predictions about hospital services being overwhelmed and unable to cope with rising demand for services which prompted the need for further investigation.[11,12]

2.3 COMMUNICABLE AND NON-COMMUNICABLE DISEASES- THE DOUBLE BURDEN

For centuries, communicable diseases (CD) were the main cause of death globally. After the Second World War, non-communicable diseases (NCD), began to cause major problems in industrialised countries.[13,14] Now, at the dawn of the third millennium, NCD's appear to be sweeping the entire globe, with an increasing trend in developing countries.[13,14]

In 1990 the leading causes of disease burden were identified as pneumonia, diarrhoeal diseases and peri-natal conditions. By 2020, it is predicted that NCD's will account for 80% of the global burden of disease, causing seven out of every ten deaths in developing countries.[14, 15] (see Table 1).

Table 2.1: Evolution and projection of communicable and non-communicable diseases in developing countries (in millions) [15, 16, 17]

Year	Non-communicable diseases n, (%)	Communicable diseases + maternal peri-natal + nutritional n (%)	Injuries n (%)	Total n (%)
1990	18.7 (47)	16.6 (42)	4.2 (11)	39.5 (100)
2000	25.0 (56)	14.6 (33)	5.0 (11)	45.0 (100)
2020	36.6 (69)	9.0 (17)	7.4 (14)	53.0 (100)

Lopez *et al* (2006)[18] attributed the ten leading diseases for global disease burden to perinatal conditions, lower respiratory infections, ischemic heart disease, cerebrovascular disease, HIV/AIDS, diarrhoeal disease, unipolar depression, malaria, chronic obstructive pulmonary disease and tuberculosis. Almost half the disease burden in low-and-middle income countries is from NCD's.[18] This constitutes a major concern for health authorities in developing countries. Preventable strategies must take into account this growing trend in developing countries.[14] The global trend of all leading chronic diseases is increasing with the majority occurring in developing countries and predicted to increase substantially over the next two decades.[19]

This "epidemiological" transition imposes more constraints to deal with the double burden of infective and non-infective diseases in a poor environment characterised by ill-health systems.[13]

2.4 NON-COMMUNICABLE DISEASES

The results of a study at the University of Nigeria Teaching Hospital, Enugu, showed an increasing trend in medical admissions with non-communicable diseases accounting for 60.7% and communicable diseases accounting for 39.3%.[61] Diseases of the circulatory system was the most common diagnosis with respiratory diseases diagnosed in 5% of the admissions at a community hospital in Israel.[62] In another study, admissions to medical wards at Hillbrow Hospital, Gauteng, were most frequently associated with diseases of the circulatory system followed by respiratory and infectious diseases.[8] An examination of

medical admissions to Groote Schuur Hospital, Cape Town, in 1982 showed a predominance of circulatory systems pathology followed by endocrine, nutritional and metabolic disorders and infectious diseases.[7] These results were in line with other studies of hospital admissions in cities and towns where the increasing urbanisation and westernisation of the population is changing the morbidity pattern of diseases.[4, 67, 68]

2.4.1 Diabetes

According to the statistics released by the International Diabetes Federation, the number of diabetics in the world is expected to increase from 194 million in 2003 to 330 million by 2030 with three in four living in developing countries.[20]

An epidemic of diabetes is unfolding in countries undergoing rapid economic development and modernization. Non-industrialised countries are exchanging their high morbidity from infectious disease for morbidity from "diseases of affluence" including type 2 diabetes.[21]

The study by King *et al* [21] estimated that the prevalence of diabetes in adults worldwide to be 4.0% in 1995 and to rise to 5.4% by year 2025. The number of adults with diabetes in the world will rise from 135 million in 1995 to 300 million by the year 2025. The majority of this numerical increase will occur in developing countries.[22, 23] It is assumed that the increase in the number of patients will be most pronounced in nations undergoing socio-economic development including urbanization.[24, 25] A study in Chennai, representing urban India, demonstrated that the prevalence of diabetes increased by 73% in a span of 14 years (1989-2004).[26]

Diabetes is an important cause of morbidity and mortality in Africa. Although a dramatic increase in disease burden is projected, it remains to be seen what effect the ongoing devastation of HIV disease will have on the epidemiology of such chronic diseases as diabetes.[27]

The burden of disease due to chronic disease such as diabetes and hypertension is on the increase in Gauteng.[2] According to the District Health Information System, 2007, the incidence of diabetes is 112.3 per 100 000 population 45 years and older. Self-reported prevalence of diabetes in Gauteng is 2.6% for males and 3.5% for females.[28]

2.4.2 Cardiovascular disease and Hypertension

With recent improvement in the control of malnutrition and infectious diseases, cardiovascular diseases (CVD) has emerged as a major causes of morbidity and mortality in many African countries.[29] Hypertension is the most common CVD, followed by rheumatic disease and cardiomyopathy.[29]

Most of the studies spanning the early part of the 20th century reported that CVDs were very rare and were predominantly infection related. As quoted from Akinboboye *et al*[29], "Cooke in 1901 reported on the first 1500 in-patients that he saw in his hospital in Uganda, in East Africa, 6% all medical admissions were because of cardiac diseases. Donnison also noted in 1905 the rarity of hypertension in a hospital-based survey of 1800 subjects in Kavirondo, district of Kenya, East Africa." The spectrum of diseases also began to change with hypertension the most prevalent CVD in the region.[29]

The prevalence of CVDs increased slightly by the middle of the century as reported by other studies based on percentage of medical admissions because of CVDs. As cited in Akinboboye *et al* [29] these include studies by Nkonoli in Tanzania, East Africa, 1968 (8.8%), Lauckier et al in Ibadan Nigeria, West Africa in 1958 (11.2%). In South Africa in 1972 in Seklukhuneland, the percentage was (8.6%).[30]

Later studies conducted in the 1960 and beyond reported a higher prevalence of CVDs in general and hypertension in particular. A profile of CVDs in Ibadan, Nigeria showed hypertension to be the most prevalent CVD in adults.[31] Vaughn reported the following spectrum of CVDs in Sub-Saharan Africa: hypertension 16.3-44.5%, rheumatic heart disease 9.7-38.3% and Coronary Artery Diseases 0.4-2.2%.[32]

A survey by Steyn *et al* revealed high levels of hypertension in the South African community.[33] In a house-to-house study of 994 urban Zulu, the prevalence of hypertension was 25% and in a rural Zulu study of 987, the prevalence was 9.4%.[34] The prevalence of hypertension in South Africa in 2003 was 8.8% for males and 18.8% for females.[28]

Hypertension incidence has remained fairly stable in Gauteng, with over 200 new cases per 100 000 people (aged 45 years and older) diagnosed annually.[35]

Hypertension is an important worldwide public-health challenge because of its high frequency and concomitant risks of cardiovascular and kidney disease.[36] It has been identified as the leading risk factor for mortality and is ranked third as a cause of disability-adjusted life-years. While the general trend is increasing levels of hypertension in most developing countries, the prevalence rates across nations vary widely.[37]

2.5 COMMUNICABLE DISEASES

Infectious diseases were shown to be the main cause for admission to medical wards in certain rural hospitals in South Africa (Gelukspan[5]and Murchison[69] Hospitals).

However, in another study, admissions to medical wards at Hillbrow Hospital, Gauteng, were most frequently associated with diseases of the circulatory system followed by respiratory and infectious diseases.[8] An examination of medical admissions to Groote Schuur Hospital, Cape Town, in 1982 showed a predominance of circulatory systems pathology followed by endocrine, nutritional and metabolic disorders and infectious diseases.[7] These results were in line with other studies of hospital admissions in cities and towns where the increasing urbanisation and westernisation of the population is changing the morbidity pattern of diseases.[4, 67, 68]

Also, the results of a study at the University of Nigeria Teaching Hospital, Enugu, showed an increasing trend in medical admissions with non-communicable diseases accounting for 60.7% and communicable diseases accounting for 39.3%.[61] Diseases of the circulatory system was the most common diagnosis with respiratory diseases diagnosed in 5% of the admissions at a community hospital in Israel.[62] For a while, these diseases were associated with economic development and regarded as diseases of the rich. Now, at the dawn of the third millennium, the non-communicable diseases appear to be sweeping the entire globe, with an increasing trend in developing countries.[14]

2.5.1 Tuberculosis (TB) and HIV Infection

Tuberculosis is among the top 10 causes of global mortality.[39] It has been estimated that approximately one third of the world's population is infected with the tuberculosis bacillus and that each year 8 million people develop tuberculosis disease and about 2 million die of it.[14]

TB is the leading cause of death from a curable infectious disease.[38] The WHO African region has the highest estimate incidence rate (356 per 100 000 population per year).[39] The global increase is attributed to the striking proliferation of cases in countries of Europe since 1990 and in sub-Saharan Africa since the mid-1980s.[39]
TB is probably the disease that has most extensively decimated the world population throughout history and at present it is estimated that there are more patients with TB worldwide than ever before. [40]

South African is one of the 22 High Burden Countries that contribute approximately 80% of the total global burden of all TB cases. In 2004, South Africa had the seventh highest TB incidence in the world. During the past ten years the incidence of TB has increased, in parallel to the increase in the estimated prevalence of HIV in the adult population. This has resulted in the increasing recognition of the problems posed to public health by TB.[41]

High prevalence of TB among in-patients were reported in1998 in the Hlabisa District, South Africa[10] and in 2004 at Edendale Hospital in Pietermaritzburg, South Africa.[74]

The factors that have been identified as contributing to an increase in TB in developing and industrialise countries are: population growth, pandemic with HIV virus and also increased poverty.[40] At least 80% of TB patients are HIV positive in countries with high prevalence of HIV.[39]

The resurgence of TB cannot only be attributed to the above factors. A major contributing factor is likely to be non-implementation of modern control measures or the dismantling of existing programmes. With the improvement of TB control programmes, case detection and patient cure rates; there should be an accelerated decline in incidence and a reduction in the number of TB-related deaths.[42]

South Africa's TB and HIV epidemics continue to challenge health care providers and the country health systems. In particular, rising rates of pulmonary and extra-pulmonary TB, fuelled by a large burden of HIV in the country have seen a growth in the caseload of multi-drug resistant(MDR) TB and the emergence of outbreaks of extremely drug-resistant (XDR) TB.[43]

In South Africa the cure rates and treatment success has gradually increased for the five year period from 66% in 2000 to 70% in 2004. The defaulter rates remain high creating a barrier to achieving the targets for treatment success and cure and increasing the potential for drug resistance.[41]

In 2005, the South African Health Minister declared TB to be a national crisis. In order to achieve effective TB control a coordinated multi-sectoral approach was adopted throughout the country.[41]

In Gauteng, the incidence of TB cases per 100 000 has decreased from 424 in 2006/2007 to 379 in 2007/2008 and the total number of TB patients has decreased from 47 949 in 2006/2007 to 42084 patients in 2007/2008.[3]

2.5.2 Pneumonia

The burden of pneumococcal disease among adults in developing countries is neither widely known nor appreciated. The incidence of pneumococcal pneumonia is uncertain because a precise diagnosis cannot be obtained for most patients. [44]

Accurately determining the incidence of hospitalisation for pneumococcal pneumonia remains difficult because of the large variations between countries on hospitalisation rates for all patients with pneumonia. As quoted from Fedson *et al* [44], rates in the order of 45-60 cases per 100 000 elderly have been observed in studies in USA, Canada, Sweden, Denmark and Norway. Hospitalisation rates for pneumonia has increased among US adults age 64 to 74 years and age 74 to 84 years during the past 15 years.[45]

In the absence of population-based data on the incidence of pneumococcal disease among adults on developing countries, indirect estimates must be sought from other sources. Although high risk groups do not reflect the frequency of a disease in a population, they help define the upper limit for the range of incidence estimates.[44] For example, among migrant workers who entered the South African gold mines in 1913, the risk of pneumonia was 15-68 per 1000 people.[46] Sixty years later the annual incidence of "putative" pneumococcal pneumonia alone was 90 per 1000 persons.[47]

Hospital admission data of pneumonia can provide useful information on the burden of disease to health services. Of 20, 454 admissions to the adult medical wards in East and Southern African hospitals during the period1957-1990, 2300 (11%) were attributed to pneumonia.[44]

In a study conducted in Soweto, the South African community-based incidence estimates have been derived for bacteraemia pneumococcal disease by combining the microbiology records of the Chris Hani Baragwanath Hospital with the local census and HIV seroprevalence studies. In HIV-seronegative adults 18-40 years and >65 years in age, the annual incidence estimates for pneumococcal disease were 24 per 100 000 persons and 64 per 100 000 persons respectively. For HIV-seropositive adults 18-40 years in age, the annual incidence estimate was 197 per 100 000 persons.[48]

In another study at Chris Hani Baragwanath Hospital, the incidence of pneumococcal disease increased from 26 per 100 000 persons in 1986/1987 to 36 per 100 000 in 1996/1997, the increase was most marked among patients aged 25-44 years (24 cases per 100 000 persons to 45 cases per 100 000 persons) and ≥65 years (43 cases per 100 000 cases to 50 cases per 100 000 persons). Of the 161 patients with pneumococcal disease who tested for HIV in 1996/1997, 108 (67%) were HIV seropositive.[49]

A cohort of 1792 HIV-positive and 2970 HIV-negative South African miners were observed for 12 months starting in 1998. All cause hospitalisations and deaths were significantly associated with HIV infection. Tuberculosis, bacterial pneumonia, cryptococcus and trauma were the major causes of admission of HIV-positive patients whereas *Pneumocystis carinii* was an uncommon cause (respective admission rates 8.5, 6.9.2, 26.0, and 0.53 admissions per 100 person- years).[50]

2.6 LENGTH OF STAY

Black *et al* suggested a number of explanations for the recently identified increase in length of stay namely: Delayed discharge, long stay outliers, inappropriate referral and admission to hospital, co-morbidity among increasingly elderly population. It is recognised internationally that in order to solve the issue of delayed discharge and hospital congestion, competent medical and managerial skills will be needed.[51]

McCormick *et al* observed substantial inter-hospital variation in the lengths of stay for patients hospitalised with community acquired pneumonia. The findings where those medical outcomes were similar in patients admitted to the hospital with the shortest length of stay and those admitted to the hospital with the longest length of stay. The recognition that earlier discharge in many conditions may not be dangerous but may often be better for the patient.[51] The coordination of inpatient and outpatient services can also result in a reduced acute-care hospital stay and cost.[53]

Acute medical admissions were largely appropriate at the time of admission, but a substantial proportion of subsequent days of care were considered inappropriate due to organisational issues. The commonest reason was remaining in the hospital after the medical purpose for admission had been accomplished e.g. awaiting placement, transport home and delayed referral to appropriate level of care.[54] Variations in length of stay resulted from physician- and hospital- related behaviours rather than from patient-related factors.[55] However, a positive correlation has been observed between length of stay and disease severity. Teaching hospitalist care was associated with shorter length of stay in patients requiring close clinical monitoring and complex discharge planning, without adversely affecting readmissions or mortality rates.[56]

In England the decline in the LOS were attributed to the increased use of ambulatory care and the recognition that earlier discharge in many conditions was not dangerous and may often be better for the patient.[65] In contrast the findings at a tertiary institution in Kenya, the LOS remained constant over a ten year period which was attributed to the changing impact of HIV/AIDS.[66]

2.6 MORTALITY TRENDS

Studies from a tertiary hospital in South Africa[7] and a community hospital in Israel showed a reduction in mortality.[62] These results were in contrast to a study in a rural South African hospital where a large increase in deaths in the wards was noted which reflected the increased numbers of critically ill patients being admitted at that hospital as a result of HIV infection.[6]

CHAPTER 3
STUDY METHODS AND MATERIALS

3.1 STUDY DESIGN

The study was a retrospective trend analysis record review of adult patients admitted to the Internal Medicine Department at TMH. Quantified data was extracted from the medical admission ward registers and other supporting document across the study period.

3.2 STUDY SETTING

The study was conducted in the adult medical admission ward and the adult medical wards at TMH, an urban public hospital situated in the Ekurhuleni Metropolitan District of Gauteng Province, South Africa serving a population of approximately 750 000 people. The hospital is a regional hospital with 540 beds and a bed occupancy rate averaging 86.7 %.

3.3 STUDY PERIOD

The study period was from 1 January 2005 to 31 December 2005 and 1 January 2007 to 31 December 2007. Alternate years were selected as trends would be demonstrable. The challenges in selecting a larger study period were great, needless to mention the demand on time and resources.

3.4 STUDY POPULATION

All the patients that were admitted through the medical admission ward to the adult medical wards at TMH for the periods 1 January 2005 to 31 December 2005 and 1 January 2007 to 31 December 2007 were included in the study population. However, at this institution only patients older than 15 years of age were included. Patients younger than 15 years are admitted to the paediatric wards.

3.5 SAMPLING

The average annual number of medical admissions for the periods to be covered was estimated to be approximately 10,000. The sample was based on the assumption (from the researcher's experience) that 50% of medical admissions were HIV/AIDS related and if a 5% error at 95% confidence interval was required, a sample size of 385 medical records per year

was needed.[•] As the records review was based on the medical admission ward registers and related stored information, a systematic random sampling of 1 in every 25 records provided the required sample. The starting point was determined by selecting a random number between 1 and 25.The subsequent samples were selected by applying a sample interval of 25 until the last admission for the respective years was reached.

The samples were only included if the records were complete. "Complete" records were defined as those with:

- Patient demographic details (age and gender)
- Diagnosis at the time of separation
- Date of admission and date of separation
- Outcomes

If the information in the record could not provide the required data, the record was considered incomplete and therefore not used. As a replacement, the immediate next file was retrieved up to a maximum of two attempts.

3.6 MEASUREMENT TOOL

The measurement tool for the data collection was specially designed data capture sheets (see appendix A).

The following variables were included in the data capture sheets:

- Age
- Gender
- Date of admission
- Date of separation
- Length of stay
- Clinical diagnosis at time of separation
- ICD 10 coding[57]
- Outcome.

[•] 1.96^2*p*(1-p)/e^2, where p=% of admissions of HIV/AIDS; e=error

3.7 PILOT STUDY

The pilot study was conducted on a random review of two medical admission registers. This pilot study assisted in to validating the measurement tool and revealing possible limitations to the tool as well as what required clarification in the data capture sheet.

The following limitations were identified:

- Missing, untraceable or destroyed patient records were fairly common.
- Incomplete information in the ward registers.
- The variables utilised in the study were recorded by different people at different times in the medical records, thus there could have been information bias.
- Patients were admitted directly to the medical wards if the admission ward was full which meant that in terms of the hospital policy they were inappropriately placed.

Temporality was not an issue since the study was not investigating risk factors and exposures. Instead it was a record review, assessing trends over time.

3.8 DATA PROCESSING AND DATA ANALYSIS

The principal researcher extracted the data from the sample of medical records retrieved from the archives and captured the data on the data capture sheets. The data was captured on Excel version 5, 2007 where it was "cleaned" and then exported to Epi-Info version 3.5.1.[58] Analysis of the clean data was performed using Epi-Info version 3.5.1.[58] The data were further validated for miscoding and inconsistencies by running frequencies and cross tabulations. The fields which were a source of inconsistencies and miscoding were identified and corrected accordingly.

Variables were categorised as numerical and categorical. Descriptive analyses were carried out with continuous variables being summarised using measures of central tendency (mean, median, and mode) and measures of dispersions (variance, standard deviation, ranges and inter-quartile ranges). Categorical variables were summarised using frequencies and percentages. Chi-square tests were used to determine difference between comparison variables. Statistical applications using Student t-test and in some cases, 95% confidence intervals for means .The statistical significance was calculated at the 95% confidence level. The differences in values were considered to be statistically significant if the p-value was <0.05.

3.9 ETHICAL CONSIDERATIONS

The protocol was submitted to the Human Research Ethics Committee (Medical) of the University of the Witwatersrand for consideration. (Ethics number: M081143)
(see appendix B).

Permission to conduct the study and access to medical records at TMH was submitted to the Gauteng Department of Health for approval (see appendix C).

Precautions were taken to ensure that the study was conducted in an ethical manner. Information obtained respected patients' confidentiality, in that the information captured on the data sheet did not indicate the patient's name. All data was presented in aggregate.

Validity of the study

The validity of the study was ensured by:

- including a significant number of cases in the study
- objective data collection instruments
- the researchers' professional qualifications to conduct research appropriately
- consideration of ethical issues by guarding against personal, intellectual and professional biases during the study
- documentation of the development of the study by which the researcher reached his conclusions to provide for an audit trial and reconstruction of the study.

CHAPTER 4
RESULTS OF THE STUDY

4.1 INTRODUCTION

This chapter outlines the main results of the study. Demographic characteristics (age and gender) of the study samples are presented, followed by the lengths of stay and the clinical outcomes. The disease profiles pertinent to the study are also included.

4.2 RETRIEVAL RATE

As mentioned in the methodology a sample size of 385 medical records per year were required. Utilizing the systematic random sampling method, with the medical admission ward registers as the sampling frame; the records available for analysis were 266 for 2005 and 358 for 2007. The lower numbers of medical records available for analysis resulted from direct admissions to the inpatient medical wards. Hence, all these direct admissions to the inpatient medical wards were not recorded in the sampling frame. Furthermore, only 199 complete records out of 266 records were retrieved for 2005 and 334 complete records out of 358 records identified for 2007 were retrievable. Further investigation revealed that the lower retrieval rate in 2005 was a result of inactive records being destroyed prematurely than what the hospital policy prescribed. In addition, the improved retrieval rate in 2007 could be attributed to the introduction of enhanced filing system which allowed easy retrieval of records and prevented misfiling. In addition, a computerised patient registration was introduced at the hospital in 2006.

An overall retrieval rate of 69.22% (533/770) was achieved in this study. The following table demonstrates the retrieval rate for the total sample as well as each year surveyed.

Table 4.1: Retrieval Rate

Year	Sample	Retrieval Rate	
	n	n	%
2005	385	199	51.69
2007	385	334	86.75
Overall	770	533	69.22

If the information in the record could not provide the required data or the medical records could not be retrieved, the record was considered incomplete and was not used. For replacement, the immediate next file was retrieved up to a maximum of two attempts. The majority of the complete records were retrieved with the first attempt for both years of study (57.29% in 2005 and 73.55% in 2007). It has been noted that for the year 2007 a higher retrieval rate of 86.75% was achieved, as compared with 51.69% for the year 2005.

4.3 COMPARISON OF MEDICAL ADMISSIONS BETWEEN 2005 AND 2007

The total number of patients admitted to the hospital during 2005 and 2007 was 28 195 and 28 971 respectively.

The adult medical admissions accounted for 34.25% of the total adult admissions in 2005 and 36.32 in 2007 as illustrated in Table 4.2. A minimum increase of 2.07% was noted in the adult medical admissions between the two years of study.

Table 4.2: Adult Medical Admissions compared with Total Adult Admissions

Year	Total Adult Admissions n	Medical Admissions n (%)
2005	28 195	9 658(34.25%)
2007	28 971	10 522(36.32%)

4.4 DEMOGRAPHICS

The demographics distribution according to gender and age between the study groups were as follows:

4.4.1 Gender

In 2005, approximately half of the patients admitted, 50.25% [100/199(CI 43.1-57.4)] were males and 49.75% [99/199 (CI 42.6-56.9)] were females resulting in a male to female ratio of 1:0.99.

In 2007, 51.64% of the patients admitted were males [172/344 (CI 46.0-57.0)] and 48.36% were females [162/344 (CI 43.0-54.0)]. A male to female ratio of 1:0.94 was noted.

A slightly higher percentage was noted for male admissions in 2007 as compared to female admissions in 2005.

Table 4.3: Comparisons of gender between the study groups

Year	Total Patients	Male n (%)	95% CI	Females n (%)	95% CI	Male to female ratio
2005	199	100 (50.25)	43.1-57.4	99 (49.75)	42.6-56.9	1:0.99
2007	334	172 (51.64)	46.0-57.0	162 (48.36)	43.0-54.0	1:0.94

4.4.2 Age

The ages in the study groups ranged from 15 to 89 years in 2005 and 15 to 90 years in 2007. The mean age of males decreased from 42.3 years [standard deviation (SD) 13.88] in 2005 to 40.41 years (SD 14.35) in 2007, but this was not statistically significant (p-value <0.82). Similarly, no statistically significant difference was noted for the mean age of females admissions between the two years of study, which increased from 41.82 years (SD 17.22) in 2005 to 43.30 years (SD 17.08) in 2007 (p-value <0.09).

However, in 2005 male patients were older than female patients (42.30 years vs. 41.82 years) whereas, in 2007 male patients were younger than female patients (40.41 years vs. 43.30 years) (see Table 4.4 and Figure 4.1).

Table 4.4: Age of patients between the study groups

Year	Gender	Mean age, Y	Standard Deviation	Median age, y	Inter-quartile range, y
2005	Male	42.30	13.88	43.00	31-52
	Female	41.82	17.22	38.00	29-52
2007	Male	40.41	14.35	37.50	30-48
	Female	43.30	17.08	40.50	30-54

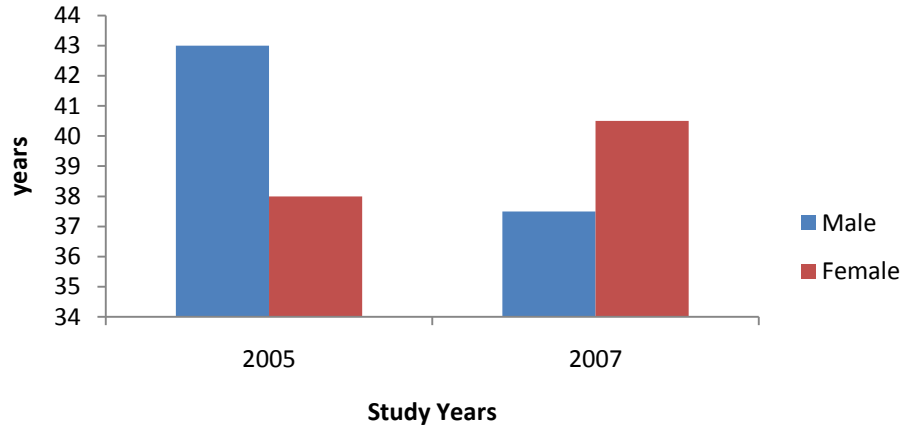

Figure 4.1: Comparison of median age between study groups

4.4.3 Age and gender distribution

The trends for age and gender distribution demonstrated fluctuations within and between the study groups.

The age and gender distribution contributing to the highest number of admissions were in the 25-34 years age group in both study groups (see Table 4.5 and Figures 4.2 and 4.3).
During 2005, of the 100 males admitted 28% were in the age group 25-34 years of age which represented the highest percentage of admissions from all age groups. Almost similar results were observed in the 2007 study group (29.65%).

During 2005, 26.26% of the females admitted were in the age group 25-34 years of age. This also represented the highest percentage of admissions from all age groups. Similarly, in 2007 this group had the highest percentage (24.07%) of admissions from all age groups.

In the youngest age group (15-24 years) there were more female admissions compared with male admissions in both years of study, 15.15% vs. 9.00% in 2005 and 12.35% vs. 9.88% in 2007. There was a slight increase in male admissions (9.00% in 2005 to 9.88% in 2007) whereas the female admissions decreased (15.15% in 2005 to 12.35% in 2007).

In the age group 35-44 years, more females were admitted in 2005 than 2007 (22.22% vs. 21.00%), whereas in 2007 more males (27.91% vs. 19.72%) were admitted than in 2005.

However, the percentage of male admissions increased from 21.00% in 2005 to 27.91% in 2007 and the female admissions decreased from 22.22% in 2005 to 19.72% in 2007.

The number of male admissions in 2005 as compared to female admissions was 21.00% vs. 12.12% for the age group 45-54 years of age in 2005. However, in 2007 for the same age group more females were admitted than males (20.37% vs. 16.28%). In this group the trend across the study years was a decline in male admissions and an increase in female admissions.

The pattern of admissions for the age group 55-64 years of age showed more male admissions in 2005, 14.00% vs. 10.10%, but in 2007 the admissions for females were slightly higher than males, 9.88% vs. 8.72%. The number of female patients was almost similar for both years of study (10.1% vs.9.88%). In contrast a higher number of male patients were admitted in 2005 as compared to 2007 in this age group.

Of interest, less male patients were admitted as compared to female admissions in the age group 65years and older in both years of study. Specifically, the number of female patients admitted was almost double the number of male patients for both study years (7% vs. 14%).

Table 4.5: Breakdown of age groups and gender between the study groups

		Age groups					
Year	**Gender (n)**	**15-24 n (%)**	**25-34 n (%)**	**35-44 n (%)**	**45-54 n (%)**	**55-64 n (%)**	**≥65 n (%)**
2005	Males (100)	9 (9.00)	28 (28.00)	21 (21.00)	21 (21.00)	14 (14.00)	7 (7.00)
	Females (99)	15 (15.15)	26 (26.26)	22 (22.22)	12 (12.12)	10 (10.10)	14 (14.14)
2007	Males (172)	17 (9.88)	51 (29.65)	48 (27.91)	28 (16.28)	15 (8.72)	13 (7.56)
	Females (162)	20 (12.35)	39 (24.07)	32 (19.72)	33 (20.37)	16 (9.88)	22 (13.58)

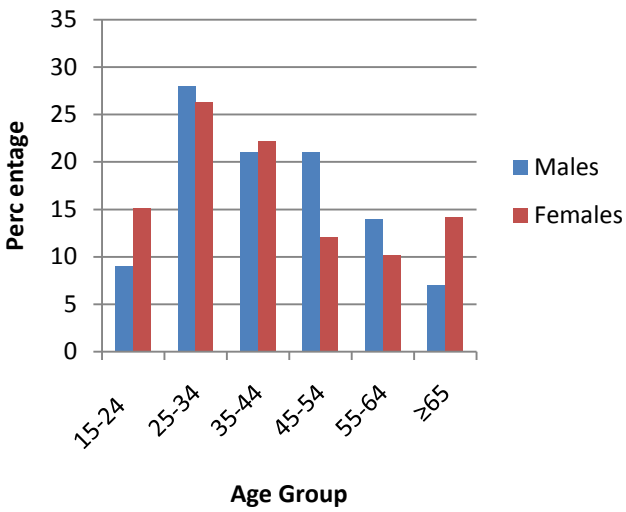

Figure 4.2: Breakdown of age groups between gender: 2005

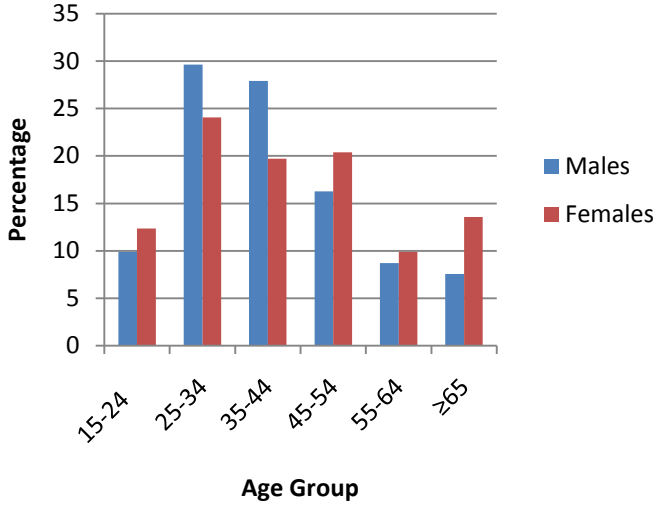

Figure 4.3: Breakdown of age groups between genders: 2007

4.5 LENGTH OF STAY (LOS)

4.5.1 Length of stay for 2005 and 2007

The LOS in the study groups ranged from ≤ 1 day to 32 days in 2005 and ≤ 1day to 30 days in 2007. The average LOS for 2005 was 6.16 days and for 2007 was 5.33 days

4.5.2 Comparison of LOS for gender between the study groups

Though the mean LOS for males decreased from 6.18 days (SD 5.23) in 2005 to 5.27days (SD 5.06) in 2007, this was not statistically significant (chi square test, $p<0.92$) (see Table 4.6).

For female patients the mean LOS decreased from 6.14 days (SD 4.30) in 2005 to 5.39days (SD 5.22) in 2007 but the decrease was not statistically significant (chi square test, $p>0.82$) (see Table 4.6).

Table 4.6: Length of Stay in days across the study groups

Year	Sex	Mean	Standard Deviation	Median	Inter-quartile range
2005	Male	6.18	5.23	5	3.0-8.0
	Female	6.14	4.30	6	3.0-8.0
2007	Male	5.27	5.06	4	2.0-7.0
	Female	5.39	5.22	4	2.0-7.0

4.5.3 Comparison of LOS for main diagnoses between the study groups

Generally for all groups of diseases a decline in LOS was observed in 2007 as compared to 2005 as indicated in Table 4.7.

The highest decline in LOS was noted in the diabetic patients which was 6.08 days in 2005 and declined to 4.48 days in 2007 (1.8 days difference).

The longest mean LOS (7days) was observed in TB patients in 2005 with the least difference in decline in LOS (0.36 days) in 2007.

Table 4.7: Mean LOS for main diagnoses between the study groups

	2005	2007	Decline in days
TB	7.00	6.64	0.36
Pneumonia	6.00	4.52	1.48
Hypertension	5.00	4.19	0.81
Diabetes	6.08	4.28	1.80
Cardiac Disease	6.42	5.92	0.50

4.6 OUTCOMES AT TIME OF SEPARATION

Table 4.8 and Figures 4.4 and 4.5 illustrate the outcomes at the time of separation.

4.6.1 Discharge

The majority of the patients admitted were discharged home for both years of study (86.93% in 2005 and 80.24% in 2007).

4.6.2 Transferred

The number of patients transferred almost trebled in 2007 as compared to 2005 from 5.53% in 2005 to 14.67% in 2007.

4.6.3 Absconded

There were minimal changes in the percentage of patients in the study groups who absconded; namely 0.5% and 0.6% in 2005 and 2007 respectively.

4.6.4 Refused hospital treatment

In 2007 the number of patients who refused hospital treatment increased slightly compared to 2005 (3.02% in 2005 to 4.19% in 2007).

4.6.5 Died

There were more deaths in 2005 (4.02%) as compared to 2007 (0.03%).

For all the patient outcomes between the study groups the differences were not statistically significant (chi square test, p <0.69).

Table 4.8: Outcomes at Time of Separation between the study groups

Outcome	2005 (n=199), n (%)	95%CI	2007 (n=334), n (%)	95%CI
Discharge	173 (86.93)	81.4-91.3	268 (80.24)	75.6-84.4
Transferred	11 (5.53)	2.8-9.7	49 (14.67)	11.1-19.0
Absconded	1 (0.50)	0.0-2.5	2 (0.60)	0.1-2.4
Refused hospital treatment	6 (3.02)	1.1-6.4	14 (4.19)	2.4-7.1
Died	8 (4.02)	1.8-7.8	1 (0.30)	0.0-1.9

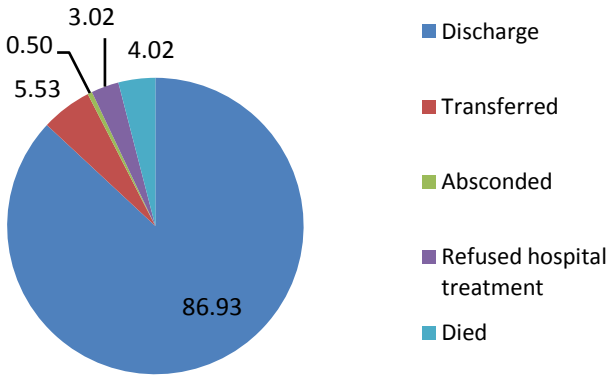

Figure 4.4: Outcomes at time of separation 2005

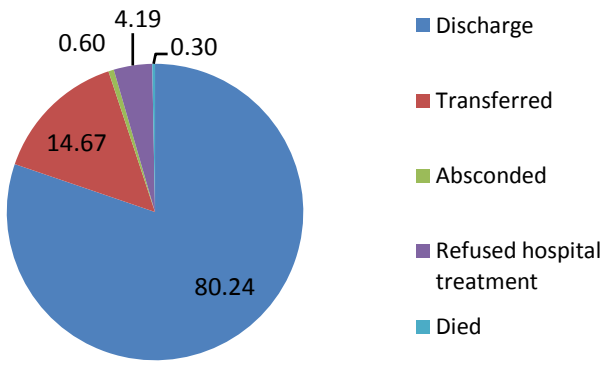

Figure 4.5: Outcomes at time of separation 2007

4.7 DISEASE PROFILE

This section describes the disease profile. The overall distribution of diagnoses in the major ICD 10 disease categories for 2005 and 2007 are shown in Table 4.9 and Figure 4.6.

Table 4.9: Percentages of Total Diagnoses in the Major ICD 10 Categories between the study groups

ICD 10	Disease Category	2005 (n=199) n (%)	95%CI	2007 (n=334) n (%)	95%CI
A00-B99	Infectious and Parasitic Diseases	76 (38.19)	29.0-49.4	106 (31.74)	25.2-39.9
C00-D48	Neoplasms	2 (1.01)	0.1-3.6	2 (0.60)	0.1-2.4
D50-D89	Diseases of the Blood	3 (1.51)	0.3-4.3	2 (7.48)	0.1-2.4
E00-E90	Endocrine, Nutritional and Metabolic Diseases	13 (6.53)	3.5-10.9	25 (7.49)	5.0-11.0
F00-F99	Mental and Behavioural Disorders	5 (2.51)	0.8-5.8	16 (4.79)	2.9-7.8
G00-G99	Diseases of the Nervous System	27 (13.57)	9.1-19.1	36 (10.78)	7.8-14.7
I00-I99	Diseases of the Circulatory System	31 (15.58)	10.8-21.4	52 (15.57)	11.9-20.0
J00-J99	Diseases of the Respiratory System	33 (16.58)	11.7-22.5	72 (21.56)	17.3-26.4
K00-K93	Diseases of the Digestive System	2 (1.01)	0.1-3.6	6 (1.80)	0.7-4.1
L00-L99	Diseases of Skin and Subcutaneous tissue	1(0.50)	0.0-2.8	1 (0.30)	0.0-1.9
M00-M99	Diseases of the Musculoskeletal System and Connective Tissue	1(0.50)	0.0-2.8	4 (1.20)	0.4-3.2
N00-N99	Diseases of the Genitourinary System	5 (2.51)	0.8-5.8	8 (2.40)	1.1-4.8
R00-R99	Symptoms, signs and abnormal clinical and laboratory findings, not elsewhere	0 (0.00)	0.0-1.8	4 (1.20)	0.4-3.2

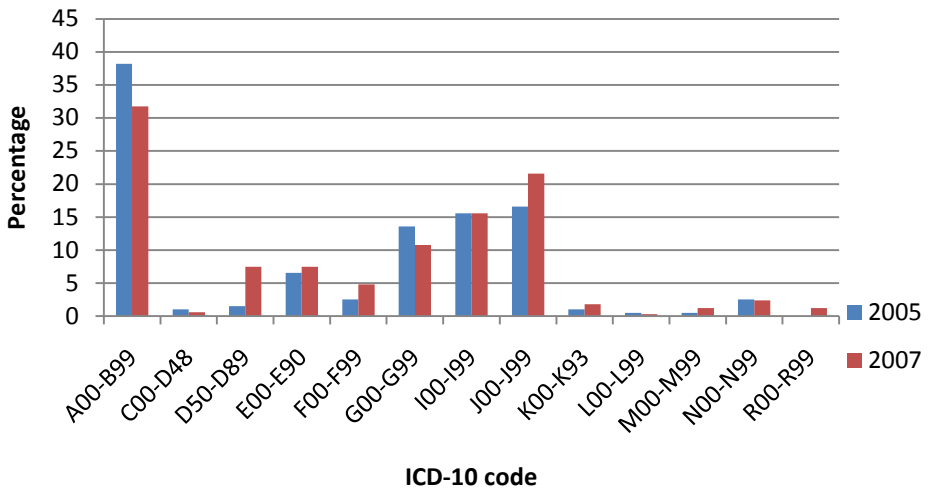

Figure 4.6: Percentages of Total Diagnoses in the Major ICD 10 Categories between the study groups

Infective and parasitic disorders were the main cause of admissions accounting for 38.19% (CI 29-49) in 2005 and 31.74% (CI 25-39) in 2007.

The number of patients admitted with diseases of the respiratory system increased in 2007 as compared to 2005 (16.58% to 21.56%).

Diseases of the circulatory system were represented equally in both years of study, but the number of patients admitted with diseases of the nervous system in 2005 (13.57%) declined 10.78% in 2007.

The percentage of patients admitted for endocrine, nutritional and metabolic disorders increased from 6.53% in 2005 to 7.49% in 2007.

The remaining categories represented smaller percentages of changes of the total diagnoses. There were significant differences amongst all the major ICD 10 categories (chi-square test, p=0.001).

4.7.1 Specific diagnoses

The distributions of diagnoses were expressed as the percentage of the patients in each study group in which a diagnosis was registered in subcategory of the major ICD 10 category.

The five main causes for medical admissions were tuberculosis (TB), pneumonia, hypertension, diabetes and cardiac diseases. The rankings were similar for both study groups as shown in Table 4.10 and Figure 4.7 and 4.8.

TB was the most frequent discharge diagnosis for both years of study. The percentage of the patients with TB were higher during 2005 [30.10% (CI 23-37)] as compared to 2007 [26.95% (CI 22-32)] but this was statistically insignificant (chi-square test, p-value=0.94).

Pneumonia was ranked as the second frequent discharge diagnosis for both years of study. No statistically significant difference was noted in the number of admissions during 2005 [10.55% (CI 6.7-15.7)] compared to 2007 [12.57% (CI 9.3-16.7)]
(chi-square test, p value= 0.89).

There were no statistically significant differences in the number of patients admitted with hypertension, diabetes and cardiac diseases between the study years (chi-square test, p-value >0.05). However, the study demonstrated increased trends in admissions for diabetes and cardiac diseases. For hypertension a decreasing trend was noted.

Table 4.10: The five most common groups of diagnoses between the study groups

Ranking	Diagnosis	2005 (n=199) n (%)	95%CI	2007 (n=334) n (%)	95%CI	p-value
1	Tuberculosis	60 (30.10)	23.9-37	90 (26.95)	22.3-32.1	0.94
2	Pneumonia	21 (10.55)	6.7-15.7	42 (12.57)	9.3-16.7	0.89
3	Hypertension	19 (9.55)	5.8-14.5	27 (8.08)	5.5-11.7	0.46
4	Diabetes	13 (6.53)	3.5-10.3	25 (7.49)	5.0-11.0	0.80
5	Cardiac Disease	12 (6.03)	3.2-10.3	25 (7.49)	5.0-11.0	0.98

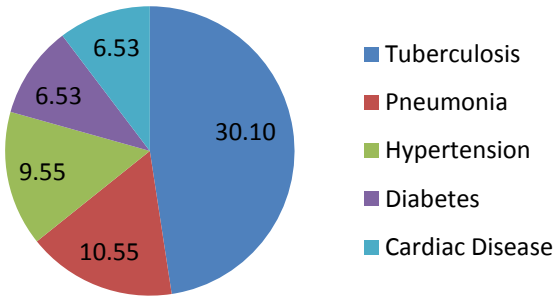

Figure 4.7: Top five diagnosis 2005

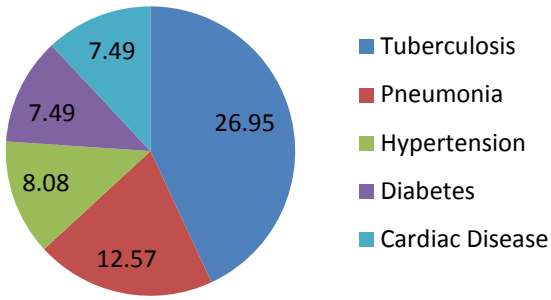

Figure 4.8: Top five diagnosis 2007

4.7.2 Age profile for specific diagnoses

Figures 4.9 and 4.10 demonstrate the admissions for the specific diseases as per age groups for 2005 and 2007 years of study.

TB was the discharge diagnosis with the highest percentage for both years 2005 and 2007, specifically for the age group 25-34years of age which accounted for 44.4% and 41.1% respectively. TB was consistently above 15% for all age groups in 2005. Despite, being above 15% in most age groups in 2007, it was much the same in the age groups 55-64 years of age (3.2%) and ≥65 years of age (2.8%).

Pneumonia was a common diagnosis in both study groups and peaked in the age group 15-24 of age (33.3%) in 2005 and in the age group 25-34 years of age (23.3%) in 2007. In 2007, the percentages of admissions in the age groups 55-64 years of age and ≥65 years of age were higher as compared to 2005; 12.9% vs. 4.17% and 8.57% vs. 4.76% respectively.

Hypertension peaked in the age group 45-54 years (24.4%) in 2005 and in the oldest age group (≥ 65 years) (28.8%) in 2007. However, in the youngest age group (15-25 years) there were no admissions for hypertension. The highest percentage of admissions for diabetes was in the age group ≥65 years of age (19.0%) in 2005 and in the age group 55-64 years of age (16.3%) in 2007. No admissions with hypertension were recorded in 2005 for the age group 45-54 years of age and for 2007 in the oldest group.

Most admissions for cardiac diseases were in the age group 55-64years of age (16.8%) in 2005 and in the age group ≥65 years of age (22.9%) in 2007. A notable observation was the absence of this diagnosis in the youngest age group for both study years.

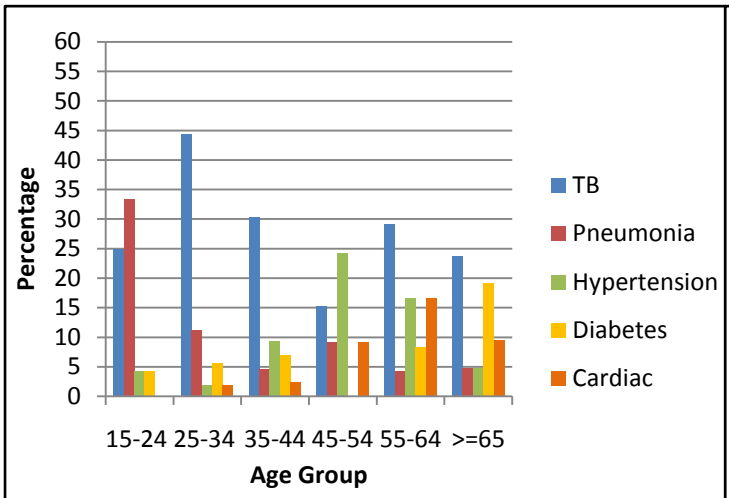

Figure 4.9: Admission profile by age group for the specific diagnoses: 2005

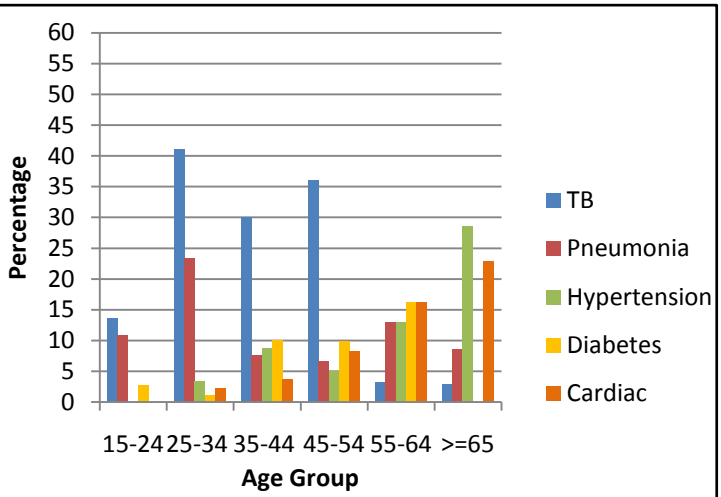

Figure 4.10: Admission profile by age groups for specific diagnoses: 2007

4.7.3 Gender profile for specific diagnoses

The percentages of the five main causes of admissions to the hospital according to gender distribution are outlined in Figures 4.11 and 4.12.

TB was the most frequent cause of admissions for male patients in both years of study with percentages of 29.0% and 30.8% respectively. Likewise, admissions to female adult medical wards showed that the most common reason for admissions was TB; 31.0% in 2005 and 22.8% in 2007. However, in 2005 there were more female admissions than male and in 2007 the male admissions exceeded those for females.

During 2005, more males (12.00%) were diagnosed with pneumonia than females (8.08%). For 2007 the admissions were almost similar for both sexes (12.79% and 12.33%).
More male patients were admitted hypertension with than females for 2005 (10.00 % vs. 9.09%). In 2007 the female admissions exceeded those for females (9.26% vs. 6.78%).

The most admissions for diabetes were observed in females. In 2005, the proportions of male to female admissions were 5.08% to 8.08%. In 2007, the percentage admissions for females were almost doubled as compared to that for males (5.33% vs. 9.88%)

The sub-category for cardiac diseases showed preponderance for male admissions across the study years. However, the number of male admissions decreased between 2005 and 2007.

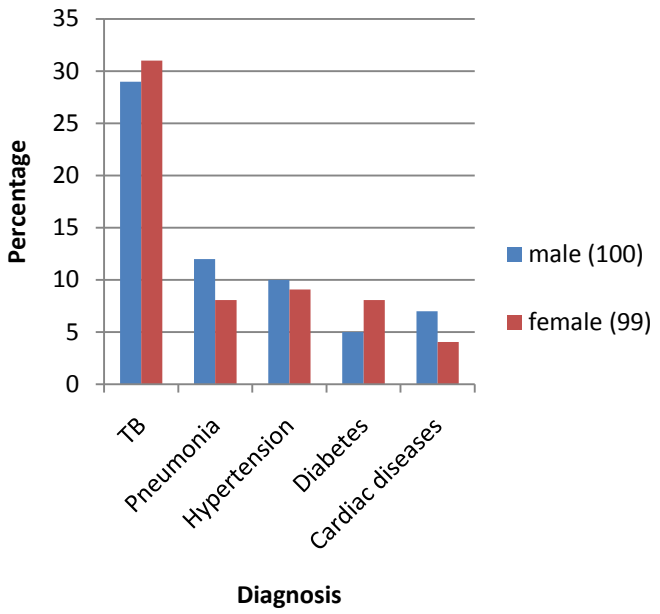

Figure 4.11: Gender and specific diagnoses 2005

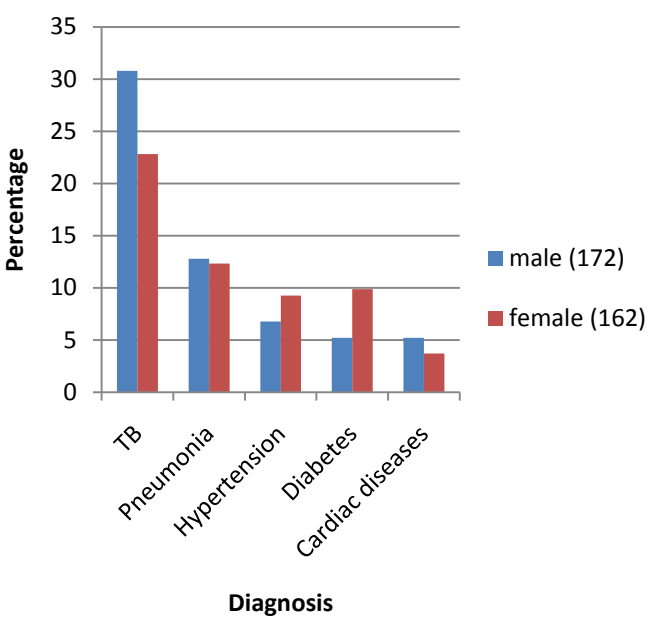

Figure 4.12: Gender and specific diagnoses 2007

4.7.4 Gender and age groups for specific diagnoses

The following Figures 4.13, 4.14, 4.15 and 4.16 demonstrate the findings of the admission profile by gender and age groups between the study years.

Males

The predominant discharge diagnosis for males of all age groups in 2005 and 2007 was TB with peaks of 39.29% and 41.18% respectively in the 25-34 years age groups. In 2007, the trend was above 29% up to age 55 years but decline to 6% thereafter. In contrast, in 2005 the TB admissions were above 25% after the age of 55 years.

In 2005 pneumonia accounted for (55.56%) of male admissions in the youngest age group: 15-24 years of age in 2005, whereas in 2007 there were no admissions for pneumonia in this age group. In contrast, in 2007 the highest percentage admissions for pneumonia (23.08%) were in the oldest age group: ≥65 years of age.

Another interesting observation was the absence of admissions for hypertension in the age 65 years and older in 2005, whereas in 2007, 23.08% of male patients were admitted for hypertension.

There were no male admissions for diabetes in 2007 for the age 65 years and older as compared to 42.51% admitted in 2005 for this age group.

Male patients with cardiac diseases accounted for an average of 14.29% age group of 55years and older in 2005. This percentage was found to be increased to an average of 24.37% in 2007 for the same age group.

Females

Similarly, the predominant discharge diagnosis for female admissions for 2005 and 2007 was TB with peaks of 50.00% and 41.03% respectively in the 25-34 years age groups. However, in 2007 there were no admissions for TB in the youngest age group 15-24 years of age and the 55 years old and older.

In 2005, female patients with pneumonia were admitted in all the age groups. A peak of 20.00% was noted in 15-24 years age group. In 2007, the highest percentage of female admissions was noted in the age group 25-34 years of age. No female admissions for pneumonia in the age group of ≥65 years were noted in 2007.

Female admissions for hypertension were found in all age group in 2005, whereas in 2007 no admissions were noted for the youngest age group (15-24 years old). A peak of 33.33% for female admissions was noted in 2005 for the age group 45-54 years of age, whereas in 2007 the peak (31.82%) of female admissions was observed in the ≥65 years of age group.

In 2005, 25.00% of the female admissions were diagnosed with diabetes for the age group 55-64 years of age. This was the highest percentage observed in 2005 in all the groups. There were no admissions with diabetes in the age group 45-54 years. The majority of female admissions in 2007 (18.875%) was found in the older the age groups of ≥55 years of age. No female admissions with diabetes were observed in the age group 15-24 years of age.

The highest number of female admissions (20%) for cardiac diseases in 2005 was noted in the age group 55-64 years of age. No female admissions were noted in the groups 15-24 years and 45-54 years of age. However, in 2007 female patients with cardiac diseases was admitted in all the age groups. A peak of 22.75% was observed in the 65 years and older patients.

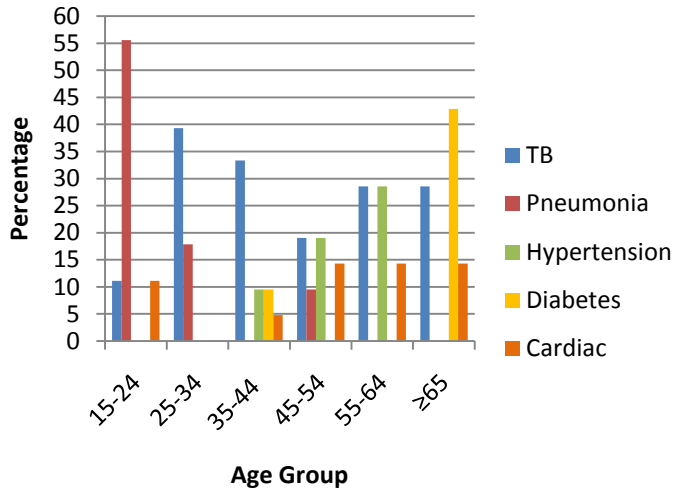

Figure 4.13: Males, age and specific diagnosis for 2005

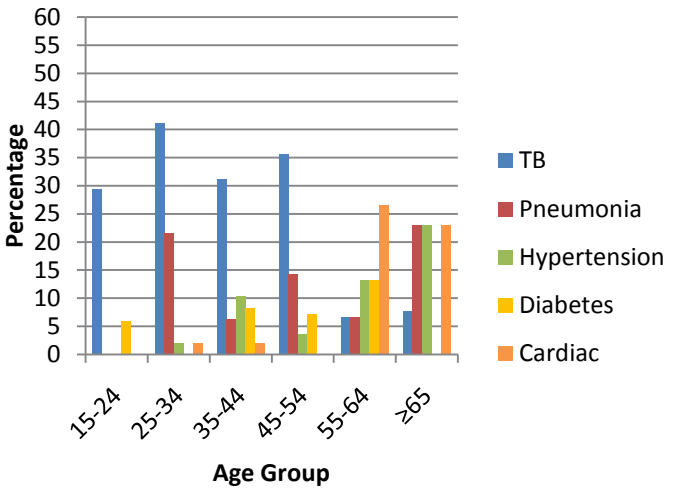

Figure 4.14: Males, age and specific diagnosis for 2007

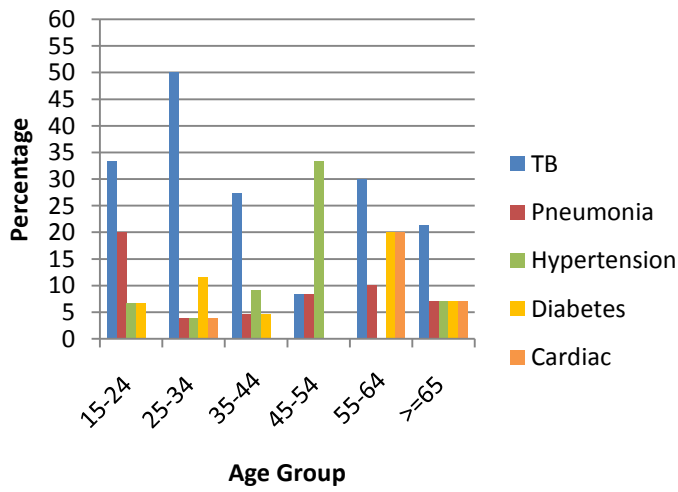

Figure 4.15: Females, age and specific diagnosis for 2005

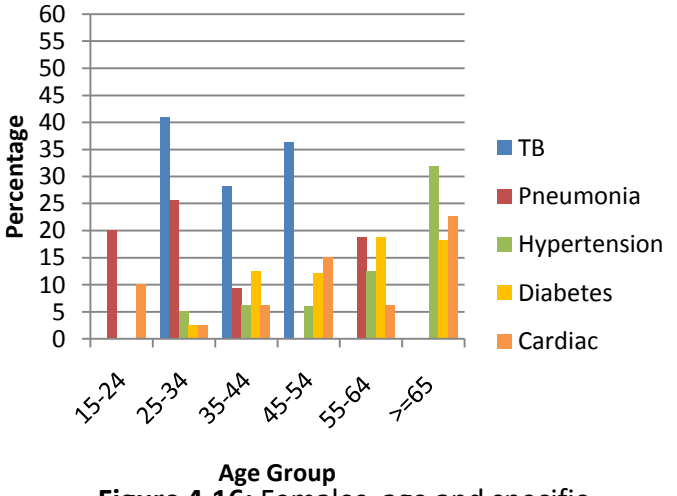

Figure 4.16: Females, age and specific diagnosis for 2007

CHAPTER 5
DISCUSSION

5.1 INTRODUCTION

To a large extent, the patterns of diseases in any community are reflected in the admissions to hospital, though specifically only the more serious diseases are represented. However, certain conditions tend to be treated on an out-patient basis and therefore the hospital admission rate is not necessarily an accurate reflection of the community disease profile. Nevertheless, the hospital admissions do reflect the overall disease patterns of the community and thus analysis of this provides material for comparison with diseases patterns in other countries and with the pattern seen in past as well as those anticipated future. Problems requiring further investigation or a new therapeutic approach serve as guidelines for revised public health interventions and more importantly to the hospital administration in prioritising and reviewing resource allocation, building, planning and staffing.[59]

In view of the above and since no previous analysis of admission trends to TMH were available; this study was for all admissions to the adult medical wards at TMH for the years 2005 and 2007.

5.2 RETRIEVAL RATE OF DATA

An overall retrieval rate of 69.22% for the two years of study was achieved. A lower retrieval rate, despite three attempts was noted in 2005 (51.69%) as compared to 2007 (86.75%). Further investigation revealed that the lower retrieval rate in 2005 was as a result of inactive records being destroyed prematurely than what the hospital policy prescribed. In addition, the improved retrieval rate in 2007 could be attributed to the introduction of enhanced filing system which allowed easy retrieval of records and prevented misfiling. In addition, a computerised patient registration was introduced at the hospital in 2006.

In developing countries like South Africa, the quality of medical records varies amongst institutions. Whilst some hospitals have computerised data storage systems, others may have

less advanced filling. Unfortunately, good record keeping is essential in providing an invaluable database for researchers, as morbidity statistics are scarce.[4]

Despite obvious limitations associated with the hospital records for example inaccurate recording of discharge diagnosis, omissions and poor documentation of patients information, misfiling, lost files and the like, the analysis of the data had still yielded a representative picture of the prevailing trends in medical admissions at TMH and to some extent the diseases of the community served by the institution. However, the difficulties in collecting reliable information are great and would require a large commitment of time and resource.

5.3 COMPARISON OF MEDICAL ADMISSIONS BETWEEN 2005 AND 2007

The general hospital admissions for 2005 were 28 195 and 28 971 for 2007. Of these, the adult medical admissions for 2005 were 9 658 and 10522 for 2007. Surprisingly, only a 2.07 % increase of medical admissions was noted across the two years of the study.

The minimal increase in medical admissions at TMH could be the result of the following:

- the inadequate number of beds available in the hospital, with consequent channelling of patients to other institutions
- awareness of bed shortages among medical staff
- the pressure of limited beds resulting in more selective admissions
- the increased use of ambulatory care
- senior medical staff were more involved in the process of the final decision to admit a patient
- the introduction of protocols to improve quality of care and proper bed management
- increased length of stay resulting in a decrease bed turnover rate
- selection bias for hospitalisation by patients.

In a community hospital in Israel there was no significant change in the admission rate in the period examined. The yearly admission rate was 10 482 ± 386.[62]

In contrast, data presented in studies at Hlabisa Hospital, a rural hospital in South Africa, showed a 275% increase of adult medical admissions over a 12 year period[6] and at G F Jousted Hospital, in Manenburg, Cape Town, showed a 44% increase over an 11 year period.[7]

5.4 DEMOGRAPHICS

5.4.1 Gender

The study demonstrated a slight difference in admissions for males than females with a male to female ratio of 1:0.99 for 2005 and 1:0.94 for 2007. This finding closely paralleled the gender trends in Gauteng, which indicates that there are slightly more males (51.4%) than females (48.6%) according to figures of Statistics SA 2007.[35] Other studies from various hospitals in South Africa[5, 7, 10] and a teaching hospital in Nigeria, Ilorin[60] have documented similar trends in gender admissions to adult medical wards.

However, studies in a teaching hospital in Nigeria, Enugu[61] and a community hospital in Israel[62] found that females were admitted more often than males. This was attributed to the overall trend of longer survival rates and higher morbidity for women.[62] In a rural South African hospital the ratio of admissions of women as compared to men increased over the the12-year study period from 0.95 to 1.08.[6] This may be due to the rural areas having a larger population of females as well as the stress associated with poor socio-economic conditions.

5.4.2 Age

The ages of the patients ranged from 15 years to 90 years with a mean of ± 40 years. The mean age of admission for males declined from 42.3 years to 40.4 years whereas, those for females increased from41.8 to 43.3. This reflected the impact of HIV/AIDS and related infections on young male adults, who more often than not place little demands on the health care services.[4,6] The rollout of the Anti-Retroviral Treatment programme, increased access to health care, health education and promotion and awareness campaigns encouraged patients to seek health care earlier. A study in Nigeria, Enugu showed an increasing trend in medical admissions and those affected were in the 30-60 years range.[61] It was evident that the admission pattern of young adults in this hospital community closely resembled those in developing countries.[7]

In contrast, trends in studies from developed countries demonstrated that the older patients were responsible for the majority of the admissions.[9, 21, 44, 45] A study in a community hospital in Israel, showed that patients age 75 years and older (6.9% of the local adult population) were responsible for a large number of the admissions.[62]

5.4.3 Age and gender distribution

The patients in the age groups between 25 years to 34 years accounted for the majority (28% to 30 %) of admissions with a predominance of male admissions in both study groups. After the age 55 years there was a decline in the number of patients admitted. South Africa is experiencing a rapidly emerging HIV epidemic, amongt the productive adult age group that is likely to have serious implication for health care services.[10]

A study conducted at G F Jooste Hospital, in Manenburg, Cape Town, showed that at admission the ages of the patients ranged from 13 years to 87 years (mean: 40 years), with males in the age group 20 to 30 years predominating.[4] The study at Gelukspan Hospital, North West Province showed similar trends.[5]

There was some evidence of a downward trend in admissions for the age 65 years and older between the study period. However the female admissions in this group were almost doubled as compared to the male admissions for both study years. This was again probably due to the overall trend of longer survival rates and higher morbidity for women.[62]

5.5 LENGTH OF STAY

A decline in the mean length of stay (LOS) was noted for both sexes across the study groups. For the five main discharged diagnosis, a decline in LOS was also observed. However, this was higher than the 4.8 days as prescribed by the Gauteng Department of Health and Social Development.

The increase in the annual admissions at TMH without an appropriate increase in the beds led to a rapid patient "turnover" which was reflected in the shorter mean duration of stay. This left the system with little flexibility and very vulnerable to small fluctuations in demand. The current trend of increased demand for efficiency, substitution between inpatient and outpatients and changes in clinical management are likely to continue.

The longest mean LOS (7days) with the least difference in LOS (0.36 days) was for TB. This was due to the increasing global burden of TB that is linked to HIV infection.[63] The global importance of TB and its association with the HIV/AIDS pandemic was acknowledged by the Millennium Development Goals.[64] The HIV/AIDS epidemic has had an important impact on

demand for adult TB medical care.[10] The decline in LOS for TB at TMH, despite being small, was attributed to the improved turnaround time of sputum results by the laboratory staff, the increased availability of convalescent TB beds within the province, TB wards in General Hospital, Specialised TB Hospitals, the follow-up treatment of TB patients by primary health care clinics and the introduction of a community-based therapy program in which patients treatment was directly monitored for compliance. Finally, HIV-related disease has emerged as the dominant challenge in sub-Saharan Africa with the size of the epidemic calling for a response beyond the traditional boundaries of TB control.[64]

The highest decline was noted in the diabetics (1.8 days) followed by the pneumonia group (1.48 days). These patients were frequently discharged earlier when they appeared to be on their way to recovery. Furthermore, the use of ambulatory care was encouraged. This was also an indication of the substantial demand for hospital care for the growing numbers of adult TB and non-TB clinical AIDS admissions at the expense of other chronic diseases.

In tandem, with the increase in admission rates, both average LOS and the number of beds per 1000 population have shown a consistent reduction in developed and developing countries across the world.[9] Unfortunately, LOS is only governed to a degree by the convalescent needs of the patient as bed space is at a premium and patients are frequently discharged when they appear to be on their way to recovery.[59]

However, the findings of a study in New York concluded that reduced LOS was associated with close clinical monitoring, patients in whom real-time adjustment of therapy is critical, those with high acuity and those for whom complex discharge planning is necessary.[56] In England the decline in the LOS were attributed to the increased use of ambulatory care and the recognition that earlier discharge in many conditions was not dangerous and may often be better for the patient.[65]

The decline in LOS observed at TMH and other studies were in contrast to findings at a tertiary institution in Kenya, where the LOS remained constant over a ten year period attributed to the changing impact of HIV/AIDS.[66]

5.6 OUTCOMES AT THE TIME OF SEPARATION

5.6.1 Discharge

As anticipated the majority patients admitted during both years of study were discharged home. The decline in the percentage of patients discharged home in 2007 (80.23%) as compared to 2005 (86.93%) was most probably the result of the implementation of down referral system to a District Hospital. The down referral system was initiated in 2006 after a memorandum of understanding was signed with Germiston Hospital, whereby, four patients (two males and two females) were transferred daily from TMH to Germiston Hospital for admission and further management. These patients needed level one clinical management and were therefore inappropriately admitted at TMH, a level two hospital. These patients were regarded as transferred out rather than being discharged.

5.6.2 Transferred

There was a marked increase in the number of patients transferred out. This was the result of transferring patients who were inappropriately admitted at TMH to Germiston Hospital. In addition, patients were transferred to a tertiary hospital if the capacity or competency at TMH could not manage the patient.

5.6.3 Absconded

A minimal change was noted in patients who absconded. This was due to the increased security surveillance implemented at TMH. Furthermore, it was policy for all admitted patients to wear hospital attire once admitted in order to prevent them from leaving the hospital unnoticed.

5.6.4 Refusal of treatment

A slight increase in patients who refused hospital treatment was observed. This was partly due to the patient's awareness of the Patients Rights Charter of permitting them to refuse treatment provided that such refusal does not endanger the health of others. Other common reasons were family commitments, unhappiness with the service provided, staff attitudes and perception in delays in investigations.

5.6.5 Deaths

The proportion of patients dying as inpatients dropped from 4.02% in 2005 to 0.3% in 2007. The reduction in mortality could be due to many factors, amongst others;

- improved ICU services at TMH
- transferring of complicated cases to tertiary hospitals for further management
- effects of the ART programmes
- seriously ill patients tend to seek health advice from different health facilities
- improved home-based care and hospice facilities
- patients choosing to die at home.

.

Studies from a tertiary hospital in South Africa[7] and a community hospital in Israel showed similar findings.[62] These results were in contrast to a study in a rural South African hospital where a large increase in deaths in the wards was noted which reflected the increased numbers of critically ill patients being admitted at that hospital as a result of HIV infection.[6]

5.7 DISEASE PROFILE

The study highlighted that infectious and parasitic diseases were the most common indication for admission to the hospital during the period of study. The second most common admission was due to diseases of the respiratory system followed closely by diseases of the circulatory system. Infectious diseases were shown to be the main cause for admission to medical wards in certain rural hospitals in South Africa (Gelukspan[5]and Murchison[69] Hospitals).

However, in another study, admissions to medical wards at Hillbrow Hospital, Gauteng, were most frequently associated with diseases of the circulatory system followed by respiratory and infectious diseases.[8] An examination of medical admissions to Groote Schuur Hospital, Cape Town, in 1982 showed a predominance of circulatory systems pathology followed by endocrine, nutritional and metabolic disorders and infectious diseases.[7] These results were in line with other studies of hospital admissions in cities and towns where the increasing urbanisation and westernisation of the population is changing the morbidity pattern of diseases.[4, 67, 68]

Also, the results of a study at the University of Nigeria Teaching Hospital, Enugu, showed an increasing trend in medical admissions with non-communicable diseases accounting for 60.7% and communicable diseases accounting for 39.3%.[61] Diseases of the circulatory system was the most common diagnosis with respiratory diseases diagnosed in 5% of the admissions at a community hospital in Israel.[62] For a while, these diseases were associated with economic development and regarded as diseases of the rich. Now, at the dawn of the third millennium, the non-communicable diseases appear to be sweeping the entire globe, with an increasing trend in developing countries.[14]

5.7.1 Specific Diagnoses

The study demonstrated that five predominant causes for medical admissions at TMH in order of ranking were TB, pneumonia, hypertension, diabetes and cardiac diseases. These findings were consistent for the period during which the study was undertaken. The percentage of admissions across the two study years for TB and cardiac diseases decreased. However, increasing trends in admissions were observed for pneumonia, hypertension and diabetes.

5.7.1.1 Tuberculosis

Among hospitalised patients at TMH, TB was common in the young and was first diagnosed on admission. High prevalence of TB among in-patients were reported in1998 in the Hlabisa District, South Africa[10] and in 2004 at Edendale Hospital in Pietermaritzburg, South Africa.[74] The incidence of TB cases is increasing rapidity in sub-Saharan Africa, and South Africa has the seventh highest per capita incidence in the world.[71] So-called traditional TB in developing countries with low rates of HIV infection responds to well-organised control programmes.[64] Locally, diagnosis and treatment of active TB patients is primarily ambulatory and is undertaken at primary care centres. All patients diagnosed with TB are routinely placed on standard anti- tuberculosis treatment.

The establishment of the TB focal point and the Antiretroviral Clinic in 2005 at TMH most probably has lead to the improvement of the TB control programmes. Programmes have promoted the awareness in the community and among health professionals of the signs, symptom, infectiousness and devastation of TB, the benefits of early detection, the association of TB and HIV and the importance of universal HIV testing of suspected TB patients. The strengthening and broadening of the DOT strategy together with the deployment

of community health workers within the districts may have resulted in vigorous tracing of treatment defaulters and active TB cases among contacts of known patients. The patients' commitment to antiretroviral treatment programme will impact positively on TB control. Antiretroviral treatment reduces the incidence of HIV-associated TB by more than 80% in areas where both diseases are endemic. Early detection and effective treatment of TB constitute its best prevention and must be the focus of public and primary health care strategies for TB control.[73]

Another study reported that there were an estimated 8.9 million new cases of TB in 2004, fewer than half of which were reported to public health authorities and WHO. About 80% of individuals newly diagnosed with the disease every year live in the 22 most populous countries. The WHO African region has the highest estimated incidence rate (356 per 100 000 population).[39]

The rise in TB rates in the last decade is related to the HIV pandemic[63] and TB is the leading cause of death of people infected with HIV worldwide, accounting for 11% of deaths.[71] this has resulted in the increasing recognition of the problems posed to public health by TB.[41]

The factors that have been identified as contributing to an increase in TB in developing and industrialise countries are: population growth, pandemic with HIV virus and increased poverty.[40] At least 80% of TB patients are HIV positive in countries with high prevalence of HIV amongst others, Asia, Bangladesh, China and China.[39] More admissions attributed to HIV and increased incidence of tuberculosis have been documented previously in a rural Kenyan hospital.[70]

The HIV/AIDS epidemic has had an important impact on demand for adult TB and general medical care in a rural South African District hospital.[10] In South Africa, it is estimated that 60% of TB patients aged 15-45 years are HIV positive.[71] A study from a district hospital in Hlabisa District, South Africa demonstrated a high prevalence of TB among inpatients.[6]

The resurgence of TB cannot be attributed to the above factors only. The other major contributing factors were likely to be non-implementation of modern control measures or the replacement of old existing programmes. With the improvement of TB control programmes, case detection and patient cure rates; there should be accelerated decline in incidence and a reduction in the number of TB-related deaths.[42] The prevention and control of HIV and TB, the extension of WHO DOTS programmes and a focused effort to control HIV-related TB in countries with high HIV prevalence are matters of great urgency.[63]

TB is probably the disease that has most extensively decimated the population throughout history and at present it is estimated that there are more patients with TB worldwide than ever before.[40]

5.7.1.2 Pneumonia

The burden of pneumococcal disease among adults in developing countries is not widely known. The incidence of pneumococcal pneumonia is uncertain because a precise diagnosis cannot be obtained for most patients. [44]

Pneumonia accounted for most of the admissions of the rest of the load due to communicable diseases. Various reasons may be postulated for the increased trend in pneumonia, amongst others the patients accessing medical care at the inappropriate level of care between the years of the study. This was evident by reduction in the LOS of approximately 1.5 days for patients admitted with pneumonia. These patients were either discharged or transferred to lower levels of care. As indicated in the methodology the diagnosis was the diagnosis captured on admission therefore, the other possibilities could be that the diagnosis of *Pneumocystis carinii* was overestimated or TB was under diagnosed.

Efforts to prevent pneumonia should include reducing preventable co-morbid chronic conditions and improving the vaccination programmes in high risks patients.

5.7.1.3 Hypertension and cardiac disease

Hypertension and cardiac disease were among the top five medical admissions in this study. The number of admissions for hypertension decreased over the study period. However, the percentage of admissions for cardiac diseases increased over the study periods. This could be due to the success of health promotion strategies and secondary prevention through drug treatment at the primary health care level.

Hypertension incidence has remained fairly stable in Gauteng, with over 200 new cases per 100 000 people (aged 45 years and older) diagnosed annually.[35] While the general trend is increased levels of hypertension in most developing countries, the prevalence rates across nations vary widely.[37] A survey by Steyn *et al* revealed high levels of hypertension in the South African community.[33]

Hypertension is an important worldwide public-health challenge because of its high frequency and concomitant risks of cardiovascular and kidney disease.[36] It has been identified as the leading risk factor for mortality and is ranked third as a cause of disability-adjusted life-years. While the general trend is increased levels of hypertension in most developing

countries, the prevalence rates across nations vary widely.[37] The global trend of all leading chronic diseases-cardiovascular disease, cancer and diabetes are increasing with the majority occurring in developing countries and predicted to increase substantially over the next two decades.[19]

The national prevalence rate of 21% for hypertension in South Africa is equivalent to other industrialised countries and greater than that of many developing countries. With nearly half of the population still rural and much of the urban population now adopting Western lifestyles, it is likely that the prevalence will increase with time.[33]

With recent improvement in the control of malnutrition and infectious diseases, cardiovascular diseases (CVD) have emerged as major causes of morbidity and mortality in many African countries.[29].The high prevalence of hypertension worldwide has contributed to the present pandemic of cardiovascular disease.

5.7.1.4 Diabetes

The number of patients admitted with diabetes increased between the study periods. The burden of disease due to chronic disease such as diabetes and hypertension is on the increase in Gauteng.[2] According to the District Health Information System, 2007, the incidence of diabetes is 112.3 per 100 000 population 45 years and older. Self-reported prevalence of diabetes in Gauteng is 2.6% for males and 3.5% for females.[28]

It is assumed that the increase in the number of patients with diabetes will be most pronounced in nations undergoing socio-economic development including urbanization.[24, 25]

Diabetes is an important public health challenge in both economically developed and developing countries. A large number of individuals with diabetes are unaware of their condition and among those with diagnosed diabetes, treatment is frequently inadequate.

5.7.2 Age and gender profile for specific diagnoses

The age and gender profiles were informative of the diseases affecting age groups and gender. The most frequent causes of admissions were communicable diseases: TB and pneumonia among 25 and 34 years of age and non-communicable: hypertension, diabetes and cardiac diseases in the age groups 45 years of age and older. The gender difference was a high proportion of admissions due to communicable diseases among males and a high proportion of non-communicable diseases among females

The study demonstrated TB as a major cause of admissions for both males and females between the study periods. However, the study showed that the number of male TB patients

increased whereas the number of female TB patients decreased across the study period. Furthermore, among adults aged 25-34 years for both males and females, the diagnosis of TB was prominent between 2005 and 2007.

The study therefore, can conclude: with higher admissions rates and high morbidity rates at the peak of their economically active years, men bear the brunt of the TB epidemic. Gender differences in the experience and expression of illness may play a role in accessing health care. In poor countries, women have more barriers to cross before accessing general health care services. The reasons for this are many: apprehension about the disease and its lengthy treatment, lack of resources, stigma, non acceptance of the probable diagnosis, shopping for an "acceptable" or "better" diagnosis and lack of psychological support.[72]

In a study at Chris Hani Baragwanath Hospital in Gauteng, the increased in the incidence of pneumococcal disease was most marked among patients aged 25-44 years.[49] In a cohort study, 1792 HIV-positive and 2970 HIV-negative South African miners were observed for 12 months starting in 1998. All cause hospitalisations and deaths were significantly associated with HIV infection with TB and pneumonia being the main causes for admissions.[50]

The major contributors among the non- communicable diseases were diabetes, hypertension and cardiac diseases. Most frequently affected were for the age groups older than 45 years with a higher proportion of females. The trend is increasing as a consequence of lifestyle changes brought about by urbanisation in developing countries engaged in socio-economic transition. This is further promoted by risks factors like smoking, alcohol, physical inactivity and unhealthy diet.[13,14]

In studies of impact of disease, it is not always easy to distinguish between communicable and non-communicable diseases. More generally, evaluation of disease burden is complicated by the overlapping between different diseases and conditions. For example, it is well known that infections affect its management and conversely, uncontrolled diabetic people are more exposed to infectious diseases.[14]

CHAPTER 6

CONCLUSIONS AND RECOMMENDATIONS

6.1 CONCLUSIONS

The main conclusions of the study have been drawn as follows:

- The medical admissions for both years of the study exceeded a third of the total number of adult admissions (34.25% in 2005 and 36.32% in 2007).
- There was no major increase in the number of medical admissions (2.07% across the study periods).
- When gender was considered separately, a predominance of admissions for males was observed in both years with a male to female ratio averaging 1:0.94.
- The age trends indicated that the mean age for males' admissions decreased (42.3 years to 40.41 years), whereas the mean age for females' admissions increased (41.84 years to 43.30 years) between the years of study.
- The majority of the admissions were in the younger (15-34 years) age groups for both years.
- Generally, the average length of stay shortened by one day across the study period.
- The disease profile for both male and female admissions was similar with infectious and parasitic disorders with diseases of the respiratory system featuring prominently.
- The most common indication for admission was TB (30.10% in 2005 and 26.95% in 2007) and it was prevalent in the relatively younger age group (25-34 years of age).
- Non-communicable diseases were prevalent in the older age group (45years and older). Hypertension was the leading diagnosis (9.55% in 2005 and 8.08% in 2007).
- The majority of the patients were discharged home for both years of the study. Although in 2005 more patients were discharged home as compared with 2007, a considerable number of patients were transferred to other institutions as part of an up-referral or down-referral system.
- Importantly, the number of deaths decreased over time.
- The difficulty in the retrieval of medical records at TMH was clearly demonstrated with a retrieval rate of 51.69% in 2005 and 86.75% in 2007.

6.2 RECOMMENDATIONS

- The study has provided a baseline against which to measure admission trends at TMH. The estimates can be used to expand the epidemiological database. A repetition of this study in subsequent years will provide a follow up against which to measure changes in hospitalisation, rank priorities, rationalise the planning of effective interventions and evaluate their impact.

- Since this study only analysed medical admissions, which did not include patients seen in the outpatients department per se, a further study is needed to analyse the disease profile and number of patients treated on an outpatient's basis. It is anticipated that information yielded from such a study would serve to inform the planning and management ambulatory care services.

- The challenges in collecting more reliable data are great, needless to mention the demand on time and resources required for a large scale effect. To introduce effective ICD 10 coding, the personnel involved in coding, whether medical or non medical staff will require careful training. Coded information might be stored and analysed with relative ease using the current generation of computer technology at TMH.

- The introduction of an electronic medical record will ensure safe storage of reliable patients' general and medical information. Computerised systems are an infinite mine for statistical and medical data. The accessibility of reliable information is invaluable in the planning and development of hospital services. In addition, an analysis of hospital statistics would assist in determining the causes of morbidity in an area as a whole. This, in turn can facilitate public health planning and intervention.

  Unfortunately it is beyond the scope of this research to offer recommendations for such a complex issue as the electronic medical record system. At the simplest level, the recruitment of ward clerks may be a starting point.

- Expanding and sustaining the Antiretroviral Treatment programmes will reduce the progression of communicable diseases associated with HIV/AIDS with a consequent

reduction on the strain of hospitalisation. Since HIV is dramatically fuelling the TB epidemic in South Africa, a necessary prerequisite for TB prophylaxis is knowledge by patients of their HIV status. Hence, necessitates the rapid expansion of HIV voluntary counselling and testing in South Africa.

TB should not be a burden on hospital beds, as it is a fully treatable and preventable disease that is amenable to ambulatory diagnosis and treatment even in the presence of HIV infection.

- Admission trends at secondary hospitals need to be seen in the context of a poorly developed community health services. At the primary health care level, the lack of suitable facilities, results in many patients being referred directly to secondary or tertiary hospitals. The inadequate primary health care and community hospital services does not only result in a deficiency of health care provision at an appropriate time, level and cost in the community, but also causes undue pressure on the secondary hospital system, thus preventing optimal use of its expensive resources.

  Strengthening the relationship between the primary health care and district hospital system and regional hospital services, will lead to better plan strategies and should ensure the optimal use of resources in the future.

- Secondary screening and prevention at primary care level could reduce the hospitalisation for key diseases. These interventions include the identification and treatment of those who are at more risk. However, cost effective implementation interventions for TB, AIDS, hypertension and diabetes fails when they are scaled up to cover increasing numbers of patients at a poorly developed primary care level.

- The construction of the District Hospital in Daveyton in the Ekurhuleni Metropolitan District should commence as soon as possible. This will partially alleviate the problem of bed shortages in the Ekurhuleni Metropolitan District.

- There should be a defined referral network system that guides clinicians at all levels when referring patients or sharing cases across different levels. In addition, an up-to-

date resource list, including maps, and contact telephone numbers of facilities that receive patients being referred for specific services according to Provincial guidelines should be available. A reliable communication system must be accessable to ensure speedy referrals (e.g. telephone, radio-phone or cellular phone). This must be supported by staffing levels and skills and essential equipment that meet minimum requirements for the level of healthcare facility. This would ensure that users utilise the system at the correct point of entry.

REFERENCES

1. The Boksburg-Benoni Hospital *Golden Jubilee Brochure 1905-1955*. In-house printing, 1955.
2. Gauteng Department of Health. Gauteng Department of Health *Annual Performance Plan 2009/2010-2011/2012.* Government Printers, March 2008.
3. Gauteng Department of Health. Gauteng Department of Health *Annual Report.* Government Printers, 2008.
4. Marszalek J, De Villiers PJT. Morbidity profile of admissions to GF Jooste Hospital, Mannerburg, Cape Town, *SA Fam Pract* 2006;**4(**6):15a-15e.
5. Kakembo ASL, Walker BF, Walker ARP, Causes if admission of African patients to Gelukspan Hospital, North West Province, South Africa. *Ease African Medical Journal* 1996;**73(**11):746-751.
6. Read A, Dedicoal M, Lalloo D, Gilks CF. Trends in Adult Medical Admissions in a Rural South African Hospital between 1991 and 2002. *J. Acquir. Immune Defic. Syndr*. 2005; **40**(1):53-56.
7. Benator SR, Saven A. Morbidity trends in the Medical Wards at Groote Schuur Hospital- 1971 and 1982. *SAMJ* June 1985;**87**:968-974.
8. Dean MPG, Gear JSS. Medical Admissions to Hillbrow Hospital, Johannesburg, by discharge diagnosis. *SAMJ* May 1986;**69**:672-673.
9. Hensher M. International trends in provision and utilisation of hospital care. *BMJ* September 1999;**25(**319):845-848.
10. Floyd K, Reid RA, Wilkonson D, Gilks CF. Admission trends in a rural South African Hospital during the early years if the HIV Epidemic. *JAMA* 1999;**252**:1087-1090.
11. Gilly A, Bhatt SM, Muhindi D, et al. The changing impact of HIV/ADIS in Kenyatta Hospital, Nairobi from 1988/89 through 1992 to 1997. *AIDS* 2000;**14**:1625-1631.
12. Lewis DK, Callaghan M, Phiri K, et al. Prevalence of HIV and AIDS among adults admitted to medical and surgical wards in Blantyre, Malawi. *Trans R Soc Trop Med Hyg.* 2003;**97**:96-96.
13. Boutayeb A, Boutayeb S. The burden of non-communicable diseases in developing countries. *International Journal for Equity in Health.* 2005;**4(**2**):**54-62.

14. Biutayeb A. The double burden of communicable and non-communicable diseases in developing countries. *Royal Society of Tropical Medicine and Hygiene.* 2006;**100:** 191-199.
15. World Health Organization: The World Health Report. *Today Challenges.* 2003; Geneva.
16. Burden of Disease Unit: *The global burden of disease in 1990.* [http://www/hsph.harvard.edu/organizations/bdu/GBDseries.html]. Accessed on February 2009.
17. Mathers CD, Bernard C, Iburg KM, Inoue M, Fat DM, Shibuya K, Stein C, Tomijima N, Xu H. *Global Burden of Disease in 2002 data sources, methods and results.* Paper 54 World Health Organization.
18. Lopez AD, Mathers CD, Ezzati M, Jamison DT, Murray CJL. Global and regional burden of disease and risks factors, 2001; systematic analysis of population health data. *Lancet* May 2006;**367:**1747-1757.
19. Yach D, Hawkes C, Gould L, Hofman KJ. The Global Burden of Chronic Diseases. *JAMA* 2004; **291**:2616-2622.
20. International Diabetes Federation (IDF). *Action Now: A joint initiative WHO and IDF* 2003. [www.idf.org/home/index.cfm?node=1079]. Accessed on March 2009.
21. Fall CHD. Non-Industrialized countries and affluence *British Medical Bulletin*. 2001; **60**: 33-50.
22. King H, Albert RE, Herman WH. Global burden of Diabetes, 1995-2005: prevalence, numerical estimates, and projections. *Diabetes Care* 1998;**21**(a):1414-1431.
23. Amos AF, McCarty DJ, Zimmet P. The rising global burden of diabetes and its complications: estimates and projections to the year 2010. *Diabet Med* 1997;**14**(5): 51-58.
24. Grela A, Hirsch NC, Pramming SK. The changing world demography of type 2 diabetes. *Diabetes/Metabolism Research and Previews* 2002;**19**(1):3-7.
25. Vaughen P, Gilson L, Mills A. Diabetes in developing countries: its importance for public health. *Health Policy and Planning* 1989;**4**(2):97-109.
26. Mohan V, Deep M, Deepa R, et el. Secular trends in the prevalence of diabetes and impaired glucose tolerance in urban South India. *Diabetologia* 2006;**49**(6):1432-1438.
27. Motala AA. Diabetes trends in Africa. Internal Symposium held at EASD, Jerusalem, Israel September 2000.

28. Department of Health South Africa Demographic and Health Survey 2003 Preliminary Report. Department of Health, 2004.
29. Akinboboye O, Idris O, Akinkugbe. Trends in coronary artery disease and associated risk factors in Sub-Saharan Africans. *Journal of Human Hypertension* 2003;**17**:381-387.
30. Edington GM. Cardiovascular disease as a cause of death on the Gold Coast African. *Royal Society of Tropical Medicine and Hygiene* 1954;**48**(5):419-425.
31. Akinkugbe OO, Nicholson DM, Cruickshank JK. Heart disease in blacks of Africa and the Caribbean. *Cardiovasc Clin* 1991;**21**:377-391.
32. Vaughan JP. A brief review of cardiovascular disease in Africa. *Royal Society Trop Med and Hyg* 1979;**71**:226-231.
33. Steyn K, Gasiano TA, Bradshaw D, Laubshcer R, Fourie J. Hypertension in South African adults: results from the demographics and Health Survey, 1998. *Journal of Hypertension* 2000;**19**:1717-1725.
34. Seedat YK, Seedat MA, Hackland DB. Prevalence of Hypertension in the urban and rural Zulu. *Journal of Epidemiology and Community Health* 1982;**36**:256-261.
35. Gauteng Provincial Government Department of Health. *Heath in Gauteng* Status Report 2006/2007. Published by Gauteng Department of Health.
36. Kearney PM, Whelton M, Reynolds K, Munter P. Whelton PK, He J. Global Burden of Hypertension. *Lancet* 2005;**365**:217-223.
37. Ezzati M, Lopez AD, Rodgers A, Van der Hoorn S, Murray CJ. Selected risk factors and global and regional burden of disease. *Lancet* 2002;**360**:1347-1360.
38. World Health Organization. The World Health Report 2004: changing history. Geneva: World Health Organization, 2004.
39. Dye C. Global Epidemiology of tuberculosis. *Lancet* 2006;**367**:938-940.
40. Marnero A, Caminero JA, Rodrigue R, Billo NE. Towards elimination of tuberculosis in a low income country: the experience of Cuba, 162-1997. *Thorax* 2000;**59**:39-45.
41. Department of Health. The Draft National Infection Prevention and Control Policy of TB, MDR-TB and XDR-TB. April 2007. Pretoria. Government Printers.
42. Suarex PG, Uvatt CJ, Alarcon E. The Dynamics of Tuberculosis in Response to 10 years of Intensive Control Effort in Peru. *The Journal of Infectious Disease* 2000;**184**:437-478.

43. London L. Confinement in the management of drug resistant TB: the unsavoury prospect of balancing individual human rights and public good. *SAJBL* June 2008; **1**(1):11-19.
44. Fedson DS, Anthony J, Scott G. The burden of pneumococcal disease adults in developed and developing countries: what is known and is not known Vaccine 1999; **17**:S11-S18.
45. Fry AM, Shay DK, Holman RC, Curns AT, Anderson MD. Trends in Hospitalization for Pneumonia among persons aged 65 years or older in the United States, 1998-2002. *JAMA* 2004:**294**:2712-2719.
46. Maynard GD. An enquiring into the etiology, manifestation and prevention of pneumonia among natives on the Rand from tropical areas. *Publ S Africa Inst Med Res* 1913;**1**:1-101. (cited from ref. 44).
47. Austrian R, Douglas RM, Schiftmae G, Coetzee AM, Koornhof HJ, Hayden-Smith S, Reid RDW. Prevention of pneumococcal pneumonia by vaccination. *Trans Assoc Am Physician* 1976;**39**:121-35. (cited from ref. 44).
48. Jones N, Hucbner R, Khoosal M, Crewe-Brown H, Klugman K. The impact of HIV on streptococcus pneumonia bacteraemia in a South African population. *AIDS* 1998; **12**:2177-84.
49. Karstaedt AS, Khoosal M, Crewe-Brown HH. Pneumococcal bacteraemia in adults in Soweto, South, South Africa, during the course of a decade. *Clin Infect Disease* 2001; **33**:610-4.
50. Cerbett EL, Churchyard GJ, Chlaralambo S, Samb B, Moloi V, Clayton TC, Grant AD, Hayes RJ, De Cock KM. Morbidity and Mortality in South African Gold Miners: Impact of untreated disease due to HIV. *Clin Infect Diseases* 2002;**34**:1251-1258.
51. Black D, Pearson M. Average length of stay, delayed discharge and hospital congestion *BMJ* 2002;**325**:610-611.
52. McCormick D, Fine MJ, Coley CM, Marne TJ, Lave JR, Obrosky DS, Kapoor WN Singer DE. Variation in length of stay in patients with community-acquired pneumonia: are shorter stays associated with worse medical outcomes. *Am J Med* 1999;**107**(1):5-12.
53. Holmes J, Alcabes P, Zampane C, Selwyn P, Friedland GH, Rawlings J. Reducing length of stay for HIV + patients at an urban medical center. *Int Conf AIDS* 1994;**10**:34 (abstract number 428B).

54. Smith HE, Bryce A, Carlisle L, Jones JM, Scarpello J, Partia C. Appropriateness of acute medical admissions and length of stay. *JR Coll Physicians* 1997; **31**(5):527-32.
55. Feagen BG, Marie TJ, Lau CY, Wheeler SL, Wong CJ, Vandervoort MK. Treatment and outcomes of community-acquired pneumonia at Canadians hospital. CMAJ 2000; **162**(10):1415-1421.
56. Southern WN, Berger MA, Bellin EY, Hailpera SM, Armsten JH. Hospitalist care and length of stay in patients requiring complex discharge planning and close monitoring. *Arch Intera Med* 2007;**167**(10):1869-74.
57. World Health Organization Central Statistical Services. Internal Statistical Classification of Diseases and Related Health Problems. ICD10. 10th revision, 2004.
58. World Health Organization. Centre for Disease Control. *Epi-Info Software* (computer program). Version 3.5.1. Atlanta GA, August 2008.
59. Shaper AS, Shaper L. Analysis of medical admissions to Mulago Hospital. *East African Medical Journal* 1958 Dec **35**(12):647-668.
60. Sanya EO, Akande TM, Opadijo G, Olarinoye JK, Bojuwoye BJ. Patterns and outcomes of medical admissions of elderly patients seen at University ofv Ilorin Teaching Hospital, Ilorin. *Afr J Med Sci* 2008 Dec;**37**(4):375-81.
61. Ike SO. The trends of admissions into the medical wards of the University of Nigeria Teaching Hospital, Enugu. *Niger Clin. Pract.* 2008 Sep;**11**(3):185-92.
62. Stein GY, Zeidman A. Trends in admissions to internal medicine wards in a *community hospital in Israel. European Journal of Internal Medicine.* 2006;**17***:281*-285.
63. Corbett CL, Watt CJ, Walker N, Maher D, Williams BG, Raviglione MC, Dye C. The growing burden of TB Global trends and interactions with the HIV epidemic. *Archives of Internal Medicine* 2004 May;**163**(9):1009-1021.
64. Corbett EL, Marston M, Churchyard CJ, De Cock KM. Tuberculosis in sub-Saharan Africa: opportunities, challenges and change in the era of antiretroviral treatment. *Lancet* 2006;**367**:936-37.
65. Jarrett DRJ, Hilton A, Seddon DJ. Average length of stay, delayed discharge and hospital congestion. *BMJ* 2003;**326**:48-54.
66. Arthur G, Bhatt SM, Muhindi D, *et al*. The changing impact of HIV/AIDS on Kenyatta National Hospital, Nairobi from 1988/1989 to 1997. *AIDS* 2000;**14**:1625-31.
67. Ndjeka NO,Ogunbanjo GA. Disease patterns in the medical wards of a rural South African hospital. *S A Fam Pract* 2003;**45**(4):14-5.

68. Mayet GHF. Lifestyle disease patterns in Indian South Africans. *S Afr Med J* 1982;**61**:966-72.
69. Dunn MJ, Dunn SE, Walker ARP, Walker BF. Causes of admissions of rural African patients to Murchison Hospital, Natal South Africa. *J Roy Soc Health* 1994;**114**(1):33-8.
70. Torrens JK. HIV and tuberculosis in a rural hospital in Kenya. *East Afr Med J.* 2000;**77**:185-188.
71. World Health Organization. The WHO Global Report. Global TB Control. Surveillance, planning, financing 2003: 108-109. Geneva, Switzerland:2003.
72. Rangan S, Uplekar M. Gender perspectives of access to health and Tuberculosis care. In Gender and Tuberculosis: An international research workshop May 24-26 1998. Goteborg, Sweden.
73. Badri M, Wilson D, Wood D. Effect of highly active antiretroviral therapy on incidence of tuberculosis in South Africa. *Lancet* 2002;**359**:2059-2064.
74. Alvarez GG, Thembela FJ, Muller FJ, Clinch J, Singhal N, Cameron DW. Tuberculosis at Edendale Hospital in Pietermaritzburg,KwaZulu Natal, South Africa. *Int J Tuber Lung Dis* April 2004;**8**(12):1472-1478.
75. Colvin M, Dawood S, Kleinschmidt I. Prevalence of HIV and HIV-related diseases in the adult medical wards of a tertiary hospital in Durban, South Africa. *Int J STD AIDS* 2001;**8**:1472-1478.

APPENDIX A

DATA CAPTURE SHEET

Year:.....

Observation codes	Age (Years)	Sex (M/F)	Date of Admission	Date of Separation	LOS	Diagnosis	Outcome
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							

APPENDIX B

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG

Division of the Deputy Registrar (Research)

HUMAN RESEARCH ETHICS COMMITTEE (MEDICAL)
R14/49 Naidoo

CLEARANCE CERTIFICATE	**PROTOCOL NUMBER M081143**
PROJECT	Trends in Adult Medical Admissions at Tambo Memorial Hospital, Gauteng between 2005and 2007
INVESTIGATORS	Dr A Naidoo
DEPARTMENT	School of Public Health
DATE CONSIDERED	08.11.28
DECISION OF THE COMMITTEE*	Approved unconditionally

Unless otherwise specified this ethical clearance is valid for 5 years and may be renewed upon application.

DATE 08.11.28 **CHAIRPERSON** .....
(Professor P E Cleaton Jones)

*Guidelines for written 'informed consent' attached where applicable

cc: Supervisor : Prof S Naidoo

DECLARATION OF INVESTIGATOR(S)

To be completed in duplicate and **ONE COPY** returned to the Secretary at Room 10004, 10th Floor, Senate House, University.
I/We fully understand the conditions under which I am/we are authorized to carry out the abovementioned research and I/we guarantee to ensure compliance with these conditions. Should any departure to be contemplated from the research procedure as approved I/we undertake to resubmit the protocol to the Committee. **I agree to a completion of a yearly progress report.**

PLEASE QUOTE THE PROTOCOL NUMBER IN ALL ENQUIRIES...

APPENDIX C

DEPARTMENT OF HEALTH

ACTING CHIEF DIRECTOR: HOSPITAL SERVICES

DR S. B MFENYANA

Tel: (011) 355 3494
Fax: 086 5585931
Email: Sandile.Mfenyana@gauteng.gov.za
Mervlin.Deoraj@gauteng.gov.za

MEMORANDUM

TO: DR A. NAIDOO – CHIEF EXECUTIVE OFFICER – TAMBO MEMORIAL HOSPITAL

FROM: DR S. B MFENYANA – ACTING CHIEF DIRECTOR: HOSPITAL SERVICES

Cc: DR MAZAMISA N- DIRECTOR: HEALTH SUPPORT

DATE: 29TH AUGUST 2008

SUBJECT: PERMISSION TO ACCESS BED LETTERS FOR THE PURPOSES OF THE MPH PROGRAAME.

MESSAGE:

This letter serves to grant permission to Dr Naidoo, Chief Executive Officer of Tambo Memorial Hospital to access patients bed letters, for the purposes of the MPH Programme ONLY, in light of improving the skills capacity of the Gauteng Health Department, senior management services. This permission is granted in line with the code of ethics on research.

The information of the Gauteng Health Department will be used for the purpose of research and it will be used discreetly and not for PUBLIC CONSUMPTION, and that confidentiality will be contained at all times. We grant the permission in good faith, with the notion and understanding that the abovementioned clause will be upheld.

Yours faithfully

Acting Chief Director: Hospital Services