

**IMPLEMENTATION OF THE PERINATAL
PROBLEM IDENTIFICATION PROGRAMME AT
PUBLIC HEALTH FACILITIES IN THE
EMFULENI SUB-DISTRICT OF GAUTENG
PROVINCE**

BY

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2. DECLARATION

I, Sylvia Thandi Chaane declare that this thesis embodies only my original work except where acknowledgement indicates otherwise and that no part of it has been or is being submitted for a degree at any other University

Signed: ----- at ----- Date: -----

The work for this thesis was done in the School of Child and Adolescent Health of the University of Cape Town.

LIST OF ABBREVIATIONS:

ANC	Antenatal Care
BBA	Born Before Arrival
CEO	Chief Executive Officer
CHC	Community Health Centre
CME	Continued Medical Education
ICA	Identification, Cause, Avoidable Factors
ICU	Intensive Care Unit
IUGR	Intrauterine growth retardation
KMC	Kangaroo Mother Care
LBWR	Low birth weight rate
MCH	Maternal and Child Health
MRC	Medical Research Council
MOU	Midwife Obstetric Unit
NCCEMD	National Committee on Confidential Enquiry into Maternal Deaths
NICU	Neonatal Intensive care Unit
NNMR	Neonatal mortality rate
NNDR	Neonatal death rate
PCI	Perinatal Care Index
PNMR	Perinatal mortality rate
PMTCT	Prevention of Mother To Child Transmission
PPIP	Perinatal Problem Identification Programme
SBR	Stillbirth Rate
SAMJ	South African Medical Journal
SANC	South African Nursing Council

USA	United States of America
VCT	Voluntary Counselling and Testing
WHO	World Health Organisation

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EXECUTIVE SUMMARY

Aim

To implement the Perinatal Problem Identification Programme (PPIP) at public health facilities in the Emfuleni Sub-district, this will document the medical conditions that led to perinatal deaths and describe the avoidable factors, missed opportunities and sub-standard care.

Setting

All health facilities providing maternity services in the Sedibeng district were included in the study. The Midwife Obstetric Units (MOU) included were Sharpeville, Johan Heyns, Levai Mbatha and Boipatong. Sebokeng and Kopanong Hospitals were the sites selected for the implementation of PPIP.

Method

All health facilities providing maternity services at public health facilities in the Emfuleni Sub-district collected maternal and perinatal health statistics on the number of deliveries, maternal deaths, stillbirths and neonatal deaths in weight categories, number of caesarean sections and number of women delivering who were under 18 years and above 35 years. Data was analysed from 1 April 2002-to 31 March 2003, by the hospital and MOU using the perinatal audit form. Data was then entered and analysed using the PPIP computer-based software programme. The indices calculated by PPIP were the neonatal death rate, perinatal mortality rate, low birth weight rate, the perinatal care index, stillbirth rate, caesarean section rate and the proportion of the mothers who were teenagers and older women.

Results

A total of 11 674 infants weighing 1000g or more, were born in the six facilities and 303 perinatal deaths were reported. The PNMRs for public health facilities in the

Emfuleni Sub-district was reported as being 26/1000 for babies weighing 1000g or more and the NNDR 7.8/1000. The PNMR at the public health facilities in the Emfuleni sub-district was lower than Gauteng Province 32/1000 births.

The PNMR for Sebokeng and Kopanong hospitals and the MOUs were 63/1000, 18.1/1000 and 3.7/1000 births respectively. The NNMR was highest in Sebokeng Hospital (21.5/1000 live births), lower at Kopanong Hospital (3.2/1000 live births) and lowest at the MOUs (0.6/1000 live births). The LBWR was highest in Sebokeng Hospital (26.8% of total deliveries), followed by Kopanong Hospital (11.8% of total deliveries) and lowest at the MOUs (9.2% of total deliveries).

The primary cause of death at each of the three sites varied. At Sebokeng Hospital the commonest primary cause of perinatal death was intrapartum asphyxia (13.8 /1000 births), followed by spontaneous preterm labour and hypertensive disorders (12.7/1000 and 12.4/1000 births respectively). The commonest primary cause of perinatal death in Kopanong Hospital was also intrapartum asphyxia (5.9/1000 births) followed by unexplained intrauterine death (4.3/1000 births). In the MOUs the commonest primary cause of perinatal death was unexplained intrauterine death (1.4/1000 births). Intrapartum asphyxia, spontaneous preterm labour, hypertensive disorders and intrauterine growth retardation accounted for a perinatal death rate of (2.0 /1000 births) in the MOUs. Prematurity-related complications and hypoxia were the commonest final causes of neonatal death in all the facilities.

Medical personnel-associated avoidable factors were present in 34.4% of the perinatal deaths, followed by patient-associated factors (33.9%) and administrative problems (22.1%). In 1.8% of cases there were insufficient notes to comment on avoidable factors.

Conclusion

The perinatal mortality rate was calculated using data collected from the research sites, and confirmed that the perinatal mortality rate at public health facilities in the Emfuleni sub-district was 26/1000 births. Focus should be to remedy problems related to antenatal care, to resuscitation of asphyxiated neonates, to management of labour, and problems related to management of premature babies.

Recommendations

1. Medical personnel should use protocols and be adequately trained in managing complications of pregnancy, labour and delivery; they need to be provided with effective equipment and hold regular perinatal audit meetings.
2. Referral routes and criteria, that have been established, should be followed as outlined in the NCCEMD report to avoid delays in transferring patients. Efficient transport for referral of patients during labour and sick premature and term neonates should be prioritised. There should be enough neonatal ICU beds in the Province to cater for critically ill babies.
3. KMC, a cost-effective method that can reduce PNMR, should be provided at Kopanong Hospital and other hospitals in the province providing maternity services.
4. Policy makers should support the implementation of PPIP in all hospitals in Gauteng Province and ensure that an appropriate budget is available.
5. Staffing and equipment norms should be developed and implemented at all levels of care. Equipment according to levels of care should be provided as a priority and should be well-maintained.
6. Programs for education of communities in health promotion with specific health messages related to women and children's health should be provided.

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I. CHAPTER ONE: INTRODUCTION

The Maternal/Child Health and Nutrition Directorate of the Gauteng Department of Health collected data from 1st April 1998 to 31st March 1999. The data contained the number of deliveries, maternal deaths, stillbirths and neonatal deaths in weight categories, number of caesarean sections and the number of deliveries of women under 18 years and above 35 years. Data were analysed by hospital, region and level of care. The Neonatal Death Rate (NNDR), low birth-weight rate, perinatal care index (PCI), caesarean section rate, and the proportion of teenagers and older women delivering were calculated. This data had limitations according to Pattinson et al. (1998) because no data were available for deliveries in private institutions and the community health centres in weight categories, although the total deliveries were included. Another limitation was that the causes of perinatal mortality were not identified.

The key findings of the analysis according to Pattinson et al (1999, p. iii) were:

- The perinatal mortality rate of 32/1000 births for Gauteng Province was high compared with the Peninsula Maternal and Neonatal services of the Western Cape (18.7/1000 births) and very high when compared with developed countries. When compared with developing countries, it was substantially lower.
- The neonatal death rate for the province was unacceptably high at 12.09/1000 live births although it was similar to developing countries.
- The majority of births occurred in level 2 and 3 institutions.
- Perinatal mortality rates were unacceptably high in some institutions such as Sebokeng Hospital (PNMR 63/1000 births), Tembisa Hospital

(PNMR41/1000 births).

The recommendations from their analysis were as follows:

- Institutions identified as possibly having problems needed further investigation to answer specific questions defined by the report.
- A detailed analysis of the pattern of disease and avoidable factors needed to be carried out in sentinel sites throughout Gauteng to pinpoint specific problems in perinatal care. This could lead to a targeted approach to solving the problems throughout the Province.
- A specific investigation into neonatal care needed to be conducted and serious attention given to introducing a maternal lodging facility in all institutions caring for neonates, to encourage skin-to-skin care (Kangaroo Mother Care).

It was thought that PPIP could be instrumental in implementing some of these recommendations (Pattinson et al 1999, p. iii).

The Perinatal Problem Identification Programme (PPIP) is a user-friendly, computer-based audit programme that calculates various indices of perinatal care once simple perinatal data is entered, and lists the causes of perinatal and neonatal deaths (Pattinson 2000, p.1). Furthermore, perinatal care indices, pattern of disease and avoidable factors, missed opportunities and substandard care related to each perinatal death, are collated and analysed. The programme was developed in the 1990s by the MRC Unit and has been extensively field- tested since 1996. PPIP has been adopted as a surveillance programme by the National Department of Health for perinatal care. The Department of Health has requested that more PPIP sites be established so that the data collected is more representative of perinatal care for the whole country as published by Pattinson (2000, p.1).

The study conducted in Gauteng by Pattinson et al (1999) highlighted Sebokeng Hospital as one of the hospitals with a high perinatal mortality rate, and this hospital has been selected for the study. The perinatal mortality rate for the Province, as mentioned earlier, is 32/1000 live births but for Sebokeng Hospital 63/1000 births according to Pattinson et al (1999, p. iii). However, Sebokeng Hospital is a referral hospital for five other birth sites and therefore, a high PNMR might be related to the referral pattern and not to poor care in the hospital. For this reason the Emfuleni sub-district, which includes Sebokeng Hospital, and all the birth sites that refer to it, were identified as PPIP sentinel sites and study area. By using the health facility-based data in the sub-district, more valuable information can be collected and analysed. The high perinatal mortality rate in Sebokeng Hospital and outlying areas is a major concern and there is therefore an urgent need to identify the causes of perinatal deaths at public health facilities in the Sedibeng District (Emfuleni and Midvaal Sub-districts).

High rates of pre-term deliveries and low birth-weight babies are major factors contributing to high neonatal and infant mortality rates in most developing countries. The perinatal care index (PCI) for the Province was 1.74 and the Stillbirth: Neonatal Death Ratio was 1.74:1. Pattinson et al (1999). The perinatal care index (PCI) for Sebokeng Hospital, which is the main referral hospital for Emfuleni sub-district and Sedibeng district, was 3.94. The higher the PCI the poorer the care, and the lower it is the better the care that is given to pregnant women and their newborn infants. Gauteng Health Department is continuously in search of service excellence. A detailed analysis of the pattern of disease and avoidable factors will assist in informing the department about the norms and standards that it seeks to set for itself. The data is also important for monitoring, evaluating and planning obstetric and neonatal care. It will therefore be used for planning and monitoring perinatal care.

Sebokeng Hospital is not the only hospital with a high perinatal and neonatal mortality rate. Emfuleni sub-district has been selected for the study because it falls within the region of the researcher. In Sedibeng district of which Emfuleni sub-district is part, there are three hospitals namely Kopanong, Heidelberg and Sebokeng (Refer Annexure A). By identifying avoidable causes, missed opportunities and sub-standard care, an appropriate strategy can be identified and implemented. This will help in improving the standard of perinatal care and reduce perinatal mortality rates in the sub-district.

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CHAPTER TWO: LITERATURE REVIEW

2.1 PERINATAL SURVEY

In the United Kingdom, according to the Perinatal Care Survey of South Africa conducted by Pattinson (2000, p. vi) in the Saving Babies Report, the Confidential Enquiry into Stillbirths and Deaths in Infancy (CESDI), is an example of a successful initiative of systematic auditing, that assists all health workers and administrators tasked with the provision of maternal and perinatal health services, to be able to identify gaps and problems in the provision of care. This survey in the United Kingdom (CESDI) identified areas of weakness in obstetric and neonatal services, and a number of changes that needed urgent interventions (Pattinson 2000, p. vi).

In the study cited by Ward, et al (1995, p.147) to evaluate the role of “Identification, Cause and Avoidable factor” (ICA) method of perinatal audit in reducing perinatal mortality, it was found that the primary causes of perinatal loss included intrapartum trauma, intrapartum asphyxia, and infection. This study was done at Livingstone Hospital Maternity Services, as it had been the major referral hospital for the region for 1991 to 1992.

Where the gestation was above 28 weeks or the birth weight was above 1000g, one hundred and sixty perinatal deaths were classified by primary obstetric cause of perinatal loss. In the second year the study was able to identify avoidable factors in 50% of the perinatal deaths. The perinatal mortality rate in Livingstone Hospital Maternity Services was reduced by 23% from 52.8/1000 to 40.6/1000 births by implementing appropriate interventions. The avoidable factors that were identified were 20% of the women were unbooked and 50% of the perinatal deaths occurred in these women.

2.2 QUALITY OF CARE

According to Hulton et al (2000, p. 9) “quality of care is the degree to which health services for individuals and populations increase the likelihood of timely and appropriate treatment for the purpose of achieving desired outcomes that are consistent with current professional knowledge”. For this reason a quality assessment framework for perinatal and maternal health can be divided into two parts namely:

- (i) The quality of the provision of care within an institution
- (ii) The quality of care as experienced by the users

Quality of care as discussed by Hulton et al (2000, p. 9) identified ten elements in the provision and experience of care. These elements focus on the quality of care within an institution as far as the availability of human and physical resources. The shortage of staff, lack of skills and lack of appropriate equipment are some of the avoidable factors that have been identified in the study that contributed to the death of the neonate. Hulton et al (2000, p.9) discusses in the literature the importance of establishing an effective and efficient referral system to reduce morbidity and mortality. Although some of the recommendations such as social support (labour companions) are being implemented in Gauteng it is still also difficult to change practices in our maternity units. The suggestion of a woman adopting any position during delivery has not been implemented although Hofmeyer et al (1991) suggested it. Internationally recognized best practices are possibly to be implemented as suggested by Hulton et al (2000, p. 9) but need re-orientation and continuous education of staff. What has been identified in the study is management of emergencies, experience of the woman regarding care in terms of respect and dignity afforded the woman during pregnancy and labour, attitudes of health workers because that will determine if the woman will return to the same health facility or not,

cognition and emotional support which are mostly lacking due to a variety of factors such as shortage and attitudes of staff. (Hulton et al 2000, p 9).

These elements will be discussed below.

2.2.1 The quality of the provision of care

(i) Human and physical resources

Human and physical resources apply both to provision of care and experience of care. They will be discussed under this element and the discussion will include the quantity and quality of health, and non-health staff that are responsible for the provision and support of service delivery of patient care, Hulton et al (2000, p. 19, citing De Geyndt, 1995). Human resources include supervision, staffing norms and ratios, staff development and the type of training the staff receive. It is important that staff skills are evaluated and decisions made for in-service training or ensuring availability of appropriate training courses. Physical resources are the buildings that are fixed and not fixed, equipment used in caring for patients and vehicles for transporting referred patients to other levels of care. Also included in physical resources are laboratory services, pharmaceuticals, radiology, maintenance services, storage, water and electricity supply. Auditing of the availability of these resources is important in order not to compromise the health of patients. In Hulton et al (2000, p.19) it is stated that the audit should focus on hours of duty and salaries and not only the clinical skills and experience of staff. In order to provide an effective maternity service it is important that staff are well managed in terms of hours of duty and should be appropriately remunerated and that patient load is well within the norms agreed.

(ii) Referral system

A referral system, that is effective and efficient, should be in place to ensure that patients can be transferred from the lowest point of care, such as MOU, to the highest level of care, such as a regional or tertiary hospital (Hulton et al 2000, p. 22). During

antenatal care pregnant women with high or medium risk factors can be identified and referred early before the onset of labour. High-risk patients presenting, for example, with hypertensive disorders of pregnancy, obstetric haemorrhage, multiple pregnancy, breech presentation or poor obstetric history can be referred early, using an effective and reliable transport system that includes emergency medical services, public transport such as taxis and own transport if available. This element applies to the province as a whole and the Emfuleni sub-district as required by the NCCEMD's recommendations that referral routes, and criteria for referral should be clearly defined so as to prevent unnecessary delay for the patient. Management protocols should be made available to the staff at all levels so that they are aware which patients can be managed at which level. The referral system cannot be effective if the transport and communication system are not efficient. Communication at all levels of care should be effective and all staff involved with the care of the pregnant woman should co-operate and co-ordinate their functions.

(iii) Maternity information systems

Patient information is very important in order to identify causes of perinatal deaths. The maternity information system is aimed at collecting patient data and records and registers should therefore be legible and complete. The maternity records should be designed in such a way that they collect data that can be used for peer reviews and the determination of the impact of programmes. Gauteng as a province designed its own maternity record for the reasons stated in this element and for easier record keeping and capturing of important data if the review needs to be conducted. The maternity information can be used to determine causes of perinatal death if accurate notes are kept. It is suggested by Hulton et al (2000, p. 23) that record-keeping is the key to policy development and planning and therefore data collection, regular reporting and analysis of data are the crucial essential components of a maternity information

system.

Hulton et al (2000, p. 24) further suggest items needed to assess quality of information that:

1. registers to record data to monitor and evaluate activities effectively are kept;
2. procedures for recording information results;
3. a review process to ensure data is comprehensive and used effectively to improve patient management;

The PPIP process fulfils this element and during the reviews each complicated case is effectively reviewed, analysed and avoidable factors, sub-standard care and missed opportunities are identified.

(iv) Use of appropriate technology

There are medical procedures in obstetrics that are performed routinely, but that are not appropriate such as shaving of the pubic area, and giving of an enema. These procedures could compromise safety (Hulton et al 2000, p. 24-25), scarce resources are wasted and some of these procedures are uncomfortable for the pregnant woman. It is important to use procedures that have been scientifically tested. According to the World Health Organisation (1999), a technology is “an association of methods, procedures, techniques and equipment which together with the people using them can contribute to solving a health problem. An appropriate technology is one that is scientifically sound, adapted to local needs, acceptable to those who use it or for whom it is used, and that can be maintained and utilised with resources that the community can afford”. All these factors need to be taken into account when selecting the most appropriate technology in obstetric care.

(v) Internationally recognised best practices

Some randomised studies have shown that certain procedures are beneficial to both mother and her unborn infant. Only interventions that are beneficial to the patient

should be encouraged, and those that are harmful or poorly evaluated should be discouraged and stopped. The latter include routine pubic shaving, administering enemas, routine episiotomies and adoption of the supine position in labour, amongst the various procedures.

The UK Royal College of Obstetricians and Gynaecologists published a list of effective procedures according to Klaus, et al., Hodnett and Osborn, Hemminki, et al, and Hofmeier, et al (cited in Hulton et al. 2000, p. 31) such as:

1. The use of magnesium sulphate as the drug of choice for the treatment of eclampsia; this concurs with the addition of magnesium sulphate for severe pre-eclampsia, as outlined in the Guidelines for Maternity Care in South Africa (2002, p, 82)
2. Active consideration of a woman for a vaginal delivery after one caesarean section;
3. The use of prophylactic antibiotics routinely at the time of an emergency caesarean section;
4. The use of ventouse as the instrument of choice for the low cavity operative vaginal delivery;
5. Allowing the woman social support of her choice during labour and birth, which includes support by people that the woman trusts;
6. Allowing the woman for non-complicated delivery to adopt any position she feels comfortable in;
7. Monitoring the woman's physical wellbeing regularly during labour.

The interventions mentioned in this element are implemented in most of the health institutions in Gauteng. The current practice in the maternity units is that women are not allowed to deliver in the position they feel comfortable with requiring the need for reorientation by staff. All the other procedures mentioned above are being

implemented on a daily basis. Women who have been supported during labour have shown a decrease in the duration of labour, less necessity for pain relief medication, fewer Apgar scores of less than seven recorded in their infants, and fewer caesarean sections performed according to (Hulton et al 2000, p.31-33).

(vi). Management of emergencies

In Hulton et al (2000, p. 34), citing WHO (1994), the direct primary causes for maternal deaths, are haemorrhage, sepsis, unsafe abortion, obstructed labour and hypertensive disorders of pregnancy. It is therefore important, for all health facilities providing maternal health services to have essential drugs and resuscitation equipment to manage these complications. In South Africa in Saving Mothers (2001, p.7), indirect causes of maternal deaths were similar for example non-pregnancy related infections, and pre-existing medical conditions. Direct causes of maternal deaths included complications of hypertension, obstetric haemorrhage and pregnancy related sepsis. Midwives and doctors should be able to use the partogram to detect problems during labour. The MOU, as the first entry for low-risk patients, should be able to screen for medium and high-risk complications and refer timeously to the next level of care. Theatres should be available in case a caesarean section or any other surgical intervention needs to be performed. Intravenous fluid should be available when needed at all levels of care for the pregnant woman and the newborn infant.

2.2.2 Experience of care by the users

(i) Experience of care

As mentioned by Hulton et al (2000, p. 39) experience of care relates to the woman's impression of physical and human resources, for example cleanliness of bed linen, quality of food served and the manner in which it is served. It is important for the woman that the staff assigned to care for her is competent as this will bring about the feeling of security and confidence.

(ii) Cognition

The interpersonal relationship between the woman and the health care provider (midwife or doctor), depends on the communication they use, to determine what the health problems are in order to reach a diagnosis. Cognition according to Hulton et al (2000, p. 40) depends on whether the woman understands the process that is unfolding around her and how she feels about it, and whether those providing the care are providing adequate and factual information that she can understand.

(iii) Respect, Dignity and Equity

Respect for the woman includes avoidance of humiliation, insensitive utterances, lack of confidentiality and judgemental attitude on the side of the health care provider as stated by Hulton et al (2000, p. 42-23). If women are treated with respect and dignity and afforded the opportunity to discuss their concerns and fears about the labour, they would feel comfortable in the care of the health provider. Rudeness amongst certain health care providers is a concern for management. It needs to be avoided at all costs, in order to ensure that pregnant women can attend antenatal clinics without fear of victimisation.

(iv) Emotional Support

The woman in labour needs emotional support in order to encourage her to endure the strange environment, the medical interventions and, sometimes, unfriendly health care providers, and to maintain self-control and self-esteem to live up to the staff's expectations, as suggested by Hulton et al (2000, p. 44-45). Health care workers should be able to find an opportunity to provide emotional support to the woman for her to gain control of herself and maintain a good mental state.

2.2.3 Evaluation of the provision of care

When assessment of the quality of care is carried out in relation to human and physical resources according to Hulton et al (2000, p. 21) it includes assessing

- the skills mix which should be appropriate to cope with patient flow and the case mix of deliveries;
- whether the obstetric units are adequately equipped to perform their function effectively and consistently with internationally recognised good practice;
- whether the operating theatre is properly equipped with drugs and emergency equipment to perform life-saving procedures when necessary;
- the organisation and management of labour, delivery and the postpartum period to ensure effective use of resources.

2.3 CLINICAL AUDIT

According to Scrivener et al (2002, p.1) in the National Institute for Clinical Excellence, clinical audit is defined as “a quality improvement process, that seeks to improve patient care and outcomes, through systematic review of care, against explicit criteria for the implementation of change”. Aspects of the structure, processes, and outcomes of care are selected and systematically evaluated against explicit criteria. Where indicated, changes are implemented at an individual, team, or service level and further monitoring is used to confirm improvement in healthcare delivery.

2.3.1 The Clinical Audit Cycle or Spiral

It is further suggested by Scrivener et al (2002, p.3) that there are three stages that follow a systematic process of establishing best practices. The stages are measuring care against criteria, taking action to improve care, and monitoring to sustain improvement. It is suggested that, as the process continues, each cycle aspires to a higher level of quality.

Clinical audit requires the use of a broad range of methods from a number of disciplines, for example statistics, organisational development and information management. Clinical audit can be undertaken by an individual health professional, a

group of health professionals, or a multidisciplinary team. Philpott et al (2001, p.1) suggests that the reviewing of a perinatal death should be done within 24 hours following the death. The purpose of the review should be:

- To ensure accurate and complete record of information whilst the facts are still fresh in the minds of those involved in the care;
- To undertake a preliminary assessment of the primary cause, the final cause of death, and the preventable factors.

The review meetings can be staggered anytime in the month, as long as they are conducted on a specific day and time so that all those responsible for the care of the woman and infant, can prepare adequately. In the Health Systems Trust publication by Philpott & Voce (2001, p.2) explains the purpose of the monthly review meetings as follows:

- To review the perinatal statistics for each month
- To review the causes and preventable factors in the perinatal deaths
- To determine corrective actions
- To advance the education and learning of health workers in the maternal health services by reviewing one or two perinatal deaths in detail
- To review all maternal deaths.

As discussed by Mancey-Jones & Burgher (1997, p.118) the clinical audit should follow a specific process as outlined in figure 1 below;

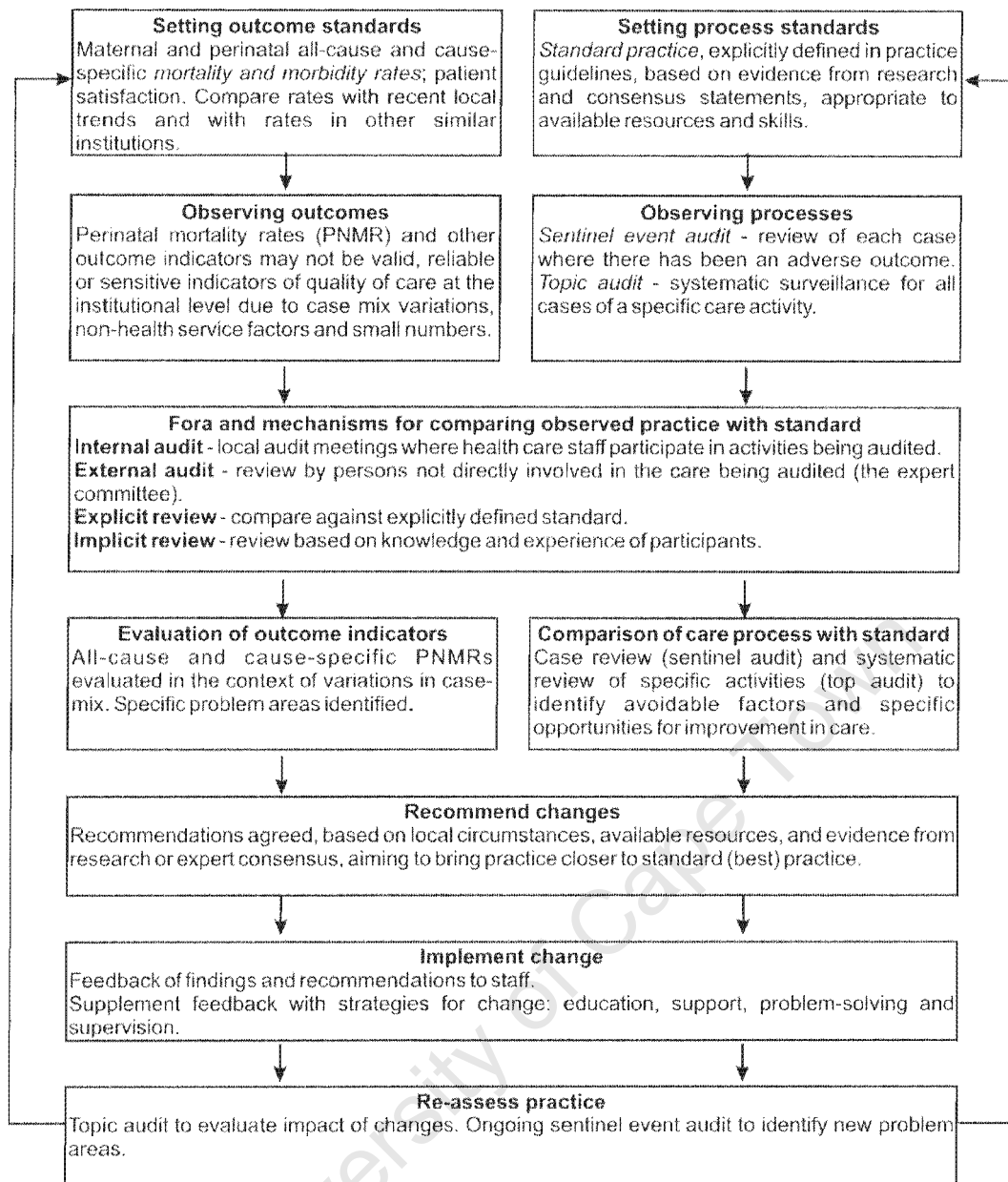


Figure 1: Outline of process for clinical audit (Mancey-Jones & Brugha, 1997)

2.4 USE OF IDENTIFICATION, CAUSES AND AVOIDABLE FACTORS

In the implementation of the ICA method in Livingstone Hospital Maternity Service, Ward et al (1995, p. 147) identified potentially avoidable factors in 50% of perinatal deaths, and by implementing appropriate interventions the perinatal mortality was lowered by 23%. They conclusively demonstrated that the ICA method of perinatal audit was able to identify problems in obstetric care and facilitate a significant decrease in perinatal mortality. This method has the strength of enabling health

institutions to detect problem areas with regard to administration and medical management. ICA identifies areas for in-service education and training for staff, identifies information that need to be conveyed to the community in terms of improving maternal health services. This method forms part of the PPIP because it identifies missed opportunities, sub-standard care and avoidable factors.

2.5 REPRODUCTIVE HEALTH INDICATORS FOR GLOBAL MONITORING

The countries at the International Conference on Population and Development (ICDP) in 1996 endorsed a number of global goals and targets in the area of sexual and reproductive health (www.who.int/reproductive/publication/RHR). At this conference the conclusion and recommendations included;

- Essential obstetric care indicators;
- Research to identify indicators to measure “Quality of Care and “Prevention” that could address each area of reproductive health care

The indicators for global monitoring of reproductive health are;

1. Total fertility rate
2. Contraceptive prevalence
3. Maternal mortality
4. Antenatal care coverage
5. Births attendance by skilled health personnel
6. Availability of basic essential obstetric care
7. Availability of comprehensive essential obstetric care
8. Perinatal mortality rate
9. Prevalence of low birth weight
10. Prevalence of positive syphilis serology in pregnant women
11. Prevalence of anaemia in women

12. Percentage of obstetric and gynaecological admissions owing to abortion
13. reported prevalence of women with genital mutilation
14. Prevalence of infertility in women
15. Reported incidence of urethritis in men
16. Prevalence of HIV infection in pregnant women
17. Knowledge of HIV-related preventive practice

2.6 REDUCTION OF MATERNAL MORTALITY

According to WHO (2003) complications that affect women during pregnancy and childbirth affect the fetus as well. It is also stated that 8.1 million infants die each year, of which 50% die within the first month of life. Of these, two thirds die in the first week after birth. Neonatal deaths are sometimes the direct result of poor management during labour. The main causes of neonatal deaths are birth asphyxia; trauma or infections and most pregnancy-related complications can be effectively prevented and managed without expensive technology or drugs WHO (2003). The prevention and management of pregnancy-related complications would include screening for pregnancy problems and assessment of risks through the determination of blood pressure, urine dipstick for protein and glucose, syphilis serology, rhesus (D), haemoglobin (HB) level, HIV serology with pre and post test counseling and current and previous obstetric history), management of problems that may arise during the antenatal period, administration of medication that may improve pregnancy outcome, provision of information to pregnant women, preparation of women physically and psychologically for childbirth and parenthood. Establishing of proper and efficient referral system, with a reliable transport system or ambulance and/or, communication system, i.e. telephone or radio, is essential to manage complications at a higher level of care, with the aim of preventing and reducing maternal and neonatal

mortality.

The Safe Motherhood Initiative WHO (2003) “with the international health community established the effectiveness of different interventions for maternal health, and how these can be implemented in a resource-poor setting. It is therefore, crucial to recognise that management interventions, needed to save the lives of mothers and their newborn infants, should not be implemented in a vertical and uncoordinated manner. It should form part of a broad strategy to improve reproductive health through Primary Health Care. Proper and adequate management of obstetric complications can reduce maternal and perinatal morbidity and mortality. The goals of the “Mother Baby Package” globally were that by the year 2000;

- There should have been a 50% reduction of maternal mortality;
- Perinatal and neonatal mortality should have been reduced by 30-40% of the 1990 levels;
- Through partnership between non-governmental organisations and national government, a global momentum for support to health services should have been created, enabling them to deliver maternal and newborn care more effectively.

However, these WHO Safe Motherhood Initiative indices have not been achieved in South Africa including Gauteng Province. The MMR for Gauteng in Saving Mothers (2002-2004) showed that there was an increase in maternal deaths due to various causes e.g. indirect causes such as HIV and AIDS, and direct causes eg hypertensive disorders of pregnancy and obstetric haemorrhage. The goal of reducing maternal mortality has not yet been realised because of the HIV and AIDS pandemic which remains the leading indirect cause of maternal death. Missed opportunities for preventing death that is related to the pregnant women themselves including the community within which they live. Other factors are non attendance at antenatal care

clinic and delays in seeking medical assistance during pregnancy and labour.

Monitoring of the implementation of the ten recommendations should be a priority for all managers in obstetric units in order to reduce the mortality rate. South Africa is implementing the 10 recommendations of the NCCEMD appointed by the Minister of Health and is aimed at reducing maternal mortality. In the Guidelines for Maternity Care in South Africa (2002, p.5) South Africa has developed its own Safe Motherhood Initiative based on WHO safe Motherhood Initiative and these five pillars are;

- Choice on contraception
- Antenatal care
- Clean and safe delivery
- Essential obstetric care
- Choice on termination of pregnancy

These five components have been chosen because of their importance in reducing maternal and neonatal morbidity and mortality. All pregnant women should be encouraged to use contraception to be able to space their children. Contraception is important to reduce unwanted pregnancies. Attendance at antenatal care is important for early detection of existing conditions during pregnancy and prompt treatment. Advise on nutrition and provision of iron or folate supplementation to prevent anaemia. Clean and safe delivery that is atraumatic and a competent health worker attends to the woman during labour and delivery in a health centre or hospital with all the necessary resources to manage any diagnosed complications such as prolonged labour or hypertension. The choice on termination of pregnancy is essential to reduce maternal deaths caused by illegal abortion,

The maternal mortality rate in Sweden and the United State of America towards the

beginning of the 19th century was probably reduced due to the increasing proportion of midwives conducting births, and their high quality of care Van Lerberghe et al (2001, p.7). The Sweden **Sunkommissionen** by Van Lerberghe et al (2001, p.132) reported that “400 out of 651 women who died in childbirth, could have been saved if only there were enough midwives”. The Swedish **Sunkommissionen** with its authority set up a policy of midwifery training to ensure that a qualified midwife attend all home deliveries. Van Lerberghe et al (2001, p. 14 citing Loudon, 1997) stated that *“To the American obstetrician, the midwife was a ‘relic of barbarism’ who had to be abolished” and if European countries persisted in employing midwives on a large scale, it only showed how backward Europe was compared to America*”. This meant that midwives were not accorded the recognition they deserved as partners in the care of pregnant women. In the USA and Sweden the maternal mortality ratio decreased to 60/10000 and further reductions after the 1970 a reduction of less than 10/100000 with the introduction of certain techniques such as antibiotics, caesarean section and blood transfusions (Van Lerberghe et al 2001, p. 7).

The PPIP allows insight into the perinatal care in South Africa, as the data provides information on how, when, where, what and why babies die and can inform the interventions that need to be put in place to address these questions. The reduction of perinatal and neonatal mortality is slowly being achieved in Gauteng. In the study conducted in Gauteng by Pattinson et al (1999) the PNMR for Gauteng was 32/1000 and has been reduced to 30.7/1000 according to Pattinson (2003,p.131) in the fourth Saving Babies Report. In the same report PNMR in South Africa is 27.63/1000 as compared to for example to Western Europe 7/1000 according to the Global and regional estimates of perinatal and neonatal mortality, by United Nations Region in 1995, (WHO, 1996). South Africa and Gauteng Province have relatively low neonatal

mortality rates of 9.90/1000 and 9.7/1000 respectively as compared to other provinces Pattinson (2003, p. 4 & 131) in the Fourth Saving Babies. The implementation of the recommendations from Saving Babies are aimed at the reduction of PNMR and NNMR. Effective prevention of complications of pregnancy, clean and supervised deliveries, adequate resources in terms of human and equipment should be a priority.

According to WHO (1999, p.1) “there are an estimated 3 million stillbirth and 3 million early neonatal deaths (death in the first week of life) each year. Most of these deaths occur largely due to inadequate or inappropriate care during pregnancy, childbirth and the first few hours after birth”. The emergence of HIV and AIDS in Sub-Saharan Africa has been identified as the number one cause of death amongst pregnant women. This has been the case in South Africa and in Gauteng according to the Saving Mothers (2002-2004).

Identifying women infected with HIV and AIDS should form part of the screening during antenatal subject to the principles of VCT counselling provided. This process will enable women who need PMTCT and for inclusion for anti-retroviral treatment. HIV and AIDS is associated with an increase risk of opportunistic infections and transmission of HIV to the newborn.

In South Africa deaths during pregnancy, childbirth and the puerperium were made a notifiable event on the 1st October 1997 in terms of the National Policy Health Act (No. 116 of 1990) which has now been changed to the National Health Act No. 61 of 2003. The Minister of Health appointed a National Committee on Confidential Enquiry into Maternal Deaths (NCCEMD) with the task to “make recommendations based on the confidential study of maternal deaths to the Department of Health, so that the implementation of the recommendations would result in a decrease in maternal mortality” Saving Mothers (1999-2001, p. ix). Proper and adequate

management of obstetric complications can reduce maternal and perinatal morbidity and mortality. The NCCEMD made the following ten (10) recommendations Saving Mothers (1998, p. 9).

1. Guidelines on the management of important conditions causing maternal deaths must be displayed and used in all institutions where women deliver.
2. The criteria for referral and referral routes must be established and utilised appropriately.
3. Emergency transport must be available for all pregnant women with complications at any site.
4. Blood must be available at every institution where caesarean sections are performed.
5. The establishment of staffing and equipment norms per level of care must be performed for every health institution concerned with the care of pregnant women.
6. The distribution of public sector Termination of Pregnancy (TOP) services (especially with respect to second trimester TOPs) must be expanded and the sites must be advertised to the public.
7. The correct use of the partogram should become the norm in each institution conducting births. A quality assurance programme should be implemented, using an appropriate tool.
8. Skills in anaesthesia should be improved at all levels of care. Regional anaesthesia should be promoted in all sites performing caesarean sections.
9. Contraceptive use must be promoted through education and service provision, especially for those who are 35 years of age or older, or those with five or more pregnancies.
10. Counselling and voluntary HIV testing for all pregnant women should be

made operational.

Intrapartum asphyxia, hypertensive disorders, antepartum haemorrhage and maternal diseases are some of the primary causes of perinatal deaths and these can be adequately managed if the ten recommendations are implemented in all institutions providing maternal health services. If the recommendations of the NCCEMD are implemented, they will have an impact on the reduction of both maternal and perinatal mortality and morbidity.

2.7 PERINATAL AUDITS

A study to investigate the value of incorporating avoidable factors into perinatal audits was conducted by Pattinson et al (1995, p. 145). The findings of the study concluded that classification of avoidable factors enabled the detection of problem-areas that would immediately be improved at a very low cost. In this study avoidable factors were found in 58% of patients with babies weighing >1kg, and grade 2 factors present in 30.2% of these cases. Grade 2 patient related factors were present in 15.4% of cases, medical personnel-related avoidable factors in 17.3% and administrative factors in 7.4% of perinatal deaths. In certain patients there was more than one avoidable factor hence the discrepancy in the numbers Pattinson et al (1995, p. 146).

The study identified abruptio placentae, congenital abnormalities and unexplained intra-uterine death of unknown origin as primary causes of perinatal deaths. The important strategy was to identify those avoidable factors and implement strategies that would have the maximum benefit to reduce problems resulting in a decreased perinatal mortality rate.

The Third Saving Babies by Pattinson (2002, p. 2) identified the following five key strategies for reducing perinatal deaths in South Africa:

1. Ensure each site conducting births has the necessary equipment and protocols and that the health care providers are appropriately trained to manage labour and are especially trained in the use of the partogram. Introduce a quality assurance tool to assess the success of the training.
2. Ensure each site conducting births has the necessary equipment and protocols, and appropriately trained staff to manage asphyxiated neonates. See that training programmes in neonatal resuscitation are accessible to all staff involved with conducting childbirth.
3. Ensure that each site caring for premature infants has the necessary equipment and protocols for the level of care, and that the health care workers, especially those in cities, towns and rural areas, are appropriately trained in the care of the premature infant, including kangaroo mother care.
4. Ensure each site providing antenatal care has protocols in place for referring patients and that health care providers are appropriately trained therein. Introduce a quality assurance tool to assess the success of the training.
5. Move to a system where the time and point at which the woman confirms her pregnancy also becomes the woman's first antenatal visit, where she can be classified according to risks, and where her further antenatal care is planned. If this is not practice, establish what the barriers are and overcome them.

CHAPTER THREE: AIM AND OBJECTIVES

3.1 AIM OF THE STUDY

The aim of the study was to implement the Perinatal Problem Identification Programme (PPIP), which would document the medical conditions, avoidable factors, missed opportunities and sub-standard care leading to perinatal deaths at public health facilities in the Emfuleni sub-district.

3.2 OBJECTIVES OF THE STUDY

The objectives of the study undertaken at public health facilities in the Emfuleni Sub-district were

1. To determine the perinatal and neonatal death rates;
2. To determine the causes of perinatal and neonatal deaths
3. To identify the factors (patient, health worker and administrative) contributing; to perinatal mortality;
4. To make recommendations for improving perinatal care.

CHAPTER FOUR: RESEARCH METHODOLOGY

4.1 DEFINITION OF TERMS

- Booked status rate:

$$\frac{\text{Number of booked women (who have given birth)} \times 100}{\text{Total number of births}}$$

(Pattinson 2001, p 5)

- Caesarean Section Rate (C/S)

$$\frac{\text{Number of C/S} \times 100}{\text{Total number of births}}$$

(Pattinson 2001, p. 5)

- Early Neonatal Mortality/Death Rate

$$\frac{\text{Number of deaths from birth to 7 days after birth} \times 1000}{\text{Number of live births}}$$

(Kibel & Wagstaff 2001, p. 247)

- Neonatal Mortality Rate

$$\frac{\text{Number of deaths of infants under 28 days of age} \times 1000}{\text{Number of live births}}$$

(Kibel & Wagstaff 2001, p. 247)

- Early neonatal death
Infants who die from birth to less than 7 days after birth

PPIP Edition (2001, p. 11)

- Low Birth Weight Rate (LBWR)

$$\frac{\text{Total number of births} < 2500\text{g} \times 100}{\text{Total number of births}}$$

(Pattinson 2001, p. 4)

- Maternal Mortality Rate

$$\frac{\text{Number of deaths due to pregnancy or childbirth during year}}{\text{Number of births (live and stillbirths) during the year}} \times 10\,000$$

(Katzenellenbogen et al 1997, p. 16)

- Maternal Mortality Ratio

$$\frac{\text{Total number of maternal deaths} \times 100\,000}{\text{Total number of live births}}$$

(PPIP Edition 1.1 p. 10)

- Perinatal Care Index (PCI): This is an index that can be used to compare the standard of care provided by various areas. It takes into account the environmental factors so that the comparison can be valid.

$$\text{PCI: } \frac{\text{Overall perinatal mortality rate}}{\text{Percentage low birth weight babies}}$$

(Pattinson 2001, p. 5)

- Perinatal Mortality Rate

$$\frac{\text{Total number of early neonatal deaths and stillbirths} \times 1000}{\text{Total number of births}}$$

(Pattinson 2001, p. 4)

- Preterm labour: labour occurring prior to 37 completed weeks of pregnancy.
- Stillbirth: According to the legal definition used in South Africa namely “when a baby is born dead after six months of intra uterine life and this equates to 28 weeks of gestation”
(PPIP Edition 1.1, p.10)

- Stillbirth Rate:

$$\frac{\text{Total number of stillbirths} \times 1000}{\text{Total number of deliveries}}$$

(Pattinson 2001, p. 4)

- Stillbirth: Neonatal Death ratio (SB:NND)

If the data on perinatal deaths has been collected by separating stillbirths and neonatal deaths, the SB:NND ratio can be calculated, and it serves as an indicator of the perinatal environment. (Pattinson 2001, p. 5).

4.2 STUDY DESIGN

This was a descriptive study, which set out to describe the perinatal and neonatal mortality rates, and the factors associated with these at public health facilities in the Emfuleni Sub-district.

4.3 STUDY POPULATION

All perinatal deaths of infants weighing 1000g or more from Sebokeng and Kopanong hospitals, and Johan Heyns, Levai Mbatha, Sharpeville and Boipatong Midwifery Obstetric Units (MOUs) were reviewed. The study covered the period from 1st April 2002 to 31st March 2003.

4.4 STUDY METHODS

All perinatal deaths were classified using a Perinatal Death Audit Form (see Annexure B) using the coding system for primary obstetric cause of death; the final neonatal cause of death and whether there were any avoidable factors, missed opportunities and or sub-standard care present which could have contributed to the death. Pattinson et al. (1998, p. 1) defines a missed opportunity as- “when an action or omission by the patient, administration or health worker results in an adverse outcome for the mother or baby”.

4.5 SAMPLE SELECTION AND SIZE

The study population:

- All perinatal deaths weighing 1000 g or more delivered at Kopanong and Sebokeng hospitals, Boipatong, Sharpeville, Levai Mbatha and Johan Heyns MOUs;
- Babies Born Before Arrival (BBA) as stillbirths or neonatal deaths weighing 1000 g or more, brought to the health facilities were included in the study;
- All perinatal deaths weighing 1000 g or more were included, irrespective of the body status, gender, race, or parity of the mother.

The sample size was determined by the number of perinatal deaths that occurred at the study sites from 1st April 2002- 31st March 2003.

4.6 DATA COLLECTION

Data collection was done with the aid of a perinatal audit (Figure 2) form that was completed using the patient record, audit meetings and feedback. This form was completed by the doctor/midwife who examined the body of the stillbirth or neonatal death, and as part of a team determined the primary obstetric and final neonatal death and any avoidable factors.

Statistics were collected on a monthly basis from the four Midwife Obstetric Units (MOUs) Sebokeng and Kopanong hospitals, where the staff was required to fill in an audit form and submit this by the 7th of every month.

SEDIBENG DISTRICT HEALTH SERVICES			
PERINATAL AUDIT FORM			
Identification No _____		Date of Death: _____	
Date of Delivery _____			
Tick one of the following:			
Early neonatal death		Syphilis Serology	
Stillbirth alive on admission		Positive	
Fresh Stillbirth dead on admission		Negative	
Macerated stillbirth		Not done/Unknown	
		Results not available	

Summary of Findings (history and examination)

Antenatal Care _____

On admission _____

1st Stage of labour _____

2nd Stage of labour _____

Postpartum _____

Cause of Death

Primary obstetric cause (the factor or condition that led to the baby's death) _____

Final Cause of death (the event that actually caused the death i.e. how did the baby die?) _____

Avoidable factors:

Patient's doing _____

Administrative problems _____

Medical/Nursing personnel's doing _____

Name of doctor/midwife _____ **Date** _____

Designation _____

Telephone No. _____

Figure 2: Perinatal Audit Form (Adapted from Pattinson (2000, p. 3))

The audit form did not include the HIV status because of confidentiality, but an agreed coding system to identify HIV positive and negative pregnant women was used. Testing for Rhesus (RH) factor, syphilis, Haemoglobin is performed and recorded in the antenatal card. If the woman tests RH negative, then blood is taken to screen for antibodies. RH and HIV results will be mentioned if they contributed to the deaths from the antenatal card. However, the form has been amended and does

include the HIV status

A summary of total deliveries in weight categories, antenatal care, delivery methods, referrals and Born Before Arrival (BBAs) and multiple pregnancies information was submitted by the 7th of every month by the hospitals and the MOUs (Annexure C).

A perinatal death summary was completed by the delivery unit. This used the PPIP coding system for the following information:

- Classification of the primary obstetric cause of death
- The final neonatal cause of death
- Avoidable factors, missed opportunities and sub-standard care.

4.7 DATA ANALYSIS

Statistical analyses were done using the PPIP computerised software programme. According to Pattinson (2000, p.1) “PPIP is a user-friendly, computer-based audit programme, that once data is entered, the various indicators of perinatal care are calculated and the causes of perinatal and neonatal deaths are listed. It has capacity to collate data from a lowest level to highest”

The programme was developed in the early nineteen-nineties by the Pretoria University MRC Maternal and Infant Health Care Strategies Research Unit and has been extensively field-tested since 1996. Furthermore, perinatal care indices, pattern of disease and avoidable factors, missed opportunities and substandard care related to each perinatal death, were collated and analysed. PPIP has been adopted as a surveillance programme by the National Department of Health for perinatal care. The Department of Health has requested that more PPIP sites be established so that the data collected is representative of perinatal care for the whole country as published in the Saving Babies Pattinson (2000, p. 1). The audit form used has been included in the attached annexure B. Statistical Analysis support was requested from the MRC Unit for Maternal and Infant Health Care Strategies.

CHAPTER FIVE: RESULTS/ FINDINGS

The findings from the results are discussed in this chapter so that the objectives that were established for this research report are addressed. The deliveries at public health facilities in the Emfuleni Sub-district for the period 1 April 2002 - 31 March 2003 were 11795. The distribution of these deliveries is shown in (Annexure D), per regional and district hospitals and the MOUs. Of these deliveries 3786 (32.5%) were at Sebokeng Hospital, 3186 (27.3%) at Kopanong Hospital and 4823 (40.2%) deliveries were conducted in the MOUs combined. The MOUs combined were conducting more deliveries than any of the two hospitals, and this should be expected for normal low risk deliveries. However, almost 60% of patients were delivering in hospitals.

5.1 COMPARISON OF THE PERINATAL HEALTH INDICES

Table: 1 Comparison of Perinatal Health Indices for Sebokeng and Kopanong hospitals, the MOUs and all public health facilities

Perinatal care indices	Sebokeng Hospital	Kopanong Hospital	MOUs	All public health facilities
Total deliveries (All weight categories)	3 786	3 186	4 823	11 795
Total Deliveries >1000g	3687	3168	4819	11674
Total live births>1000g	3529	3126	4804	11459
Stillbirths >1000 g	158	42	15	215
Early neonatal deaths	75	10	3	88
Late neonatal deaths	1	0	0	1
Neonatal deaths >1000 g	76	10	3	89
Total deaths >1000 g	233	52	18	304
Caesarean section rate	25.4%	17.5%	0	13.0%

Perinatal care indices	Sebokeng Hospital	Kopanong Hospital	MOUs	All public health facilities
PNMR >1000 g	63/1000	16.4/1000	3.7/1000	26/1000
NNDR >1000 g	21.2/1000	3.2/1000	0.62/1000	7.7/1000
NNDR 1000-1499 g	176/1000	133/1000	83.3/1000	130.7/1000
NNDR 1500-1999 g	92/1000	37/1000	0.0/1000	43/1000
NNDR 2000-2499 g	13/1000	0.0/1000	0.0/1000	4.3/1000
NNDR 2500 g+	7.4/1000	1.4/1000	0.5/1000	3.1/1000
LBWR	26.8.0%	11.8%	9.2%	15.6%
Perinatal care index	2.4	1.4	0.4	1.70
SB:NNDR	2.4:1	4.7:1	6.3:1	2.8:1

5.2 PRIMARY OBSTETRIC CAUSES OF PERINATAL DEATH

Table: 2 -Primary Obstetric Causes of Perinatal Death for Sebokeng and Kopanong hospitals, the MOUs and all public health facilities

Causes	Sebokeng Hospital. No. (%)	Sebokeng Rate/ 1000	Kopanong Hospital No. (%)	Kopanong Rate/ 1000	MOUs No. (%)	MOUs Rate/ 1000	All public health facilities No. (%)	All public health facilities Rate/1000
	Deliveries 3687 (31.5%)		Deliveries 3168 (27.3%)		Deliveries 4819 (41.2%)		Deliveries 11674 (100%)	
Intrapartum asphyxia	51 (21.9%)	13.83	19 (36.5%)	5.96	4 (22.3%)	0.83	74 (24.4%)	6.33
Spontaneous preterm labour	47 (20.2%)	12.74	8 (15.4%)	2.82	2 (11.1%)	0.41	57 (18.8%)	4.88
Hypertensive disorders	46 (19.7%)	12.47	4 (7.7%)	1.25	3 (16.7%)	0.62	53 (17.5%)	4.54
Antepartum haemorrhage	39 (16.7%)	10.57	1 (1.9%)	0.31	0	0	40 (13.2%)	3.42
Unexplained IUD	18 (7.7%)	4.88	14(26.9%)	4.39	7(38.9%)	1.45	39 (12.9%)	3.34
Infections	14 (6.0%)	3.79	4 (7.7%)	1.25	0	0	18 (5.9%)	1.54
Fetal abnormality	10 (4.3%)	2.71	2 (3.8%)	0.62	1 (5.6%)	0	13 (4.3%)	1.11
IUGR	4 (1.7%)	1.08	0	0	1 (4.5%)	0.20	5 (1.7%)	0.42
Trauma	2 (0.9%)	0.54	0	0	0	0	2 (0.7%)	0.17
Total	234(100%)	63.1	52(100%)	16.32	18(100%)	3.73	304 (100%)	25.95

1. The most common primary obstetric cause of death was intrapartum asphyxia with 13.83/1000 births in Sebokeng Hospital, 5.96/1000 in Kopanong Hospital, 0.83/1000 births in the MOUs and 6.33/1000 births at public health facilities in the Emfuleni Sub-district. (Table 2). Intrapartum asphyxia in Sebokeng Hospital causes a concern as it would be expected that the skills base of doctors and midwives would be in the Regional Hospital. Perhaps this reflects the case of higher patient acuity that are dealt with at Sebokeng Hospital. Nonetheless this trend should be investigated. Health care personnel should improve their skills in intrapartum monitoring of the fetus during labour.
2. Deaths caused by spontaneous preterm labour in Sebokeng Hospital were 12.74/1000 births, in Kopanong Hospital 2.82/1000 births, in the MOUs 0.41/1000 births and the Emfuleni sub-district 4.88/1000 births. This reflects poor socio economic status of the district or sub-district. Spontaneous preterm labour is often associated with conditions of the mother such as hypertension, diabetes, antepartum haemorrhage and they contribute to morbidity and mortality. Although the deaths were less common in the MOUs and most common in Sebokeng and Kopanong Hospitals, the referral were done in line with the Referral Criteria policy of the province including the recommendations of the NCCEMD.
3. Deaths caused by hypertensive disorders of pregnancy in Sebokeng Hospital were 12.47/1000 births, in Kopanong Hospital 1.25/1000 births, in the MOUs 0.62/1000 births and at all public health facilities in the Emfuleni sub-district 4.54/1000 births. Sebokeng Hospital should be managing more complicated cases, and Kopanong Hospital and the MOUs should refer patients that cannot be managed at that level. The death rate from hypertension is still high and the compliance to protocols available should be monitored during supervision and ward rounds.

4. Deaths caused by antepartum haemorrhage (APH) in Sebokeng Hospital were 10.57/1000 births, in Kopanong Hospital 0.31/1000 births; no deaths due to APH were reported in the MOUs and all public health facilities in the sub-district 3.42/1000 births. Placenta abruptio is a complication of hypertension and as above as contributed to the increased death rate.
5. Unexplained intra-uterine deaths in Sebokeng Hospital amounted to 4.88/1000 births, in Kopanong Hospital 4.39/1000 births, the MOUs 1.45/1000 births and all public health facilities in the sub-district 3.34/1000 births. These deaths are often associated with cases where syphilis serology is not known.
6. Deaths due to infections in Sebokeng Hospital were 3.79/1000 births, Kopanong Hospital 1.25/1000 births, no deaths due to infection were identified in the MOUs, and in all public health facilities in the sub-district as a whole 1.54/1000 births. Sebokeng Hospital is the referral hospital, therefore it is expected that the deaths are higher in this institution.
7. Deaths due to fetal abnormalities in Sebokeng Hospital were 2.71/1000 births, Kopanong Hospital 0.62/1000 births, no deaths identified due to fetal abnormality in the MOUs, and for all public health facilities 1.11/1000 births.
8. Deaths due to intra-uterine growth retardation in Sebokeng Hospital amounted to x 1.08/1000 births, the MOUs 0.20/1000 and in Kopanong Hospital no deaths were reported due to IUGR and for all public health facilities 0.42/1000 births. This reflects appropriate referral as the more complicated cases are sent to the referral hospital.
9. Deaths due to trauma in Sebokeng Hospital were 0.54/1000 births. No deaths were attributed to trauma in Kopanong Hospital and the MOUs. In the perinatal deaths for all public health facilities 0.17/1000 births were due to trauma. Sebokeng Hospital is a regional hospital and thus severe trauma is referred selectively and

not to Kopanong Hospital. Severe trauma resulting in fetal and/or maternal wastage will thus be more at Sebokeng Hospital.

10. Deaths due to maternal disease in Sebokeng Hospital were 0.54/1000 births. No deaths due to maternal disease were reported in Kopanong Hospital and the MOUs. The perinatal death due to maternal disease for all public health facilities was 0.17/1000 births. It is expected that all patients with maternal diseases are referred during antenatal care to level two hospitals such as Sebokeng Hospital.

5.2.2 Breakdown of the categories of primary obstetric causes at public health facilities in the Emfuleni Sub-district

Table 3 illustrates the rate per 1000 births of the primary obstetric causes of death of infants with a birth weight of $\geq 1000\text{g}$. Intrapartum asphyxia was the most common primary cause of perinatal death (6.3/1000). Pattinson (2002, p. 5) cited a study done in the city and town group in 2000-2002 showing a similar pattern of disease and intrapartum asphyxia (6.21/1000).

Table: 3 Primary Obstetric Causes of Perinatal Death at All Public Health Facilities

Primary obstetrical causes	Number	%	Rate/1000
Primary causes	Perinatal deaths=303		N=11674 (>1000g)
1. INTRAPARTUM ASPHYXIA	74	24.4	6.34
Labour related asphyxia (including. Meconium aspiration)	48	16.4	4.11
Cord around neck	16	5.5	1.37
Cord prolapse	6	2.1	0.51
2. SPONTANEOUS PRETERM LABOUR	57	18.8	4.88
Idiopathic preterm labour	46	15.8	3.94
Preterm rupture of membranes	11	3.8	0.94
3. HYPERTENSIVE DISORDERS	53	17.5	4.54
Proteinuric hypertension	40	13.7	3.42
Chronic hypertension	7	2.4	0.59
Eclampsia	3	1.0	0.25
4. ANTEPARTUM HAEMORRHAGE	40	13.2	3.42
Abruptio placentae	27	9.2	2.31
Abruptio placentae with hypertension	11	3.8	0.94
Placenta praevia	2	0.7	0.17
5. INTRA-UTERINE DEATH	39	12.9	3.34
Unexplained intra-uterine death - macerated	29	9.9	2.48
6. INFECTION	18	6.0	1.54
Syphilis	13	4.5	1.11
Amniotic fluid infection	3	1.0	0.25

Primary obstetrical causes	Number	%	Rate/1000
Primary causes	Perinatal deaths=303		N=11674 (>1000g)
Other	2	0.7	0.17
AIDS/HIV -related infection	1	0.3	0.08
7. FETAL ABNORMALITY	13	4.3	1.11
Neural tube defect	5	1.7	0.42
Multiple systems	5	1.7	0.42
Fetal chromosomal abnormality	3	1.0	0.25
8. INTRA-UTERINE GROWTH RETARDATION	5	1.7	0.42
Post-maturity	3	1.0	0.25
Idiopathic intra-uterine growth retardation	2	0.7	0.17
9. TRAUMA	2	0.7	0.17
Traumatic breech delivery	1	0.3	0.08
Domestic violence	1	0.3	0.08
10. MATERNAL DISEASE	2	0.7	0.17

5.3 CAUSES OF NEONATAL DEATH

Table: 4 Final Causes of Neonatal Death at Public Health Facilities

Causes	Sebokeng hospital No=76	% 100	Kopanong Hospital No=10	% 100	MOUs No=3	% 100	All public health facilities No=89	% 100
Prematurity related	35	46.0	5	50.0	1	33.3	41	46
Hypoxia	27	35.5	3	30.0	2	66.7	32	36.0
Congenital abnormalities	9	11.8	2	20.0	0	0	11	12.4
Infections	5	6.6	0	0	0	0	5	5.6
Total	76	100	10	100	3	100	89	100

Table: 5 Descriptions of Final Causes of Neonatal Deaths at All Public Health Facilities

Description	Number No=89	%	Rate/1000 Born Alive (N:11459)
1. PREMATURETY RELATED	41	46.0	3.57
Hyaline membrane disease	36	40.9	3.14
Extreme multi-organ immaturity	3	3.4	0.26
Pulmonary haemorrhage	1	1.1	0.08
Necrotising enterocolitis	1	1.1	0.08
2. ASPHYXIA AND BIRTH TRAUMA	32	35.9	2.79
Meconium aspiration	19	21.3	1.65
Asphyxia	13	14.6	1.13
3. CONGENITAL ABNORMALITIES	11	12.4	0.95

Other (incl. multiple/skeletal)		4.5	0.34
Central nervous system	3	3.4	0.26
Chromosomal abnormalities	3	3.4	0.26
Cardio vascular system	1	1.1	0.08
4. INFECTIONS	5	5.6	0.43
Congenital syphilis	3	3.4	0.26
Pneumonia	1	1.1	0.08
Congenital infection	1	1.1	0.08

The discussion in table 5 is depicted by (Annexure E)

Causes of Neonatal Deaths

1. Prematurity was the most common cause of neonatal death in Sebokeng Hospital (46.0%), Kopanong Hospital (50.0%) and in the MOUs (33.3%). It was identified as the final cause in 46.0% of the neonatal deaths for all public health facilities in the Sub-district (Table 4). As stated above Sebokeng Hospital is the referral centre and the type of patients managed are of higher acuity. The women with premature labour are referred appropriately to higher levels of care.
2. Hypoxia was the second most common cause of neonatal death in Sebokeng and Kopanong hospitals, 35.5% and 30.0% respectively, and the commonest cause of death in the MOUs (66.7%). It was identified as the final cause in 36.0% of the neonatal deaths at all public health facilities. Hypoxia is easily recognisable during labour if the woman is monitored accordingly, and if any deviations from the normal is identified appropriate intervention is implemented. The possibility is that the resuscitation skills of the attending delivery personnel need to be reassessed and in-service training conducted. The high neonatal death rate in both hospitals is a for concern as Sebokeng Hospital has specialists in both paediatric and in obstetrics.

3. Congenital abnormalities were the third most common cause of neonatal death in all public health facilities. Sebokeng Hospital recorded 11.8% and Kopanong Hospital 20.0%. No deaths were reported from this cause for the MOUs. It was identified as the final cause of neonatal death in 12.4% at all public health facilities. Proper history taking during antenatal care is crucial so that proper interventions can be taken such as genetic counselling where age is a contributing factor or the woman has had previous baby with an abnormality.
4. Deaths due to infections occurred infrequently at Sebokeng Hospital (6.6%). No deaths due to infection were reported in Kopanong Hospital and the MOUs. Infection was identified as the final cause of neonatal death at 5.6% of all public health facilities in the sub-district. The results maybe related to the fact that all labouring women who may present with symptoms of infection are referred to Sebokeng Hospital.

5.4 THE FACTORS CONTRIBUTING TO PERINATAL DEATHS

Table: 6 Avoidable Factors, Missed Opportunities and Sub-standard Care

Contributing to Perinatal Deaths

Avoidable factors	All		Probable	
	Number	% of deaths (No=303)	Number	% of deaths (No=303)
Patient-related	137	45.2	78	25.7%
Medical personnel-related	124	40.9	97	32.0
Administrative problems	76	25.0	48	15.8
Insufficient notes	4	1.3	2	0.66

Denominator 303 perinatal deaths

It is important to note that more than one avoidable factor was identified in some of the perinatal deaths, but also it is important to note that in some cases no avoidable factor could be identified (see Table 6).

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**5.5 BREAKDOWN OF AVOIDABLE FACTORS, MISSED OPPORTUNITIES
AND SUB-STANDARD CARE AT PUBLIC HEALTH FACILITIES IN THE
EMFULENI SUB-DISTRICT**

Table: 7 Avoidable factors, Missed Opportunities and Sub-standard Care

FACTOR	NUMBER Perinatal deaths (No=303)	%
PATIENT-RELATED FACTORS	137	45.2
Inappropriate response to poor fetal movements	48	15.8
Never initiated antenatal care	37	12.2
Delay in seeking medical attention during labour	23	7.5
Booked late in pregnancy	11	3.6
Infrequent visits to antenatal care	11	3.6
Inappropriate response to rupture of membranes	5	1.6
Declines admission /treatment for personal reasons	2	0.6
MEDICAL PERSONNEL-RELATED FACTORS	124	40.9
No response to maternal hypertension	19	6.3
Fetal distress not detected intrapartum; fetus not monitored	15	4.9
Fetal distress not detected intrapartum; fetus monitored	12	3.9
Delay in referring patient for secondary/tertiary treatment	11	3.6
Medical personnel overestimated foetal size	7	2.3
Medical personnel underestimated foetal size	6	1.9
No response to apparent post-term pregnancy	6	1.9
Inadequate/no advice given to mother	5	1.6
Delay in medical personnel calling for expert assistance	5	1.6
Poor progress in labour, but partogram not used	5	1.6
Poor progress in labour, partogram interpreted incorrectly	4	1.3
Breech presentation not diagnosed until late in labour	4	1.3
Delay in doctor responding to call	3	0.9

No response to poor uterine fundal growth	3	0.9
Management of 2 nd stage: prolonged with no intervention	3	0.9
FACTOR	NUMBER Perinatal deaths (No=303)	%
No response to history of stillbirths, abruption etc.	3	0.9
Neonatal resuscitation inadequate	2	0.6
Neonatal care: inadequate monitoring	2	0.6
Physical examination of patient at clinic incomplete	2	0.6
No response to history of poor foetal movement	2	0.6
Multiple pregnancy not diagnosed intrapartum	2	0.6
Nosocomial infection	1	0.3
Baby managed incorrectly at hospital/clinic	1	0.3
Other	1	0.3
ADMINISTRATIVE RELATED FACTORS	76	25.0
Inadequate facilities/equipment in neonatal unit/nursery	30	9.9
Lack of transport – home to institution	16	5.2
Result of syphilis screening not returned to hospital/clinic	10	3.3
Inadequate theatre facilities	5	1.7
Lack of transport – institution to institution	3	0.9
Personnel not sufficiently trained to manage the patient	3	0.9
Insufficient doctors available to manage the patient	3	0.9
Personnel too junior to manage the patient	2	0.9
Inadequate resuscitation equipment	2	0.6
No dedicated high-risk ANC at referral hospital	1	0.3
Insufficient nurses on duty to manage the patient adequately	1	0.3
INSUFFICIENT NOTES TO COMMENT ON AVOIDABLE FACTORS	4	1.3
Insufficient notes	3	0.9
File missing	1	0.3

5.5.1 Patient-Related Factors

- The most common patient-related factors identified were inappropriate response by the patient to poor fetal movements, which occurred on 48 occasions and contributed to perinatal death in 15.8% of cases (see Table 7). The importance of early reporting at antenatal care clinic if there is change in fetal movement should be stressed at every visit to the women during pregnancy education and one on one.
- Patients never attending antenatal care, booking late in pregnancy and infrequently visiting antenatal care occurred on 59 occasions and contributed to the death of the infant in 19.4% of cases. Early booking for antenatal care is encouraged when the woman misses her first period. In Gauteng Province 95% of women attend antenatal care based on the Hospital and District Health Information System.
- Delays in seeking medical attention during labour occurred on 23 occasions and contributed to the death of the infant in 7.6% of cases. Pregnant women due to previous experience of attitudes of health workers are still reporting late in labour.

5.5.2 Medical Personnel Related Factors

- The most common personnel-related avoidable factor was no response to maternal hypertension, which occurred on 19 occasions and contributed to the death of the infant in 6.3% of cases. This is being addressed by the 10 recommendations of the NCCEMD. Protocols have been developed to manage hypertension and other conditions. In-service education should continue to address the importance of early recognition of complications during pregnancy and early treatment.

- Problems related to the monitoring of the fetus during labour were identified on 27 occasions, and thought to have contributed to the death of infants in 8.9% of cases. Failure to detect fetal distress when the fetus is monitored and not monitored needs to be addressed through supervision and in-service training. Training on the use of the partogram and its interpretation should be continuous to improve skills of midwives and doctors.
- Delays in referring the patient for secondary or tertiary treatment, calling for expert assistance and delay in doctor responding to call occurred on 19 occasions and thought to have contributed to the death of the infants in 6.2% of cases. It is important that junior medical staff should be able to understand their capability so that they can be able to call expert advice when needed. A senior medical expert should be on standby or on call for senior opinion. Relevant disciplinary measures should be implemented when staff is not available to take calls when they are supposed to be on duty.

5.5.3 Administrative Related Factors

- Inadequate facilities/equipment in neonatal unit, inadequate theatre facilities and inadequate resuscitation equipment occurred on 37 occasions and thought to have contributed to the deaths of the infant in 12.2% of cases. Proper auditing and planning for equipment should be done yearly. Newborns need to be resuscitated using effective appropriate equipment. Plans should be in place to increase neonatal units that are well equipped.
- Transport delays occurred on 19 occasions and thought to have contributed to the death of the infants in 6.2% of cases. Shortage of emergency transport such as ambulances should be avoided at all times to save lives especially in Gauteng that has good transport infrastructure.

- Results of syphilis screening not returned to hospital occurred on 10 occasions and was thought to have contributed to the infant deaths on 3.3% of cases. System for the transportation of results should not have been a problem and this needs to be improved by identifying blockages in the system.

5.6 RELIABILITY AND LIMITATIONS OF THE DATA

The data is relatively reliable although a very small percentage of records could not be found at Kopanong Hospital, which is a district hospital, which refers to Sebokeng Hospital, a regional hospital in the sub-district. However, overall the findings in the study reflected the situation as it existed in Emfuleni sub-district.

A problem with the data is that the information collected only reflected the public hospitals and MOUs. The births from private institutions were not collected.

However, this study represents the perinatal care of indigent people at public health facilities in the Emfuleni sub-district. The Centre for Health Policy at Witwatersrand and District Health Services (DHS) (1998) indicated that less than 5% of births occur at home in Gauteng and most of these are born before arrival (BBA) in the health facility. Infants born before arrival (BBAs) were included in the study, but there may have been BBAs who died at home and were not brought to the health facility. Thus even though this study was institutionally based and not population-based the potential for bias was extremely small for determining the causes of death and problems of care of the indigent pregnant women of the sub-district.

In order for the perinatal mortality rate in the sub-districts to reflect the real picture, it should include the whole district, and be incorporated into the hospital minimum data set and be collected routinely in the whole province. Unfortunately Heidelberg Hospital, which forms part of the district, was not included in the study, because it did not form part of the sub-district and refers to another hospital outside the district.

Probably the inclusion of private hospitals would have reduced the perinatal and neonatal mortality rates. In some health facilities the data was incomplete and some anomalies occurred, but all possible means were followed to ensure the accuracy of the data.

Infants, who died after discharge and before 28 days of age, were also not included in the study.

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CHAPTER SIX: DISCUSSION

The data from the study was obtained from four MOUs, one district hospital and one regional hospital. The MOUs performed 40.2% of the deliveries, while Sebokeng and Kopanong hospitals delivered 32.5% and 27.3% of the babies respectively. This rate is considerably lower than that stated by WHO which indicates that at least 75-85% of the births in any community should take place at MOUs WHO (1985, p. 2, & 436-437). This is not found in any system in South Africa where MOUs are integrally involved. On average is around 40-50% of all births are performed in MOUs. At public health facilities in the Emfuleni Sub-district, the MOUs were responsible for 40.2% of all deliveries. It is advantageous to have MOUs as a gateway service for all low-risk pregnancies and allow hospitals to dedicate more time and resources to medium-risk and high-risk patients. MOUs should be supported and outreach visits provided where possible by the referral institutions so that the skills of the midwives can be developed and improved.

6.1 PERINATAL AND NEONATAL MORTALITY RATES

6.1.1 Perinatal Mortality Rate

The PNMR at public health facilities in the Emfuleni sub-district for infants weighing $\geq 1000\text{g}$ was 26/1000 births. This was lower than the Provincial and National rates of 32/1000 and 40/1000 total births $\geq 1000\text{g}$ respectively, but was high as compared to the developing countries Pattinson (2000, p. 9).

The low birth weight rate of 15.6% for all public health facilities in the sub-district was associated with the relatively high PNMR of 26/1000 births. The low birth weight rate compares well with the city and towns results of the PPIP Users in South Africa of 16.5% as indicated by Pattinson (2002, p.8) in the Saving Babies . It is however, still lower than those of the Winelands, (19.2%), Karoo (21.9%) and the Overberg

(19.5%) in the Western Cape Province according to the Pattinson (2000, p. 11) in the Saving Babies Report. The perinatal mortality rate in the MOUs was 0.5/1000 births, and the PCI in all the MOUs studied was low. Unfortunately there was no data available to compare these MOUs with other MOUs in the Gauteng Province. According to Pattinson (2000, p.14) if the PCI is low this indicates good care because the PNMR is relatively low in relation to the percentage of low birth weight babies, taking into account the environmental factors Pattinson (2000, p 14) in Saving babies Report. A high PCI indicates poor care because the PNMR is relatively high in relation to the percentage of low birth weight babies. Lack of skills of medical and nursing personnel, lack of resources such as ICU beds may be other contributory factors. The PCI allows for comparison among health institutions that function at a similar level. It can be used for monitoring and evaluation within any single institution within the same area or other similar areas. It also takes into account the environmental factors so that the comparison can be more valid. The PCI does not depend so much on the care received in the health facility (MOU or hospital). The perinatal mortality rate of infants weighing 1000g or more was very high in Sebokeng Hospital, (63/1000 live births) as compared to Kalafong Hospital (30/1000 births), although it was similar to King Edward Hospital (63/1000) as documented in Pattinson (2000, p.88). Sebokeng Hospital environmental factors are similar to the other health facilities (MOUs and Kopanong Hospital) as they are all located within the same area in Emfuleni Sub-district.

6.1.2 Neonatal Death Rate

The NNDR at public health facilities in the Emfuleni Sub-district was low at 8/1000 live births as compared to the results of 27 PPIP User sites throughout the country of 14.8/1000 live births in the city and town groups Pattinson (2002, p. ix) in Saving Babies Report. The NNDR at public health facilities in the Emfuleni Sub-district was

lower than that of Gauteng Province (12.09/1000 live births) Pattinson et al (1998, p. 1), and the NNDR in Sebokeng Hospital has decreased from 30.2/1000 live births in 1998 to 22/1000 live births in 2002, although it was still higher than Tembisa and Mahatma Ghandi Hospitals (14.1/1000 and 14/1000 live births respectively), which are both are regional hospitals.

When the NNDR of Sebokeng Hospital is compared with other regional hospitals in the province it is higher. This is because Sebokeng Hospital is a referral hospital and receives referrals from the MOUs and Kopanong Hospital. This reflects an effective referral system from the MOUs and Kopanong Hospital resulting in an overall reasonable rate. Sebokeng Hospital transfers about 2% of the cases to the tertiary hospital which is Chris Hani Baragwanath Hospital. Kopanong Hospital and the MOUs had a low neonatal death rate of 3.2/1000 and 0.62/1000 live births respectively. Kopanong Hospital had a low NNDR (3.2 /1000 live births) when compared with Standerton Hospital (12.3/1000 live births), a district hospital in Mpumalanga Pattinson (2000) in Saving babies. The short distance of Sebokeng Hospital as a referral centre for Kopanong hospital partially accounts for the low rate there and a higher rate for Sebokeng Hospital.

The Neonatal Death Rate is also an indicator of the perinatal environment and in Sebokeng Hospital this may reflect problems with resuscitation of the infant, inadequate monitoring and shortage of neonatal ICU beds in the province. The nearest tertiary neonatal care facility, Chris Hani Baragwanath Hospital, is 62km away and this may contribute to the delay in referring neonates. Sebokeng Hospital is staffed with specialists including paediatricians and has a small neonatal ICU, which provides care to all infants born in that hospital and referring units. When compared with other regional hospitals in the province the high Stillbirth: Neonatal Death ratio (SB: NND) reflects poor antenatal and intrapartum care. If improved care were to be provided

during pregnancy the fetus at risk could be identified, and monitored properly and delivered at the right gestational age for survival. If the care is improved during labour and the mother and fetus are in good health, the duration of labour will be reduced and safe intervention may be offered. As identified in the results, there were more stillbirths than neonatal deaths: SB: NND ratio 2.8:1. This is typical of developing countries as suggested by Pattinson (2000, p.14) which usually has a ratio of above 2, as a result of poor socio economic factors and problems within the health care system, as compared with developed countries with an SB:NND ratio of around 1. When the stillbirth to neonatal death ratio is higher this indicates poor perinatal care and reflects inadequate provision of quality antenatal care Pattinson (2000, p.14). It may be related to failure of health professionals to identify complications in pregnancy, or identifying complications but not treating them immediately. If the stillbirth rate is low, this indicates that antenatal and intrapartum care is effective. However, deaths of the fetus during labour may be an indication of poor monitoring of the fetus and the mother. If the fetus dies outside the health facility before admission it may indicate administrative or patient related factors.

6.2 THE PRIMARY OBSTETRIC CAUSES OF PERINATAL DEATH

6.2.1 Intrapartum asphyxia

Intrapartum asphyxia was the commonest cause of death in all the health facilities, i.e. Sebokeng and Kopanong hospitals and the MOUs. In this category, the avoidable factors that were identified that contributed to perinatal deaths were: fetal distress not detected intrapartum, fetus not monitored; fetal distress not detected intrapartum, fetus monitored; poor progress in labour, but partogram interpreted incorrectly; delay in seeking medical care during labour, and inappropriate response to poor fetal movements. Lack of monitoring of the patient during labour and difficulty in interpreting signs of fetal distress is a cause for concern. This reflects that the staff are

either inadequately trained or not supervised and working in the labour wards without appropriate skills. In Gauteng Province according to Pattinson (2002, p.46), intrapartum asphyxia was the third most common cause of perinatal death.

6.2.2 Spontaneous preterm labour

Spontaneous preterm labour was the second most common cause of perinatal death in Sebokeng Hospital; in Kopanong Hospital, the third; and in the MOUs, the fourth most common cause of death. The reason for the spontaneous preterm labour rate for the MOUs being relatively low (11.8%), seems to be identifying and referring timeously those women presenting with premature labour, or infants born prematurely, to the next (secondary or tertiary) level. Kopanong Hospital (15.4%) has a relatively high rate. This may be related to either the patient being admitted late or to delays in referring the patient to Sebokeng Hospital. In Sebokeng Hospital the high PNM causal rate from spontaneous preterm labour of 20.2% occurs because it is the only referral site in the Emfuleni sub-district and in the district as a whole. Premature infants are further compromised by associated conditions, such as congenital malformations, multiple pregnancies, or severe complications of the mother, e.g. hypertension, diabetes, antepartum haemorrhage, that contribute to morbidity and mortality. All these factors contribute to premature delivery being a common cause of perinatal deaths in Sebokeng Hospital, because all pregnant or intrapartum women with these conditions will be referred to Sebokeng Hospital as the only regional referral hospital in the sub-district.

6.2.3 Obstetric haemorrhage and hypertensive disorders of pregnancy

6.2.3.1 Antepartum haemorrhage

Antepartum haemorrhage in most cases due to abruptio placentae may result in fetal mortality and morbidity during pregnancy and intra-uterine or neonatal death. Antepartum haemorrhage was the third most common cause of death in Sebokeng

hospital, the cause of one perinatal death in Kopanong hospital and none in the MOUs. High-risk factors for abruptio placenta (i.e. pre-eclampsia) should be identified by nursing and medical personnel during the antenatal care period, so that these patients can be timeously referred for specialised care.

6.2.3.2 Hypertensive disorders

Hypertensive disorders were the third most common cause of death in Sebokeng Hospital and the MOUs. In Kopanong Hospital, it was fourth in the list of causes of death. The results show that all the areas have serious problems in diagnosing and managing hypertensive disorders in pregnancy. This could be attributed to the fact that antenatal care is also provided by local government clinics and the province cannot provide in-service training unless there are new policies or guidelines. There is also the issue of providing comprehensive health care in a PHC setting, with nurses who are not experienced midwives but generalists and who may not be skilled in maternity care. However, this may change because PHC will be provincialised as from 2006/07 starting with the District Councils and then the Metro Councils. Overall hypertensive disorders accounted for 17.5% of perinatal deaths, which makes it an important primary cause of perinatal death, and if abruptio placenta are included as a hypertensive disorder it accounts for 26.4%. It is important to diagnose hypertensive disorders of pregnancy early and refer appropriately so that management of any complications that may occur can commence immediately. The management should be aimed at preserving the life of the unborn infant and its mother. The important message to pregnant woman at antenatal clinic is to be aware of warning signs such as severe headache, oedema, blurred vision, abdominal pains and vaginal bleeding. It is also important to convey the message to stop smoking whilst pregnant and seek medical attention for decreased fetal movements early. It is also important to note according to Axemo et al (1995, p. 97) that medical personnel may not take

appropriate action when are not in normal range, and this defeats the aim of antenatal care for pregnant women. Visits to antenatal care does not involve risk identification only but offers an opportunity for health promotion, and ensuring that the physical, mental and social wellbeing of both mother and baby is maintained at the optimal level Axemo et al (1995, p. 98) Medical personnel's inability to respond to maternal hypertension and to poor fetal movements, and delays in referring patients or seeking expert advice when needed were some of the avoidable factors identified that contributed to the deaths.

6.3 UNEXPLAINED INTRA-UTERINE DEATHS

Unexplained intra-uterine death was the second most common cause of death in Kopanong Hospital (4.39/1000 births) and the commonest cause of perinatal death in the MOUs (1.45/1000 births). The majority of these deaths were macerated stillbirths and the avoidable factors that contributed to the deaths were inappropriate response to poor fetal movements, delay in seeking medical attention during labour, lack of transport from home to clinic/hospital and insufficient notes to comment on the death. The high number of intra-uterine deaths in the MOUs and Kopanong Hospital is a huge concern that needs to be addressed particularly during antenatal care. In most of the cases no cause of death was identified from the information available in the maternity records.

6.4 FETAL ABNORMALITY

Perinatal deaths from fetal abnormalities resulted in 1.1/1000 births in Emfuleni Sub-district. The province developed a form for the notification of birth defects in 1999 and distributed it to all units performing deliveries excluding private clinics, to quantify the extent of the problem. This auditing exercise showed the five major birth defects in Gauteng to be neural tube defects (NTD), albinism, Down Syndrome, cleft lip and palate and chromosomal abnormalities, although the last was relatively low.

This notification exercise has now been extended to all provinces and notification forms are sent to the Western Cape for analysis. Pregnant women, or couples, who have been identified as having a higher risk of genetic conditions, should be offered genetic counselling.

6.5 LOW BIRTH WEIGHT

The low birth weight rate of 15.6% at the public health facilities in the sub-district was lower than that of Gauteng Province's 18.4% according to Pattinson (Edition 1.1). The factors contributing to the high low birth weight rate in public health facilities in the Emfuleni sub-district were poor socio economic status, and delay in referring the woman whilst the baby is still in utero to a tertiary institution for assessment when inadequate growth is suspected. The low birth weight rate (LBWR) in the province and sub-district is higher than that of the developed countries (7%) according to the survey by Pattinson et al (1999) conducted in Gauteng Province. The low birth weight rate in Kopanong Hospital decreased from 14.5% to 11.8% in the four years that had lapsed from the 1998 survey report until this index study. In the same survey report Sebokeng Hospital (13.5%) had a lower LBWR when compared with other regional hospitals such as Coronation Hospital (30.1%) and Leratong Hospital (41.7%). A better socio-economic status will result in improved survival and health of infants. Preterm labour should not only be referred according to the definition. Information such as the last menstrual period, ultrasound report, and stage of labour, skills of staff available in the health facility should be considered. Patients less than 34 weeks must be referred and >34 to 37 weeks should be dependent on other risk factors, e.g. hypertensive disorders of pregnancy, multiple pregnancy and abnormal lie. According to Kibel & Wagstaff (2001, p. 80) most low birth weight infants born in affluent communities are preterm. In indigent communities the low birth weight infants are born full-term but under weight for gestational age. A

randomized study conducted by Charpak et al (1997, p. 682-688) on kangaroo mother care versus the traditional method for low birth weight babies, found that nosocomial infection were more common in babies cared for using the traditional method; length of stay was shorter in KMC method. KMC is recommended in Gauteng province as an alternative method to care for LBW babies as it is a cost effective strategy, shortens length of stay, reduces infection and promotes bonding as well as providing skills for new mothers in caring for their infants, It is therefore important in Gauteng Province to establish KMC for low birth weight babies. Data for IUGR for was not documented in the study, but perinatal death from IUGR was 1.7% at public health facilities in the sub-district. The LBWR of 9.3% in the MOUs is due sometimes to delays in the transport of the pregnant woman with preterm labour. When the MOUs in this study are compared with each other the rates are very similar. The preterm infants and mothers in preterm labour should be referred urgently. The MOUs are not equipped to deal with low birth weight infants, except for immediate care. Referral to the nearest hospital with appropriate skills and equipment must happen quickly. It is not possible to compare the MOUs in the Emfuleni sub-district with other MOUs in the province because there is no data available for the other MOUs.

6.6. OTHER CONTRIBUTORY FACTORS

6.6.1 Referral System

The health facilities included in the study have a relatively well-defined referral route and criteria. The referral routes apply to emergency and routine referrals of all patients including antenatal, intrapartum, postpartum and neonates. Johan Heyns, Sharpeville and Boipatong MOUs all refer to Kopanong Hospital, which is a district hospital. Kopanong Hospital and Levai Mbatha MOU refer to Sebokeng Hospital, which is a regional hospital. However, this does not prevent the other MOUs from referring directly to Sebokeng Hospital in the case of an emergency, to avoid delays.

Patients referred as percentage of deliveries in Kopanong Hospital decreased from approximately 50% in April 2002 to approximately 25% in March 2003 (Annexure F), and similarly patients referred as percentage of deliveries in Sebokeng Hospital decreased from approximately 35% in April 2002 to 15% in March 2003 (Annexure G). At the beginning of each year new staff is appointed especially medically and this decrease may reflect more experienced staff being appointed. It may also reflect better staffing ratios. There is no tertiary service in Emfuleni sub-district, but when there is a patient who needs tertiary care the patient will be referred to Chris Hani Baragwanath Hospital, which is located in another district. The distance between Kopanong and Sebokeng Hospitals is 13 km and takes less than 10 minutes to transport the patient, unless the emergency medical service response is delayed. Criteria for referral of patients need to be developed in conjunction with the referral hospital so that there is clear understanding of the whole system, and co-operation between the institutions.

6.6.2 Antenatal Care

It is becoming a huge concern that women who have attended antenatal clinic regularly, on several occasions end up with a perinatal death, or die themselves during pregnancy, or during labour or in the puerperium. Debates have been held regarding acceptable numbers of antenatal care clinic visits a pregnant woman should make.

The Gauteng Antenatal Care Policy requires five (5) antenatal care visits for a multipara and eight (8) antenatal visits for a nullipara for a normal pregnancy. Each visit has a particular emphasis. Women with a high risk pregnancy may need to attend for antenatal care more frequently as indicated in existing protocols. The purpose of antenatal care involves more than just risk-assessment. It includes health promotion, VCT, PMTCT education with breast feeding or formula feeding as a choice, promotion and maintenance of the physical and psycho-social well being of the mother and her unborn child, contraception and nutrition education. The philosophy

that a safe delivery and postpartum period depends largely on good antenatal care and good referral criteria and referral system is not far from the truth. In the Second Report on Confidential Enquiries into Maternal deaths in South Africa (Department of Health 1999-2001, p.28) it was found that 95% of pregnant women in the report attended antenatal care in South Africa. Of those women who died of pregnancy-related causes only 57.2% had documented antenatal care attendance. 23.6% did not attend antenatal care. Documentation of the rest was incomplete. Audit of women who delivered at public health facilities in the Emfuleni sub-district showed that 45.9% attended local clinics for antenatal care, 49.2% attended clinics outside the sub-district, 1.4% attended for care outside the provincial health system and 3.5% of the women did not attend antenatal care. These results showed that most women delivering in the Emfuleni sub-district do attend antenatal care. (Annexure H).

6.6.3. INFANTS BORN BEFORE ARRIVAL

For the whole Emfuleni sub-district (616) infants were born before arrival in the health facility. Eighty-nine infants were born in transit from home to the delivery unit and 1 infant was born in transit from clinic to hospital (Annexure I). This clearly shows a problem with transport for the woman in labour. Lack of transport is one avoidable factor that has been identified as contributing to perinatal death in the sub-district. The investigation of the possibility of a “Flying Squad” or obstetric ambulance in Gauteng is underway. Alternatively a dedicated MOU based obstetric ambulance should be prioritised for all districts. In all areas obstetric and neonatal calls for ambulance services should receive priority one status until the “Obstetric Ambulance” is in place.

6.7 AVOIDABLE FACTORS, MISSED OPPORTUNITIES, AND SUB-STANDARD CARE

6.7.1 Patient Related Problems

The relatively high proportion of inappropriate response to poor fetal movements by the women themselves (15%) is of great concern. Questions by the medical and nursing staff regarding fetal movements should be routine. If a woman reports reduced fetal movement she cannot be sent home to return the next day unless fetal wellbeing has been proven. This must be done either with a repeat fetal movement count or a cardio-tachograph (CTG). Although no study has been documented in developing countries regarding the benefit of this method, Pattinson (2002, p. 17) in *Saving Babies*, citing Neldam, stated that the introduction of the fetal movement scoring chart was associated with a significant reduction in perinatal mortality in Sweden in 1979. A similar study should be done locally to prove or disprove these hypotheses.

Cases where antenatal care was never initiated in (37), where bookings occurred late in the pregnancy, (11) and where visits to antenatal care clinics were infrequent (11) together amounted to a considerable number and (59 or 43%) of patient-related avoidable factors (137) see Table 7. Attitudes of staff and the quality of antenatal care as previously experienced by the woman could be the reasons why patients do not visit antenatal care clinics regularly, and why they delay in seeking medical attention for pregnancy related problems. Quality of care as defined by the (Institute of Medicine Report 1990, p. 40) “is the degree to which maternal health services for individuals and populations increase the likelihood of timely and appropriate treatment for the purpose of achieving desired outcomes, that are both consistent with current professional knowledge and uphold basic reproductive rights”. The woman from previous experience may think that the care she received from a particular

facility was unacceptable although the health sector believes that the care is of high quality, good practice and standard. Affording women dignity, support, respect and humane treatment is very important if we want them back in our institutions, unafraid to seek help when the need arises. Women should be informed of their rights as patients so that they can question certain practices performed by health care providers.

6.7.2 Medical Personnel Related Problems

Medical personnel related problems are where a health professional: doctor or midwife, did or did not do something which had a direct influence on the death of the mother or her baby. According to Pattinson (2000 p.31) this area can be divided into three categories:

1. Honest error where the health professional acted correctly according to the information available or the clinical findings, but where the information or clinical findings on which the management was based was incorrect, for example over- and under-estimation of fetal weight.
2. An oversight where the health professional failed to respond to information that was available.
3. Gross deviation from acceptable practice where a potentially dangerous and inappropriate procedure was carried out on the woman or her baby.

As stated in the findings, medical personnel /related problems were the second most common contributory factor to perinatal death. No response to maternal hypertension in (19 or 6.3%) of total avoidable factors is of great concern because hypertensive disorders were the number one direct cause of maternal deaths as reported in the Saving Mothers (1999-2001, p. 208) in Gauteng Province. The CHCs and MOUs and the clinics are the first point of contact for the pregnant woman, and therefore protocols or guidelines should be available for the management of the pregnant woman presenting with hypertension. The use of magnesium sulphate for the

management of eclampsia and severe pre-eclampsia should be included in the protocols as this is already available on the (PHC Essential Drug List 2003, p.102-121). As discussed earlier in the referral system, the referral pattern and criteria should be communicated and displayed. Blood pressure measurement and urinalysis are sometimes not properly done by health professionals even when proper equipment is available, and incomplete assessment or infrequent observations are all cited in the Second Report on Confidential Enquiries into Maternal Deaths in South Africa (Department of Health 1999-2001, p. 44). Health professionals should be made aware of their lack of action and responsibility where applicable through the morbidity and mortality meetings. Supervision and periodic audits of records to identify gaps in the provision of care will also heighten awareness.

Fetal distress not detected during labour even when the fetus was monitored, and a delay in referring patients for secondary or tertiary care, were also common avoidable factors in this category. Protocols and guidelines have been developed for managing conditions that may lead to perinatal or maternal death. Training institutions should ensure that all students in nursing and medical schools are competent in the use of the partogram. The Second Report on Confidential Enquiries into Maternal Deaths in South Africa (Department of Health 1999-2001, p. x) recommended that the 'correct use of the partogram should become the norm in each institution conducting births', for monitoring labour in every pregnant woman and that problems detected should be managed appropriately.

6.7.3 Administrative Related Problems

Syphilis is an avoidable death because it is preventable and can be detected using a simple on-site or laboratory test that is cheap and can be treated cost effectively.

Almost 18% of women had no results of STI/VDRL were available or no investigation had been done at public health facilities in the Emfuleni sub-district

(Annexure J). The hospitals and the MOUs are using on-site syphilis testing equipment. It is important that management ensures that resources to provide basic antenatal care are available, and also to comply with the antenatal care policy which requires that syphilis, Rhesus factor and haemoglobin testing be done when the woman books for the first time. Congenital syphilis, which is a notifiable disease, is least reported as a cause of death in all sites, due to possible lack of diagnostic skills amongst health care providers. No infant should still be dying of syphilis in this era where tests and treatment are available (Table 5).

Inadequate facilities / equipment in neonatal units were the most common avoidable factor in this category that contributed to neonatal deaths. Not enough neonatal 'ICU beds' is of great concern to policy makers as it leads to frequent closure of hospitals for neonatal admissions

Lack of transport from home to institutions was identified in 4.6% of perinatal deaths, and this is similar to the data presented in Pattinson (2002, p. 12). Insufficient notes to comment on avoidable factors were implicated in 1.2% of the deaths. Proper notes need to be kept and legible handwriting is an important aspect. Medical and nursing personnel should constantly be reminded of their responsibility to provide safe care.

6.8 Method of Delivery

The caesarean section rate for the sub-district of 13.2% (Annexure K) was lower than the Province's 14%. Pattinson et al (1999) Gauteng Province Survey Report. In the same report Sebokeng Hospital had a relatively high caesarean section rate of 25.3% and a normal vertex delivery rate of 66.5%. The caesarean section rate will vary from hospital to hospital, and one would expect a high caesarean section rate in a referral hospital. The optimal rate for caesarean section is not accurately known, but is generally accepted as around 15%. It could range between 5% and 25%. The

performance of more caesarean sections does not guarantee a good outcome of the woman's labour.

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CHAPTER SEVEN: RECOMMENDATIONS

7.1 THE POLICY MAKER

1. Should ensure resources are available for institutions conducting deliveries and caring for premature and sick newborn infants eg. Finance, human resources and equipment, such as on-site syphilis testing equipment.
1. Should ensure an adequate budget to establish KMC units in all hospitals conducting births, as a cost saving measure for reducing the PNMR.
2. Should ensure a monitoring process for creation of additional ICU beds in the province where necessary to avoid shortage and consequent closure of hospitals and to increase patient access to appropriate health care.
3. Should ensure an efficient EMS for patient referrals, and acquire dedicated obstetric ambulance for the MOUs to reduce the response time.

7.2 THE DISTRICT HEALTH MANAGER

1. Should ensure Human Resource Development programmes in the district are available, and ensure that all staff working in maternity units have a schedule for continuing in-service training. A special focus on neonatal resuscitation skills training should be prioritised for doctors and nurses. The district health manager should also monitor personnel practice by keeping up to date with research and also commissioning small research studies to be conducted to in her/his health district improve care and service (Ball et al 1991).
2. Should ensure monitoring of referral routes and criteria and should ensure that these are strictly followed by all health staff and EMS personnel.
3. Should ensure also that the emergency medical fleet is maintained and readily available to the needs of pregnant women.
4. Should ensure budgets and other resources are allocated equitably to all health facilities and do not compromise patient care.

7.3 HEALTH FACILITY MANAGER

In order to maintain quality assurance in the service as whole Ball et al (1991, p. 63) states that “a manager need to take a positive part in initiatives that are designed to provide better care or make use of current resources allocated to the health facility.” The health facility manager needs to be able to listen to other views from colleagues, other health professionals and facilitate good working relationship to promote good quality of care. The health facility manager;

1. Should ensure that staff is released to attend in-service training as planned in the yearly schedule and monitor the attendance.
2. Should ensure proper allocation of staff in the unit for adequate coverage in every working shift.
3. Should ensure equipment is maintained in good condition.
4. Should ensure protocols are available and used in all facilities providing maternal and neonatal care. The Guidelines for Maternity Care in South Africa (2002) which is a manual for use in clinics, CHCs and district hospitals should be utilised to guide practice of midwives and doctors.
5. Should encourage obstetric emergency drills once per month.
6. Should ensure communication between all levels of care in the sub-district, to improve quality of referrals.
7. Should ensure mortality and morbidity audit meeting are held monthly or weekly using PPIP, involving all staff caring for pregnant women and their neonates.
8. Should conduct visible supervision, provide support, mentoring and coaching of all new midwives and other staff members.
9. Should possess or acquire extensive knowledge, experience and skills in order to lead the unit.

7.4 CLIENTS

In the provision of health service and care to the clients that visit the health facilities, nursing, medical and other health professional should not forget that they exists to ensure that the clients' needs and expectations are met. (Ball et al 1991, p. 63). The client;

1. Should be encouraged to take responsibility for their own health and that of the unborn infant, by ensuring early booking and regular attendance at antenatal clinic. Be made aware of danger signs during pregnancy such as bleeding, rupture of membranes and decreased fetal movements during health education and promotion sessions.
2. There should be facilitation of their involvement campaigns such as Pregnancy Education Week, Breastfeeding Week and Premature Day, with provision of Information Education and Communication (IEC) material in their own language. They must be advised to avoid smoking, and alcohol consumption and the taking of any medication not prescribed by the doctor or midwife during pregnancy.
3. Should make plans for their own transport to hospital or MOU for delivery well ahead of the expected date of delivery and should know the telephone number to call an ambulance.

7.5 THE COMMUNITY

1. Support and commitment from politicians, religious leaders, women themselves forming lobby groups and assist in the investigation of deaths during pregnancy is essential.
2. The health education and health promotion messages, campaigns should target communities to create awareness of pregnancy-related complications and where the nearest health facility is and what services are provided.

3. The Hospital Boards, Local Councillors and Community Health Committees have to engage communities; reports from the audit meetings can be dealt with by them particularly related to patient avoidable factors such as lack of transport to hospital or MOU. These committees can also take an active role in the investigation of maternal or perinatal mortality and set up strategies to improve access to health facilities.
4. Campaigns to be conducted in the community to raise awareness particularly for pregnant women to access emergency care, including ambulances, and hospitals timeously.
5. Training of communities to be able to recognise danger signs in pregnant women such as swelling of feet, bleeding during pregnancy and rupture of membranes during pregnancy and advise them to seek medical aid. The community should also know the toll-free telephone number for an emergency medical service.

CHAPTER EIGHT: CONCLUSION

The report covered two hospitals and four MOUs in Emfuleni sub-district where the PPIP was implemented. It would be interesting to include Heidelberg Hospital in the district to see the whole picture of perinatal care in the district, instead of only the sub-district. The most important advance is that the PPIP Programme has been implemented as part of an ongoing monitoring and evaluation process of maternal and perinatal health care services. There is a great need to provide support to all these facilities to ensure implementation of recommendations, sustainability of the programme and regular evaluation. Identification of avoidable factors, missed opportunities and sub-standard care, primary obstetric and final neonatal causes of perinatal deaths, will assist health care providers to implement strategies to prevent these causes and be able to reduce the mortality rate. Ongoing training of health care providers should be prioritised, monitored and evaluated from time to time.

Political and senior management commitment should be emphasised in implementing strategies to improve maternal and neonatal health care services. The health care providers should be adequately trained in order to improve care of pregnant women postpartum mothers and their newborn infants. Good training of health care providers is essential in this paradigm.

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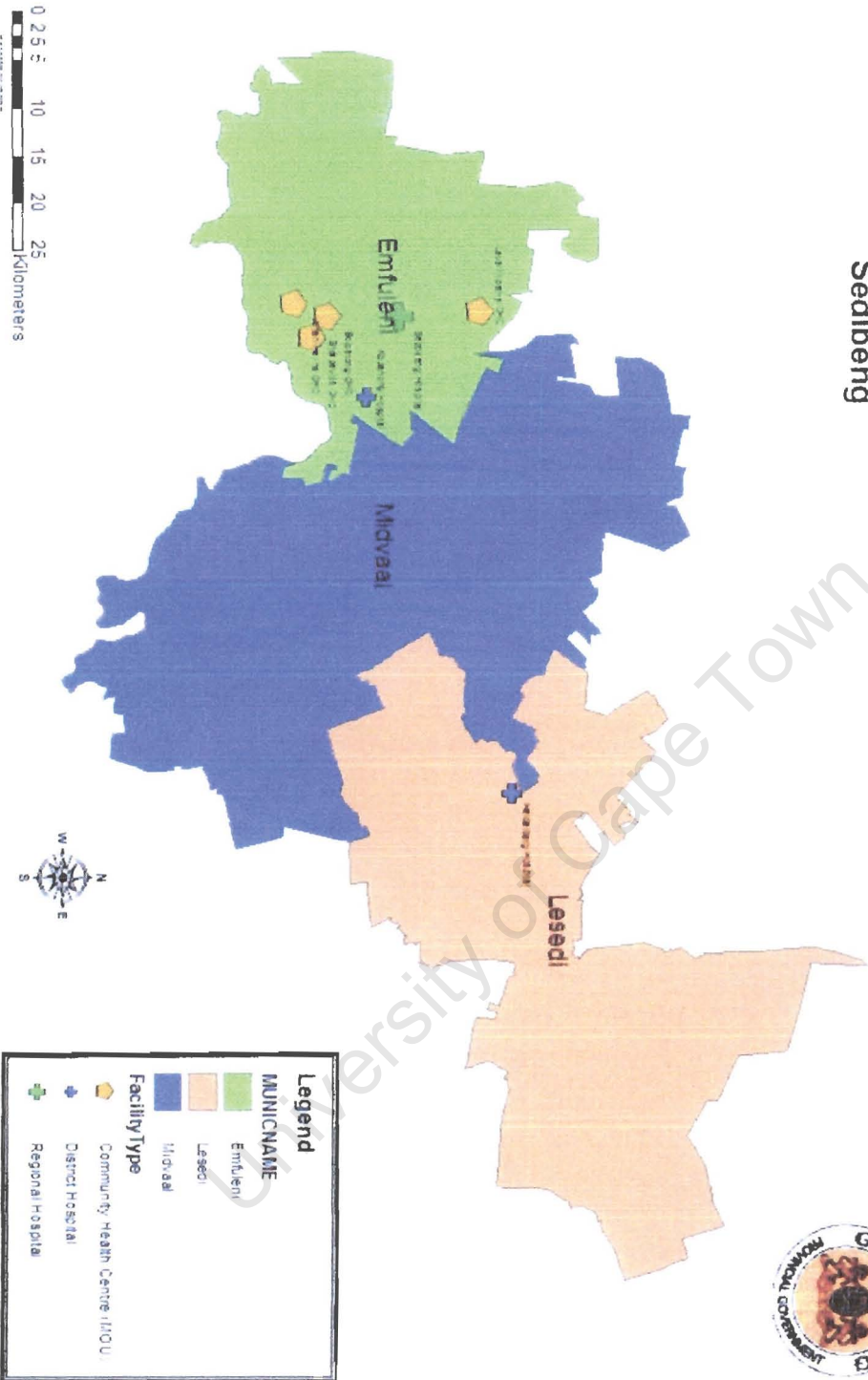
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Hospitals and MOU's
Sedibeng



PERINATAL DEATH AUDIT FORM

Identification Number _____

Date of Delivery _____

Date of Death _____

Birth Mass _____

☐ Born Alive ☐ Stillborn, alive on admission ☐ Fresh stillborn, dead on admission ☐ Stillborn, admission status unknown ☐ Macerated stillborn Tick one	Syphilis serology ☐ Positive ☐ Negative ☐ Not done ☐ Results not available Tick one
--	---

☐ Single pregnancy

☐ Multiple pregnancy
Tick one**Cause of death:**

Primary Obstetrical cause of perinatal death _____

Code: _____ Description if 'other' _____

Final cause of neonatal death

Code: _____ Description if 'Other' _____

Avoidable factors:

Code: _____	Possible cause	or	Probable cause
Code: _____	Possible cause	or	Probable cause
Code: _____	Possible cause	or	Probable cause
Code: _____	Possible cause	or	Probable cause
Code: _____	Possible cause	or	Probable cause

Perinatal Problem Identification An introduction to auditing mother and baby health care using the ICA Solution audit system (Patinson, RC) MRC Maternal and Infant Health care Strategies Research Unit.

TOTAL DELIVERIES

Data Collection Period:

Month: _____

Year: _____

General:	Multiple pregnancies: _____
Total deliveries: _____	(Amount of babies born)
500-999g: _____	
1000-1499g: _____	
1500-1999g: _____	
2000-2499g: _____	

Miscellaneous 1:	Delivery methods:
Antenatal care:	Normal vaginal: _____
Local clinic: _____	Assisted vaginal: _____
Elsewhere: _____	Vaginal breech: _____
None: _____	Caesarean section: _____

Miscellaneous 2:	
Referrals:	Born before arrival
Received: _____	In transit: _____
Sent: _____	Born at home: _____
	In transit from: home referring unit: _____
Teenage delivery: _____	
<18 years	

Perinatal Problem Identification. An introduction to auditing mother and baby health care using the ICA Solution audit system (Partinson, RC) MRC Maternal and Infant Health Care Strategies Research Unit.

**Comparison of deliveries performed at units referring to
public health facilities in the Emfuleni sub-district
(Cumulative data)**

Data included: April 2002 to March 2003

Calculated by PPIP

September 2, 2004

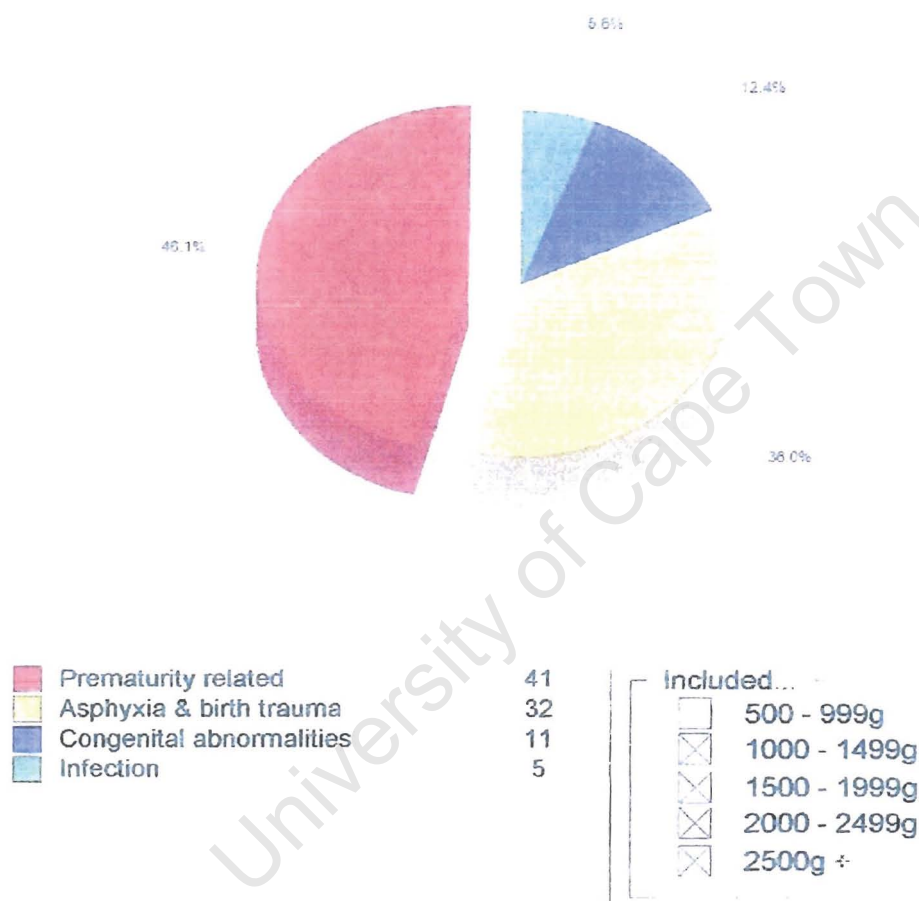
Unit	500-999g		1000-1499g		1500-1999g		2000-2499g		2500g +		Total	
	Amt	%	Amt	%	Amt	%	Amt	%	Amt	%	Amt	%
Emfuleni	121	100.0	193	100.0	358	100.0	1,159	100.0	9,824	100.0	11,655	100.0
Sebokeng Complex	121	100.0	193	100.0	358	100.0	1,159	100.0	9,824	100.0	11,655	100.0
Kopanong Complex	22	18.2	39	20.2	85	23.7	479	41.3	5,285	53.8	5,910	50.7
Boipatong	2	1.7	4	2.1	6	1.7	53	4.6	832	8.5	897	7.7
Johan Heyns	0		3	1.6	13	3.6	90	7.8	1,003	10.2	1,109	9.5
Kopanong	18	14.9	30	15.5	54	15.1	275	23.7	2,809	28.6	3,186	27.3
Sharpeville	2	1.7	2	1.0	12	3.4	61	5.2	641	6.5	718	6.2
Levai Mbatsha	0		6	3.1	24	6.7	160	13.8	1,769	18.0	1,959	16.8
Sebokeng	99	81.8	148	76.7	249	69.6	520	44.9	2,770	28.2	3,786	32.5

Final causes of neonatal death: Emfuleni (Headings 1 - 4)

Data included: April 2002 to March 2003

Calculated by PPIP

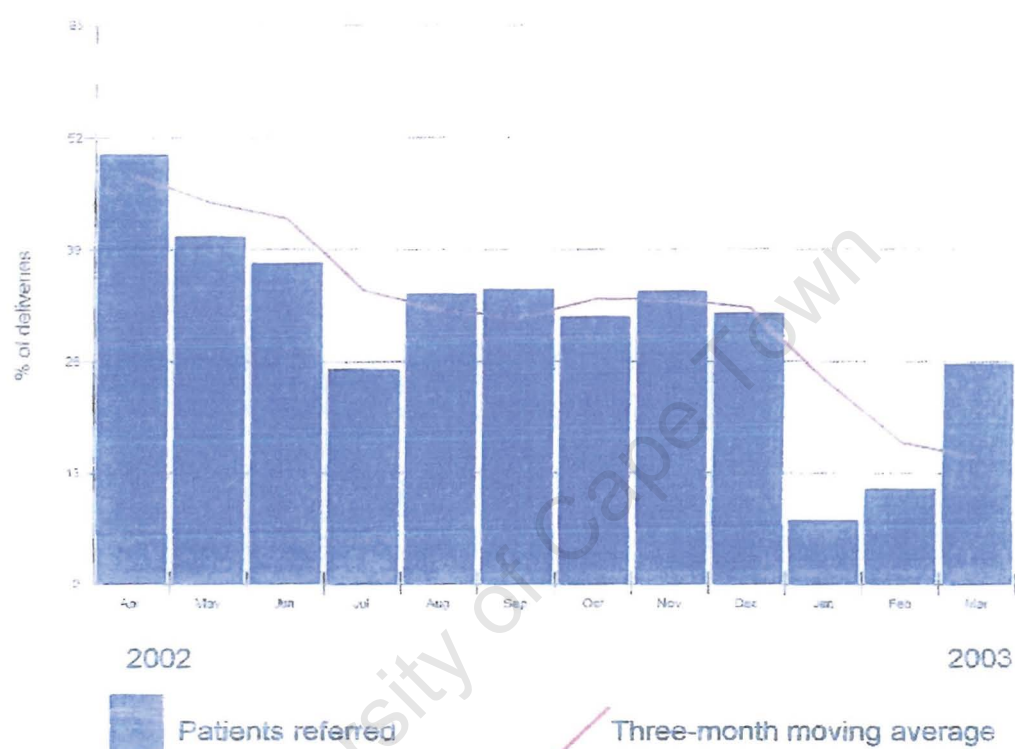
August 16, 2005



Patients referred as percentage of deliveries: Kopanong Complex

Data included: Apr 2002 to Mar 2003

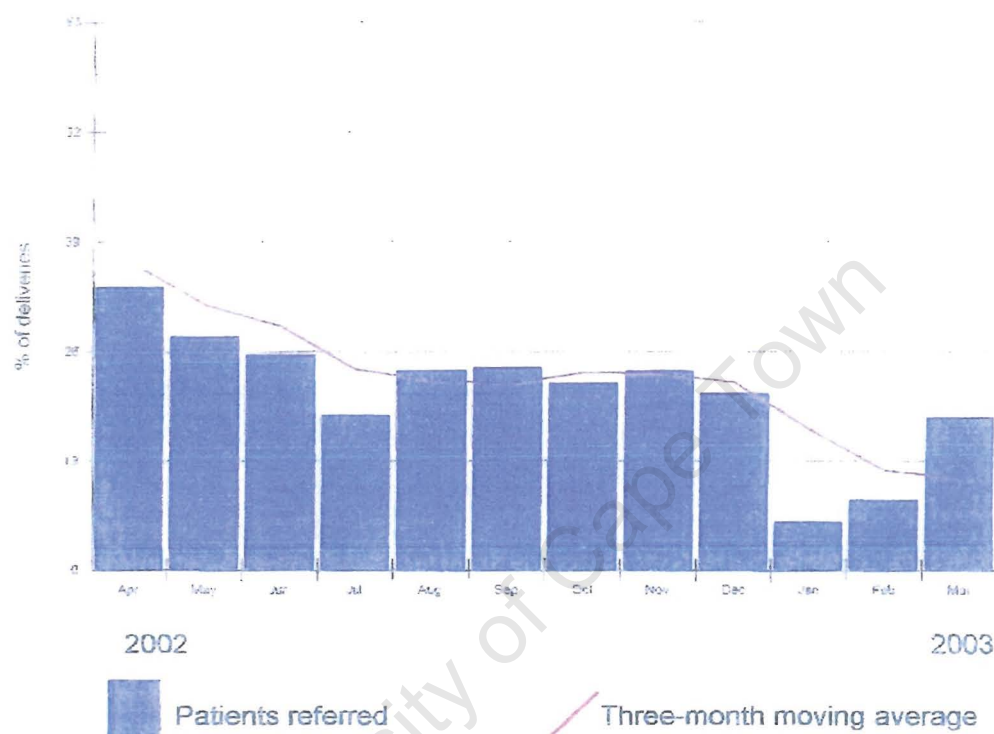
Calculated by PPIP



Patients referred as percentage of deliveries: Sebokeng Complex

Data included: Apr 2002 to Mar 2003

Calculated by PPIP

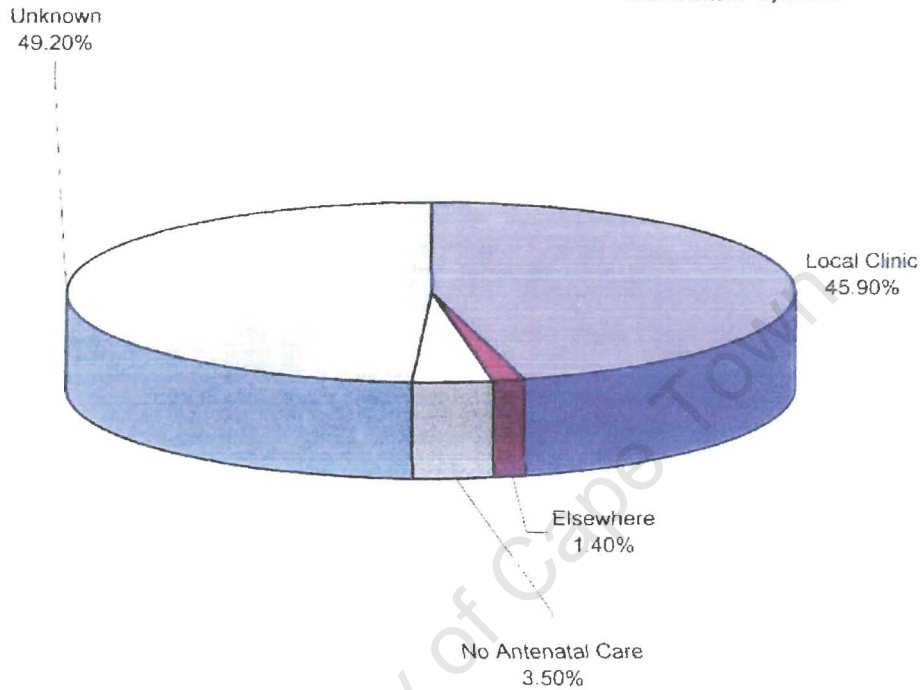


Antenatal care of patients delivering at public health facilities in the Emfuleni sub-district

Data included: April 2002 to March 2003

Calculated by PPIP

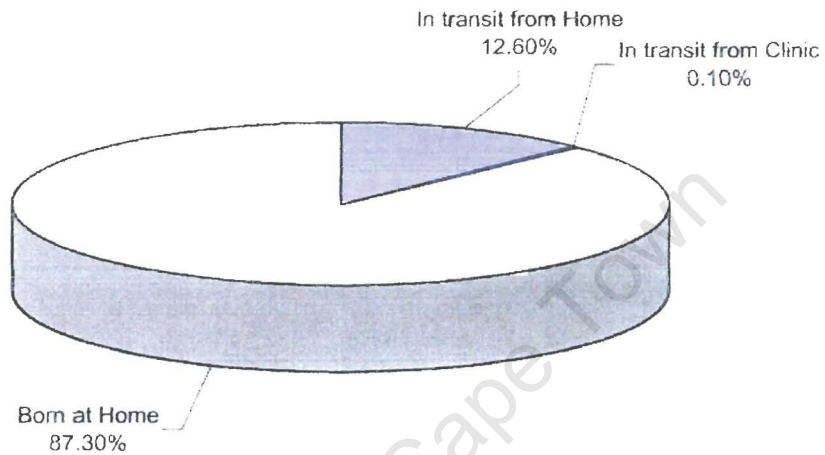
November 3, 2005



Infants Delivered before Arrival: Emfuleni

Data included: April 2002 to March 2003

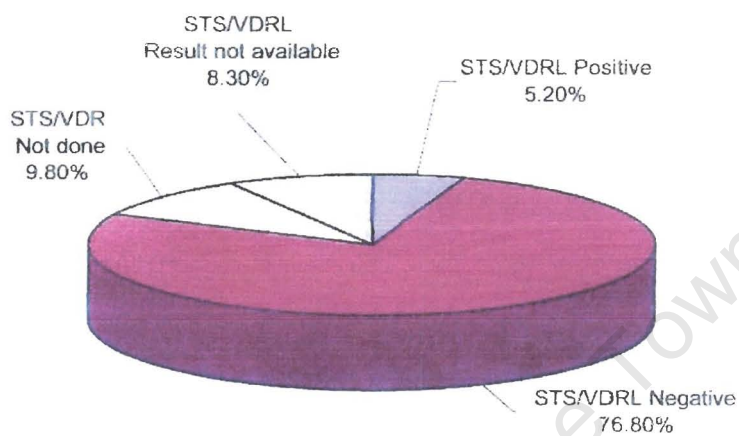
Calculated by PPIP



Maternal Syphilis Serology of Perinatal deaths occurring at Emfuleni

Calculated by PPIP

April 26, 2004



Method of Delivery: Emfuleni

Data included: April 2002 to March 2003

Calculated by PPIP

November 3, 2005

