

A critical evaluation of the anaesthetic services in the province  
of Gauteng outside of the greater Johannesburg area

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Witwatersrand, in partial fulfillment of the requirements for the degree  
of  
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## DECLARATION

I, Lionel Green-Thompson, declare that this research report is my own work. It is being submitted for the Degree of Master of Medicine 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

Signed at

On this date

## **PRESENTATIONS ARISING FROM THIS PROJECT**

### Oral Presentations:

- South African Society of Anaesthesiologists National Conference, Sun City, 2003
- Wits Health Science Faculty Research Day, 2004
- World Congress of Anaesthesiologists, France, 2004

### Poster Presentations:

- Wits Health Science Faculty Research Day, 2006

## ABSTRACT

The purpose of this study was to evaluate the anaesthetic services in the province of Gauteng outside of the greater Johannesburg area in two parts:

Part 1: assessing the level of training in anaesthesia of those doctors who deliver the anaesthetic service in the area described and

Part 2: reviewing the records of anaesthetics delivered in a two week period.

Part 1 of the study was conducted using a questionnaire at three academic and five non academic hospitals. The questionnaire was administered to all doctors delivering anaesthesia at these hospitals and achieved a response rate of 50% and 69,2% at the academic and non academic hospitals respectively.

Part 2 of the study reviewed the records of anaesthetic procedures performed over a two week period using the theatre registers as a primary data source and then a formal record retrieval for additional data.

The findings of part one showed that the majority (n=15, 83.33%) of practitioners at the non academic hospitals did not have a postgraduate qualification in anaesthesia while this applied to a smaller (n=22, 39.29%) proportion at the academic hospitals. There are significantly fewer doctors with postgraduate qualifications in anaesthesia at the non academic hospitals studied. Similarly 45% of the doctors at the non academic hospitals felt that their training was inadequate for the anaesthetics they were expected to perform.

The findings of part two showed that a wide range of procedures were performed for patients of all ages. There were significant differences in the distribution of major and minor cases between the regional and district hospitals. While the selection of anaesthetic was appropriate in all cases, there was a higher than accepted rate of general anaesthesia for caesarean sections. However, there was no significant difference in the length of hospital stay following either a spinal or a general anaesthetic for Caesarean Sections. Most of the cases reviewed took shorter than an hour to be completed and most patients were discharged within a week of surgery.

In only 27 (5%) of the procedures reviewed could a complete anaesthetic record be retrieve

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## **List of Abbreviations**

ACLS	Advanced Cardiac Life Support
ATLS	Advanced Trauma Life Support
ASA	American Society of Anesthesiology
CEO	Chief Executive Officer
CMSA	Colleges of Medicine of South Africa
DA	Diploma in Anaesthesia
FCA	Fellowship of the College of Anaesthetists
HPCSA	Health Professions Council of South Africa
SA	South Africa
SASA	South African Society of Anaesthesiologists
WFSA	World Federation of Societies of Anaesthesiology

# CHAPTER ONE

## OVERVIEW OF THE RESEARCH

### 1.1 INTRODUCTION

The evaluation of the anaesthesiology services in the Gauteng province required consideration of the levels of training of those delivering the anaesthesiology care as well as the nature of anaesthesia being delivered.

This chapter provides an overview of the area that was studied and includes the background to the study; the problem statement; the aims and objectives; relevant definitions and a brief overview of methodology that was followed. The importance of this study for anaesthesiology in South Africa (SA) will also be addressed.

### 1.2 BACKGROUND

The practice of anaesthesia is relatively safe; however, the mortality associated with it has been shown to be largely preventable (1). Mortality and morbidity associated with anaesthesia is multi-factorial. The Australian Incident Monitoring Study highlighted that an inadequate preoperative assessment contributed to perioperative morbidity and mortality (2). The level of training of the anaesthesiology provider has an impact on the safety of anaesthesiology provision. (3, 4, 5, 6).

Internationally, the delivery of anaesthesiology services shows a dichotomy between urban and rural settings (7). The rural Canadian anaesthesiology system has evolved from a service in which general practitioners administered anaesthesia with little or no training to one in which the Canadian Medical Association recommends at least one year of formal training in anaesthesiology. (8).

In rural Australia, there is a high degree of general practitioner involvement with varying periods of training in the provision of anaesthesiology care (9). Authorities in South Australia recognized that the challenge was to provide formal training programs and to maintain competency levels where service levels were not high enough to guarantee competence.

The training of pre-registration house officers in the United Kingdom is inadequate in the management of postoperative pain (10). Power and Norman (11) also reviewed the level of general skills of the equivalent pre-registration house officer in the UK. Their conclusion following this review is that the discipline of anaesthesiology should take increased responsibility for a wide range of training activities for pre-registration house officers. It is hoped that this will provide a balanced approach to preoperative assessment, the acquiring of skills in basic resuscitation, knowledge of fluid management as well as improving management of postoperative pain (11).

The South African Saving Mothers Reports document maternal mortality triennially since 1998. In the second of these reports (12), Rout and Kruger reported that anaesthesia related causes accounted for 3.1% of the overall maternal mortality. They assert that this mortality is associated with a lack of experience and training in obstetric anaesthesiology of those doctors providing anaesthesia, in particular, at Level One hospitals in SA. These observations have been confirmed for the Free State province where 11% of those performing obstetric anaesthesia had no prior experience in this type of anaesthetic (13).

In South Africa, Payne et al. (14) demonstrated the great divide in the provision of perioperative services between the central academic urban based and peripheral, rural services. Specialists visiting from the academic centres improved the delivery of anaesthesiology care in the rural hospitals which were studied. Few practitioners in these hospitals had formal training in anaesthesiology. With training in anaesthesia, an improved level of practice was observed. These levels of training may have an impact on the level of anaesthesiology care (14). One form of formal training and assessment is the Diploma in Anaesthesia which is offered by the Colleges of

Medicine of South Africa (CMSA). It is a valuable qualification in training general practitioner anaesthetists (15).

There are no data for anaesthetic practice in the province of Gauteng. Neither the level of training of practitioners nor the nature of anaesthesia required has been reported on before. This study will attempt to provide this information for the Gauteng province outside of the greater Johannesburg area. There is currently research nearing completion which is investigating and assessing “procedure related deaths in the greater Johannesburg area” (16).

### **1.3 PROBLEM STATEMENT**

The provision of quality anaesthetic services is a vital part of a comprehensive health care delivery system. Currently in the South African context, there exists a wide range of standards of care in anaesthesia and limited data evaluating existing practice.

A substantial anaesthetic service is rendered in the Gauteng province outside the greater Johannesburg area, yet there has been no critical evaluation of these services.

### **1.4 AIMS AND OBJECTIVES**

#### **1.4.1 Aims**

This critical evaluation of anaesthetic services in Gauteng outside of the greater Johannesburg area was conducted in two parts. The aims of the evaluation were:

- **Part 1-** to describe the level of training of doctors who provide anaesthesiology services at five non-academic hospitals and three academic hospitals, in

Gauteng outside of the greater Johannesburg area and their perception of the adequacy of their training.

- **Part 2** - to describe the anaesthetic practice at the five non-academic hospitals above over a two week period. These were the only non academic hospitals in the area of the study. The study was limited to these hospitals to provide preliminary data regarding the conduct of anaesthetic services at this level where Part 1 had shown that there was little specialist supervision. It was reasonable to suppose that more instances of practice outside the accepted guidelines would be found at these hospitals.

#### **1.4.2 Objectives**

The aims of this study were achieved by the following objectives:

##### **Part 1**

- Document and compare the level of anaesthesiology training and postgraduate qualification of doctors who are expected to provide the anaesthesiology service at five non-academic hospitals and three academic hospitals;
- Describe the range of procedures for which the doctors are expected to perform anaesthesia;
- Determine their perceptions about the adequacy of their preparation for the level of service which they were expected to provide.

##### **Part 2**

- Document the anaesthetic patient profile and the surgical procedure performed at the non-academic hospitals over a two week period;
- Evaluate the adequacy of the anaesthetic service provided by analysing anaesthetic choices and presence of anaesthetic records;

- Evaluate the outcomes of the anaesthetic delivery using length of hospital stay following the procedure.

## 1.5 RESEARCH DEFINITIONS

The following definitions were used in this study.

**Academic hospital:** is a hospital which is administered by a provincial Department of Health and offers undergraduate and postgraduate training of medical doctors. This type of hospital is formally associated with a university. They may also be referred to as Level 3 hospitals.

**Advanced Cardiac Life Support (ACLS®):** is a standardised internationally directed and approved course offered by a number of accredited providers in South Africa.

**Advanced Trauma Life Support (ATLS®):** is a standardised internationally directed and approved advanced trauma life support course offered by the Trauma Society of South Africa.

**Anaesthetist:** is any doctor who delivers the anaesthetic to patients. This doctor is not recognized as a specialist.

**Appropriate anaesthetic:** for the purposes of this study, was defined as being an acknowledged choice for that procedure. The definition does not suggest that the choice of anaesthetic technique is best practice for the procedure, only that it is an acknowledged technique for that procedure. In the study, the researcher used this definition to guide his judgement.

**ASA 1 – 5:** is an American Society of Anaesthesiologist risk assessment for patients undergoing anaesthesia. The level ranges from 1 (lowest risk for completely healthy patient) to 5 (highest risk for patient in imminent danger of death).



**Colleges of Medicine of South Africa (CMSA):** is a South African examining authority which assesses competencies in the postgraduate practice of medicine in a variety of disciplines.

**Community service doctor:** is a doctor who is completing his/her community service as prescribed by the HPCSA prior to being granted full registration for independent practice. This doctor has usually completed a one year internship which is acknowledged as an extended period of training following graduation with a medical degree.

**Consultant/Anaesthesiologist:** is a doctor who has a specialist qualification endorsed by the HPCSA for specialist anaesthesiology practice. This status may be conferred on doctors who have obtained the FCA or a MMed. International qualifications may be subjected by the HPCSA to special scrutiny.

**Diploma in Anaesthesiology (DA):** a postgraduate qualification offered by the Colleges of Medicine of South Africa (CMSA) for doctors who have completed at least six months of anaesthetic practice at an accredited facility. The qualification is awarded following assessment of competency.

**District Hospital:** is a hospital, administered by a provincial Department of Health, which has no specialist anaesthesiology post available. They may also be referred to as Level 1 hospitals.

**Fellowship of the College of Anaesthetists (FCA):** is a postgraduate professional qualification offered by the Colleges of Medicine of South Africa (CMSA) which serves as a specialist qualification which can be registered with the HPCSA.

**Health Professions Council of South Africa (HPCSA):** the statutory body which governs the professional accreditation of doctors and other health professions in South Africa. The council also determines which qualifications are required for registration as a specialist in South Africa.

**Intern:** a doctor who has graduated from university and is completing further supervised training for a period of one year at the time of the study. This category of doctors is not registered by the HPCSA for independent practice.

**Length of stay:** for the purposes of this study, this means the length of hospital stay following the administration of an anaesthetic. Length of stay has been used as a surrogate measurement for the outcome of anaesthesia. (17,18) Significant anaesthetic complications lead to prolonged length of hospital stay.

**Level of training:** is the degree to which doctors performing anaesthesia have attained a postgraduate qualification in anaesthesia or resuscitation.

**Master of Medicine (MMed):** is a university awarded master's degree in specialist medicine which serves as a qualification which allows registration as a specialist with the HPCSA. For this study the degree is in the field of study of anaesthesia.

**Medical Officer:** is a doctor employed by the provincial government in a designated medical officer post. This doctor may have no formal postgraduate training in anaesthesiology.

**Non-academic hospital:** is a hospital which is administered by a provincial Department of Health, but does not offer formal training for undergraduate and postgraduate doctors. This hospital may or may not be formally associated with a university. This category of hospitals includes both regional and district hospitals for this study.

**Regional Hospital:** is a hospital, administered by a provincial Department of Health, which may have a specialist anaesthesiology post available. They may also be referred to as Level 2 hospitals.

**Surgical procedure:** for the purposes of this study, all procedures recorded in the theatre register were regarded as such whether these were conducted under sedation, local, regional or general anaesthetic. These included examinations under anaesthesia.

## 1.6 LOCATION OF STUDY

This study was conducted in Gauteng province, outside the greater Johannesburg area at the following hospitals. These are the only hospitals outside the greater Johannesburg area which offer an anaesthetic service.

### **Academic:**

- Kalafong Hospital, a regional hospital affiliated to University of Pretoria
- Ga-Rankuwa Hospital, a tertiary hospital affiliated to Medical University of South Africa and
- Pretoria Academic Hospital, a tertiary hospital affiliated to University of Pretoria

### **Non-academic:**

- Thembisa Hospital, a regional hospital with informal affiliation to University of Pretoria
- Kopanong Hospital, a district hospital with no university affiliation
- Sebokeng Hospital, a regional hospital with no university affiliation
- Pretoria West Hospital, a district hospital with no university affiliation
- Heidelberg Hospital, a district hospital with no university affiliation.

The designation and affiliation of these hospitals was recorded as the status of the hospital at the time the study was conducted.

## 1.7 ETHICAL CONSIDERATIONS

The proposal for this study was accepted by the Postgraduate Committee of the University of the Witwatersrand (Appendix 1). Ethics approval was obtained from the Committee for Research on Human Subjects (Medical) of the University of the Witwatersrand. (Protocol Number M01-11-30, Appendix 2). Written permission to conduct the study at the respective hospitals was obtained from the Gauteng Department of Health (Appendix 3). Consent was requested from the CEO of the

respective hospitals and was received verbally. Although this process is not ideal, each instance of consent granted in this way was recorded in the research diary.

Once consent had been obtained from the CEO of each hospital, the Head of each Department of Anaesthesiology was visited. An initial visit was conducted to explain the nature of the study. At a second visit, the questionnaires were distributed to all doctors responsible for the provision of the anaesthesiology service. The return of the anonymous questionnaire, in a sealed envelope, was accepted by the Ethics Committee as being implied consent.

Anonymity of participants and hospital records was ensured in that names were not recorded.

Confidentiality was maintained as the researcher was the only person that had access to the raw data.

The study was conducted in adherence to the principles of the Declaration of Helsinki (18).

## **1.8 RESEARCH METHODOLOGY**

### **1.8.1 Research design**

A cross-sectional, contextual, descriptive research design was followed in this study

### **1.8.2 Part one**

#### **1.8.2.1 Research population**

The research population for this part was the medical staff providing anaesthesia in academic and non-academic hospitals outside of the greater Johannesburg area in the Gauteng province.

### **1.8.2.2 Research sample**

#### **Sample method**

A convenience sampling method was used in this part.

#### **Sample size**

All medical doctors administering anaesthesia in the five non-academic and three academic hospitals were invited to take part in the study.

#### **Inclusion and exclusion criteria**

Inclusion criteria were medical doctors administering anaesthesia in the three academic hospitals and five non-academic hospitals. There were no exclusion criteria.

### **1.8.2.3 Method**

A questionnaire was used in this part to collect data.

#### **Questionnaire development**

The questionnaire (Appendix 4) was developed by the researcher, (FCA,SA,2001), and an expert anaesthesiologist, (FCA,SA and Certificate Intensive Care, SA. and an Academic Head of a Department of Anaesthesiology,)

#### **Data collection**

During February 2002, the questionnaire was distributed at five non-academic hospitals and three academic hospitals. A senior member of each department assisted in identifying the anaesthetic providers and in the distribution of the questionnaires. The senior member of the department identified and informed the anaesthetic providers of the study and handed each of them a questionnaire which had the information sheet attached. On occasion, the researcher (who had no line

authority over the providers) handed these documents directly to the providers when this was practicable. The respondents were advised to seal the completed questionnaires in an envelope and hand these back to the departmental contact person with no identification. The researcher collected the completed questionnaires from the respective hospitals one week after first dropping them off.

The collected data was entered on an Excel spreadsheet.

### **1.8.3 Part Two**

#### **1.8.3.1 Research population**

The research population for this part consisted of all the medical records of patients who had had a surgical procedure performed, during the two week period from the 1 – 14 August 2002, at the five non-academic hospitals outside of the greater Johannesburg area in the Gauteng province.

#### **1.8.3.2 Research sample**

##### **Sample method**

A purposive sampling method was used in this part.

##### **Sample size**

All elective and emergency procedures recorded in the theatre registers during the period from 1 – 14 August 2002 were included in the study. This included cases which required any form of anaesthesia. Cases were included which started after 00h00 on the 1 August 2002 and before 24h00 on the 14 August 2002.

##### **Inclusion and exclusion criteria**

All patients' records from surgical procedures during the period 1 – 14 August 2002 were included in the study. There were no exclusion criteria.

### **1.8.3.3 Method**

In this part of the study a retrospective record review was done. A data capture record was completed which combined information taken from both theatre registers and patient records.

#### **Data Collection**

Data was collected from the theatre registers and patients' files and entered on a Excel spreadsheet.

## **1.9 DATA ANALYSIS**

Descriptive statistics were used to analyse the data obtained during the study.

## **1.10 SIGNIFICANCE OF THE STUDY**

The Second Saving Mothers Report 1999 – 2001 (12) identified the level of training of anaesthesiology providers as a major contributor to maternal mortality in SA. This study will contribute to the body of knowledge which currently exists about this level of training of doctors providing anaesthesiology services in Gauteng. The results will assist the future planning and delivery of this scarce resource.

This study was awarded a post-internship research grant by the South African Medical Research Council in recognition of the contribution to knowledge of anaesthetic practice in South Africa.

## **1.11 LIMITATIONS**

The study was done contextually in the Gauteng province, outside the greater Johannesburg area, the implication being that the results of this study cannot be generalised to the rest of South Africa. However this study does address an important problem.

The questionnaire used in part one has only face validity, this level of validity was deemed appropriate for the scope of this study as this is a research report.

## **1.12 OUTLINE OF THE STUDY**

The study will be presented as follows:

In chapter one an overview of the study was provided. A review of the relevant literature will be presented in chapter two. Chapter three will describe the research methodology in detail. The results of the study will be presented in chapter four. In chapter five these results will be discussed. The limitations of, recommendations and conclusions from the study are contained in chapter six.

## **1.13 SUMMARY**

In this chapter an overview of the study has been given. It has described the background; problem statement; aims and objectives; the research design and methodology; importance of the study and ethical considerations.

In the next chapter a review of the literature related to the topic under research will be presented.



# CHAPTER TWO

## LITERATURE REVIEW

### 2.1 INTRODUCTION

The evaluation of anaesthesiology services demands an appropriate definition of the quality of anaesthesiology. The sensitivity and specificity of the traditional monitors of quality and safety in anaesthesia have been questioned because of the multi-factorial nature of perioperative morbidity and mortality. Critical incident monitoring, a recognised approach to error identification, is not ideal as one needs the co-operation of practitioners (20). The goal of this literature review was to discuss quality in anaesthesiology with regards to patient safety and the education of the workforce which have been accepted as markers for the quality process within a department of anaesthesiology (21).

Anaesthetic mortality studies have to take into account the relatively low prevalence of death due to an anaesthetic. Anaesthesia is relatively safe with British mortality rates reported at one death per ten thousand anaesthetics and in South Africa being reported as 0.22 deaths per thousand anaesthetics in the literature as early as 1978 (1,5). Mortality and morbidity reporting is the current method for evaluating the safety and quality of anaesthesia and these will be discussed with a particular reference to the maternal mortality reports in South Africa as an example. The training of the anaesthetic workforce will be discussed primarily using the standards for anaesthetic practice set by international and local organisations. Finally this review will examine the level of training of the anaesthesia practitioner as one characteristic which may enhance the quality of anaesthetic care.

## 2.2 QUALITY ANAESTHESIA

The American Institute of Medicine (IOM), 1990 (22) offers the following definition for quality in the health care system:

“Quality of care is the degree to which health services for individuals and populations increase the likelihood of desired health outcomes and are consistent with current professional knowledge”

Using this definition, Donaldson (22) suggests that the measurement of quality in health services is multidimensional and would take into account, amongst other dimensions, the structure and process of the health service as well as the outcomes of the delivery of health care. These outcomes are related to morbidity and mortality and, increasingly, to the assessment of patient reports of their situation following the encounter with the health system.

Within this multidimensional approach to quality, the performance of the health care practitioner becomes the heart of the quality of health care (23). Donabedian (23) uses a series of concentric circles to indicate the levels at which quality may be assessed. At the centre of this model is the healthcare practitioner whose quality is a mix of knowledge and technical ability on the one hand complemented by an interpersonal dimension. The idea of a patient input to the reflection on quality is a growing dimension in the literature surrounding quality (24).

The idea of the inclusion of the patient dimension is reinforced by the International Standards Organisation Norm ISO 9000:2000 (24) where quality is defined as:

“The ability of a set of inherent characteristics of a product, system, or process to fulfil the requirements of customers and other interested parties”

In 1990, Donabedian described the seven pillars of quality of health care quality as being efficacy, effectiveness, efficiency, optimality, acceptability, legitimacy and equity (24). More recently, this idea has been further refined for the practice of anaesthesia

by Dhamen and Albrecht (25) who listed seven attributes for describing a quality anaesthetic system, namely safety, provider competence, acceptability, accessibility, efficiency, appropriateness and effectiveness.

Safety of the patient remains a key feature of the practice of anaesthesia and this is reflected in the many reports on the mortality and morbidity associated with anaesthesia.

### **2.3 ANAESTHETIC MORTALITY AND MORBIDITY**

In the systematic review of mortality in anaesthesia conducted by Braz et al. (26), the difficulties associated with the review are reflected in their finding of a wide variety of definitions used for describing causes of death from anaesthesia. The definition of the perioperative period in the studies reviewed varied from 24 hours to as long as one week after the anaesthetic event. Braz, et al. (26) conclude that despite the declining mortality rates in the developing world, the anaesthesia related mortality rates remain much higher in developing countries than those prevalent in developed countries.

Braz, et al. (26) reported mortality rates per 10 000 anaesthetics in the period between 1954 and 1989 of between 7.9 in teaching hospitals in the United States and 0.3 in teaching hospitals in Sweden (this research used death in the operating room as the definition of mortality). In a similar table showing the incidences between 1990 and 2006, these authors show a general decline of incidences to the levels of 5.7 in a Thai hospital to 0.12 in Japan.

A cohort of patients was studied prospectively in Holland between January 1995 and 1997 (27). The study categorised the factors associated with the adverse outcomes as being related to anaesthesia, surgery, a combination of the two, inevitable and fortuitous events (such as pulmonary embolism) and events which could not be assessed or where the data were inadequate. In the anaesthetic category further

definition of causes related to cardiovascular management, ventilatory management, patient monitoring and other anaesthetic management.

The key findings of this research are that different parts of the anaesthetic process may be contributing to the perioperative death or significant morbidity especially at the times of induction and maintenance. While asserting that not all anaesthetic deaths are preventable, in 20% of the anaesthesia related deaths the anaesthetic care was inadequate. For three of the four categories of causes listed above, human factors contributed to over 70% of the anaesthesia related deaths. The authors go on to report that where the monitoring of the patient was inadequate, 60% of these occurrences were due to human failures and 40% to system-related factors.

A recurring concern in the reporting of anaesthesia related mortality and morbidity is the lack of a set of accurate definitions. Arbous, Grobbee et al. (27) referred to this and created specific definitions for the conduct of the Dutch research. Incident reporting systems may use definitions such as near miss, adverse event and medical error (26). An error, according to the Institute of Medicine, is the making of an incorrect decision or the incorrect conduct of a planned action (22).

Outcomes of anaesthesia bear testament to the levels of quality achieved in its delivery. From the earliest reports by Beecher and Todd, the description of what anaesthetic mortality and morbidity are, and what inferences can be made from this information has occupied the anaesthetic community in a variety of ways. Lundgren (29) answers a question on whether anaesthesia is safer than it was previously: "it depends on which country and continent one is referring to." This statement captures the wide range of assessments of mortality and morbidity that abound.

In a report from Togo, West Africa a mortality rate of 2.5% has been reported in a consecutive series of anaesthetics delivered for the period January to June 2002 (30). More than half (56%) of the deaths recorded occurred in patients classified at the level of ASA 1 and 2. At greatest risk were the patients presenting for obstetric/gynaecological procedures with these patients making up 50% of those who die within 24 hours of the procedure. In this hospital where 80% of the procedures

were deemed urgent, there was no succinylcholine to effect a rapid sequence induction (the effect of this on the mortality is not clearly ascribed by the authors).

Harrison (5) provides the most comprehensive survey of the anaesthetic related mortality in the South African context. Limiting the definition to death within 24 hours of the anaesthetic, he reports an incidence of death associated with anaesthesia of 2.2 per 1000 anaesthetics performed between 1967 and 1976. He subsequently reported a decline in the incidence of anaesthetic contributory death to 0.9 per 1000 anaesthetics in the Groote Schuur Hospital in the five year period up to 1987 (31).

This work is the last study of its magnitude in South African anaesthesia (31). There is little current data on the mortality and morbidity associated with anaesthesia in South Africa. The Saving Mothers Reports, which have recorded the mortality of mothers country wide since 1998, have consequently become a valuable albeit flawed source of information regarding the ongoing practice of anaesthesia in the country.

## **2.4 MATERNAL MORTALITY**

There is an increasing concern worldwide regarding maternal mortality and it is reflected in James' (34) reworking of a John Donne phrase from *Devotions upon Emergent Occasions*:

“Any (wo)man’s death diminishes me, because I am involved in Mankind”

Set as one of the Millennium Development Goals (MDG) in 2000, maternal mortality has become one of the indices by which the development of health care in the developing world is being monitored in anticipation of the MDG target year – 2015. (35). Cooper, Lewis and Neilson (36) in an editorial discussing the United Kingdom Confidential Enquiry into Maternal deaths (UKCEMD) 1997 – 1999, speak of the ever reducing impact of anaesthesia on maternal mortality ascribed, in part, to the

adherence to recommendations from professional organisations. The report combines all data from the United Kingdom and has been developed since 1952, issuing 16 reports in that time. The 1997 – 1999 triennium is the first in which the majority of the deaths are due to the exacerbation of conditions by the pregnancy rather than from direct obstetric causes. They also comment on the increased relative risk of delivery by Caesarean section.

Thomas and Cooper (37) present a series of twenty cases of maternal death from the 1997 – 1999 UK CEMD report entitled “Why Mothers Die” using the descriptions: caused by anaesthesia, contributed to by the anaesthetic or serious events which happened during an anaesthetic. In the category where anaesthesia has contributed to the deaths, the authors have described these as being the result of poor teamwork and communication, major obstetric haemorrhage, poor postoperative care, inadequate assessment and sepsis. In three of the twenty deaths, the cause was as a consequence of substandard care from the anaesthetist ranging from a lack of understanding of the pharmacology of oxytocin to an inappropriately managed airway.

World Health Organisation (WHO) data suggest that 536 000 women die in events related to childbirth and pregnancy per year, of which 99% occur in the developing world. The maternal mortality rate per 100 000 live births in the developed world is nine compared with that in the developing world of 450, with the rate in sub-Saharan Africa at 900 per 100 000 live births. Despite the MDG focus on maternal mortality, there are many policy barriers to the effective reduction in the maternal mortality rates in the developing world (38). Using India as an example, Mavalankar and Rosenfield (38) highlight the absence of clear policy frameworks leading to a situation where delivery of care may be compromised.

The Saving Mothers Reports from South Africa have provided the most consistent and regular data of the events surrounding delivery of maternal care countrywide. Three reports have been issued covering the triennia 1999 – 2001, 2002 – 2004 and 2005 – 2007. An important part of these reports is information regarding the conduct of anaesthesia in the mothers who have died. However, it is important to reflect on

the meaning and scope of such reporting. There are epidemiological limitations to such reports, dealing as they do with a high risk anaesthetic population and only studying death in that population. In order to contextualise the anaesthetic record emerging from this report, it is necessary to understand the definition for such a report. The Fourth Saving Mothers Report: 2005 – 2007 (37) defines a confidential enquiry into maternal death (CEMD) as a “systematic multidisciplinary anonymous investigation of all or a representative sample of maternal deaths occurring at an area, region (state) or national level which identifies the numbers, causes and avoidable/remediable factors associated with them.”

Rout (40), reflecting on the results of the initial 1998 South African report, is disturbed by the contribution of the anaesthetic to the mortality of mothers. He comments on the lack of training of the anaesthetists delivering the anaesthetic care as being a major contributing factor. In particular, he expresses concern about the numbers of deaths which are associated with spinal anaesthesia which, internationally, is the preferred mode of anaesthesia for Caesarean section. The comments above are further reflected in the subsequent triennial reports which are documented in Table 2.1 below.

**Table 2.1:** Maternal deaths due to anaesthesia over three triennia – percentage of spinal and general anaesthesia (adapted from Pattinson (editor) Fourth Saving Mothers Report (39))

Triennium	1999 – 2001	2002 - 2004	2005 - 2007
Spinal	42%	41%	72%
General	54%	59%	24%
Other anaesthetic methods/ no record	4%	0%	4%

Rout (40), using data from the 1998 Saving Mothers Report, reported that for general anaesthetics the most common cause of death was difficult or failed intubation and that for a spinal anaesthetic, high motor block was responsible. This trend has changed for the 2005 – 2007 triennium. Table 2.2 below shows the most common

cause of death in mothers undergoing a general anaesthetic is now hemodynamic collapse.

**Table 2.2:** Most common causes of maternal death associated with anaesthesia from 2005 – 2007 (reproduced from Pattinson (editor) Fourth Saving Mothers Report (39))

<b>Total cases assessed</b>	<b>N = 74</b>	<b>%</b>
<b>General Anaesthetic</b>	<b>18</b>	<b>24</b>
• Intraoperative collapse	10	14
• Difficult/failed intubation	4	5
• Equipment failure	2	3
• Other	2	2
<b>Spinal Anaesthetic</b>	<b>53</b>	<b>72</b>
• High spinal	4	5
• Hypotension and/ high spinal	30	41
• Hypotension	2	3
• Intraoperative collapse	10	14
• Other	7	9
<b>Epidural</b>	<b>1</b>	<b>1</b>
<b>Sedation</b>	<b>2</b>	<b>3</b>

The Fourth Saving Mothers Report: 2005 - 2007 (39) reports a 20% increase in the number of maternal deaths when compared to the previous triennium 2002 – 2004 with deaths from non-pregnancy related infections, especially AIDS, making up 43,7% of the total deaths. Anaesthesia related causes of death made up 2.7% of the total number of deaths which is similar to previous reports. Of the 107 cases reported to be due to anaesthesia, only 74 were available for review by the National Anaesthesia Assessor (NAA). The data from one province were not available for review, an indication of the difficulties associated with the administration and record keeping of maternal mortality. This theme of inadequate record keeping recurs in the report especially when it comes to attempting to ascribe cause of death and the extent to



which the anaesthetic is the primary or associated cause. Only 35 (33%) of the cases in which anaesthesia was implicated had a completed anaesthetic chart. The provinces of Free State and Limpopo together make up the largest contribution to the maternal death statistics related to anaesthetics (45.7% of cases reported and 28% of cases assessed). Gauteng had 10 (9.3%) cases reported as being related to anaesthesia with 60% of these being confirmed on assessment by the NAA. The gap between cases reported and those assessed is related to the absence of records and inadequate administration. The skills profile for anaesthesia at district and regional hospitals in the Free State is inadequate in many cases (13). Linked to the level of skill is the low use of regional anaesthetic techniques for Caesarean section in the same province (41).

The report also highlights the lack of appropriately trained staff as being a significant contributor to the mortality of mothers. There is a reduction in the percentage of deaths which can be ascribed to health worker related problems between the 2002 – 2004 triennium and the 2005 – 2007 triennium, but there is a disproportionate number of deaths which are associated with poorly trained staff in the district (Level One) hospitals.

The Fourth Saving Mothers Report: 2005 – 2007 documented 3959 maternal deaths (39). Of these deaths 1519 (38.4%) were regarded as avoidable. Inadequate resuscitation was found to be responsible for 20% of the avoidable deaths. Of these inadequately resuscitated cases, most were as a result of either failure to secure the airway or to manage the circulation. As regards the 107 maternal deaths associated with anaesthesia, 91 (85%) were assessed as being avoidable. As a result, the anaesthesia related deaths make up 6% of all the avoidable causes of maternal death - the largest category of avoidable deaths.

A large proportion of the avoidable maternal mortality has been associated with capacity of health workers. While the report is not specific regarding the level of health worker to whom the responsibility is ascribed, there are deficiencies in the health workers' response to resuscitation and general emergency management. At

Level One (district) hospitals, 76% of the anaesthesia related deaths are associated with inadequate management of emergencies.

The report asserts that while the numbers of personnel is a relatively minor problem, inappropriate training and skills may account for as many as 34.8% of the maternal deaths which the assessors were able to review completely. Health workers arrived at the correct diagnosis in the majority of these reviewed cases. The majority of problems arose from the substandard care (incorrect management after correct diagnosis) by the practitioner. This figure takes on even greater significance when a breakdown is done to the various levels of hospital. The data is shown in the following table. (Table 2.3)

**Table 2.3:** Avoidable anaesthesia related deaths due to health care provider factors (adapted from Pattinson (editor) Fourth Saving Mothers Report (39))

Description	2005 - 2007					
	Level 1 (district)		Level 2 (regional)		Level 3 (academic)	
Total assessable deaths	N = 69	%	N = 34	%	N = 18	%
Initial Assessment	4	5.8	6	17.6	0	0
Incorrect Management (incorrect diagnosis)	2	2.9	1	2.9	0	0
Substandard management (correct diagnosis)	38	55.1	16	47.1	5	27.8
Five additional factors	25	36.2	11	32.4	13	72.2

The anaesthetic data from these reports are limited because of the nature of the cohort of patients for whom this data is recorded. However, the reports make a very strong statement about the inadequacy of training of the obstetric anaesthetic provider, particularly at Level 1 (district) hospitals.

## **2.5 WORLD PRACTICE GUIDELINES**

### **2.5.1 WORLD FEDERATION OF SOCIETIES OF ANAESTHESIOLOGY (WFSA)**

The World Federation of Societies of Anaesthesiology (WFSA) adopted the International Standards for Safe Practice of Anaesthesia in June 1992 (42). The guidelines introduced the vocabulary of levels of intervention being introduced from highly recommended, recommended and encouraged. These descriptors inform practitioners of the requirements for safe anaesthesia. The 2008 update define the highly recommended parts of the guidelines as being mandatory for safe practice even where anaesthesia is being delivered in environments with the most basic infrastructure (43).

#### **2.5.1.1 Minimum International Standards**

The WFSA guidelines set out a series of general considerations which are regarded as minimum standards. These include reference to the professional collective governing the practice of anaesthesia more closely through organisations and peer review. The initial and continuing training of anaesthetists in order to maintain an adequate standard of practice are also regarded as a minimum standard. A trained anaesthetist must be present throughout the period of anaesthetic care, including the recovery phase where care must be handed over to an appropriately trained person.

#### **2.5.1.2 Anaesthetic process**

The guidelines also make specific recommendations regarding the anaesthetic process. Recognition of the three stages of the anaesthetic process, pre-anaesthesia care, monitoring during anaesthesia and postoperative care – is important to safe conduct of anaesthesia. Preoperative care includes the full assessment of the patient and preparation of the operating room. Intraoperative care should include the monitoring of oxygenation, the airway and ventilation, circulation as well as depth of anaesthesia.

The process of all of these phases must be documented in an adequate anaesthetic record.

### **2.5.1.3 Anaesthetic practitioner**

The revision of the general guidelines in 2008 places an added emphasis on the role of the anaesthetic practitioner (43). The document makes the point that:

“The most important standards relate to individual anaesthesia professionals. Monitoring devices play an important part in safe anaesthesia as extensions of human senses and clinical skills rather than their replacement.” (page 1, WFSA 2008)

This recognition of the need for training for those who deliver anaesthesia applies equally to those who are medically qualified as well as those who are not medically qualified. However, the document and its 2008 revision do not give clear guidelines as to what an adequate period of training should be and what that training should entail. While recommending formal certification, the guidelines fall short of detailing what this certification should be. There is little guidance as to the competencies the trainees should attain at their particular level of practice.

Training of the practitioner is seen as improving the safety of patients. The delivery of safe anaesthesia as a dimension of safe surgery has drawn the attention of more broadly based organisations such as the World Alliance of Patient Safety aligned to the World Health Organisation (WHO).

## 2.5.2 WORLD HEALTH ORGANISATION

The World Health Organisation (WHO) in its pursuit of health as “a state of complete physical, mental and social well-being” has launched, through the World Alliance for Patient Safety, a challenge called “Safe surgery saves lives” (44). The goal of safe surgery necessarily means that a large part of the work of this challenge will examine the needs for safe anaesthesia. The World Federation of Societies of Anaesthesiology (WFSA) participates in this challenge and, in particular has established basic and advanced training in anaesthesia through its education committee (45).

The elements of the Surgical Safety checklist which emerged from this challenge focus attention on the three phases of a surgical procedure namely sign in, time out and sign out (46). While giving these phases ordinary sounding descriptions, the guidelines create an alignment with the stages of the anaesthetic process which includes a preoperative assessment, induction, maintenance and emergence from anaesthesia into a post-anaesthesia care period.

Sign-in period (preoperative preparation) actions include checking informed consent, airway assessment, pulse oximeter checks and a prediction of the potential blood loss anticipated. The guideline begins to introduce the importance of the anaesthesia care team both in the sign-in period – “all members of the team must be aware of any known allergies” as well as in the sign out period – “the surgeon, nurse and the anaesthesia professional review aloud the key concerns for recovery and care of the patient”.

Time out actions include both a surgical and anaesthetic review of critical features of the patient and the procedure about to be performed. Ancillary steps such as antibiotic delivery and imaging films are checked in this phase as well. Again there is an expected role for surgeon, anaesthetist and nurse in this step. The final step of sign out re-emphasises the team role, with a loud verbal review of the expectations in the postoperative care period.

The importance of this anaesthesia care team throughout the conduct of the surgery and anaesthetic is highlighted by Abenstein and Warner (47) who showed in a Minnesota based review of anaesthetic outcomes that the anaesthesia mortality rates were lowest where an anaesthetic care team was responsible for the delivery of anaesthesia services. These authors reviewed the providers, outcomes and costs of the anaesthetic practice in Minnesota and show that multiple providers in an anaesthesia care team add a synergistic value to the care of the patient regardless of their individual professional roles (47).

The professional roles of the anaesthetic provider are often championed by national organisations. These organisations, like the South African Association of Anaesthesiologist (SASA), often take on the responsibility for setting guidelines for the most appropriate practice in order to enhance the safety of patients.

## **2.6 SASA GUIDELINES**

In an attempt to enhance the quality of anaesthetic care in South Africa, SASA has issued guidelines for safe practice (48). The guidelines define the requirements for safe anaesthetic practice addressing the interaction of patients and their preoperative assessment, the required facilities and equipment and, particularly, the level of training of the practitioner. The SASA guidelines suggest the following five principles which will contribute to the practice of safe anaesthesia:

- Administration of anaesthesia only by practitioners with appropriate training in anaesthesia.
- The physical presence of such a practitioner constantly in attendance during anaesthesia. The practitioner should be available for the recovery period as well.
- A full and contemporaneous record of the anaesthetic technique, patient responses to anaesthesia and other medical information pertaining to the anaesthetic should be made by the practitioner delivering the anaesthetic.

- That every presenting patient should have a general medical assessment (preoperative assessment) by a medical practitioner, preferably the one scheduled to give the anaesthetic.
- Availability of certain basic facilities and equipment for the safe administration of an anaesthetic.

Four of these principles refer to the practitioner of anaesthesia and one refers to the facilities and equipment required. The following section of this review will examine each of the principles regarding the practitioner.

### **2.6.1 Practitioners with appropriate training in anaesthesia**

This statement is an echo of those made by international organisations such as previously discussed by the WFSA (43). The HPCSA clearly defines the required training for specialist anaesthesiologists, but does not specify such requirements for non-specialist anaesthetists.

The SASA guidelines state that the training period for non-specialists should be at least six months, three of which should be continuous in an accredited training hospital with sufficient patient case loads to ensure adequate exposure to a range of cases. These guidelines go on to prescribe the knowledge domains and include the decision making capacity for the appropriate choice of anaesthetic to be administered. The Colleges of Medicine of South Africa offers a Diploma in Anaesthesia for which candidates must demonstrate they have had supervised training in an accredited anaesthesiology department for at least six months.

SASA recognises the South African reality of practice by non-specialist anaesthetists, but suggests significant limitations be placed on their practice. The SASA guidelines recommend that the College diplomates only be allowed to provide anaesthetic services for the healthiest patients, namely the ASA Level 1 and 2. They should only provide anaesthesia to children over the age of three and healthy obstetric patients.

The guidelines further recommend that medical practitioners without any formal training in anaesthesia should not administer an anaesthetic without supervision. There are no data to show the extent to which the guidelines regarding the level of training are being adhered to in the practice of anaesthesia in South Africa.

### **2.6.2 A practitioner constantly in attendance during anaesthesia**

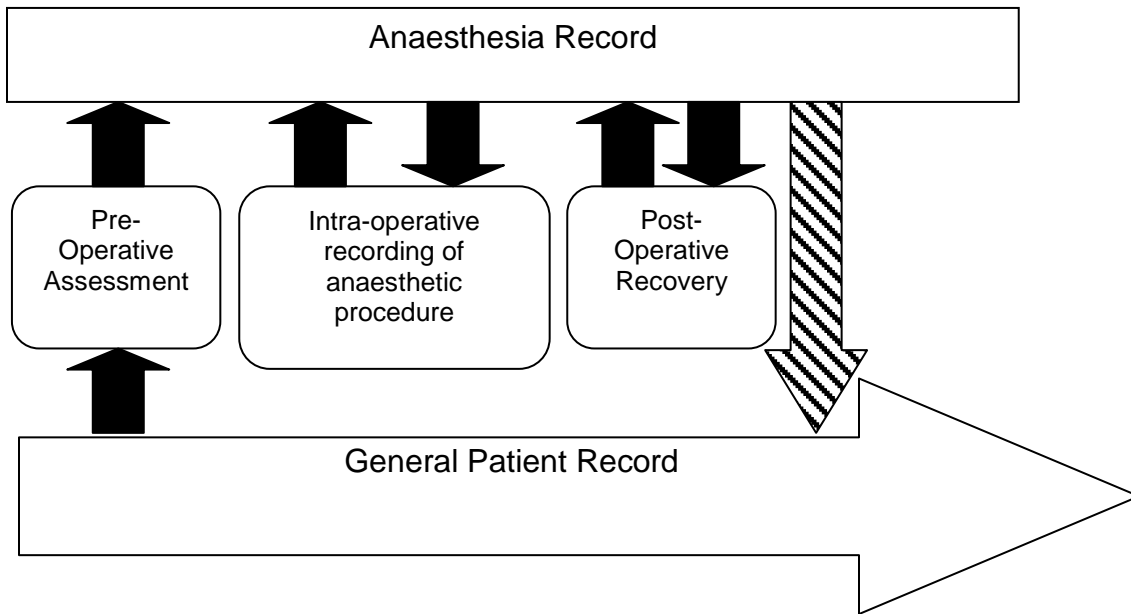
The SASA guidelines confirm the international recommendation of the presence of a “vigilant” anaesthetist as an essential minimum standard. Staender (50) contends that the presence of a “knowledgeable, competent, careful and vigilant” anaesthetic practitioner is the most important element in the delivery of safe anaesthesia.

### **2.6.3 A full and contemporaneous record of the anaesthetic technique**

The patient undergoing an anaesthetic is taken from a primary place of care for example, the ward, and placed for a variable time in the care of the anaesthetist. There is an understanding that in the ward a certain level of care is taken in the recording of a patient’s stay. It thus becomes a reasonable expectation that the anaesthetist who assumes responsibility for the care of the patient during this care interlude should keep an adequate record of that time. Friesdorf et al. (49) offer a model by which to view the anaesthetic record. The preoperative assessment is recorded as the first encounter with the anaesthetic process. The next encounter with the anaesthetic record is during the procedure where there is an iterative interaction between the anaesthetist, the surgical procedure, the effects of the anaesthesia and the surgery on the patient and the recording of these events. The record ends with the postoperative procedures – again a two way interaction of recording all the events in the post-operative period. After this the anaesthetic record should be returned to form part of the general patient record (49). Record keeping is not interrupted. The record may then serve to inform further management of the patient on the ward or subsequent anaesthetic procedures. The figure below (Figure 2.1) captures the image that the anaesthetic record is really the ongoing record of general patient care



and illustrates the need of returning such record to the patient's general medical record.



(Arrows represent the progress of the patient through the anaesthetic process. Striped arrow represents return of anaesthetic record to general patient record)

**Figure 2.1:** Schematic representation of the interaction between the patient's general record and the anaesthesia record at various phases of the anaesthetic process. Finally the anaesthetic record becomes part of general record (adapted from Ergonomics applied to anaesthesia record keeping, Friesdorf, Konichezky et al. in Int J of Clinical Monitoring and Computing 1993) (49)

Medical records have been used for primary and secondary purposes (51). The primary uses are those which directly support patient care through keeping track of the patient's clinical developments over time. The secondary function has a more administrative and planning focus and would include the potential for their being a source for audit research and service planning. Both of these functions are important in the practice of anaesthesia.

Balust and Macario (52) note that the anaesthesia record is "by far the most detailed general physiological and pharmacological account available in routine clinical

practice". Anaesthesia records may be regarded as a secondary task for anaesthetists and are often completed after the fact. This may result in omissions, illegibility, rounding off of findings including their placement within normal limits and averaging of values around an abnormal figure (52).

Much has been written about the accuracy of the anaesthetic record. Byrne, Stellen and Jones (53) showed that the anaesthetic record is not always accurate, but showed that in simulated critical incidents the accuracy of the record is compromised even further. They suggest that the more stressful the critical incident, the greater the likelihood of an inaccurate record.

The question of accuracy of the anaesthetic record has bedevilled the practice of anaesthesia from the earliest times. The Nuffield Provincial Hospital Trust Report of the 1970's points to the absence of clinical anaesthetic records, insufficient consultation between surgeons and anaesthetists and, more significantly, the idea that anaesthetists often ignored pre-existing disease which may have had an impact on surgery (1). More recently, a report from Portugal (53) showed that while there was a high level of correct entries, only 81% of the charts were completed. The authors make the important observation that procedures which had less incorrect data were those which lasted longer than one hour, were done under general anaesthetic or were emergency procedures. Preoperative events such as the ASA evaluation, airway assessment and the selection of the anaesthetic technique were completed less correctly. In an audit of the anaesthetic records in an orthopaedic surgery unit, Davis (55) showed that while the practitioners felt some of the variables such as blood loss and urine output were important, these were sometimes the variables omitted from the anaesthetic record.

Tessler, Tsiodras, Kardash and Shrier (57) reported on the relationship between what anaesthesiologists regarded as important information to have recorded on the anaesthetic record and what they actually recorded. There were major differences between these two ideas. Preoperative assessment of the airway received a rating as essential information to be recorded from the survey of the practitioners. Despite

the practitioners rating, the analysis of the records of the institutions at which these doctors worked revealed that this feature was recorded in only 49% of the records. The ASA score (a measure of fitness for surgery linked with outcomes) was rated by the practitioners only as useful information but the study did not assess how often it had been recorded. In general, the report showed that recording of intraoperative variables matched the ratings ascribed to them by practitioners. However, only 24% of records showed a value for the estimated blood loss despite this variable achieving a rating of between essential and important.

Many professional associations have described the minimum requirements of the anaesthetic record. Recent Canadian guidelines (56), recommend that physiological variables like blood pressure and pulse rate should be recorded at least every five minutes with a proviso that this may be determined by the clinical circumstance. The oxygen saturation should be monitored continuously and recorded periodically. The guidelines are quite specific with regards to all the intraoperative events being recorded. There is an explicit expectation that the patient's condition in the immediate postoperative period is also clearly noted. The SASA guidelines are, however, silent on the details of what would make up the full and contemporaneous record.

#### **2.6.4 A general medical assessment**

“The preoperative anaesthetic assessment record is a written response to a referral from the surgical team for anaesthetic care”

Simmonds and Petterson (58) use this statement to establish the importance attached to an adequate preoperative assessment as well as the recording of such an encounter. They conducted an initial audit based on 12 items which they had jointly decided as being an important part of the preoperative assessment. Only a quarter of the 12 items was recorded prior to their introduction of a dedicated anaesthetic assessment sheet. They found that patients classified as ASA grade 3 or higher had a more complete record of preoperative findings.

The SASA guidelines are established to guide the daily practice of anaesthesia in South Africa. This practice is widely varied across the regions within the country as well as in the greater African context.

## **2.7 ANAESTHETIC PRACTICE IN AFRICA**

The delivery of anaesthesia in Africa is a challenge with regard to the individual practitioners responsible for delivering anaesthesia. Hodges, Mijumbi, Okello, et al. (59) make the observation about anaesthesia in the developing world that “anaesthesia is most frequently delivered by non-physicians; it is seen as a low priority and lacks the voice to demand access to resources.” Hodges et al. report that in Uganda only 23% of hospitals have the facilities to conduct safe adult anaesthesia, 13% for safe obstetric anaesthesia and 6% for safe anaesthesia for children. Of particular concern was the fact that only 48% of those practitioners canvassed reported the availability of a textbook for reference. This observation must raise awareness of the impact that can be made through education and support of current practitioners of anaesthesia outside of the academic centres. Almost all of the anaesthetic practitioners believed that the way to improve safety of anaesthesia is to improve the anaesthetic equipment (95%) and the availability of anaesthetic drugs (51%). Most of the anaesthesia practitioners in the Ugandan study had been trained in a certified programme over 2 – 3 years. Only one of the providers was a medically trained anaesthesiologist.

Fenton, Whitty and Reynolds (60) report that in Malawi there is a great reliance on paramedical officers for the anaesthesia service. These practitioners normally do 15 months formal training in anaesthesia after a three year foundational health course as clinical officers. All of the Caesarean sections monitored prospectively were performed by such paramedical practitioners: however, a remarkable 9% of these practitioners had no formal anaesthesiology training – reporting only having been trained “on the job” (sic) They established that a low level of training in both anaesthesia and surgery was a risk factor for poor outcome for the mothers .

### 2.7.1 South African context

James, Harrison and Morrell (32) reflecting in an editorial on an article in the South African Medical Journal (SAMJ), draw lessons for South African anaesthetic practise from mortality and morbidity research by McKenzie (33) in Zimbabwe. The lessons they draw centre on the need for increased training of those who deliver the anaesthetic service. McKenzie (33) reports that 51% of the perioperative deaths in the two Harare teaching hospitals were avoidable. The junior levels of anaesthetic provider (senior house officers and registrars) accounted for the greatest incidences of avoidable factors. This statistic has echoes in the most recent South African Saving Mothers Report 2005 – 2007 (39) suggesting the South African anaesthetic community have been slow in learning the Zimbabwean lessons from McKenzie (33).

In South Africa, the administration of anaesthesia is the exclusive preserve of medically trained practitioners. The SASA 2002 Scope of Practice document (61) asserts that there are too few anaesthesiologists in South Africa but only comments on the scope of practice for medically trained anaesthetic providers (61). This scope of practice document argues that the quality of anaesthesia delivered by specialists is superior to that delivered by non-specialists. The document also reports that non-specialist anaesthetists in an urban private practice have a much higher rate of critical incidents than their specialist counterparts. There are no continuing education requirements of non-specialist practitioners of anaesthesia for developing and maintaining anaesthesia competencies specifically. Only the general practice requirements for continuing professional development applied at the time of writing.

In terms of the SASA guidelines, general practitioners without 'additional (post - graduation) training' should only deliver an anaesthetic in a dire emergency situation while diplomates in anaesthesia are recommended to have a wider practice. SASA recommends that community service doctors (pre-registration level medical officers) should always be supervised, even if remotely, after a two month period of anaesthetic training during their community service year. Currently this level of

practitioner will have completed a two year internship which includes a two month period in anaesthetics (62).

The requirement for anaesthesia training in the internship has been part of the requirements of the Health Professionals Council of South Africa (HPCSA) since the 2005 -2006 cohort of medical graduates. The programs for this period of training during internship are varied. King (63) is responsible for the intern training program in a rural/urban hospital complex in the KwaZulu Natal Midlands and makes the point that while this two month training period in internship is unlikely to create competent anaesthetists, it may ensure the provision of some basic anaesthesia skills in the community service period.

## **2.8 WHO SHOULD DELIVER ANAESTHESIA?**

Wilson (64) and Jacob (65) in two separate articles took opposing views on who should deliver anaesthesia for paediatric patients in the developing world. Wilson (64) argues that while in the developed world it is uniform practice that anaesthetic services are provided by medical trained anaesthetists, the state of anaesthesia in the developing world is still poor. He concludes his arguments by suggesting that non-medical trained cadres of anaesthesia providers are important in the establishment of safe anaesthetic practice for much of the developing world. He makes the point that such providers need to be well trained for the service and, perhaps more importantly, they need to be seen as partners in the improvement of the situation that exists. In her counter argument, Jacob (65) reports that in the developing world there are increasingly rigorous comments regarding anaesthesia for children. She quotes the 1989 National Confidential Enquiry into Peri Operative Deaths (UK) report as saying “surgeons and anaesthetists should not undertake occasional paediatric practice”. Jacob challenges the idea that non-medical providers should be used to deliver anaesthesia in the developing world. She calls it a practice of double standards arguing that the developed world would not accept such a development. She offers a

success story as evidence of what training may make possible. The example is from Nepal where a group of Canadian anaesthesiologists developed a year long course – similar to a diploma in anaesthesia internationally - which assisted the medically trained personnel in developing the skills required for safe anaesthetic practice. Mavalankar and Rosenfield (38) report positively about India and Bangladesh where anaesthesia is exclusively provided by medical officers. Both India and Bangladesh have introduced substantial training programmes to improve the anaesthesia skill level with a particular view to improving emergency obstetric services.

Abenstein and Warner (47) report that anaesthetic service may be provided by nurse providers in the United States. The training of the nurse anaesthetist includes a post-basic two year programme in most areas of anaesthetic practice. This follows the four year undergraduate degree programme and specified clinical experience, in particular, a year in a critical care environment. These authors assert that the training is half of the training which physician anaesthesiologists undergo. Martin-Sheridan and Wing (66) in a scathing critique of the above report show that most nurse anaesthesia education programmes confer a Master's degree on qualification of nurse anaesthetists. They report that nurse anaesthetists personally administer 62% of the 25 million anaesthetics in the United States. This figure reaches 70% in the rural areas of the US.

## **2.9 SUMMARY**

Reflection on the quality of health care is best served using a multidimensional model at the centre of which should be the health care practitioner. The quality of the health care practitioners is a function of their training with its consequent knowledge and skills. These two domains are of particular importance in the delivery of safe anaesthetic care. Attention to training requirements, facilities and record keeping have formed part of the numerous international and local guidelines which seek to direct the safe practice of anaesthesia in both the developed and developing world.

The dichotomy which currently prevails in the mortality rates due to anaesthesia between the developed and developing worlds is a cause for concern. This has led to debate about who should be permitted to conduct anaesthesia. While South Africa retains an exclusively medical anaesthetist service, much of the developing world deploys paramedical staff in this role.

The maternal mortality reports (Saving Mothers) remain an important, albeit somewhat skewed, source of information regarding the anaesthetic events leading to mortality. There must be some concern that there are still a significant number of avoidable deaths due to anaesthesia in the maternal death cohort. Lamacraft, Kenny, Diedericks and Joubert (66) suggest that these reports should form part of any response to the anaesthetic training and delivery issues.

There is no data regarding the practice of anaesthesia in Gauteng. This study seeks to provide information regarding this aspect on the practice of anaesthesia in the province outside of the greater Johannesburg area.

Therefore, the aim of this study is

- to describe the level of training of doctors who provide anaesthesiology services at five non-academic hospitals and three academic hospitals, in Gauteng outside of the greater Johannesburg area and their perception of the adequacy of their training.
- to describe the anaesthetic practice at the five non-academic hospitals above over a two week period.



# CHAPTER THREE

## RESEARCH METHODOLOGY

### 3.1 INTRODUCTION

This chapter consists of the problem statement, aims and objectives, ethical considerations, research design and methodology that was followed and the discussion of validity and reliability of the study.

### 3.2 PROBLEM STATEMENT

The provision of quality anaesthesiology services is a vital part of a comprehensive health care delivery system. Currently in the South African context, there exists a wide range of standards of care in anaesthesia and limited data evaluating existing practice.

A substantial anaesthetic service is rendered in the Gauteng province outside the greater Johannesburg area, yet there is no critical evaluation of these services.

Therefore, the aim of this study was to critically evaluate the anaesthetic service in Gauteng outside the greater Johannesburg area by establishing in the first instance; the level of training of practitioners delivering anaesthetic services, the range of procedures they encounter and their perception of the adequacy of that training. In the second instance to review the records of patients.

### **3.3 OBJECTIVES**

The aims of this study were achieved by the following objectives:

#### **Part 1**

- Document and compare the level of anaesthesiology training and postgraduate qualification of doctors who were providing the anaesthesiology service at five non-academic hospitals and three academic hospitals;
- Describe the range of procedures for which the doctors are expect to perform anaesthesia;
- Determine their perceptions about the adequacy of their preparation for the level of service which they were performing; and

#### **Part 2**

- Document the anaesthetic patient profile and the surgical procedures performed at the non-academic hospitals over a two week period;
- Evaluate the adequacy of the anaesthesiology service provided at the non academic hospitals by analysing anaesthesiology choices and presence of anaesthesiology records; and
- Evaluate the outcomes of the anaesthetic delivery using length of hospital stay following the procedure.

### **3.4 ETHICAL CONSIDERATIONS**

The proposal for this study was approved by the Postgraduate Committee of the University of the Witwatersrand (Appendix 1). Ethics approval was obtained from the Human Research Ethics Committee (Medical) of the University of the Witwatersrand. (Protocol Number M01-11-30, Appendix 2). Written permission to conduct the study

at the respective hospitals was obtained from the Gauteng Department of Health (Appendix 3). Consent was requested from the CEO of the respective hospitals and was received verbally.

Once consent had been obtained from the CEO of each hospital, the Head of each Department of Anaesthesiology was visited. An initial visit was conducted to explain the nature of the study. At a second visit, the questionnaires were distributed to all doctors responsible for the provision of the anaesthesiology service. The return of the anonymous questionnaire, in a sealed envelope, was accepted by the Ethics Committee as being implied consent.

Anonymity of participants and hospital records was ensured in that names were not recorded.

Confidentiality was maintained as the researcher was the only person that had access to the raw data.

The research was conducted in adherence to the principles of the Declaration of Helsinki (19).

### **3.5 RESEARCH DESIGN**

A cross-sectional, contextual, descriptive research design was followed in this research.

This study looked at a prevailing situation at a particular moment in time. The level of training was evaluated in February 2002 and the record review of anaesthesiology cases performed from 1 – 14 August 2002 was reported.

## **3.6 RESEARCH METHODOLOGY: PART ONE**

### **3.6.1 Location of study**

This part of the study was conducted at the following hospitals:

#### **Academic:**

- Kalafong Hospital, a regional hospital affiliated to University of Pretoria
- Ga-Rankuwa Hospital, a tertiary hospital affiliated to Medical University of South Africa and
- Pretoria Academic Hospital, a tertiary hospital affiliated to University of Pretoria.

#### **Non- academic:**

- Thembisa Hospital, a regional hospital with informal affiliation to University of Pretoria
- Kopanong Hospital, a district hospital with no university affiliation
- Sebokeng Hospital, a regional hospital with no university affiliation
- Pretoria West Hospital, a district hospital with no university affiliation
- Heidelberg Hospital, a district hospital with no university affiliation.

The designation and affiliation of these hospitals was recorded as the status of the hospital at the time the study was conducted.

### **3.6.2 Research population**

The research population for this part was the medical staff providing anaesthesia in non-academic and academic hospitals outside of the greater Johannesburg area in the Gauteng province.

### **3.6.3 Research sample**

#### **Sample method**

A convenience sampling method was used. This method of sampling is accepted in descriptive research design (70).

#### **Sample size**

All the medical doctors administering anaesthesia in the three academic and five non-academic hospitals were invited to take part in the study.

#### **Inclusion and exclusion criteria**

Inclusion criteria were medical doctors administering anaesthesia in the five non-academic and three academic hospitals.

Anaesthetic providers who were on leave were not included in the study.

It transpired that interns were not recognised as anaesthetic providers by the management of anaesthetic departments.

### **3.6.4 Method**

A questionnaire was used in this part to collect data.

#### **Questionnaire development**

The questionnaire (Appendix 4) was developed by the researcher, (FCA,SA,2001), and an expert anaesthesiologist, (FCA,SA and Certificate Intensive Care, SA. and an Academic Head of a Department of Anaesthesiology. The questionnaire (Appendix 4) comprised both open ended and closed questions. It was divided into three sections, namely

- Designation: asked about the level of employment and period of experience at that level
- Qualifications: requested information about the doctors' postgraduate qualifications in anaesthesiology. These were listed individually as prevailed in the country at the time. The questionnaire asked respondents about any additional post graduate qualifications in resuscitation. The ATLS<sup>®</sup> and ACLS<sup>®</sup> were used as recognised certificate qualifications for resuscitation training.
- Practice: the questionnaire attempted to obtain an overview of the nature of the surgery performed at the respective hospital (definitions of the major and minor surgery were not considered necessary for this purpose). This section included a question about whether the doctors felt their training had been adequate for the type of cases they were expected to anaesthetise.

The questionnaire provided information which was beyond the scope of this report. For the purpose of meeting the objectives of this study, only answers to questions about level of anaesthetic and resuscitation qualification, surgical procedures for which anaesthesia was expected to be performed and adequacy of training for expected practice were considered.

### **Data collection**

During February 2002, the questionnaire was distributed at five non-academic hospitals and three academic hospitals. A senior member of each department assisted in identifying the anaesthetic providers and in the distribution of the questionnaires. The senior member of the department identified and informed the anaesthetic providers of the study and handed each of them a questionnaire which had the information sheet attached. On occasion, the researcher (who had no line authority over the providers) handed these documents directly to the providers when this was practicable. The respondents were advised to seal the completed questionnaires in an envelope and hand these back to the departmental contact person with no identification. The researcher collected the completed questionnaires from the respective hospitals one week after first dropping them off.

The collected data were entered on an Excel spreadsheet.

### **3.6.5 Reliability and Validity**

Reliability of the research instrument (questionnaire) entails that the questionnaire deliver consistent results if used repeatedly over time on the same person or if used by two different people (68).

Instrument validity seeks to ascertain whether a research instrument accurately measures what is supposed to measure (68).

Face validity of the questionnaire was confirmed by an expert anaesthesiologist that helped the researcher to develop the questionnaire.

## **3.7 RESEARCH METHODOLOGY: PART TWO**

### **3.7.1 Location of study**

This part of the study was conducted at the following non-academic hospitals:

- Thembisa Hospital, a regional hospital with informal affiliation to University of Pretoria
- Kopanong Hospital, a district hospital with no university affiliation
- Sebokeng Hospital, a regional hospital with no university affiliation
- Pretoria West Hospital, a district hospital with no university affiliation
- Heidelberg Hospital, a district hospital with no university affiliation.

The designation and affiliation of these hospitals was recorded as the status of the hospital at the time the study was conducted.

### **3.7.2 Research population**

The research population for this part consisted of all the medical records of patients who had had a surgical procedure performed, during the two week period from the 1 – 14 August 2002, at the five non-academic hospitals outside of the greater Johannesburg area in the Gauteng province.

### **3.7.3 Research sample**

#### **Sample method**

A purposive sampling method was used in this part.

#### **Sample size**

All patients' records from surgical procedures during the period 1 – 14 August 2002 were included in the study.

#### **Inclusion and exclusion criteria**

All the entries of surgical procedures entered in the theatre registers during the period 1 – 14 August 2002 were included in the study. There were no exclusion criteria.

### **3.7.4 Method**

In this part of the study a retrospective record review was done. A data capture record was completed which combined information taken from both theatre registers and patient records.

#### **Data Collection**

All procedures performed in the operating theatres are recorded in a theatre register. The theatre register was, therefore, used as the primary source of the record of the anaesthetic delivered in the specified period.



**Information obtained from the theatre register:**

- Patient name, age, sex and file number and ward of origin
- Procedure performed on patient
- Date of procedure
- Nature of anaesthetic
- Duration of the theatre procedure. The duration of the anaesthetic was represented in time periods of < 30 minutes, 30 – 60 minutes and periods longer than one hour.

Once this primary source of data was exhausted, the researcher then used the hospital records filing system to retrieve the files of patients who had undergone procedures in theatre for the specified period. The files were retrieved using the patient file number and these records were then reviewed in the records departments of the respective hospitals.

**Information obtained from the patient file:**

- Presence of anaesthetic record
- Details of anaesthetic record including preoperative assessment, intraoperative details and postoperative observations
- Date of discharge (if this was not clear from the record, then the ward register was consulted for date of discharge)
- Details of the anaesthetic conducted

Major cases were described as procedures involving surgery on body cavities, for example, laparotomies, Caesarean sections and open surgery on long bones such as open reduction and internal fixation of the radius. Minor cases were described as those cases which did not meet the above criteria.

The data were entered on an Excel spreadsheet.

### **3.7.5 Reliability and Validity**

To ensure the reliability of the data, all the records were reviewed by a single researcher. A standard data sheet was used to record the details of each anaesthetic event. Analysis of the data was done by a single researcher. Clear definitions were used to make the required judgements. (see Research Definitions).

A high degree of data validity was achieved by the collection of data in the theatre register and then confirming the results through a record review.

## **3.8. DATA ANALYSIS**

Descriptive statistics are used to describe and synthesise data (68). Statistical tests were applied to data comparing the district to the regional hospitals and other related data.

The data analysis was guided by the objectives of the study and was constructed according to the two parts of the study.

## **3.9. SUMMARY**

This chapter has described the research methodology employed in this study. This includes: the research question; the aims and objectives of this study; the ethical considerations encountered in the conduct of this study; detailed the research design; the description of the population and samples used; discussed the data collection methods; reliability and validity and data analysis used.

In the next chapter, the results of this study will be presented.

# CHAPTER 4

## PRESENTATION OF RESULTS

### 4.1 INTRODUCTION

In this chapter the results of the study are presented in two parts.

#### 4.2 Part One

The questionnaire was completed by 18 (n=26) doctors from the non-academic hospitals, realizing a 69.2% response rate. In the academic hospitals 56 (n=112) doctors completed the questionnaire, resulting in a 50% response rate.

##### 4.2.1 Postgraduate Anaesthesia Qualifications

At the academic hospitals (n=56), there were 34 (60.7%) doctors who had any form of postgraduate qualification and 22 (39.3%) who had none. At the non academic hospitals, 3 (16.7%) had a postgraduate anaesthetic qualification while the majority (n=15, 83.3%) had none. There were significantly fewer doctors at the non-academic hospitals who have a postgraduate qualification in anaesthesia ( $p=0.001$ , Fisher's Exact). For the remainder of this report the postgraduate qualification data will be reported in the context of highest qualification achieved.

The details are provided in the following table.

**Table 4.1:** Highest postgraduate qualification in anaesthesia

	Academic No. (%)	Non-academic No. (%)	Total No. (%)
Specialist (FCA/MMed)	16 (28.6)	1(5,6)	17 (23)
DA	18 (32.1)	2 (11.1)	20 (27)
None	22 (39.3)	15 (83.3)	37 (50)
Total	56 (100)	18 (100)	74 (100)

Half (n=37, 50%) the doctors had no postgraduate qualification. At the academic hospitals, there were 22(39,3%) doctors without a postgraduate qualification accounted whereas at the non academic hospitals there were 15(83.3%) such doctors. The highest qualification held by the remaining group of doctors was either a DA (n=20, 27%) or a specialist qualification (n=17, 23%). Only two (3%) of those with the DA and one (1.5%) doctor with a specialist qualification worked at the non-academic hospitals. There were four (5.5%) community service doctors in the group of respondents. One of these worked at an academic hospital and three of them worked at the non academic hospitals – the latter forming 11.5% of the doctors at this level delivering anaesthesia.

At the academic hospitals 16 (28.57%) of the doctors held a specialist qualification, 18 (32.14%) held the DA and 22 (39.29%) had no postgraduate anaesthetic qualification. A different picture emerges at the non-academic hospitals where the majority (n= 15, 83.33%) of doctors had no postgraduate qualification in anaesthesia. Only one held a specialist qualification and two had obtained the DA. (Table 4.1)

#### **4.2.2 Resuscitation certificates**

Thirty three (59%) doctors at the academic hospitals held resuscitation certificates (ATLS<sup>®</sup> and/or ACLS<sup>®</sup>). Of the 16 specialists, three held only the ATLS<sup>®</sup> while two held both certificates. No specialists held only the ACLS<sup>®</sup>. One of the 18 doctors who

held the DA had completed the ACLS<sup>®</sup> only, three had done the ATLS<sup>®</sup> only and ten had completed both the ATLS<sup>®</sup> and ACLS<sup>®</sup>. Of the remaining doctors (n=22), none of whom had a postgraduate anaesthetic qualification, seven held both resuscitation qualifications, two held only the ATLS<sup>®</sup> and five held only the ACLS<sup>®</sup>.

The two certificates for resuscitation training (ATLS<sup>®</sup> and ACLS<sup>®</sup>) were held by half (n=9, 50%) of the doctors who conduct anaesthesia in the non-academic hospitals. The specialist held neither of these qualifications. One of the two doctors who held the DA had completed the ACLS<sup>®</sup>. Of the remaining doctors (n=15), none of whom had a postgraduate anaesthetic qualification, six held both resuscitation qualifications, one held only the ATLS<sup>®</sup> and one held only ACLS<sup>®</sup> (Table 4.2).

**Table 4.2:** Resuscitation qualifications by level of postgraduate anaesthetic qualification

	Academic				Non-academic			
	Total	ATLS <sup>®</sup> only	ACLS <sup>®</sup> only	Both	Total	ATLS <sup>®</sup> only	ACLS <sup>®</sup> only	Both
Specialist (FCA/MMed)	16 (28.6%)	3	0	2	1 (5.6%)	0	0	0
DA	18 (32.1%)	3	1	10	2 (11.1%)	0	1	0
No Anaesthetic PG	22 (39.3%)	2	5	7	15 (83.3%)	1	1	6
Total	56 (100%)	8	6	19	18 (100%)	1	2	6

#### 4.2.3 Range of surgical procedures

A wide range of surgical procedures were performed at both the academic and non academic hospitals and these included major and minor general surgery, major and minor gynaecological and obstetric surgery, general paediatric surgery, major and minor orthopaedic surgery, urology and ENT surgery. The academic hospitals also

performed neonatal and neurosurgical procedures which were not done at the non academic hospitals.

#### **4.2.4 Adequacy of training**

The majority (n = 49, 87.5%) of the academic hospital doctors felt that their level of training was adequate for the expectation of practice. The comments by doctors who did not feel their training was adequate were related to their needs as juniors still preparing for their exams, their need for increased consultant involvement in this preparation and in their clinical work as well as people needing increased exposure to specialised areas of anaesthetic work such as epidurals, chronic pain and cardiothoracic surgery.

At the non-academic hospitals 10 (55%) doctors felt their training had been adequate. Among the eight (45%) doctors who felt the training was not adequate, were all three community service doctors. The community service doctors also offered comment about the training versus adequacy for practice issue. One felt inexperienced. In addition the following comments were made:

“Further training in internship is necessary especially to help with difficult patients, (especially on) methods of extubation without undue stress as if it’s the right time or not”

“...level of training is good but is very dependent on the types of cases we have at hand. On the other hand shortage of staff results in us sharing the work too soon in the training so that exposure may be limited”

#### **4.3 Part Two**

The results of the two week record review of the anaesthetic cases conducted at the non-academic hospitals from the 1 – 14 August 2002 will be presented in this section.

### 4.3.1 Procedures performed

The record review covered the period of 1 August 2002 until the 14 August 2002. The theatre registers at the five non-academic hospitals were used as the starting point for data collection. A total of 514 cases were performed in these hospitals over this period. (See Table 4.3) The case load was distributed as follows: Hospital A 245 cases (48%), Hospital B 133 (26%), Hospital C 64 cases (12%), Hospital D 45 cases (9%) and Hospital E 27 cases (5%). The greater portion of these cases (n=378, 74%) were performed at the two regional hospitals.

**Table 4.3:** Distribution of case load among hospitals in the study

Name of Hospital	Level	Number of cases	Percentage
		N = 514	100
Hospital A	Regional	245	48
Hospital B	Regional	133	26
Hospital C	District	64	12
Hospital D	District	45	9
Hospital E	District	27	5

### 4.3.2 Description of procedures and patient demography

All the major surgical disciplines, with the exception of cardiothoracic surgery, neurosurgery and neonatal surgery, were represented in the total case load with 116 (23%) obstetrics cases being conducted over the period. Four major surgical disciplines were almost equally represented in the results with obstetrics contributing 23% of cases, gynaecology 25%, general surgery 23% and orthopaedics 23%. The remaining 6% of cases were made up of dental, minor otorhinolaryngology and ophthalmology cases.

The case load was equally divided between major and minor cases, as defined by the study definitions, with 50.6% of the cases being classified as major.

**Table 4.4:** Distribution of major and minor procedures according to level of hospital

Hospital level	Major procedures N=260 (50.6%)	Minor procedures N= 252 (49.0%)	Unclassified N=2 (0.4%)	Total procedures N=514 (100%)
District	57 (42.2)	78 (57.8)	1	136 (26.5% of all procedures)
Regional	203 (53.8)	174 (46.2)	1	378 (73.5% of all procedures)

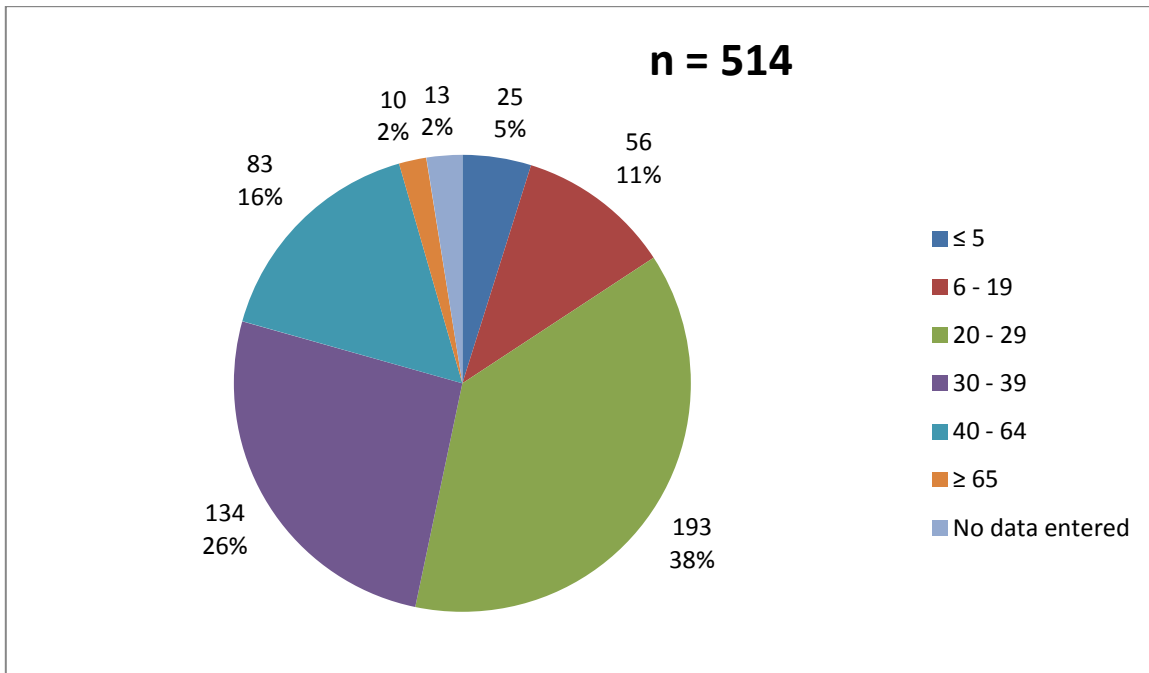
A Fisher's exact test was applied to these data and a p value of 0.0055 was established. There is a significant difference in the distribution of major and minor cases at the district hospitals compared with the regional hospitals..

Almost two thirds of the patients were female (66%) and one third were male (33%). Two cases were not ascribed a gender.

The age groups of the patients varied widely from 9 months to 92 years old. The majority of the patients (n=327, 64%) who presented for surgery were aged between 20 – 64 years of age. Procedures were performed on 25 (5%) children aged five years or less while 10 (2%) were geriatric patients older than 65 years. The age range of patients presenting for surgical procedures is represented in the following figure. (Figure 4.1)



**Figure 4.1.** Age groups for patients presenting for surgical procedures in years



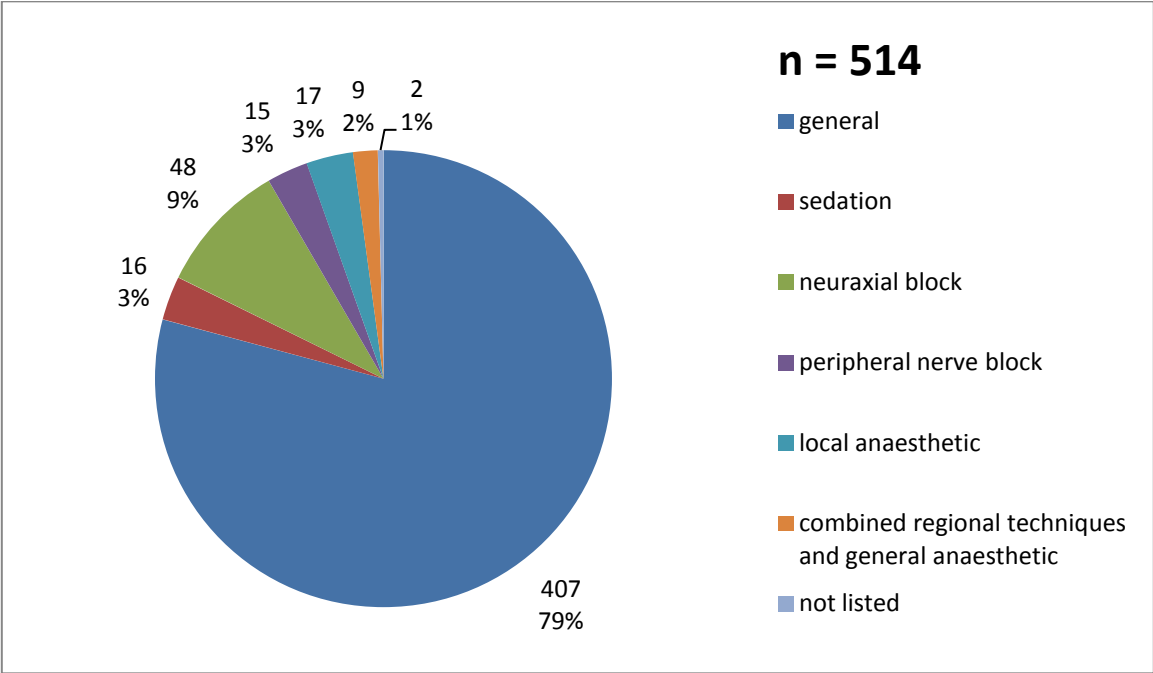
Children aged five years and under accounted for 25 (5%) of the cases performed in these hospitals. The vast majority (n=21, 84%) had their procedures performed at the district hospitals. All the procedures performed on children aged five or less were minor procedures made up of seven (28%) otorhinolaryngology cases, 12 (48%) dental cases, one (4%) orthopaedic case and five (20%) minor general surgical procedures including abscess drainage. One of these surgical cases was a 9 month old baby who presented for incision and drainage of an axillary abscess at a regional hospital. The average duration of the procedures in the five years and under age group at both levels of hospitals was 19 minutes ranging between five minutes for grommet insertion and 50 minutes for a tonsillectomy. The procedures for which the geriatric patients presented were equally split between major and minor procedures. The five major procedures comprised a retrograde femoral nail insertion, a hernia repair under spinal anaesthetic and three cholecystectomies. One of the latter procedures was a laparoscopic procedure performed on a 92 year old patient who was subsequently discharged fourteen days after the procedure. The five minor procedures were two ophthalmological procedures under local anaesthetic, two abscesses for incision and drainage and one diagnostic gynaecological procedure.

The average duration of these procedures was 46.3 minutes, ranging between five minutes for abscess drainage and 83 minutes for a laparotomy in a patient with malignant disease. Most of the geriatric patients, seven out of ten had their procedures performed at a regional hospital while the remaining three had their procedures at a district hospital. Of the procedures performed at the district hospitals, two were under local anaesthetic for an ophthalmological procedure and one for an inguinal hernia repair.

**4.3.3 Nature of anaesthetics selected**

All of the anaesthetic techniques selected were appropriately matched to the surgery performed. The figure which follows (Figure 4.2) shows the numbers of cases for which each technique has been selected.

**Figure 4.2:** Types of anaesthetic selected



Specific attention was paid to the nature of obstetric anaesthesia. The obstetric case load in these hospitals was made up of 116 cases (23%). In the obstetric group, 89 (77%) patients had their Caesarean Section under general anaesthesia while 26 (22%) had their Caesarean Section under spinal anaesthesia. (See Table 4.5). One

of the patients had their spinal anaesthetic converted to general anaesthesia for the Caesarean Section. The majority (93, 80.1%) of the Caesarean Sections in this two week period were performed at the regional hospitals.

**Table 4.5:** Technique of anaesthetic selected for Caesarean Sections including level of hospital

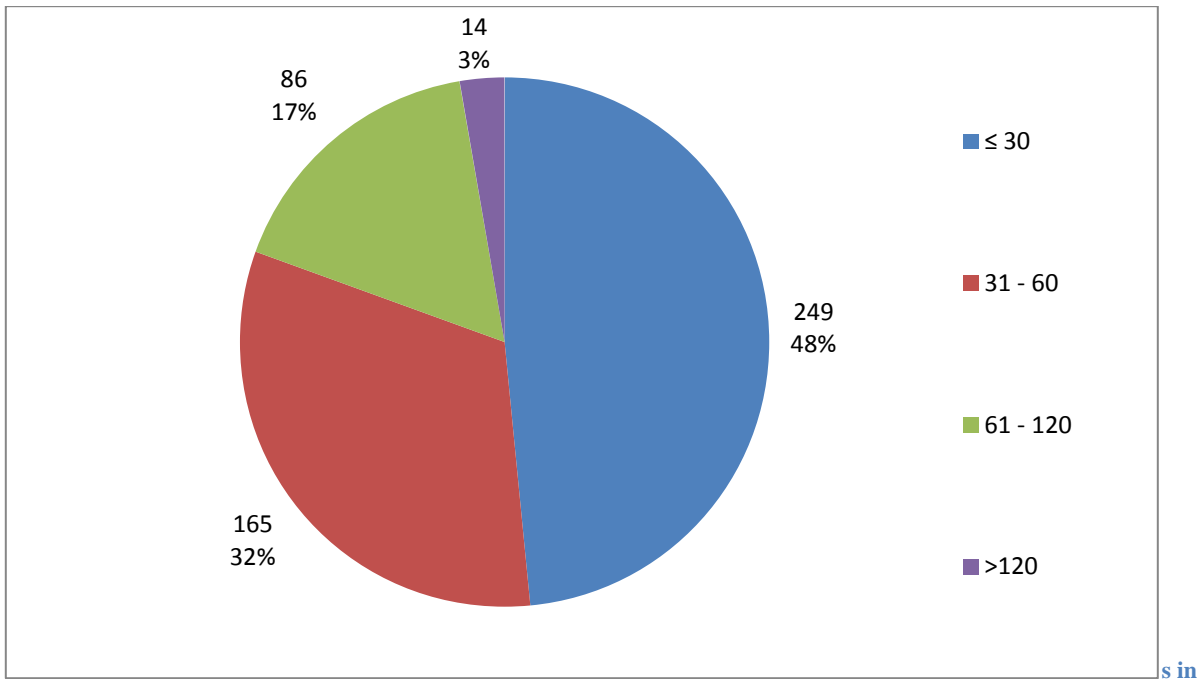
Hospital level	General anaesthetic N=89 (76.7%)	Spinal anaesthetic N=26 (22.4%)	Combined N=1 (0.9%)	Total cases N=116 (100%)
District	20 (80.1)	3 (13.0)	0	23 (19.8% of all caesarean sections)
Regional	69 (74.2)	23 (24.7)	1 (1.1)	93 (80.2% of all caesarean sections)

General anaesthesia was the anaesthetic of choice for Caesarean Sections at both regional and district hospitals. There is no significant difference between the selection of anaesthetic technique at both these levels of hospitals ( $p=0.11$ ; Fisher's exact)

#### 4.3.4 Duration of procedures requiring anaesthetic

The average duration of cases recorded in the theatre registers was 41.2 minutes. The duration of procedures ranged from two to 190 minutes. The number of cases completed in half an hour or less was 249 (47.5%) and those completed between 31 and 60 minutes was 165 (32.1%). The total number of cases performed in an hour or less was 409 which represented a significant majority (79.6%) of all the cases conducted. The remaining 100 (19.4%) cases lasted longer than one hour with two cases lasting three hours or longer. Two of the more prolonged cases were an open reduction and internal fixation of a femur which required a spinal anaesthetic being converted to a general anaesthetic and an extensive orthopaedic debridement. (See Figure 4.3)

**Figure 4.3:** Diagram showing duration of anaesthetic procedure in minutes



The mean duration of a major procedure is significantly different to the mean duration of a minor procedure ( $p=0.0001$ ; unpaired t test)

**Table 4.6:** Comparison of mean duration of major and minor procedures

Description of procedure	Mean duration (minutes)	Range of times recorded (minutes)
Major	57.3 ±32.8	5 - 190
Minor	24.7±22.8	2 - 180

The range of time for the major procedures is marked by the shortest case of five minutes duration for the open reduction and fixation of a patient's ulna and the longest procedure being for an open reduction and internal fixation of a patient's femur.

The longest minor procedure was an orthopaedic debridement which lasted 180 minutes and the shortest minor procedure was a two minute evacuation of a uterus.

### 4.3.5 Patient hospital records

The next step in the data collection process required the retrieval of the original patient records for each patient who had had a procedure recorded in the theatre registers. After repeated visits to the archiving departments of each of the hospitals, 431 (84%) of the patient's files were retrieved. Of the retrieved files, 394 (77%) did not contain an anaesthetic chart, but varying levels of detail of the anaesthetic procedure had been recorded on the consent form. The remaining 37 (7%) files contained an anaesthetic form of which 27 (5%) had been completed. A small number (n=37, 7%) of anaesthetic records were located using the search methods described before. Only 5% had been completed in full. (See Table 4.7)

**Table 4.7:** Patient records found and the presence of an anaesthetic record

	N= 514	%
No general patient record	83	16
Patient general record, no anaesthetic record	394	77
Patient general record, partially completed anaesthetic record	10	2
Patient general record, completed anaesthetic record	27	5

### 4.3.6 Length of hospital stay

Length of stay following a procedure was used as a surrogate marker for the outcome of the anaesthesia. The date of the procedure and the date of discharge was recorded for all patients who had undergone a surgical procedure. The calculation of the length of stay allows a same day discharge to be recorded as one day. The majority of patients (n= 384, 75%) were discharged within a week of their procedures. An additional 44 (9%) patients were discharged within a month of the procedure. The remaining patients had either been in hospital for longer than 30 days or their record of discharge was not found. The majority of the cases discharged after one or two days were minor surgery cases. The relatively short times to discharge may be a

reflection of the case selection for surgery at these non-academic hospitals. Amongst these discharges are four cases which were transferred to other hospitals. (See Table 4.8)

**Table 4.8:** Length of stay for patients following a surgical procedure

Days to discharge	Number of patients n=514	%
1 (discharged on same day as procedure)	61	12
2 (discharged day following procedure)	111	22
3 – 7	212	41
8 – 10	17	3
11 – 15	14	3
16 - 20	8	2
21 - 30	5	1
> 30	6	1
No discharge data available	80	15

There was a significant difference between the lengths of stay recorded for patients having major and minor procedures ( $p=0.0001$ ; Mann-Whitney test).

**Table 4.9:** Length of hospital stay (LOS) in days for major and minor procedures

Procedure	Median LOS	Longest LOS	Shortest	Missing data
Major (n=260)	5	77	1	29 (11.2%)
Minor (n=254)	2	36	1	51 (20.1%)

The longest stay for a major procedure was recorded for a patient undergoing an open reduction and internal fixation of a femur under general anaesthetic who was discharged after numerous surgical procedures, some of which were performed after the period of this study. There was a minor procedure which was noted in a patient

who was discharged after 72 days. However, this patient had also had a major procedure and so the datum for that patient has been removed from the minor cases data. The longest length of stay (36 days) for a patient who only underwent a minor surgical procedure is recorded for a woman who underwent an incision and drainage of an abscess in her thigh.

It was not possible to determine the length of stay from the records available in 29 (11.2%) of the major cases and in 51 (20.1%) of the minor cases performed in the two week period of the study.

The majority (78, 67.2%) of the 116 patients who had a Caesarean Section in the study period were discharged by the end of day five. A further 23 (19.8%) were discharged by the end of the tenth day, while only three remained in hospital for longer than ten days. These latter patients all had septic caesarean section scars which required ongoing management.

**Table 4.10:** Length of hospital stay (LOS) in days related to the choice of anaesthetic for a Caesarean Section.

	Average LOS	Range of LOS
All Caesarean sections (n=116)	5.2±2.4	2 - 20
Under spinal anaesthetic (n=26)	5.1±0.7	3 - 6
Under general anaesthetic (n=90*)	5.3±2.7	2 - 20
*Those under general anaesthetic include the case converted to general following a spinal.		

The length of stay recorded for Caesarean Sections appear very similar ( $p=0.53$ ; unpaired t test with Welch correction).

The majority of the patients who had a surgical procedure performed in the study period were discharged in a period of time which appears appropriate for the procedure which was performed on them. However, a general comment cannot be made without looking at the details of the procedures performed on those whose discharge record could not be retrieved.

### 4.3.7 Discharge records

No comment can be made on outcome following anaesthesia in 80 (15%) patients due to the absence of a discharge record. The details of these cases are summarised in Table 4.11. Amongst the general surgery cases were four laparotomies including a gunshot wound to the abdomen, a relook laparotomy and the repair of a diaphragmatic hernia.

**Table 4.11:** Details of cases with no record of discharge by breakdown of major cases

Number of cases where no discharge details found	N= 80 (15% of all cases)
Minor surgery	52 (65%)
Major surgery	28 (35%)
• Gynaecology	4 (14.3%)
• Obstetrics (Caesarean sections)	12 (42.8%)
• Orthopaedic	4 (14.3%)
• General surgery	8 (28.6%)

### 4.4 Summary

The data presented in this chapter shows that few doctors administering anaesthesia at the non academic hospitals have a postgraduate anaesthetic qualification. A greater percentage of those doctors at the non academic hospital feel their training has been adequate for their practice.

There is a significant difference in the distribution of major and minor cases between the district and regional hospitals. The record review of procedures performed in the selected period showed that the majority of cases were of short duration (< 1 Hour long) with a significant difference in the mean duration of major and minor cases.



The majority of the patients were discharged within a week in periods appropriate for their surgery. Patients who underwent a major procedure showed a significantly longer mean length of hospital stay when compared with those who had a minor procedure. However, no comment can be made regarding mortality and morbidity due to the absence of a large number of the records.

A large number of Caesarean Sections was performed in the fortnight studied. There was, however, no significant difference in choice of anaesthetic technique at either the regional or district hospitals with both levels preferring a general anaesthetic in the majority of cases. In addition, there was no significant difference in the length of stay recorded for either general or regional anaesthetic techniques employed for caesarean sections.

A discussion of the above results will be presented in the next chapter.

# CHAPTER FIVE

## DISCUSSION OF RESULTS

### 5.1 Part One

The results for Part 1 of the study were obtained from a questionnaire. Burns and Grove (68) define a questionnaire as a printed self-report form designed to elicit information that can be obtained through the written responses of the research participants.

The advantage of using questionnaires is that it is a quick way of obtaining data from a large group of people. Questionnaires are less time consuming than interviews. It is one of the easiest research instruments to evaluate for reliability and validity. The research participants completing a questionnaire feel a greater sense of anonymity and are more likely to provide honest answers than some of the other methods of data collection such as interviews. The format of the questionnaire is standard for all research participants and is therefore not subject to the mood of an interviewer (66).

The questionnaire used in this study shows some of the disadvantages which Brink (66) has previously highlighted. Some of the questions asked in the instrument appear to have had different interpretations. For example, in response to the question regarding designation some participants added the category of registrar while other participants who were registrars based on the staffing numbers must have called themselves medical officers.

There was an adequate response rate to the questionnaires with 69.2% and 50% at the non academic and academic hospitals respectively. The response rate to questionnaires is often lower than that of other forms of self reporting. The representativeness of the sample is questioned with response rates lower than 50%. A response rate of 80% is regarded as a high response rate (68).

The person who delivers the anaesthetic service is an important determinant of the quality of the anaesthetic service (40, 41, 43). Similar to previous South African findings, few doctors at non-academic hospitals have a postgraduate qualification in anaesthesia (13). This study shows that at the academic hospitals 39.29% of doctors have no postgraduate qualifications in anaesthesia while at the non academic hospitals this number rises to 83.33%. While the literature is silent on what level of postgraduate training is necessary for the safe practice of anaesthesia Jacob (63) reported on the success of a year long training programme in Nepal which improved the practice of medical officers delivering anaesthesia. Lamacraft, et al reported on the inadequate training of practitioners in the Free State province (13). The SASA recommendation of six months training is not clearly adhered to from this result.

The study evaluated the resuscitation training of doctors delivering anaesthesia at the academic and non academic hospitals. In the group of doctors who did not have a postgraduate qualification in anaesthesia, 22 were from the academic hospitals and 15 from the non academic hospitals. Of these doctors, 14 (63.64%) in academic hospitals and eight (53.33%) in non academic hospitals had formal postgraduate training in resuscitation. These figures can be viewed in the light of the Fourth Saving Mothers Report which noted that doctors' skills in general resuscitation methods have an important impact on the mortality of mothers in South Africa (37). Both of these certificate courses are usually presented by private providers either attached to universities or independently. They currently have to be paid for by the practitioner and this may lead to doctors not attending these courses. In addition, there may a gap in training in emergency care during the undergraduate period.

A greater proportion (45%) of doctors in the non academic hospitals compared with 12.5% at the academic hospitals felt that their training was not adequate for the level of cases which they were expected to perform. One of the comments from a community service doctor expected to perform anaesthetics independently suggested that the training during internship should be improved:

“Further training in internship is necessary especially to help with difficult patients, (especially on) methods of extubation without undue stress as if it’s the right time or not.”

Since the study was conducted, the HPCSA has increased the requirement for training in anaesthesia from two weeks to two months. This is part of an expanded intern training programme. The rationale for this change was to improve learning in practice as well as improving the overall competencies and skills of those who complete their internship. King (61) suggests that while this increased anaesthesia in the intern year is an important development, attention should be paid to the content of this training time. She comments that while the time will not create expert anaesthetists, there would be an improved provision of some basic anaesthesia skills in the community service year which follows.

With 514 cases performed over a two week period, the case load is sufficient to ensure ongoing experience at the level of practice expected and this is less of a problem to that identified in the Australian experience (7, 8, 9) where doctors in more remote areas performed few cases and the concern was raised that they may lose competence in anaesthesia as a result.

## **5.2 Part Two**

The review of records of procedures which required an anaesthetic during the two week period under study showed that there are a wide range of procedures performed at the five hospitals reviewed.

Procedures were performed in all the major surgical disciplines on patients from all age groups. It was expected that there was a significant difference between the distribution of major and minor procedures between the district and regional hospitals. Wilson (62) and Jacob (63) engaged in a debate in which the opposing positions are for and against the conduct of paediatric anaesthesia by medically trained anaesthetists. While the resolution of the debate will continue to depend on the

context of anaesthetic practice, the results from this study show that only 5% of the cases fall into the higher risk paediatric ( $\leq 5$  years old) group of patients. In addition, all of the cases performed in this age group were classified as being minor procedures the majority of which were performed at district hospitals. These factors together may suggest that the anaesthetic practitioners, who were all medically qualified in this study, may only have done minor paediatric cases. This may suggest that the practice in this group of hospitals may speak in support of the position held by Jacob supporting medically trained anaesthetists performing paediatric anaesthesia (63).

Similarly, only 10 (2%) anaesthetics were performed in the geriatric age group.

Using the study definition for an appropriate anaesthetic, all the procedures recorded were performed using an appropriate anaesthetic technique. However, the anaesthetic management of the obstetric cases raised concern as international practice has tended towards the use of regional anaesthesia for Caesarean Section. The Second Saving Mothers Report proposes a target of 75% regional anaesthesia for Caesarean Sections (12). This study shows that 79% of the Caesarean Section were performed under a general anaesthetic technique. Obstetric anaesthesia accounts for 23% of the total case load.

However, the mean length of stay for caesarean sections conducted under a spinal ( $5.1 \pm 0.7$  days) and those under a general anaesthetic ( $5.3 \pm 2.7$  days) are not significantly different. In light of the general trend towards regional anaesthesia for caesarean section, the comparable outcome regarding length of stay is reassuring. This finding may suggest that the anaesthetists are more comfortable with the conduct of a general anaesthetic in these circumstances. The majority of cases ( $n=414$ , 80%) were completed in an hour or less time. This timing structure is noted because it is similar to the structure used by Fernandes et al. (52) to reflect on the adequacy and accuracy of the anaesthetic record. Fernandes et al. (52) showed that there was an increased likelihood of omission of data from the anaesthetic record if the procedure took less than an hour to complete. The mean duration of major

procedures is significantly different to that for minor procedures performed. While this was expected, it is reassuring that minor procedures are being completed in vastly differing time periods.

The theme of inadequate record keeping recurs throughout this study, with only 5% of cases having a completed anaesthetic record. No comment is possible on pre-operative assessment as this is not recorded although a space was provided. The immediate post-operative course is only recorded in nursing records.

This dearth of retrievable records is a recurring theme in South African data. The Fourth Saving Mothers Report showed similar trends in the collections of records relating to the anaesthetic care of mothers who had died (37). Indeed, in the 2005 – 2007 triennium, only 74 (69%) of the 107 cases of death which had been reported as being due to anaesthesia could be formally assessed. In addition, in only 33% of these cases was an anaesthetic record found. This finding was similar in the preceding three triennial reports of the maternal mortality data (37).

The outcome of anaesthetics was evaluated using the length of hospital stay following the surgical procedure. The majority of cases (n=384, 75%) were discharged within a week of the procedure, in times which appropriately matched the procedure performed. Of these cases, 172 (34%) were discharged on the day of surgery or the day following the procedure. This is used as a surrogate marker for the safe outcome of the procedure. However, the absence of discharge records in 80 (15%) cases is a cause for concern. It is also confirmation of the Fourth Saving Mothers Report (37) reviewers' experience of the lack of record keeping.

## 5.3 Summary

The results of this study are summarised here using the SASA guidelines as a framework. The SASA guidelines are clear regarding the conduct of an anaesthetic describing amongst others the following principles:

- **Administered only by practitioners with appropriate training in anaesthesia**
  - The level of training studied in the early part of this report shows an adequate level at the academic hospitals. For the non-academic hospitals, many practitioners (45%) commented that their training was inadequate for the work they were expected to do.
- **Physical presence of an appropriately trained practitioner constantly in attendance during anaesthesia. The practitioner should be available for the recovery period as well.**
  - This study cannot confirm whether the respective practitioners remained present throughout the procedure in any particular patient because of the dearth of records of the intraoperative process. Few anaesthetic records were found during an examination of the general patient file as recommended by Friesdorf et al. (47).
- **A full and contemporaneous record of the anaesthetic technique, patient responses to anaesthesia and other medical information pertaining to the anaesthetic should be made by the practitioner delivering the anaesthetic.**
  - There were too few records retrieved to indicate whether the above is a regular practice.
- **Every presenting patient should have a general medical assessment (preoperative assessment) by a medical practitioner, preferably the one scheduled to give the anaesthetic**
  - No records were found to confirm that this was done although the form for the anaesthetic had a section for this.

This chapter presented results from the study of the level of training of anaesthetic practitioners at academic and non-academic hospitals as well as a two week record review of the procedures conducted at the non-academic hospitals.

In the final chapter, a summary of the main research findings, limitations, recommendations and conclusions will be presented.



# CHAPTER SIX

## SUMMARY, LIMITATIONS, RECOMMENDATIONS AND CONCLUSIONS.

### 6.1 INTRODUCTION

In the final chapter of this study a summary and conclusions from the main findings are presented as well as a discussion of the limitations and recommendations from the study.

### 6.2 SUMMARY OF THE STUDY

#### 6.2.1. Aims and objectives

##### Aims

This critical evaluation of anaesthetic services in Gauteng outside of the greater Johannesburg area was conducted in two parts. The aims of the evaluation were:

- **Part 1**- to describe the level of training of doctors who provide anaesthesiology services at five non-academic hospitals and three academic hospitals, in Gauteng outside of the greater Johannesburg area and their perception of the adequacy of their training.
- **Part 2** - to describe the anaesthetic practice at the five non-academic hospitals above over a two week period

## **Objectives**

The aims of this study were achieved by the following objectives:

### **Part 1**

- Document and compare the level of anaesthesiology training and postgraduate qualification of doctors who are expected to provide the anaesthesiology service at five non-academic hospitals and three academic hospitals;
- Describe the range of procedures for which the doctors are expected to perform anaesthesia;
- Determine their perceptions about the adequacy of their preparation for the level of service which they were expected to provide; and

### **Part 2**

- Document the anaesthetic patient profile and the surgical procedure performed at the non-academic hospitals over a two week period;
- Evaluate the adequacy of the anaesthesiology service provided by analysing anaesthesiology choices and presence of anaesthesiology records
- Evaluate the outcomes of the anaesthetic delivery using length of hospital stay following the procedure.

## **6.2.2 Methodology**

The study was conducted at academic and non-academic hospitals in the Gauteng province outside of the greater Johannesburg area. A questionnaire was developed by the researcher and an expert anaesthesiologist to address the objectives of part one. A record review of a two week period from 1 – 14 August 2002 was performed as part two of the study. Ethical clearance for and consent to conduct the study was obtained from the relevant authorities and university committees. A cross sectional

contextual descriptive research design was followed in this study. Data collection was performed during February 2002 for part one and in August 2002 and subsequent months for the record review. Following consultation with a statistician, descriptive statistics were employed.

## **6.3 MAIN FINDINGS**

### **6.3.1 Part One**

The questionnaire developed for Part 1 was completed by 56 doctors from the academic hospitals and 18 doctors from the non-academic hospitals in Gauteng, outside the greater Johannesburg area.

The highest qualification held by doctors at these hospitals was a specialist qualification (either FCA, MMed). A total of 17 (23%) doctors held such a qualification with only one working in a non-academic hospital. The highest qualification for 20 (27%) of the doctors was a DA, only two of which were held by doctors in the non-academic hospitals. The remaining 37 (50%) doctors did not have a postgraduate qualification in anaesthesia, of which 22 were from the academic hospital. The remaining 15 were from the non-academic hospital where they made up 83.33% of the doctors. The resuscitation qualifications (ATLS<sup>®</sup> and ACLS<sup>®</sup>) were held by 59% of those at the academic hospitals and 50% of those at the non-academic hospitals.

Doctors at both academic and non-academic hospitals are exposed to a wide range of surgery. However, those in non-academic hospitals have a higher percentage who feel inadequately prepared for their expected practice.

### **6.3.2 Part Two**

In the two week period of review, 514 anaesthetic procedures were performed. General anaesthesia was performed in 70% of these cases. All disciplines were represented in the case profile and 116 (23%) of these cases were Caesarean

sections. Of concern was the high level of general anaesthesia (79%) performed for these Caesarean sections despite the 2002 Second Saving Mothers Report targets of 75% regional anaesthesia for Caesarean section (39). The length of stay for patients following an anaesthetic was relatively short for the majority (75% discharged by day 7) of patients. These lengths of stay matched the procedures for which patients had presented. Completed anaesthetic records were retrieved in only 5% of cases. There was no discharge data available in 15% of the cases.

## **6.4 LIMITATIONS OF THE STUDY**

The following were identified as limitations of the study:

Convenience sampling was chosen for this study because of the limited scope of this study (research report). The researcher had time constraints and the hospitals were geographically wide spread. This method of sampling is accepted in descriptive research design (68).

This study was done contextually in the Gauteng province, outside the greater Johannesburg area. The implication of this is that the results of this study cannot be generalised to the rest of South Africa. However this study does address an important problem.

The questionnaire used in part one has only face validity. This validity was deemed appropriate for the scope of this study. This may have been improved by the conduct of a pilot study on the questionnaire.

Questionnaires were left with co-ordinators in departments and the researcher relied on these people to distribute and collect them. The reliance on a third party with no interest in the study may have adversely affected the response rate to the questionnaire. Anaesthetic providers who were unhappy with their training may also have been more likely to respond to the questionnaire resulting in a level of bias.

The majority of general patient records were retrieved, but there were very few completed anaesthetic records. This may have led to a skewed view of the anaesthetic practice being realised.

## **6.5 RECOMMENDATIONS FROM THE STUDY**

The results of this study raise concern regarding the level of postgraduate qualification in anaesthesia of doctors at the non-academic hospitals, the high rate of general anaesthesia for Caesarean sections at these hospitals and the relative absence of appropriate records of the anaesthetic delivered. Therefore the following recommendations are made relating to clinical practice of anaesthesia.

Recommendations for further research are also given.

### **6.5.1 Clinical practice**

The following recommendations are made for clinical practice in anaesthesia:

- The improvement of the level of training of doctors who deliver anaesthesia at the non-academic hospitals through the encouragement of the DA as a postgraduate qualification. Of the hospitals studied, only one does not have the relevant accreditation to offer the DA.
- Optimising the recently expanded internship training in anaesthesia (60, 61)
- Encouraging the training in resuscitation through the support of doctors through recognized programmes like the ACLS<sup>®</sup> and ATLS<sup>®</sup>.
- Promote the teaching and management of regional anaesthesia as the choice of anaesthetic for Caesarean sections
- Education of practitioners about the role of the anaesthetic record in the management of patient safety and anaesthetic services - in particular, emphasising the importance of recording the pre-operative assessment of the patient.

- Develop a standard anaesthetic record form for the province with a view to the development of an electronic record system.

### **6.5.2 Further research**

The following recommendations are made for further research into the quality and practice of anaesthesia:

- A prospective study of the conduct of anaesthesia in the Gauteng area. One of the key aims must be the improvement in the retention of records.
- More detailed study of who is responsible for the anaesthesia service in the Gauteng province and what their level of training is.
- Similar research could be conducted which broadens the number of hospitals and provinces involved.

## **6.6 CONCLUSIONS**

ACLS<sup>®</sup> and ATLS<sup>®</sup> are recognised as qualifications which improve the level of emergency care offered by practitioners who complete these courses. The uptake of these courses was lower in the non-academic hospitals when compared with the academic hospitals. This may impact on the delivery of emergency care in the anaesthetic service.

The providers of anaesthesia provide a service for a wide range of surgical procedures in both academic and non-academic hospitals in Gauteng, outside of the greater Johannesburg area. However, a greater proportion of doctors in the academic hospitals expressed that their training was adequate for the expected practice.

A substantial anaesthetic service was delivered at the non-academic hospitals in Gauteng, outside of the greater Johannesburg area. The majority of cases were done at the regional hospitals suggesting that the district hospitals perform less surgery and refer patients to the regional hospitals. Patient ages ranged widely and they presented for procedures in most of the major surgical disciplines.

Anaesthetic records were retrieved in only 5% of cases who had surgical procedure during the period of the study. The inability to track the record keeping made the evaluation of the quality of the anaesthetic service very difficult.

This chapter provided a summary of the study, a presentation of the main study findings, limitations of the study and recommendations for clinical practice and further research.

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## **APPENDIX 1**

**PERMISSION FROM POSTGRADUATE COMMITTEE**



*Faculty of Health Sciences*  
**UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG**

7 York Road PARKTOWN Johannesburg 2193 Telegrams WITSMED Telex 4-24655.SA  
FAX 643-4318 TELEPHONE 717-2075/2076  
E-MAIL jmainwa@chiron.wits.ac.za

DR LP GREEN-THOMPSON  
P O BOX 88590  
NEWCLARE  
2112

APPLICATION NUMBER 8214410  
STATUS ( DEG 31 ) ( MMA00 ) PZZ

2002-03-12

Dear Dr Green-Thompson

**Approval of protocol entitled A critical evaluation of the anaesthetic services in the province of Gauteng outside the greater Johannesburg area**

I should like to advise you that the protocol and title that you have submitted for the degree of Master Of Medicine (In Anaesthesia) have been approved by the Postgraduate Committee at its recent meeting. Please remember that any amendment to this title has to be endorsed by your Head of Department and formally approved by the Postgraduate Committee.

Prof S Bhagwanjee has/have been appointed as your supervisor/s. Please maintain regular contact with your supervisor who must be kept advised of your progress.

Please note that approval by the Postgraduate Committee is always given subject to permission from the relevant Ethics Committee, and a copy of your clearance certificate should be lodged with the Faculty Office as soon as possible, if this has not already been done.

Yours sincerely

JO Mainwaring (Mrs)  
Faculty Officer  
Faculty of Health Sciences

Telephone 717-2075/2076

Copies - Head of Department \_\_\_\_\_ Supervisor/s

## **APPENDIX 2**

### **PERMISSION FROM ETHICS COMMITTEE**







Deputy Registrar: Academic & Research

**UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG**

Private Bag 5, WITS 2050, South Africa • Fax +27 (0) 11 339-5708 • Telephone +27 (0) 11 716-3660  
<http://www.wits.ac.za/research>

2 August 2002

Dr LP Green-Thompson  
Department of Anaesthesiology  
Johannesburg Hospital  
University

Dear Dr Green-Thompson

**RE: PROTOCOL M011130**

This letter serves to confirm that the Chairman of the Committee for Research on Human Subjects (Medical) has acknowledged and approved the extension of the abovementioned protocol. Copy attached.

Should you require any further information, please do not hesitate to contact me.

Yours sincerely,

A handwritten signature in black ink, appearing to read 'Anisa Keshav'.

Anisa Keshav (Ms)  
Secretary  
Committee for Research on Human Subjects (Medical)

## **APPENDIX 3**

**PERMISSION FROM GAUTENG DEPARTMENT OF HEALTH**



DEPARTMENT OF HEALTH

Head of Department  
Gauteng Health  
Private bag x 085  
Marshalltown  
2107

06 May 2001

Dr. L.P. Green-Thompson  
Department of Anaesthesiology  
Johannesburg Hospital  
Private Bag X 39  
JOHANNESBURG  
2000

Dear Dr. Green-Thompson

**RE: A CRITICAL EVALUATION OF THE ANAESTHETIC SERVICES  
IN THE PROVINCE OF GAUTENG**

Support is herewith given for your study to assess the standard of anaesthetic services in the Gauteng province.

Yours sincerely

**DR. A. RAHMAN**  
**Acting Head of Department**

## APPENDIX 4

### QUESTIONNAIRE

### 1. Designation

Consultant	
Community service doctor	
Medical Officer	

0-5 years	
6-10 years	
11-15 years	
> 15 years	

### 2. Qualifications

Have you completed one of the following?	ATLS	
	ACLS	

	<b>Yes</b>	<b>No</b>
Do you have any postgraduate qualifications in Anaesthesia?		

If yes, please complete the following:

DA		FCA		M-Med	
Other		Please specify			

Where did you receive your postgraduate training?

Academic hospital	
Non-academic hospital	

	<b>Years</b>	<b>Months</b>
Cumulative time spend in training to date		

### 3. Practice

Do you administer Anaesthesia?	
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How long have you been involved in Anaesthesia?

0-5 years	
6-10 years	
11-15 years	
16-20 years	
> 20 years	

Level of surgery performed at your hospital

General – major		Paediatric surgery – general	
General – minor		Paediatric surgery – neonates	
Neurosurgery		Orthopaedic surgery – major	
Cardio thoracic surgery		Orthopaedic surgery – minor	
Obstetric surgery		ENT surgery	
Gynaecology surgery – major		Urology surgery	
Gynaecology surgery – minor		Other - specify	

In your opinion, does your level of training in Anaesthesia meet the requirements of what is expected in practice?

Yes	<input type="checkbox"/>	No	<input type="checkbox"/>
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Please explain your answer above


What methods would you use to improve your Anaesthetic expertise?

Post graduate course	<input type="checkbox"/>	Refresher course	<input type="checkbox"/>
Congress	<input type="checkbox"/>	Lectures	<input type="checkbox"/>
Other	<input type="checkbox"/>	Specify	<input type="checkbox"/>

What methods did you use to improve your Anaesthetic expertise in the last year?

Post graduate course	<input type="checkbox"/>	Refresher course	<input type="checkbox"/>
Congress	<input type="checkbox"/>	Lectures	<input type="checkbox"/>
Other	<input type="checkbox"/>	Specify	<input type="checkbox"/>

*Thank you very much for your cooperation. Please place your completed questionnaire in the envelope provided, return the sealed envelope to your hospital contact person.*

**APPENDIX 5**

**INFORMATION SHEET**



CODE		
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Hospital Level	
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Colleagues,

Hello, I am a consultant anaesthesiologist in the Wits Academic Complex currently registered for an M Med degree in anaesthesiology.

I would like you to complete the attached questionnaire as part of my research towards an M Med degree. The research proposal is to evaluate the standard of anaesthetic services provided in Gauteng hospitals outside of the greater Johannesburg area. The first part of the research is this questionnaire. The second part of the study will be an analysis of the statistics relating to anaesthetics and the associated mortality.

Completion of this questionnaire is completely voluntary and anonymous. There are no possible consequences for not completing it. In order to protect anonymity the hospitals will be grouped according to levels. If you do not wish to be part of this study please place the incomplete questionnaire into the envelope provided.

If there are any questions regarding the research, please contact me at 488-4343 or 082 931 0700.

Thank-you for your assistance with this work.

Dr. L.P. Green-Thompson  
MBBCh (Wits) DA(SA) FCA(SA)  
Specialist Anaesthesiologist  
Department of Anaesthesiology  
University of the Witwatersrand