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Profile of ICU bed requests at Helen Joseph hospital

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Profile of ICU bed requests at Helen Joseph Hospital

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A research report submitted to the Faculty of Health Sciences, University of the Witwatersrand, in partial fulfilment of the requirements for the degree

of

Master of Medicine in the branch of Anaesthesiology

Johannesburg, 2015

Declaration

I, Hemal Hurri declare that this research report is my own work. It is submitted for the admission for the degree of Master of Medicine in the branch of anaesthesiology at the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination at this or any other University.

Signature

…….. day of …….. 2015

Abstract

Intensive care units (ICU) in South Africa are resource restricted environments. Of the total number of public hospitals in SA, only 23% have been shown to have ICU facilities. Compounding the limited physical bed status is the scarcity of trained ICU staff. ICU facilitates more intense monitoring and management of patients.

The aim of this research was to compile a profile of all the ICU admission requests at Helen Joseph Hospital (HJH). A contextual, prospective, descriptive research design was followed in this study. Data was collected during one winter and one summer month in 2012.

A total of 139 patients were included in the study. The median age was 44 years. The majority of patients (79%) were under the age of 60 years. The overall admission rate was 35.25% and the most common reason for admission was mechanical ventilation. Reasons for refusal were 41% assessed as too ill, 30% assessed as too well and 29% were refused due to a lack of resources. Patients admitted to the ICU had a 77.55% survival rate. The relationship between ICU admission and 30 day outcome was statistically significant.

This study has described the patients for whom ICU beds were requested at HJH, the reasons for admission or refusal and the 30 day outcome for all patients.

The lack of resources has proven to be a significant issue in the ICU. Survival rates correlate with international trends and triage methods appear to be effective.

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Chapter One

Overview of the research

1.1 Introduction

This chapter provides an overview of the study and includes the background to the study, the problem statement, aim and objectives, research definitions, demarcation of the study field, ethical considerations, research methodology, significance, reliability and validity and an outline of the study.

1.2 Background

Intensive care (ICU) in South Africa (SA) is a resource restricted environment. Of the total number of public hospitals in SA, only 23% have been shown to have ICU facilities. Furthermore, 86% of these beds are concentrated between Gauteng, Kwazulu-Natal and the Western Cape. The bed: population ratio in these provinces is 1:20 000 but ranges from 1:30 000 to 1:80 000 in other provinces. ICU beds make up 1.7% of the total number of public sector beds. (1)

Compounding the limited physical bed status is the scarcity of trained ICU staff. Scribante et al. (2) showed that only 25.6% of ICU nurses are ICU trained, 3.8% were neonatal ICU nurses, 49.2% are registered nurses and 21.4% are semi-professional nurses. The nurse to bed ratio is 1.1 nurse per ICU bed. The international gold standard for nurse to bed ratio was determined by Williams and Clark (3) to be 6.7, which SA and many developing countries, fall short of. Bhagwanjee et al. (4) highlighted the shortage of qualified intensivists, with only 4% of all units being led by a qualified intensivist. The intensivist deficit in 2007 was estimated to be 291 which impacts on cost and quality of care.

ICU facilitates more intense monitoring and management of patients. The average potential survival benefit has been noted as 17.4 percentage points. Septicaemia, respiratory failure and central nervous system disorders have greater potential survival benefits, reaching 26

percentage points, however this benefit decreases to 8 percentage points for elective patients post-operatively. (5)

Given the limited availability of ICU beds together with the resource restrictions, physicians making admission decisions have a stressful task in correctly triaging patients. The process involves a preadmission evaluation of the patient in an attempt to determine the severity of the condition. The final decision is based on bed availability, survival prospects, and patient and family wishes. Grading systems such as the Acute Physiological And Chronic Health Evaluation (APACHE II) and Simplified Acute Physiology Score (SAPS) aims to help summarise a clinical picture and categorise patients by severity, however, the final decision making process is more complex. No evidence based critical care guidelines for ICU admissions are available specifically for the South African setting. The South African Society of Anaesthesiologists has published critical care admission guidelines, but they are not evidence based. Nesibopho was founded in 2004 to improve the quality of care in ICU in SA. Amongst its board members are world renowned South African intensivists. Nesibopho has a set of ICU and high care admission guidelines that has been endorsed by the Critical Care Society of Southern Africa. (6)

1.3 Problem statement

ICU beds are a scarce resource at Helen Joseph Hospital (HJH). A limited number of beds serve a population with a large burden of disease. Medical practitioners request ICU beds for patients they deem in need of intensive care; however the decision to admit into ICU remains with the ICU consultant on call, consultants being from different disciplines. No formal triage such as APACHE or SAPS scoring or admission guidelines are currently in place. The profile of the number of admissions, refusals and reasons for admission or refusal has not been determined.

1.4 Aim and objectives

1.4.1 Aim

The aim of this research was to compile a profile of all the ICU admission requests at HJH during one winter and one summer month in 2012 and the reasons for the requests being either accepted or refused and the outcome of patients.

1.4.2 Objectives

The objectives of this study were to:

- describe the number of ICU bed requests
- describe the demographics of the patients for whom ICU beds were requested
- compare admissions and refusals with age and discipline
- compare discipline with age and season
- compare patient outcome at 30 days with admission or refusal, age and discipline
- describe the reasons for admissions and refusals
- describe the outcome at 30 days with reason for refusals.

1.5 Research assumptions

The following definitions were used in this study.

Study months: this study will refer to August 2012 as the winter month and December 2012 as the summer month. Together, they will be referred to as the seasons.

Aggregated data: standard ICU forms filled in during the consultation process as well as admission and discharge books in ICU and the ward. No patient records will be looked at.

1.6 Demarcation of study field

The study was conducted at HJH's ICU in Johannesburg. HJH is a regional hospital affiliated to the University of the Witwatersrand. The ICU is a closed adult unit with ten beds that serves HJH and Rahima Moosa Mother and Child Hospital. It is a referral ICU for the surrounding private hospitals when patients cannot afford continued private healthcare and also assists with the overflow from other public ICUs in Gauteng.

1.7 Ethical considerations

Approval to conduct the study was obtained from the relevant authorities.

In consultation with the chairman of the ethics committee, no patient consent was necessary. Aggregated data was collected anonymously from ICU consultation forms and ICU or ward admission and discharge books onto data collection sheets.

The study was conducted in adherence with the principles of the Declaration of Helsinki (7) and the Good Clinical Research Practice Guidelines for South Africa (8).

1.8 Research methodology

1.8.1 Research design:

A contextual, prospective, descriptive research design was used in this study.

1.8.2 Study population

The study population was all the completed consultation forms for ICU beds requested at HJH.

1.8.3 Research sample

The sample size was realised by the number of ICU bed requests during the study months using a consecutive, convenience sampling method. Inclusion criterion was all the completed consultation forms for ICU beds requested at HJH. The exclusion criteria were illegible and incorrectly completed consultation forms.

1.8.4 Data collection

Data was collected from completed ICU consultation forms as well as ward and ICU admission and discharge books. Data was collected during one winter month and one summer month during 2012. All patients for whom ICU beds were requested were examined by ICU medical officers or registrars who then presented the clinical assessment to the consultant on call who made the final triage decision. The details of the consultation were documented on a routine ICU consultation form and a copy of the form was kept in the ICU. The researcher captured data from the relevant documents onto a data collection sheet and inserted it into an Excel spread sheet.

1.9 Data analysis

The data collected during the study was analysed in consultation with a biostatistician using Stata version 13.1. Descriptive and inferential statistics were used.

1.10 Significance of the study

Internationally and in SA, ICU is an expensive and limited resource. In order to utilise this resource optimally, triage of patients is vitally important. Triage assists in isolating the patients that would benefit the most from intensive care (9).

HJH has a ten bed ICU. No triage or admission policy is currently in place. Patients are either admitted or refused admission by the consultant responsible for the unit on the day of request. The number of potential ICU patients frequently exceeds the available beds, this in the absence of epidemics or mass-casualties. (10)

Understanding the profile of bed requests, admissions, refusals and subsequent outcome is key to enhancing the appropriate use of this scarce resource.

1.11 Reliability and validity

Measures were put into place to ensure the reliability and validity of the study.

1.12 Research report outline

This study is comprised of the following chapters.

Chapter One:	Overview of the research
Chapter Two:	Literature review
Chapter Three:	Research methodology
Chapter Four:	Results and discussion
Chapter Five:	Summary, limitations, recommendations and conclusions

1.13 Summary

This chapter provided an overview of the study and included the background to the study, the problem statement, aim and objectives, research assumptions, demarcation of the study field, ethical considerations, research methodology, significance, reliability and validity and an outline of the study.

Chapter Two

Literature review

2.1 Introduction

This chapter provides a review of the literature pertaining to the benefits of ICU, triage, burden of disease, cost implications, reasons for ICU admission or refusal, quality assurance, factors influencing ICU admission decisions and admission preferences.

2.2 Benefits of ICU

The ICU is a unit in the hospital that provides specialised care and continuous monitoring of medical or surgical patients that are acutely ill, have life-threatening conditions or who need comprehensive care (10).

It is expected that patients cared for in an ICU would benefit more than if they were cared for in the general wards. This was investigated by Shmueli (5) in 2005 in Jerusalem who found that the in-hospital survival for patients admitted to ICU was 84% versus 53% for patients refused ICU admission and treated in the medical wards. Iapichino et al. (11) in 2010 across seven developed countries reported that ICU admission reduced mortality by 27% at twenty eight days. Joynt et al. (12) in 2001 in Hong Kong found a 24% improvement in survival with ICU admission.

Three categories of patients who benefited the most from ICU were patients with CNS disorders, sepsis and respiratory failure. CNS disorders showed a benefit ranging from 25.68 to 26.44 percentage points. The range was influenced by age of patients, with a small difference in benefit demonstrated. (5)

Sepsis was the second most beneficial condition. The benefit percentage point range was 24.14 to 26.38. Sepsis benefit in ICU, like CNS disorder was also only marginally influenced by patient age. Age, however did affect overall patient survival probabilities. (5)

Respiratory failure survival benefit was noted to range between 21.68 to 26.51 percentage points. Postoperative emergency or non-operative emergencies showed the most benefit. On average, ICU admission was associated with an improved survival rate of 17.4 percentage points. (5)

2.3 Triage and admission criteria

2.3.1 Definition

The term triage was derived from the French word trier (13). It is defined as a process of prioritisation of patients based on the severity of their condition. It aims to determine the order and priority of emergency treatment, transport and destination, based on the special needs of the patient or the balancing of patient distribution in a mass-casualty setting. (10)

2.3.2 History

The practice of triage dates back to the 18th century battle fields where the earliest documented systems were designed to distribute health care systematically among wounded and sick warriors. Injured soldiers depended on their colleagues for medical aid, which was usually ineffective. (13)

The first formal triage system was designed by the chief surgeon of Napoleon's Imperial Guard, Baron Dominique-Jean Larrey. He realised the need for evaluation and categorization of injured soldiers on the battlefield. His system was aimed at evaluating and treating those that required emergency medical attention rather than allowing extended periods of delay, as was done previously. (13)

The early military triage prioritised soldiers that could be returned to the line of engagement the quickest. The faster the soldiers were returned to the battlefields, the more soldiers they had at the front line, the more likely they would win. Larrey altered this pattern by prioritising wounded soldiers whose life could be saved by emergency surgery, for example, amputations. (14)

Florence Nightingale prioritised with wounded on the battle field, providing them with whatever comfort she could (14). She established the principle that triage should be based on medical need and not status, rank or religion (15). She also developed the concept of intensive care by assembling critically injured patients into a common area during the Crimean War between 1854 to 1856 (16).

2.3.3 Reason for triage

There is a scarcity of hospital resources with a large demand for services which necessitates evaluation and decision making as to who will receive priority access to these services (13). The utilitarian approach is most commonly used, in which those least likely to benefit from intensive care are refused admission. Benefit, in this context, is defined as the difference in probability of survival if admitted to ICU and the probability of survival if not admitted. (9)

2.3.4 Triage models

The comprehensive care given by an ICU is most suited to patients who are critically ill and needing organ support not offered in hospital wards (10). The Society of Critical Care Medicine has developed three triage models to assist clinician with triaging patients. These models are the diagnosis model, objective parameters model and priority model. (17)

Diagnosis model

The diagnosis model uses specific conditions or diseases as admission criteria for ICU. Each organ system or illness category has specific conditions that qualify for ICU admission. (10) Examples would be acute myocardial infarction with complications or cardiogenic shock for

the cardiovascular system, acute respiratory failure requiring ventilatory support, pulmonary emboli with haemodynamic instability, massive haemoptysis and respiratory failure with imminent intubation for the respiratory system (17). The advantage of this model is that it does not require clinical assessment, but is based on specific diagnoses making it easier for non-intensivists to use. The disadvantages are that it is unable to prioritise the listed diagnoses and it excludes objective parameters. (18)

Objective parameters model

The objective parameters model comprises a list of arbitrary criteria. It is usually incorporated into the admission criteria and includes vital signs, physical examination finding, laboratory results and special investigation results like radiography, ultrasonography, tomography and electrocardiography. (10) This model also makes it easier for non-intensivists to triage patients as clinical assessment is not necessary, however triage is then based on results of examination and investigations, and not individualised to the patient. (18)

Priority model

The model most used to determine ICU admission or refusal is the priority model (17). The priority model is based on the patient's bigger clinical picture instead of just the diagnosis, vital signs or laboratory investigations. Decisions are made by attempting to predict the course of a disease making it the best of the three models. However, it relies on the doctor having clinical experience and expertise in critical care. (18)

Priority 1 patients require intensive treatment as they are unstable, critically ill patients. The level of care needed can only be offered by an ICU. Brain dead patients fall into this category for the purpose of organ preservation in lieu of organ transplantation. They have unlimited access to all therapeutic modalities available at the hospital. (10) Examples of patients in this group also include shocked or hemodynamically unstable patients requiring invasive monitoring or vasoactive drugs postoperative and patients with acute respiratory failure patients who require mechanical ventilatory support (17).

Priority 2 patients need extensive monitoring and may require instant intervention. Examples of this are patients who have conditions that may require intubation and mechanical ventilatory support. There is no limit to the extent of therapy. (10) Examples of patients in this group include patients who suffer from chronic co-morbid illnesses and then develop severe acute medical or surgical conditions (17).

Priority 3 patients have an underlying disease or acute illness that has a reduced likelihood of recovery. The acute illness may be relieved with intensive treatment, but the extent of therapy given may be limited. (10) Examples of patients in this group include airway obstruction, cardiac tamponade or infection in patients with metastatic malignancy (17).

Priority 4 patients are mostly not candidates for ICU admission. These patients are either "too well to benefit" or "too sick to benefit". (10) Examples of patients grouped as "too well" include peripheral vascular disease, mild congestive heart failure, haemodynamically stable diabetic ketoacidosis and conscious drug overdose. Examples of patients "too sick to benefit" include irreversible multiorgan system failure, patients in persistent vegetative states, brain dead non-organ donor patients, severe irreversible brain damage, metastatic cancer unresponsive to chemotherapy or radiation therapy and patients with decision making capacity that refuse intensive care and who receive supportive care only. (17)

2.3.5 South African triage guidelines

There are two guidelines available specific to the SA context. There are currently no evidence based triage guidelines available from the South African Society of Anaesthesiologists (19). Nesibopho was founded in 2004 to improve the quality of care in ICU in South Africa. Amongst its board members are world renowned South African intensivists. Nesibopho has a set of ICU and high care admission guidelines that has been endorsed by the Critical Care Society of Southern Africa (6).

The Nesibopho Best Practice Guideline on Admission to ICU and HCU follows a 3 step approach. Step 1 looks at the presence of physiological criteria related to airway, breathing, circulation, disease (organ specific), electrolyte abnormalities, fluid related pathophysiology,

glucose, haematology/oncology, infection and monitoring. If any of these criteria are fulfilled, the patient should be transferred to ICU. If they are not present or indeterminate, then co-morbidities are looked at. This constitutes step 2. If any co-morbidities are present in patients that did not qualify for admission according to step 1, the patient should be transferred to the ICU, if not, the patient can be treated in a high care unit. Lastly if neither step 1 nor 2 are present, step 3 looks at specific conditions or illnesses which require ICU admission despite criteria in step 1 and 2 not being fulfilled. (6)

These guidelines aim to help the triage process; however a careful and detailed clinical assessment is still required to correctly triage patients (6).

2.3.6 Advantages of triage

Triage facilitates the allocation and rationing of limited critical care resources. Currently, the number of ICU bed requests often exceed the number of beds available, this in the absence of an epidemic or a mass-casualty incident. (10) Triage assists in isolating the patients that would benefit the most out of intensive care (9).

Appropriate allocations of beds leads to decreased overall duration of stay by admitted patients (20). This allows more beds to be available more often, leading to fewer patients being refused beds on the basis of no bed availability (11).

2.3.7 Disadvantages of triage

Defining admission criteria for ICU is a complex task and it is challenging to identify patients that qualify or to implement the recommendations in daily practice. These factors are further compounded by lack of resources and funding. (21)

An Italian study in 2006 showed that inappropriate admissions were acknowledged by 86% of respondents. The most common reasons included clinical doubt at 33%, limited decision time (32%), assessment errors (25%) pressure from superiors (13%) and pressures from the

referring clinician (11%). Pressure from the patient's family and threat of legal action were less frequent at 5% each. (21)

The major challenge in intensive care is the decisions that need to be made by the responsible clinician. Many of these decisions have fatal consequences. The most difficult decisions are the unfavourable ones such as decisions not to admit patients, decisions not to provide potentially effective treatment and decisions to withhold life support. All of these factors add to the stresses of being an ICU clinician. (22)

2.3.8 Factors that influence triage

The ICU model, availability of beds and ICU staffing have been found to influence the triage process.

ICU Model – open versus closed

ICUs are commonly run using either an open or closed model. The open model is characterised by the primary physician having the final decision whether to admit the patient or not. The patient remains the primary physician's responsibility. They prescribe the treatment, make management decisions and request consultations from other specialists including intensivists. This model is used commonly in the United States of America (USA). (10)

The advantage of the open unit is that patients remain under the care of their primary physician, with whom they have already built a relationship. This relationship may have a greater impact on the patient's outcome than the intensive care received. Access to intensivists by consultation is still possible. A problem associated with this model includes various specialties consulting and giving instruction to nursing staff leaving the nurses uncertain as to who is actually in charge of the patient. This is compounded by conflicting instructions being received and nurses then being left to resolve these conflicts between the various consultants. It has also been shown that open units are associated with longer

duration of admissions, increasing costs and further straining the already scarce resources. (20)

In the closed model, it is the intensivist who is responsible for accepting a patient into ICU and who then takes over the management of the patient. The primary physician functions as a consultant, however all acute decision making remains the intensivist's responsibility. This is the model used in most European countries, Australia and New Zealand. (10)

The advantage of closed units is that all patients are seen by an intensivist. These units have a lower mortality rate and patients have a shorter duration of stay. There is a designated person in charge of the ICU who maintains team leadership and minimises confusion and conflict in the unit. This further improves efficiency and promotes the use of standardised protocols for care. Since the intensivists are not the primary physician outside the ICU, they are able to assess the patients and enforce admission criteria resulting in more appropriate patients being admitted to the ICU. (20)

A major disadvantage of the closed model is that there are not enough intensivists to facilitate full-time staffing of ICUs. In addition to this, it is expensive to provide a 24-hour, on-site intensivist. Physicians oppose the closed unit because their services are taken over by the intensivists and continuity of care is lost. (20)

According to Bhagwanjee and Scribante (23) in 2007 in SA, the ideal closed unit comprises of a medical director who is an accredited intensivist and a nursing manager who is a registered ICU nurse. It adheres to the South African Bureau of Standards' equipment requirements and the ICU should not be located within another ward.

An ICU should preferably be an independent unit that operates using the closed model. In this model, the ICU remains under the control and responsibility of the ICU staff. It should accommodate a minimum of six beds, but optimally 8 – 12 beds. Staff should be well trained and have access to all the necessary equipment in order to provide "state-of-the-art" intensive care medicine. (24)

SA has a mix of open and closed model ICUs. As determined by Bhagwanjee and Scribante (23) in 2007 in SA, the public sector has 56% ICUs conforming to the closed model compared to 4 % in the private sector. However, only 17 units met the requirements for the ideal closed ICU design. Of the total number of ICU beds in SA, 71% of these beds are in open units.

Availability of beds

In SA public hospitals, 23% of public hospitals have ICU facilities. The total number of public sector ICU beds was 1783 in 2004. In addition to the low percentage of units, the most of ICUs are concentrated in three provinces. The bed to population ratio ranges from 1:20 000 to 1:80 000. In the public sector, ICU beds equal 1.7% of the total hospital beds. In the private sector, 84% of private hospitals have ICU facilities and the total number of ICU beds was 2385. (1)

When comparing SA to the rest of the world, mainland China demonstrated similar ICU resource data with ICU beds equating to 1.8% of the total number of hospital beds. The bed to population ratio was 1:25 757. (25) A study of eight developed countries, namely, USA, France, United Kingdom (UK), Canada, Belgium, Germany, Netherlands and Spain shows Germany to have the most resources with a bed to population ratio of 1:4 065 with 4.1% of beds being ICU beds. The USA has a bed to population ratio of 1:5 000 with 9% being ICU beds. The lowest figures are those of Spain with a bed to population ratio of 1:12 915 and ICU bed to total bed percentage of 2.5%. (26)

ICU staffing – medical and nursing

Quality of care received in ICU is largely dependent on the ICU model, specifically closed model run by intensivists (10). There is no published data on the exact numbers of qualified practicing intensivists in SA. Bhagwanjee et al. (4) in 2008 in SA highlighted the shortage of qualified intensivists with only 4% of all units being led by a qualified intensivist. The intensivist deficit for SA was estimated to be 291 in 2008 which increased the cost of ICU care.

ICUs managed or co-managed by intensivists have been termed “high intensity staffing” by the Leapfrog group. Implementation of “high intensity staffing” has reduced hospital mortality by 30% and ICU mortality by 40%. Leapfrog guidelines for high intensity staffing state that an intensivist should manage or co-manage the ICU and be on-site exclusively in the ICU during daytime hours. When they are not present on-site, the intensivist needs to respond to being paged at least 95% of the time, within five minutes of being paged and within 5 minutes a physician certified in critical care support or a physician extender should be attending to the ICU patient. (27)

Nurses are the cornerstones of ICUs. Patient outcomes are determined by the level of nursing care received. An audit of critical care nurses in SA notes that 25.6% of nurses working in ICU are ICU trained. The remaining nurses comprised of 49.2% being registered nurses and 21.4% being semi-professional nurses. Professional nurses comprised of registered nurses, ICU trained nurses and neonatal trained nurses and totalled 4578 nurses. Of these nurses, 42.8% has 0 – 5 years of experience, 28.7% has 5 – 10 years of experience, 16.1% has 10 – 15 years of experience, 6.6% has 15 – 20 years of experience and 5.7% have more than 20 years of experience. (2)

In 2004, SA had a total of 4168 ICU and high care beds which were staffed by the professional nurses. This makes the nurse to ICU/high care bed ratio in SA 1.1. Interestingly, this value is similar between the public and private sectors; however, the difference is that the private sector has more ICU trained nurses. (2) Comparing this to other countries, British units have more than three nurses per ICU bed, but Sweden has less than two nurses per ICU bed. (28) All of these fall short of the international gold standard of 6.7 nurses per ICU bed. This ratio is dependent on at least 50% of the nurses having ICU training. (3, 24)

After the severe acute respiratory syndrome epidemic in Hong Kong, hospitals have indicated that the ICU-trained complement of nurses needs to be at least 80% to be well prepared for major incidents. SA falls far short of these targets. In 2007, it was determined that the deficit of trained nursing staff, in order to increase the nurse to bed ratio to 3:1, is 7920 nurses. (2)

Agency staff account for a third of the nurses working in South African ICUs. The majority of agency staff hold full time positions in other hospitals. This makes their hours worked exceed the recommended 40 hours per week, leading to increased fatigue and decreased quality of care. (2)

Lack of experience and qualification has been shown to increase the amount of adverse events and errors made by nursing staff in ICU. This is further compounded by staff shortages, poor supervision and lack of support staff. (2, 29)

2.4 Burden of disease

Global trends indicate that although there will be an increase in the demand for critical care, available funding will be decreasing. The ageing population is increasing the number of patients with various diseases and comorbidities. Advancement in medicine demand intensified care of high risk patients with many comorbidities. Newer technology, advancement in medicine together with the ageing population is then linked to an increased rate of complications. As an example, acute lung injury is predicted to increase by 50% of the current prevalence by the year 2030. (30)

In developed countries, the demand for ICU will be increased by the ageing population and the smaller proportion of young wage earners will lead to a shortage of ICU funding. Wunsch et al. (31) in 2011, in USA and UK reported the mean age for ICU patients at 60.4 years for USA and 57.4 years for UK. In developing countries, with the predicted change in demographics, it can be expected that if the current intensive care capacity does not increase, more poor outcomes can be expected from inappropriately managed critical illnesses. (30)

Developing countries have a greater burden of disease from motor vehicle accidents and violent interpersonal conflicts resulting in penetrating injuries. Burns are more prevalent due to the use of fire based stoves and lamps. Malnutrition further adds to the burden of

disease. (30) Malaria is responsible, annually, for 1.5 – 3 million deaths. Tetanus has an incidence of approximately 1 million cases a year, which is preventable with safe and simple immunization protocols. (32)

HIV/AIDS has a high prevalence in Sub-Saharan Africa which has altered population and critically ill patient demographics. Sub-Saharan Africa accounts for 72% of the total AIDS deaths globally. Life expectancy has been decreased to 47 years which is thirty years lower than North America and Europe. (32) This has led to the development of a sicker younger population affecting both ICU funding as well as ICU bed requests.

2.5 Cost implications

ICU is a scarce and expensive resource (1, 33). It runs despite constant high demand versus low resource availability making the need for admission policy important (34). Fowler (32) noted in 2008 that the world health care expenditure totalled US$ 4 trillion in 2004. Developed versus developing countries demonstrate large differences in health spending. The USA spends US$ 2.3 trillion which equates to 16% of their gross domestic product and US$ 7000 annually per capita. Other developed countries spend US$ 3000 annually per capita. By comparison, the majority of sub-Saharan African countries spend under US$ 25 per capita and less than 3% of the gross domestic profit.

A study done in 2003 at a Norwegian university hospital ICU showed that the average cost of a day in ICU was €2601. The average cost of a patient stay in ICU was €14223. These figures did not include the cost of diagnostic radiology and theatre related costs. Of the total 1051 patients treated, 60.9% survived up to 18 months. The average cost per year of survival per patient was €684. (35)

When comparing cost of hospital general ward stay to ICU stay, the mean daily cost per patient was $371 for ward stay and $1339 for ICU stay. This equates to an estimated $6156 difference in cost between patients accepted to ICU and those rejected. The estimated cost per life saved was $103771. The cost decreases as predicted mortality increases which

suggests that as the severity of illness worsens, intensive care becomes increasingly cost effective. (33)

Within ICU, patients require different levels of care depending on their clinical status. If the costing methods are adjusted to account for the various levels of care given to these patients, the cost per life saved was $94898. This shows that different levels of care have minimal effect on the costs of ICU, since fixed expenditure like salaries remains the same despite the severity of patients admitted. (33)

2.6 ICU admission refusal

A large multicentre international study in 2010 reported the mean overall ICU rejection rate to be 14.6%, but with marked variation between the centres, ranging from 1.4% to 31.9%. Reasons for refusal include patients too well, too ill, too old, no bed availability, more data needed for decision and other reasons. (11)

Iapichino et al. (11) in 2010 found patients categorised as too well were the largest group accounting for 39.3 % of the total number of refused patients. The mean age was 63.9 years and 55.6% of these patients were over the age of 65 years. The percentage of medical patients in this group was 85.2%. Joynt et al. (12) in 2001 reported patients categorised as too well as the smallest group of refused patients with 21% of the total number of refused patients.

Patients deemed too ill for ICU was the second largest group in the study by Iapichino et al. (11) at 23.9% of the total number of refused patients. The mean age was higher at 72 and 75.2% of patients were over the age of 65. Medical patients accounted for 88.2% of rejections. Joynt et al. (12) reported the too ill group to comprise 35% of the refused patients.

Bed availability is one of the challenges of ICU's resource restricted environment. Iapichino et al. (11) noted this lack of availability as responsible for 15.1 % of bed rejections. The mean

age for this group was 60.6 years with only 43.5% of patients older than 65 years. Medical patient refusal percentage remained high at 80.3%.

Patients assessed as being too old was the smallest group with 5.6% of the total number of rejected patients. The mean age was 84.5 with 98.7% of patients being over the age of 65. This group also had the highest percentage of medical patients being refused at 93.2%. (11)

The need for more data to make a decision was the reason for rejection in 9.7% of the total rejections. The mean age was 61.2 years with 49.6% of rejections over the age of 65 years. The percentage of medical patients rejected remained the majority at 73.32%. (11)
Across the categories, it is noted that surgical patients are more likely to be admitted as compared the medical patients. Also patients refused ICU beds were older and had a poor functional state prior to hospital admission. Patients who received multiple triages for ICU admission during a hospital stay were less likely to be admitted into ICU. (11)

Factors identified as the reasons for differing refusal rates between hospitals were differences in ICU size, number of ICU facilities in the hospital, involvement of ICU teams in the emergency setting and the variation in ICU physicians' skill and culture. (11)

2.7 Quality assurance

Having a correctly sized, located, staffed and equipped ICU is important, however quality assurance measures need to be in place to objectively compare and monitor quality of care and performance of the unit. It needs to include the process of care (sedation, medication, IV lines, mechanical ventilation, management of complications), outcomes (risk adjusted mortality) and structure (protocol availability, staffing adequacy, medication errors protocol). Morbidity and mortality meetings should also be held regularly. (24) These measures ensure the optimal functioning of units.

2.8 Factors influencing ICU admission decisions

The Society of Critical Care Medicine developed the prioritisation model of patient categorisation to assist ICU admission decisions. Using this model, a study done in Brazil in 2010 found that 34.6 % of patients admitted to ICU were classified as priority 1, 52.4% as priority 2, 25.9 % as priority 3 and 21.2% as priority 4. (36)

The authors also showed that more surgical patients were admitted to the ICU during the research period. Of the ICU bed requests, 70.4% were granted admission and 56.9% of admitted patients were surgical. The most common reason for admission was septic shock, which accounted for 5.5% of cases. Septic shock was most common in the priority 3 and 4 groups. These groups needed mechanical ventilation and went into coma more often than priority 1 and 2 patients. (36)

Clinicians running the ICU admitted mainly priority 1 and 2 patients who benefited most from ICU and spent less time in ICU. The only protective factor against ICU bed refusal was being classified priority 1. Priority 4 patients had a longer mean length of ICU stay at 28.8 days. (36)

Factors favouring ICU admission were identified as; having a surgical condition, absence of comorbidity, presence of haematological malignancy, acute clinical conditions and the need for active intensive care treatment, trauma, vascular or hepatic involvement at triage and acute severity of illness. ICU bed availability at the time of triage positively influences the admission. (11) The seasonal variation in ICU admission was assessed by Santana et al. (37) in 2010, in the Canary Islands, who found 79% of admissions during winter however no differences in age and severity of illness at admission between the seasons.

2.9 Admission preferences

The critical care environment has been designed to save immediately threatened lives. It is human nature to try to save every single endangered life despite the costs, however critical care clinicians need to make cost limiting decisions and try to optimally allocate a scarce resource. They have to limit service in order to benefit society rather than individuals. The need to try and save critically ill patients who have poor prognoses and in doing so contravening society's interest has been termed "the rule of rescue". (38)

A study by Kohn (38) in 2011 in the USA showed that 65% of clinicians felt an obligation to patients that they know. ICU clinicians find it more difficult to refuse beds when they are in front of the patient. Once the patient is known and in the ICU, the clinicians are reluctant to evacuate the bed for a new unknown patient.

Many ICUs have admission guidelines however Walter (39) in 2008 in the USA found that they are not adhered to when triage decisions are made. It is hypothesised that they were not referred to because they may not have been readily available, may not be easily applicable, staff may prefer to use their clinical judgment, the guidelines may have just been created to satisfy regulating authorities or it may be felt that the guidelines were not necessary since most of the patients already meet the criteria for admission. (39)

2.10 Summary

This chapter provided a review of the literature pertaining to the benefits of ICU, triage, burden of disease, cost implications, reasons for ICU admission or refusal, quality assurance, factors influencing ICU admission decisions and admission preferences.

Chapter Three

Research methodology

3.1 Introduction

This chapter consists of the problem statement, aim and objectives, ethical considerations and research methodology that was used as well as the validity and reliability of the study.

3.2 Problem statement

ICU beds are a scarce resource at Helen Joseph Hospital (HJH). A limited number of beds serve a population with a large burden of disease. Medical practitioners request ICU beds for patients they deem in need of intensive care; however the decision to admit into ICU remains with the ICU consultant on call, consultants being from different disciplines. No formal triage such as APACHE or SAPS scoring or admission guidelines are currently in place. The profile of the number of admissions, refusals and reasons for admission or refusal has not been determined.

3.3 Aim and objectives

3.3.1 Aim

The aim of this research was to compile a profile of all the ICU admission requests at HJH during one winter and summer month in 2012 and the reasons for the requests being either accepted or refused and the outcome of patients.

3.3.2 Objectives

The objectives of this study were to:

- describe the number of ICU bed requests
- describe the demographics of the patients for whom ICU beds were requested
- compare admissions and refusals with age and discipline
- compare discipline with age and season
- compare patient outcome at 30 days with admission or refusal, age and discipline
- describe the reasons for admissions and refusals
- describe the outcome at 30 days with reason for refusals.

3.4 Ethical considerations

This study was approved by the Human Research Ethics Committee (Medical) (Appendix A) and the Postgraduate Committee of the University of the Witwatersrand (Appendix B). Written permission was obtained from the director of HJH ICU (Appendix C), who is also the gatekeeper of the ICU records, and the ICU nursing manager was informed of the study.

In consultation with the chairman of the ethics committee, it was agreed that no patient consent was necessary as patient records were not consulted. Aggregated data was collected anonymously from ICU consultation forms (Appendix D) and ICU and ward admission and discharge books.

To maintain anonymity of the participants, no names or hospital numbers were recorded on the data collection sheets. Each patient was allocated a study number and a list of patient names and corresponding study numbers was filed separately. Confidentiality was maintained as the researcher and the supervisors were the only people with access to the raw data. Data will be securely stored for six years after completion of the study.

The study was conducted in adherence with the principles of the Declaration of Helsinki (7) and the Good Clinical Research Practice Guidelines for South Africa (8).

3.5 Research methodology

3.5.1 Study design

A prospective, descriptive, contextual research design was used in this study.

A prospective study entails the researcher selecting a population and following it over a period of time to determine outcomes. Descriptive studies provide descriptions of the variables in order to answer the research question. Contextual studies are done at a defined place and the results may not be generalisable. (40) This study was prospective as data was collected for August and December 2012, it described the profile of ICU bed requests at HJH and it was contextual as it was done only at HJH ICU.

3.5.2 Study population

The study population was all the completed consultation forms for ICU beds requested at HJH.

3.5.3 Study sample

Sample method

A consecutive, convenience sampling method was used. Endacott et al. (41) describe convenience sampling as a non-random method that uses the most readily accessible units in a study population. Consecutive sampling is a method whereby the researcher attempts to include all accessible subjects into the sample (42). As the completed consultation forms are filed chronologically, they were included in the study sample consecutively until the time period was completed.

Sample size

The sample size was realised by the number of ICU beds requested during the study months.

Inclusion and exclusion criteria

Inclusion criterion was all the completed consultation forms for ICU beds requested at HJH. The exclusion criteria were illegible and incorrectly completed consultation forms.

3.5.4 Data collection

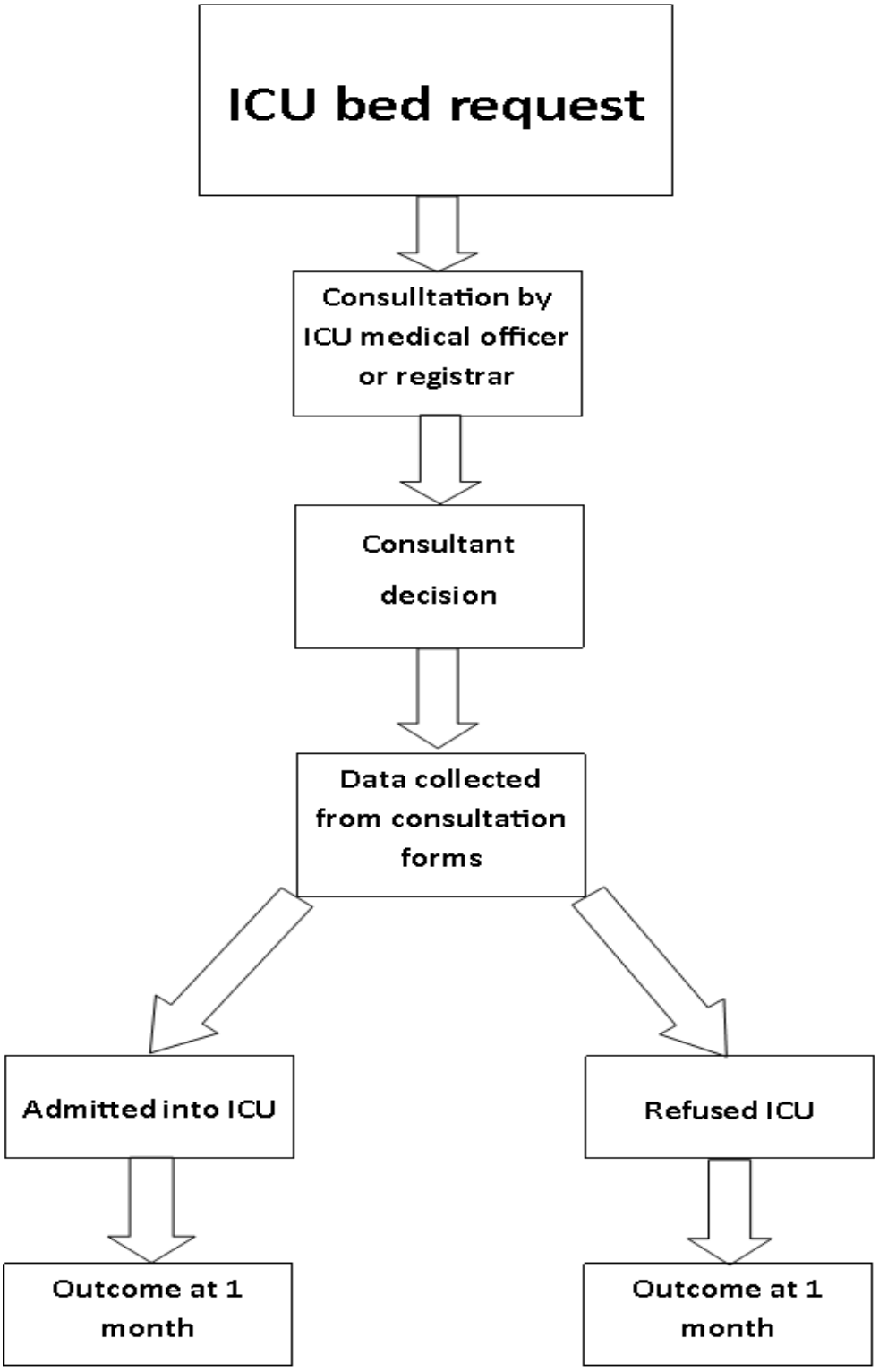
One summer month, December 2012, and one winter month, August, during 2012 were used. All patients for whom ICU beds were requested were examined by ICU medical officers or registrars who then presented the clinical assessment to the consultant on call who made the final triage decision. The details of the consultation were documented on a routine ICU consultation form and a copy of the form was kept in the ICU. This process is normal practice in this ICU. The ICU consultation forms were audited by the researcher on a regular basis. If any data was missing, the relevant medical officer or registrar was contacted to supply the information.

The researcher recorded the data on a data collection sheet (Appendix E) and captured it into an Excel spread sheet. The following information was captured on a data collection sheet;

- age
- gender
- discipline
- season
- admitted or refused
- reasons for admission
- reason for refusal
- outcome at one month.

The data on outcome was captured from the ICU and ward admission and discharge books at one month post consultation. For the sequence of data collection, see Figure 3.1.

Figure 3.1 Flowchart showing sequence of data collection



3.6 Data analysis

The data collected during the study was analysed in consultation with a biostatistician using Stata version 13.1. Descriptive and inferential statistics were used. Categorical variables were summarised using frequencies and percentages. Comparisons between variables were made using Chi-square tests. Logistic regression multivariate analysis adjusting for age, season and discipline was used to determine the relationship between ICU admission and patient outcome at 30 days. An odds ratio (OR) and 95% confidence interval (CI) were also used. P values of <0.05 were considered statistically significant.

3.7 Reliability and validity

Botma et al. (43) defines reliability of a study as the "consistency of the measure achieved" and the validity of the study as "whether the conclusions of the study are justified based on the design and interpretation".

The reliability and validity of the study were ensured by:

- using appropriate research design and methodology
- including a winter and summer month
- using consecutive sampling to ensure that all requests were included
- data being collected by the researcher only on a standardised data collection sheet
- appropriate data analysis being done in consultation with a biostatistician.

3.8 Summary

In this chapter the problem statement, aim and objectives, ethical considerations and research methodology that was used as well as the validity and reliability of the study were discussed.

Chapter Four

Results and discussion

4.1 Introduction

This chapter contains results of the data captured and the discussion thereof. The results and the discussion are presented as per the research objectives.

The objectives of this study were to:

- describe the number of ICU bed requests
- describe the demographics of the patients for whom ICU beds were requested
- compare admissions and refusals with age and discipline
- compare discipline with age and season
- compare patient outcome at 30 days with admission or refusal, age and discipline
- describe the reasons for admissions and refusals
- describe the outcome at 30 days with reason for refusals.

4.2 Results

The findings are described and analysed using descriptive and inferential statistics. The Chi-square test is used to compare categorical variables, p-values <0.05 are considered statistically significant and 95% confidence intervals are calculated where indicated. Logistic regression, odds ratio and median IQR were also used. Patients were grouped according to age (under 60 years of age and 60 years and older) and the discipline that they were receiving treatment from (medical and surgical). The surgical subspecialties were recorded but due to the low number of requests from plastic surgery, orthopaedics, urology,

obstetrics and gynaecology, they were grouped together with general surgery and trauma to form one surgical group of patients.

The study was conducted at HJH ICU during August and December 2012. Data was collected from completed ICU consultation forms and 30 day outcomes were determined from ICU and ward admission and discharge books.

4.2.1 Describe the number of ICU bed requests during the study period

A total number of 139 ICU bed requests were made during the research period. Of these 49 patients were admitted and 90 were refused admission.

4.2.2 Describe the demographics of the ICU bed requests

The demographics of the study sample are described in Table 4.1.

Table 4.1 Demographics of ICU bed requests

		Total		Admitted		Refusals	
		Frequency	%	Frequency	%	Frequency	%
Total		139		49	35.3%	90	64.7%
Age	<60	110	79.14%	40	81.6%	70	77.8%
	≥60	29	20.86%	9	18.4%	20	22.2%
Gender	Male	84	60.4%	29	59.2%	55	61.1%
	Female	55	39.6%	20	40.8%	35	38.9%
Season	Summer	72	51.8%	21	43.0%	51	56.7%
	Winter	67	48.2%	28	57.0%	39	43.3%
Discipline	Medical	76	54.7%	25	51.0%	51	56.7%
	Surgical	63	45.3%	24	49.0%	39	43.3%

4.2.3 Comparing admissions and refusals with age and discipline

Age

The patients were split into 2 age groups, under the age of 60 years and 60 years of age and older for the purpose of analysis (age was not normally distributed). The median age was 44 with an IQR 30-57.5.

The relationship between admission and age was examined using the Chi-square test. This relationship was not found to be statistically significant. Table 4.2 details the results of the test.

Table 4.2 Comparison of age and admission

Age		Refusals	Admitted	Total
<60	Frequency	70	40	110
	Row %	63.64	36.36	100
	Column %	77.78	81.63	79.14
≥60	Frequency	20	9	29
	Row %	68.97	31.03	100
	Column %	22.22	18.37	20.86
TOTAL	Frequency	90	49	139
	Row %	64.75	35.25	100
	Column %	100	100	100

(p=0.593)

Discipline

The relationship between admission and the discipline requesting the ICU bed was assessed using the Chi-square test. This relationship was not found to be statistically significant. The results are detailed in Table 4.3.

Table 4.3 Comparison of ICU admission or refusal and discipline of bed request

		Surgical	Medical	Total
Refusals	Frequency	39	51	90
	Row %	43.33	56.67	100
	Column %	61.90	67.11	64.75
Admitted	Frequency	24	25	49
	Row %	48.98	51.02	100
	Column %	38.10	32.89	35.25
TOTAL	Frequency	63	76	139
	Row %	45.32	54.68	100
	Column %	100	100	100

(p=0.523)

4.2.4 Comparing discipline with age and season

Age

The relationship between discipline of bed requests and the two age groups was examined using Chi-square test. This relationship was not shown to be statistically significant. The results of which are shown in Table 4.4.

Table 4.4 Comparison of discipline requesting an ICU bed and age

		Age <60	Age ≥60	Total
Surgical	Frequency	54	9	63
	Row %	85.71	14.29	100
	Column %	49.09	31.03	45.32
Medical	Frequency	56	20	76
	Row %	73.68	26.32	100
	Column %	50.91	68.97	54.68
TOTAL	Frequency	110	29	139
	Row %	79.14	20.86	100
	Column %	100	100	100

(p=0.082)

Season

The relationship between the discipline of bed request and the season of request was examined using the Chi-square test. This relationship was not shown to be statistically significant. The results of which are shown in Table 4.5.

Table 4.5 Comparison of discipline of bed request and season

		Surgical	Medical	Total
Winter	Frequency	29	38	67
	Row %	43.28	56.72	100
	Column %	46.03	50	48.20
Summer	Frequency	34	38	72
	Row %	47.22	52.78	100
	Column %	53.97	50	51.80
TOTAL	Frequency	63	76	139
	Row %	45.32	54.68	100
	Column %	100	100	100

(p=0.641)

4.2.5 Comparing patient outcome at 30 days with admission or refusal, age and discipline

Admission or refusal

The relationship between outcome and admission was assessed using the Chi-square test. This relationship was found to be statistically significant. The details of the assessment are noted in Table 4.6.

Table 4.6 Comparison of outcome and admission

		Demised	Alive	Total
Refusals	Frequency	41	49	90
	Row %	45.56	54.44	100
	Column %	78.85	56.32	64.75
Admitted	Frequency	11	38	49
	Row %	22.45	77.55	100
	Column %	21.15	43.68	35.25
TOTAL	Frequency	52	87	139
	Row %	37.41	62.59	100
	Column %	100	100	100

(p= 0.007)

The significance of this comparison was that 77.55% of patients admitted to the ICU were alive at 30 days follow-up compared to the refused group with 54.44% alive at 30 days. This shows a 23.11 point survival benefit with admission to HJH ICU.

Age

The relationship between outcome and age was assessed using the Chi-square test. This relationship was found not to be statistically significant. The results of which are noted in Table 4.7.

Table 4.7 Comparison of age and outcome

		Age <60	Age ≥60	Total
Demised	Frequency	43	9	52
	Row %	83.69	17.31	100
	Column %	39.09	31.03	37.41
Alive	Frequency	67	20	87
	Row %	77.01	22.99	100
	Column %	60.91	68.97	62.59
TOTAL	Frequency	110	29	139
	Row %	79.14	20.86	100
	Column %	100	100	100

(p=0.425)

Discipline

The relationship between discipline of bed request and outcome was analysed using the Chi-square test. This relationship was shown not to be statistically significant. The details of the analysis are presented in Table 4.8.

Table 4.8 Comparison of discipline and outcome

		Surgical	Medical	Total
Demised	Frequency	19	33	52
	Row %	36.54	63.46	100
	Column %	30.16	43.42	37.41
Alive	Frequency	44	43	87
	Row %	50.57	49.43	100
	Column %	69.84	56.58	62.59
TOTAL	Frequency	63	76	139
	Row %	45.32	54.68	100
	Column %	100	100	100

(p= 0.10)

Using logistic regression multivariate analysis, it was found that after adjusting for age, season and discipline, patients admitted were 2.66 times more likely to be alive at 30 days follow-up. This relationship was statistically significant with an odds ratio of 2.66 (95% CI 1.19-5.95, p=0.017, z score 2.39).

4.2.6 Reasons for admission or refusal

The reasons for admission were mechanical ventilation, inotropic support and observation. Some patients for admitted for more than one reason, hence the percentages do not total 100%. The reasons for admission are shown in Table 4.9.

Table 4.9 Reasons for admission

Total admissions = 49			
		Frequency	Percentage
Reason for admission	Mechanical ventilation	42	85.7%
	Inotropic support	10	20.4%
	Observation	12	24.5%
Total medical admissions = 25			
		Frequency	Percentage
Reason for admission	Mechanical ventilation	24	96.0%
	Inotropic support	6	24.0%
	Observation	5	20.0%
Total surgical admissions = 24			
		Frequency	Percentage
Reason for admission	Mechanical ventilation	18	75.0%
	Inotropic support	4	16.7%
	Observation	7	29.2%

The reasons for refusal were patients being assessed as too ill, too well or no resources available. The no resource available group was a combination of the no bed and no nursing staff groups. The reasons for refusal are shown in Table 4.10.

Table 4.10 Reasons for ICU bed refusal

Total refusals = 90			
		Frequency	Percentage
Reason for refusal	Too ill	37	41.1%
	Too Well	27	30.0%
	Lack of Resources	26	28.9%
Medical refusals = 51			
		Frequency	Percentage
Reason for refusal	Too ill	22	43.1%
	Too Well	15	29.4%
	Lack of Resources	9	17.6%
Surgical refusals = 39			
		Frequency	Percentage
Reason for refusal	Too ill	15	38.5%
	Too Well	12	30.8%
	Lack of Resources	12	30.8%

4.2.7 Description of outcome at 30 days with reason for refusal

The reason for ICU bed refusal together with outcomes is important as it highlights triage practice efficacy. A total of 90 patients for whom requests were made were refused admission to ICU. Table 4.11 below breaks down the reasons for refusal and outcomes of these patients.

Table 4.11 Reason for ICU refusal, outcome and discipline

		Medical	Surgical	Total
Too Ill	Alive	0	1	1
	Demised	22	14	36
	Total	**22**	**15**	**37**
Too Well	Alive	15	12	27
	Demised	0	0	0
	Total	**15**	**12**	**27**
No bed/staff	Alive	10	11	21
	Demised	4	1	5
	Total	**14**	**12**	**26**
Grand Total		**51**	**39**	**90**

4.3 Discussion

ICU is a scarce resource in South Africa and internationally. Triage is an important component of running a successful ICU. Selecting the patients most likely to benefit from admission is difficult and hence many triage scoring systems have been developed. (12) Understanding the profile of bed requests, admissions, refusals and subsequent outcome may enhance the appropriate use of this scarce resource.

HJH ICU received a total of 139 ICU bed requests over the two months. The median age of patients was 44 (IQR 30-57.5). Joynt et al. (12) in 2001, in Hong Kong reported a median age of 61 years for patients admitted to ICU. Wunsch et al. (31) in 2011 compared ICU admissions between the USA and the UK. They reported a mean age of patients in USA ICUs of 60.4 years and 57.4 years in the UK. Bapoje et al. (44) in 2011, in USA also reported a mean age of ICU patients of 52 years. Iapichino et al. (11) in 2010, across seven developed countries reported a mean age of 59.1 years. All of these studies were done in developed countries and show an older ICU patient profile compared to this study.

The expectation is that younger patients need ICU for surgical or trauma reasons and older patients for medical related illnesses. However, SA has a high burden of HIV/AIDS and tuberculosis. The estimated number of South Africans living with HIV was 6.4 million in 2012, the younger age groups being more affected. (45) The relatively younger patient profile at HJH ICU may be reflective of this.

Bed requests between the winter and summer months were similar with 72 requests made during the summer month and 67 requests during the winter month. Santana et al. (37) in 2010, in the Canary Islands showed 79% of ICU admissions were during winter, however no difference was reported according to age, severity of illness or mortality rates. When comparing the discipline requesting the ICU bed with the season, in our study, medical patients held the majority for both seasons with 56.72% of the requests during the winter month and 52.78% of the requests for the summer month. Simchen et al. (46) in 2007, in Israel also noted a 50% split between medical and surgical patients. There have been no other South African studies comparing ICU bed requests between winter and summer months.

The limited ICU beds necessitates triage of patients in an effort to only admit appropriate patients. During the study 35.25% (n=49) of patients were admitted to the ICU. Of these 81.63% (n=40) were under the age of 60 and 18.37% (n=9) were 60 years and older. Iapichino et al. (11) in 2010, studied 11 university ICUs across seven countries, namely Denmark, France, Italy, The Netherlands, Spain, UK and Israel. They reported an overall admission rate 85.6%. In addition, 44.3% of patients admitted to ICU in their study were over the age of 65 years. Joynt et al. (26) in 2001, in Hong Kong reported a 62.17% ICU admission rate. Both of these studies had substantially higher admission rates compared to HJH ICU.

The most common reason cited for admission was mechanical ventilation (85.7%), patient observation was the second highest reason at 24.4% and inotropic support was 20.4%. Some patients had more than one reason for initial admission as critically ill patients need multiorgan support. All the studies found in the literature search report the most common reasons for admission as respiratory failure or cardiac failure (5, 11, 12, 44, 46). Respiratory failure would require mechanical ventilation and cardiac failure or hypotension would

necessitate inotropic support, hence a link can be made between respiratory failure and mechanical ventilation and cardiac failure or hypotension and inotropic support. Bapoje et al. (44) in 2011, in USA reported respiratory failure as the most common reason for ICU admission at 27%. Hypotension and heart failure accounted for 21% of the admissions. Iapichino et al. (11) in 2011 reported respiratory involvement as the most common reason for admission at 38.3%, followed by cardiac involvement at 28.2%. Joynt et al. (12) in 2001 also found the most common reason for ICU admission to be respiratory failure at 24% followed by cardiac failure at 14% and observation post operatively at 13%. These figures only represent the reason for admission and do not include patients that may have needed mechanical ventilation or inotropes after admission.

Looking more closely at the medical admissions in this study, the majority of admission were patients under the age of 60 (76%). One of the initial reasons for admission in 96% of medical patients admitted was ventilatory support, 24% also needed inotropes and 20% were admitted for observation. Comparing this data to a study by Bapoje et al. (44) who noted a majority of patients under the age of 60 years as well and reported respiratory failure as the chief reason for admission.

Surgical admissions accounted for 49% of the total ICU admissions in our study. Simchen et al. (46) reported similar results with the split between medical and surgical admissions at 50%. This was in contrast with findings by Iapichino et al. ICU (11) who showed that surgical patients are more likely to be admitted with 52.4% of the admissions being surgical and an 83.8% rejection rate for medical bed requests.

A greater percentage of bed requests were refused than admitted for various reasons in this study. The rejection rate was 64.7% which is much higher than the rejection rate in developed countries as reported by Iapichino et al. (11) in 2010, at 17.2% and by Joynt et al. (12) in 2001, at 38%.

Reasons for ICU refusal were patients being assessed as too ill, too well or insufficient resources in ICU, meaning no staff or no bed available for patients who should have been admitted into ICU. The main reason for admission refusal was found to be patients too ill for ICU at 41 % followed by 30% as too well and 29% could not be admitted due to resource constraints. Iapichino et al. (11) in 2010, in seven developed countries, reported reasons for

ICU refusal at 23.9% being assessed as too ill, 39.3% as too well and 15.1% had insufficient resources. Joynt et al. (12) in 2001, in Hong Kong found that 35% of patients were assessed as too ill and 21% as too well. These comparisons suggest that the patient population for which beds are requested may be sicker at HJH, however the lack of resources is of great concern as almost a third of the rejected patients were refused solely because of the lack of resources. This is double what was found in developed countries by Iapichino et al. (11) in 2010 .

Iapichino et al. (11) in 2010 across seven developed countries, showed medical patients contributing to 85.2% of the too well group, 88.2% of the too ill group and 80.3% of the bed not available group. This was significantly higher than what was found in HJH ICU with medical patients contributing 60% to the too ill group, 56% to the too well group and 43% to the lack of resources group.

The 30 day outcome showed that 62.59% of patients in the study were alive irrespective of admission and 37.41% had demised. The admitted patient mortality rate was 22.45% which is better than that reported by Joynt et al. (12) in 2001 in Hong Kong who reported an ICU mortality rate of 37%.

Comparing admission and outcome showed similar results to a study by Shmueli et al. (5) who demonstrated an overall 17.42 point increased survival chance with ICU admission. HJH ICU had 77.55% survival rate for admitted patients and a 54.44% survival rate for patients refused admission. This is a 23.11 point survival benefit seen with admission to HJH ICU. Iapichino et al. (11) in 2010, reported a 27% reduction in mortality at 28 days with ICU admission.

Patients who were refused ICU admission due to lack of resources had a mortality rate of 19% whereas the mortality rate for admitted patients was 22.45%. Aggregated data was collected anonymously from the ICU consultation forms, hence ethical constraints prevented clinical data collection. The triage decision appears to be subjective and this makes the comparison of findings difficult.

Triage methods used by the ICU admitting doctors in this study seemed to be accurate as only one patient (2.7%) assessed as too ill was alive at 30 days. Joynt et al. (12) noted a

survival rate of 10% for the same group which is considerably higher. Patients assessed as too well for admission all survived at 30 days follow-up compared to Joynt et al. (12) who published an 8% mortality rate for this group.

4.4 Conclusion

This study has described the patients requiring ICU beds at HJH, who get admitted and for what reason, also who is refused beds, the reasons behind the refusals and the 30 day outcome of all the patients for whom ICU beds were requested. The allocation of beds between the disciplines is fairly equal, both with good survival benefit.

The lack of resources has proven to be an important issue in the ICU. Survival benefit with ICU admission has been demonstrated. Survival rates are in line with international trends and triage methods appear to be working.

4.5 Summary

In this chapter, the results of the study have been presented and discussed as per the research objectives. The data presented include demographic data of the study sample and results from the completed ICU consultation forms. The findings have been described using descriptive and inferential statistics.

Chapter Five

Summary, limitations, recommendations and conclusions

5.1 Introduction

In this chapter, a summary of the study is given. The limitations of the study are addressed, recommendations for clinical practice made and a conclusion presented.

5.2 Summary of the study

5.2.1 The aim of the study

The aim of this study was to compile a profile of all the ICU admission requests at HJH and reasons for the requests being either accepted of refused, followed by the outcome of patients.

5.2.2 Objectives of the study

The objectives of this study were to:

- describe the number of ICU bed requests
- describe the demographics of the patients for whom ICU beds were requested
- compare admissions and refusals with age and discipline
- compare discipline with age and season
- compare patient outcome at 30 days with admission or refusal, age and discipline
- describe the reasons for admissions and refusals
- describe the outcome at 30 days with reason for refusals.

5.2.3 Summary of the methodology used in the study

This was a contextual, prospective, descriptive study. The study sample included all the completed consultation forms for ICU beds requested at HJH.

A consecutive convenience sampling method was used. The study period was a winter and a summer month, August and December 2012 respectively, to account for seasonal variation in ICU requests. Inclusion criteria was all completed forms and the exclusion criteria were illegible and incorrectly completed consultation forms. Outcome data was collected from ICU and ward admission and discharge books.

5.2.4 Main findings of the study

A total of 139 patients were included in the study. The median age of patients was 44 (IQR 30-57.5). The majority (79.14%) of bed requests were for patients under the age of 60.

A similar number of requests were received from the medical and surgical disciplines for the age less than 60 years group. More beds were requested for medical patients that were 60 years of age or older compared to surgical bed requests for the same age group. The relationship between age and the discipline treating the patient was not statistically significant. Bed requests between summer and winter were similar at 72 and 67 respectively. The relationship between season and the discipline treating the patient was not statistically significant.

The overall admission rate was 35.25%. Patients under the age of 60 years accounted for 81.63% of the admissions, the remaining 18.37% were patients 60 years of age or older. The relationship between age and admission was not statistically significant.

Medical admissions comprised 51% of the total admissions. The most common reason for medical admission was mechanical ventilation with 96% of patients requiring mechanical ventilation, followed by 24% of patients needing inotropes and 20% requiring observation. Surgical admissions comprised 49% of the total admissions. The most common reason for surgical ICU admissions was mechanical ventilation with 75% of patients requiring mechanical ventilation, followed by 29% of patients needing observation and 17% requiring

inotropes. Patients may have been admitted for more than one of the listed reasons and hence the percentages total more than 100%. The relationship between ICU admissions or refusal and the discipline making the bed request was not statistically significant.

The overall ICU refusal rate was 64.7%. The refusal rate for medical patients was 57% and 43% for surgical patients. Reasons for refusal were 41% assessed as too ill, 30% assessed as too well and 29% of refusal were due to lack of resources.

Of the patients assessed as too ill, 97% had demised at 30 day follow-up. The patients assessed as too well for admission were all alive at follow-up. Patients refused admission due to a lack of resources had a 19% mortality rate at 30 days.

The overall 30 day survival of all patients in the study was 62.59%. Admitted patients had a survival rate of 77.55%. The relationship between ICU admission and 30 day outcome was statistically significant. Adjusting for age, season and discipline, those patients admitted were more likely to be alive at 30 days follow-up, odds ratio 2.66 (95% CI 1.19-5.95, p=0.017, z score 2.39).

5.4 Limitations of the study

This study was done contextually at HJH and may not be representative of ICU bed request at any other hospital. The limited generalisability is further complicated by a small, non-random convenience sample over two months of a year. It does however improve our understanding of the admission and refusal profile at HJH ICU.

Only completed ICU consultations were included in the study. Bed requests made telephonically from other hospitals or missing consultation forms could not be added to the data set.

Severity of illness scores of patients triaged were not documented. The triage decision appears to be subjective and this makes the comparison of findings to similar studies difficult.

5.5 Recommendations from the study

5.5.1 Recommendations for clinical practice

This study showed a statistically significant relationship between admission and outcome. However, patients could not be admitted due to a shortage of beds or staff. Increasing the functional beds available in the ICU may decrease HJH mortality statistics.

No documentation was made regarding the basis of the ICU triage process. It would appear that subjective means of triage were used in decision making with no severity scores documented. International standards dictate objective ICU triage scoring systems which could be implemented to improve triage. The data captured by the study may assist in formulating admission guidelines with a greater understanding HJH ICU request profile.

Record keeping in terms of out-of-hospital ICU bed requests and telephonic requests could be improved on to aid future research and to assist in attaining a more comprehensive understanding of the demands on the ICU.

5.5.2 Recommendations for future research

It is recommended that a comprehensive audit, over a longer duration of time, including severity of illness scores be conducted.

5.6 Conclusion

ICU is a limited resource with bed requests far exceeding available beds. By understanding the profile of bed requests and optimising triage practices, one can utilise the maximum capacity of benefits offered by the ICU.

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Appendix A: Permission from Human Research Ethics Committee

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG
Division of the Deputy Registrar (Research)

HUMAN RESEARCH ETHICS COMMITTEE (MEDICAL)
R14/49 Dr Hemal Hurri

CLEARANCE CERTIFICATE	**M120111**
PROJECT	Profile of ICU Bed Requests
INVESTIGATORS	Dr Hemal Hurri.
DEPARTMENT	Department of Anaesthesiology
DATE CONSIDERED	27/01/2012
DECISION OF THE COMMITTEE*	Approved unconditionally

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

DATE 27/01/2012 **CHAIRPERSON** .....
(Professor PE Cleaton-Jones)

*Guidelines for written 'informed consent' attached where applicable
cc: Supervisor : Mrs Juan Scribante

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 B: Permission from Postgraduate Committee

Faculty of Health Sciences
Medical School, 7 York Road, Parktown, 2193
Fax: (011) 717-2119
Tel: (011)717-2075/6

Reference: Ms Salamina Segole
E-mail: Salamina.segole@wits.ac.za
07 August 2012
Person No: 0201108G
PAG

Dr H Hurri
106 Flamingo Street
Extension 1
Lenasia
1827

South Africa

Dear Dr Hurri

Master of Medicine (in the specialty Anaesthesia): Approval of Title

We have pleasure in advising that your proposal entitled "*Profile of ICU bed requests at Helen Joseph Hospital*" has been approved. Please note that any amendments to this title have to be endorsed by the Faculty's higher degrees committee and formally approved.

Yours sincerely

Mrs Sandra Benn
Faculty Registrar
Faculty of Health Sciences

Appendix C: Permission from Director of Helen Joseph Hospital ICU

Helen Joseph Hospital
Intensive Care Unit

Permission to conduct research

Title of project: Profile of ICU bed requests at Helen Joseph Hospital ICU
Principal Investigator: Dr H Hurri
Department: Anaesthesiology
Supervisor: Dr S Chetty, Ms J Scribante
Ethics Clearance Certificate number: M120111 Approved 27/01/2012

Attention: Dr M Mukansi

My name is Hemal Hurri and I am a registrar in the Department of Anaesthesiology at Helen Joseph Hospital (HJH). I am also registered for a Master of Medicine (Anaesthesia) degree at the Faculty of Health Sciences, University of the Witwatersrand. As part of the course requirement, I am expected to conduct research under supervision. The title of my proposed research is "Profile of ICU bed requests at Helen Joseph Hospital".

With your permission, I would like to collect data from the completed ICU consultation forms for one summer month and one winter month. I would be looking at patient demographics, which discipline requested the bed, the season of the request, the reason for bed request, whether the patient was admitted or not, if not admitted what the reason for refusal was and finally a 30 day outcome.

I hereby apply for permission to carry out research at Helen Joseph Hospital ICU. There will be no financial implications for the ICU, the Gauteng Provincial Department of Health or the University of the Witwatersrand. All costs related to administration and stationary will be covered by me. A copy of the final report will be made available to you should you request this.

Yours faithfully

Permission: Granted / Rejected

Dr Hemal Hurri
Registrar in the Department of Anaesthesiology
University of the Witwatersrand
Helen Joseph Hospital
MBBCH (WITS), DA (SA)

Dr M Mukansi
Head of HJH ICU

Appendix D: ICU consultation form

DEPARTMENT OF HEALTH

HELEN JOSEPH HOSPITAL

CONSULTATION

NAME: WARD:

AGE: SEX:

HISTORY:

EXAMINATION:

REASON FOR ICU BED:

BP:	HR:	RR:	TEMP:
GCS:	AIRWAY:	CVP\JVP:	PERFUSION:
PH	U&E		
PaO2	HB:		
Pa CO2	WCC		
HCO3	Plates		
BE	PTT		
F102	INR	HIV	

ECG:

CXR:

MANAGEMENT PLAN:

Appendix E: Data collection sheet

Profile of ICU bed requests							
Participant Number							
Age							
Gender	Male	Female					
Discipline	Medical	Surgical	Plastics	Orthopedics	Urology	Obstetrics & Gynaecology	Other
Season	Summer	Winter					
Admitted	Yes	No					
Reason for admission	Mechanical Ventilation	Inotropic Support	Observation	Other	_____		
If Not admitted: Reason for refusal	Too ill	Too well	No bed	No Staff	Other	_____	
					If Other please state reason		
1 Month Outcome - Alive	Yes	No					