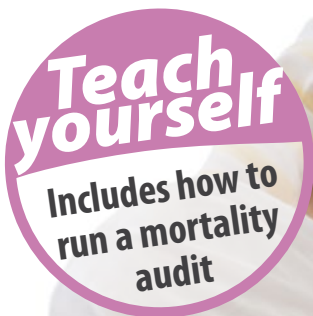


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– Saving Babies 2003: Fourth Perinatal Care Survey of South Africa

Saving Mothers and Babies

Assessing and
reducing mortality
rates in your hospital



**Teach
yourself**

Includes how to
run a mortality
audit



Developed by the
Perinatal Education Programme

Saving Mothers and Babies

**Assessing and reducing
mortality rates in
your hospital**

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Perinatal Education Programme

EBW *Healthcare*

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We have taken every care to ensure that drug dosages and related medical advice in this book are accurate. However, drug dosages can change and are updated often, so always double-check dosages and procedures against a reliable, up-to-date formulary and the given drug's documentation before administering it.

Saving Mothers and Babies:
Assessing and reducing mortality rates in your hospital

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Introduction

About the EBW Healthcare series

EBW Healthcare publishes an innovative series of distance-learning books for healthcare professionals, developed by the Perinatal Education Trust, Eduhealthcare, the Desmond Tutu HIV Foundation and the Desmond Tutu TB Centre, with contributions from numerous experts.

Our aim is to provide appropriate, affordable and up-to-date learning material for healthcare workers in under-resourced areas, so that they can manage their own continuing education courses which will enable them to learn, practise and deliver skillful, efficient patient care.

The EBW Healthcare series is built on the experience of the Perinatal Education Programme (PEP), which has provided learning opportunities to over 60 000 nurses and doctors in South Africa since 1992. Many of the educational methods developed by PEP are now being adopted by the World Health Organisation (WHO).

Why decentralised learning?

Continuing education for healthcare workers traditionally consists of courses and workshops run by formal trainers at large central hospitals. These teaching courses are expensive to attend, often far away from the healthcare workers' families and places of work, and the content frequently fails to address the real healthcare requirements of the poor, rural communities who face the biggest healthcare challenges.

To help solve these many problems, a self-help decentralised learning method has been developed which addresses the needs of professional healthcare workers, especially those in poor, rural communities.

Books in the EBW Healthcare series

Maternal Care addresses all the common and important problems that occur during pregnancy, labour, delivery and the puerperium. It covers the antenatal and postnatal care of healthy women with normal pregnancies, monitoring and managing the progress of labour, specific medical problems during pregnancy, labour

and the puerperium, family planning and regionalised perinatal care. Skills workshops teach clinical examination in pregnancy and labour, routine screening tests, the use of an antenatal card and partogram, measuring blood pressure, detecting proteinuria and performing and repairing an episiotomy.

Maternal Care is aimed at healthcare workers in level 1 hospitals or clinics.

Primary Maternal Care addresses the needs of healthcare workers who provide antenatal and postnatal care, but do not conduct deliveries. It is adapted from theory chapters and skills workshops from *Maternal Care*. This book is ideal for midwives and doctors providing primary maternal care in level 1 district hospitals and clinics, and complements the national protocol of antenatal care in South Africa.

Intrapartum Care was developed for doctors and advanced midwives who care for women who deliver in district hospitals. It contains theory chapters and skills workshops adapted from the labour chapters of *Maternal Care*. Particular attention is given to the care of the mother, the management of labour and monitoring the wellbeing of the fetus. *Intrapartum Care* was written to support and complement the national protocol of intrapartum care in South Africa.

Newborn Care was written for healthcare workers providing special care for newborn infants in regional hospitals. It covers resuscitation at birth, assessing infant size and gestational age,

routine care and feeding of both normal and high-risk infants, the prevention, diagnosis and management of hypothermia, hypoglycaemia, jaundice, respiratory distress, infection, trauma, bleeding and congenital abnormalities, as well as communication with parents. Skills workshops address resuscitation, size measurement, history, examination and clinical notes, nasogastric feeds, intravenous infusions, use of incubators, measuring blood glucose concentration, insertion of an umbilical vein catheter, phototherapy, apnoea monitors and oxygen therapy.

Primary Newborn Care was written specifically for nurses and doctors who provide primary care for newborn infants in level 1 clinics and hospitals. *Primary Newborn Care* addresses the care of infants at birth, care of normal infants, care of low-birth-weight infants, neonatal emergencies, and common minor problems in newborn infants.

Mother and Baby Friendly Care describes gentler, kinder, evidence-based ways of caring for women during pregnancy, labour and delivery. It also presents improved methods of providing infant care with an emphasis on kangaroo mother care and exclusive breastfeeding.

Saving Mothers and Babies was developed in response to the high maternal and perinatal mortality rates found in most developing countries. Learning material used in this book is based on the results of the annual confidential enquiries into maternal

deaths and the Saving Mothers and Saving Babies reports published in South Africa. It addresses the basic principles of mortality audit, maternal mortality, perinatal mortality, managing mortality meetings and ways of reducing maternal and perinatal mortality rates. This book should be used together with the Perinatal Problem Identification Programme (PPIP).

Birth Defects was written for healthcare workers who look after individuals with birth defects, their families, and women who are at increased risk of giving birth to an infant with a birth defect. Special attention is given to modes of inheritance, medical genetic counselling, and birth defects due to chromosomal abnormalities, single gene defects, teratogens and multifactorial inheritance. This book is being used in the Genetics Education Programme which trains healthcare workers in genetic counselling in South Africa.

Perinatal HIV enables midwives, nurses and doctors to care for pregnant women and their infants in communities where HIV infection is common. Special emphasis has been placed on the prevention of mother-to-infant transmission of HIV. It covers the basics of HIV infection and screening, antenatal and intrapartum care of women with HIV infection, care of HIV-exposed newborn infants, and parent counselling.

Childhood HIV enables nurses and doctors to care for children with HIV infection. It addresses an introduction to HIV in children, the clinical and

immunological diagnosis of HIV infection, management of children with and without antiretroviral treatment, antiretroviral drugs, opportunistic infections and end-of-life care.

Childhood TB was written to enable healthcare workers to learn about the primary care of children with tuberculosis. The book covers an introduction to TB infection, and the clinical presentation, diagnosis, management and prevention of tuberculosis in children and HIV/TB co-infection. *Childhood TB* was developed by paediatricians with wide experience in the care of children with tuberculosis, under the auspices of the Desmond Tutu Tuberculosis Centre at the University of Stellenbosch.

Child Healthcare addresses all the common and important clinical problems in children, including immunisation, history and examination, growth and nutrition, acute and chronic infections, parasites, skin conditions, and difficulties in the home and society. *Child Healthcare* was developed for use in primary care settings.

Adult HIV covers an introduction to HIV infection, management of HIV-infected adults at primary-care clinics, preparing patients for antiretroviral (ARV) treatment, ARV drugs, starting and maintaining patients on ARV treatment and an approach to opportunistic infections. *Adult HIV* was developed by doctors and nurses with wide experience in the care of adults with HIV, under the auspices of the

Desmond Tutu HIV Foundation at the University of Cape Town.

Well Women was written for primary health workers who manage the everyday health needs of women. It covers reproductive health, family planning and infertility, common genital infections, vaginal bleeding, and the abuse of women.

Format of the courses

1. Objectives

The learning objectives are clearly stated at the start of each chapter. They help the participant to identify and understand the important lessons to be learned.

2. Pre- and post-tests

There is a multiple-choice test of 20 questions for each chapter at the end of the book. Participants are encouraged to take a pre-test before starting each chapter, to benchmark their current knowledge, and a post-test after each chapter, to assess what they have learned.

Self-assessment allows participants to monitor their own progress through the course.

3. Question-and-answer format

Theoretical knowledge is presented in a question-and-answer format, which encourages the learner to actively participate in the learning process. In this way, the participant is led step by step through the definitions, causes,

diagnosis, prevention, dangers and management of a particular problem.

Participants should cover the answer for a few minutes with a piece of paper while thinking about the correct reply to each question. This method helps learning.

Simplified flow diagrams are also used, where necessary, to indicate the correct approach to diagnosing or managing a particular problem.

Each question is written in bold, like this, and is identified with the number of the chapter, followed by the number of the question, e.g. 5-23.

4. Important lessons

.....
Important practical lessons are emphasised by placing them in a box like this.
.....

5. Notes

NOTE Additional, non-essential information is provided for interest and given in notes like this. These facts are not used in the case studies or included in the multiple-choice questions.

6. Case studies

Each chapter closes with a few case studies which encourage the participant to consolidate and apply what was learned earlier in the chapter. These studies give the participant an opportunity to see the problem as it usually presents itself in the clinic or hospital. The participant should

attempt to answer each question in the case study before reading the correct answer.

7. Practical training

Certain chapters contain skills workshops, which need to be practised by the participants (preferably in groups). The skills workshops, which are often illustrated with line drawings, list essential equipment and present step-by-step instructions on how to perform each task. If participants aren't familiar with a practical skill, they are encouraged to ask an appropriate medical or nursing colleague to demonstrate the clinical skill to them. In this way, senior personnel are encouraged to share their skills with their colleagues.

8. Final examination

On completion of each course, participants can take a 75-question multiple-choice examination on the EBW Healthcare website, when they are ready to.

All the exam questions will be taken from the multiple-choice tests from the book. The content of the skills workshops will not be included in the examination.

Participants need to achieve at least 80% in the examination in order to successfully complete the course. Successful candidates will be emailed a certificate which states that they have successfully completed that course. EBW Healthcare courses are not yet accredited for nurses, but South African doctors can earn CPD points

on the successful completion of an examination.

Please contact info@ebwhealthcare.com when you are ready to take the exam.

Contributors

The developers of our learning materials are a multi-disciplinary team of nurses, midwives, obstetricians, neonatologists, and general paediatricians. The development and review of all course material is overseen by the Editor-in-Chief, emeritus Professor Dave Woods, a previous head of neonatal medicine at the University of Cape Town who now consults to UNICEF and the WHO.

Perinatal Education Trust

Books developed by the Perinatal Education Programme are provided as cheaply as possible. Writing and updating the programme is both funded and managed on a non-profit basis by the Perinatal Education Trust.

Eduhealthcare

Eduhealthcare is a non-profit organisation based in South Africa. It aims to improve health and wellbeing, especially in poor communities, through affordable education for healthcare workers. To this end it provides financial support for the development and publishing of the EBW Healthcare series.

The Desmond Tutu HIV Foundation

The Desmond Tutu HIV Foundation at the University of Cape Town, South Africa, is a centre of excellence in HIV medicine, building capacity through

training and enhancing knowledge through research.

The Desmond Tutu Tuberculosis Centre

The Desmond Tutu Tuberculosis Centre at Stellenbosch University, South Africa, strives to improve the health of vulnerable groups through the education of healthcare workers and community members, and by influencing policy based on research into the epidemiology of childhood tuberculosis, multi-drug-resistant tuberculosis, HIV/TB co-infection and preventing the spread of TB and HIV in southern Africa.

Updating the course material

EBW Healthcare learning materials are regularly updated to keep up with developments and changes in healthcare protocols. Course participants can make important contributions to the continual improvement of EBW Healthcare

books by reporting factual or language errors, by identifying sections that are difficult to understand, and by suggesting additions or improvements to the contents. Details of alternative or better forms of management would be particularly appreciated. Please send any comments or suggestions to the Editor-in-Chief, Professor Dave Woods.

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1

Introduction to maternal and perinatal mortality

Before you begin this unit, please take the corresponding test to assess your knowledge of the subject matter. You should redo the test after you've worked through the unit, to evaluate what you have learned.

Objectives

When you have completed this unit you should be able to:

- Explain the importance of mortality rates.
- Describe the concept of a mortality audit.
- List the important steps of a mortality audit.
- Keep a detailed birth register.
- Describe information which can be obtained from a birth register.
- Understand the importance of the low birth weight rate.

Mortality

1-1 What is mortality?

Mortality means death. The mortality in a given area is the number of people who die in that area. Mortality is the most important measurable outcome in a health service.

1-2 What is a mortality rate?

This is the number of people who die, expressed as a proportion of all the people in that area. For example, if 10 people die in a community of 1500 people, the mortality rate is 10 per 1500.

.....
The mortality rate is the proportion of people who have died.
.....

1-3 How is mortality rate expressed?

Mortality rates are usually expressed per 1000 or 100 000 individuals (i.e. as a proportion). For example, the mortality rate for newborn infants is usually given per 1000 infants delivered alive while the mortality rate for pregnant women is usually given per 100 000 pregnant women who deliver.

1-4 How can mortality rate be applied to groups of people?

A mortality rate is usually given for a specific group of people, e.g. pregnant women or newborn infants, and for a specific area or service, e.g. a town or clinic. Mortality rates may also be applied to people falling in a specific

age group such as children, teenagers or the elderly.

For example, the mortality rate could be calculated only for pregnant women between the age of 20 and 25 years of age who live in a certain town.

.....
Mortality rates are often calculated for a specific section of the population only.
.....

1-5 What is the annual mortality rate?

This is the mortality rate calculated over the period of one year. Mortality is usually expressed as an annual rate. Sometimes the mortality rate may be expressed over a longer period such as 10 years.

1-6 Should the mortality rate be calculated for a special area?

Yes. The mortality rate is usually calculated for a given health district or region. In order to determine the mortality rate for a health district or region, all the births and deaths in each part of that service (each clinic and hospital) must be added together. Sometimes the mortality rate is calculated for a whole province or country by combining the results of many regions.

1-7 Is the mortality rate the same for all health districts?

No. The mortality rate often differs markedly between health districts. Usually the rates are higher for poor

than industrialised districts. Similarly, rates are higher in developing than in industrialised countries.

1-8 Do mortality rates remain the same?

No. Mortality rates may also differ between different time periods. In most countries mortality rates have fallen over the past years. Unfortunately this is not always the case in some African countries.

1-9 Why is it often better to know the mortality rate rather than simply the number of people who die?

Knowing the rate is often more useful than simply knowing the number of individuals who die, as it allows you to compare the size of the problem between different areas or over different periods of time. A small hospital with only a few patients each year can then be compared to a large hospital with many patients.

For example, if 10 patients die out of the 1000 patients admitted to a small hospital, and 100 patients die out of the 10 000 patients admitted to the large hospital each year, then the annual mortality rate of both hospitals is the same (i.e. 10 per 1000), even though more patients died in the larger hospital. Therefore, the mortality rates of two very different sized hospitals can be fairly compared.

.....
It is often more useful to know the mortality rate than just the number of people who have died.
.....

1-10 Why would one want to know the mortality rate?

Knowing the mortality rate helps to determine both the amount of illness in a community as well as the standard of the health care provided. A high mortality rate suggests either a poor standard of health or a poor standard of health care. Mortality rates are, therefore, very useful in assessing the needs of a community and the efficiency of the health service.

.....

The mortality rate reflects both the amount of illness in a community as well as the standard of health care.

.....

NOTE Under special circumstances such as revolution, widespread crime or war, the mortality rate may also be influenced by social and political factors leading to the violent deaths of healthy people.

1-11 Why would you want to compare the mortality rates between two areas?

This will tell you about the differences in living conditions and standards of health care in the two areas. The area with the higher mortality rate either has poorer living conditions or a less efficient health care service. The area with the higher rate may also have some specific illness such as malaria or a specific health problem such as famine.

1-12 Why would you want to compare mortality rates at different times?

It is very useful to compare the mortality rates in a health care service between two periods of time. In some hospitals or health districts the mortality rate may be improving while in another it may be getting worse. An increasing mortality rate indicates a fall in living conditions or a fall on the standard of health care. Sometimes an increasing mortality rate may indicate the arrival of a specific disease such as AIDS or cholera.

1-13 Which mortality rates are usually recorded in a maternity service?

The maternal and perinatal mortality rates. The perinatal mortality rate includes both stillbirths and infant deaths in the first week of life. The following mortality rates should always be recorded:

1. Maternal mortality rate (women who die during or shortly after pregnancy).
2. Stillbirth rate (infants born dead).
3. Early neonatal death rate (infants that die soon after birth, i.e. in the first week of life).
4. Perinatal mortality rate (stillbirths plus early neonatal deaths).

Additional rates, which may be added, are:

5. Neonatal mortality (infants who die in the first month of life).
6. Infant mortality rate (infants who die in the first year of life).

1-14 Why is it important to know why mothers and infants die?

It is very important to know, not only the mortality rates, but also why mothers and infants die in order that these deaths can be prevented by avoiding or correcting the causes of death.

.....
Only when the causes of death are known can steps be taken to prevent further deaths.
.....

1-15 What are primary causes of death?

The primary cause of maternal and early neonatal deaths as well as stillbirths is the obstetric factor or condition which resulted in the death, i.e. it is the reason why the death occurred. For example, if a pregnant woman has a placental abruption and the fetus dies, the primary cause of the stillbirth is antepartum haemorrhage. Similarly, a severe antepartum haemorrhage could also be the primary cause of death of the mother. Knowing the primary causes of death helps to identify important medical conditions that need to be prevented and bad clinical practices which need to be improved.

.....
The primary cause of death is the condition which led to the maternal or perinatal death.
.....

1-16 What are final causes of death?

The final cause of maternal or early neonatal death is the event which actually caused the death (a final complication of the disease process), i.e. how the patient died. For example, if a woman has an induced abortion and dies of septic shock, the primary cause of the maternal death is the induced abortion but the final cause of death is septic shock. Similarly, if a newborn infant dies as a result of hypoxia (lack of oxygen) caused by eclampsia, the primary cause of death is eclampsia but the final cause of death is hypoxia. Knowing the final causes of death helps to identify facilities and resources, which need to be improved to prevent medical conditions resulting in death.

.....
The final cause of death is the final event which actually resulted in the maternal or early neonatal death.
.....

Note that a final cause of death is usually not recorded for stillbirths.

1-17 What is the value of knowing both the primary and final causes of death?

Because the correct diagnosis and management of the primary cause may prevent the complication which resulted in the death while diagnosing and treating the complication may prevent the final cause of death. For example, it would be best if placental abruption or eclampsia were prevented altogether or correctly diagnosed and treated as early as possible. If this was not possible,

it is important that fetal hypoxia can be prevented or diagnosed early, and correctly managed. Every effort should be made to prevent both the primary and final causes of death.

Audit

1-18 What is an audit?

This is a systematic assessment (an examination or review). In a clinical service, it is a count of the number of patients and what happens to them. An audit helps one to understand the health related problems which patients have in a service and how effective the service is in managing these problems.

For example, in the audit of a maternity service, the total number of deliveries and the method of each delivery would be important.

1-19 What is a mortality audit?

This is a detailed assessment of all the patients that have died. Both a maternal and perinatal mortality audit is necessary in a maternity service.

.....
A mortality audit is a detailed assessment of the patients who have died.

1-20 Why are mortality audits important?

Because they measure the size of the problem (the number of people who die) and indicate where the problem lies (what causes the deaths). By understanding the problem better

(what errors might have been made) solutions can often be found to reduce the risk of similar deaths in future. By decreasing the number of patients who die, the standard of care will automatically improve for all patients.

1-21 What are the important steps of a mortality audit?

1. Documenting the number of people who have died.
2. Collecting the basic information on the people who have died.
3. Calculating the mortality rate.
4. Determining the causes of mortality (or morbidity).
5. Looking for avoidable factors and missed opportunities.
6. Planning ways in which these deaths can be avoided in future.
7. Write a mortality report.

1-22 How can it be determined why a patient has died?

All the information about the patient must be very carefully reviewed. Only then can a likely cause of death be decided upon. This information consists of:

1. The history.
2. The examination of the patient.
3. Special investigations.
4. A post mortem examination, if this has been done.

1-23 What is a mortality meeting?

This is a meeting, attended by as many of the medical and nursing staff as possible, where the mortality audit is discussed, i.e. all the facts relating to the deaths are carefully examined. Mortality meetings are needed so that

the management of patients who have died can be reviewed. At the mortality meeting a cause of each death must be looked for and possible avoidable factors identified for each person who has died.

.....
At a mortality meeting the cause of death and any avoidable factors are identified and discussed.
.....

1-24 What is a mortality report?

This is an important document, which reports on the mortality audit. It gives the details of the audit and should also summarise the main findings and make recommendations. It is best to write the report at the end of the mortality meeting when all the information is still available. Usually all the mortality reports over a year are used to prepare an annual mortality report.

.....
A mortality report is the summary of the findings of a mortality audit.
.....

1-25 Why is the mortality report so important?

The information in the mortality report is used to identify problems within a clinical service and plan interventions to reduce or remove the causes of those problems. An accurate mortality report is essential if the care provided to patients is to be improved.

.....
Plans to improve patient care is based on the mortality report.
.....

1-26 What is morbidity?

Morbidity includes all the clinical problems or illnesses that patients suffer but have not died from, e.g. postpartum hemorrhage which did not kill the woman or severe pneumonia which did not kill an infant. Morbidity may result in temporary or permanent damage.

NOTE Unlike death, which is a definite end point, morbidity can sometimes be difficult to define accurately.

1-27 Why is it important to document morbidity?

While it is important to identify and prevent problems which kill patients, it is also important to address problems, which cause illness without death. To get a complete view of problems in a health service, both mortality and morbidity must be considered. Because morbidity is far commoner than mortality, deaths are only the 'tip of the iceberg'. By studying morbidity, it is possible to get a better idea of the pattern of disease or incorrect management which results in mortality. Where deaths are uncommon, it is particularly useful to study patterns of morbidity. The causes and avoidable factors of mortality and morbidity are usually the same.

.....
Deaths can often be prevented by reducing morbidity.
.....

1-28 Who is responsible for collecting and analysing mortality information?

Everyone in the service should be involved in keeping good notes and collecting mortality data. Usually one specific person is responsible for making sure that all the important data has been collected and is presented at the mortality meetings. That person usually also records and analyses the information from the mortality meetings and then writes the mortality report.

1-29 What is a confidential enquiry?

This is an analysis of deaths where the names of the people involved with the care of the patient are kept confidential, i.e. their names are not made known. The names of the individuals who have died are also kept confidential. A confidential enquiry is an important method of collecting the true facts and of finding the cause of a death. Without a confidential enquiry, many people may be afraid of providing all the correct information for fear that they may be punished or embarrassed. A confidential enquiry is particularly useful in the investigation of maternal deaths.

NOTE In South Africa, the first confidential enquiry into maternal deaths was conducted in 1998.

Birth register

1-30 What is a birth register?

This is a book in the labour ward where daily records of all deliveries are kept.

The birth register is very important as it is the formal record of all deliveries. It is essential that every delivery is included in the register. Every labour ward must have its own register. Women who deliver in theatre must also be recorded in the labour ward birth register.

.....
The birth register is a most important record of all deliveries.

1-31 What information should be recorded in the birth register?

1. The mother's name, hospital or clinic number and age.
2. Whether the mother had antenatal care.
3. The mother's VDRL status.
4. The method of delivery.
5. The Apgar scores.
6. The infant's birth weight and gender.
7. Whether the infant was born alive or dead and whether live born infants died in the first week of life.
8. Any maternal deaths.

Additional information which is often recorded in a birth register is the mother's address and contact phone number, her gravidity and parity, and whether she was referred from somewhere else.

NOTE The HIV positive rate is becoming a very important measure of the spread of the disease in each community and each woman's HIV status may also be included in the register, provided that the result is kept strictly confidential.

1-32 What useful information can be calculated from information in a birth register?

1. Teenage pregnancy rate.
2. Rate of attending antenatal care ('booking rate').
3. Syphilis rate.
4. Assisted delivery rate.
5. Caesarean section rate.
6. Asphyxia rate (low Apgar scores).
7. Low birth weigh rate.
8. Stillbirth, early neonatal and perinatal mortality rates.
9. Perinatal care index.
10. Referral rate.
11. Maternal mortality rate.
12. Percentage of pregnant women aged 35 years or more.

1-33 What is a minimal data set?

This is the basic information which must be collected from the birth register at every clinic or hospital which delivers mothers:

1. The number of live born and stillborn (fresh and macerated) infants as well as the number of early neonatal deaths by weight category.
2. The number of women less than 18 years or older than 34 years.
3. Syphilis status of the mother (negative, positive or unknown). If possible, it is also important to record the HIV status of each mother.
4. Method of delivery: normal vaginal, assisted (vacuum or forceps), breech or caesarean section.
5. The number of infants born before arrival at the clinic or hospital.

6. The number of women who have received no antenatal care.
7. The number of maternal deaths.

A summary of the minimal data set is usually presented and discussed at the start of each perinatal mortality meeting. The minimal data set reflects the activities of the health centre.

1-34 What is the value of knowing the number of young and older mothers?

The teenage pregnancy rate indicates the well being of a community. A high teenage pregnancy rate indicates many social problems in a community. These problems need to be addressed, especially in the schools.

Older mothers have a higher rate of twins and infants with congenital abnormalities.

1-35 Why measure the rate of women attending antenatal care?

Women who do not attend antenatal care have a much higher perinatal mortality rate. There are many reasons for not attending antenatal clinic, including ignorance, lack of transport, inability to get away from work, fear of revealing the pregnancy, denial of the pregnancy, lack of antenatal care services nearby, unfriendly service at the clinic, and laziness. All these factors need to be addressed to ensure that mothers come early in pregnancy for care.

1-36 Why is the number of women who are screened for syphilis important?

It is essential to screen all pregnant women for syphilis as this infection is a common cause of perinatal death in some communities. It is cheap and easy to screen for syphilis and treat the condition during pregnancy. In many parts of South Africa less than 50% of pregnant women are screened for syphilis. A low rate of syphilis screening indicates poor antenatal care.

.....
A low rate of syphilis screening indicates poor antenatal care.

1-37 Why is the HIV rate determined?

The need for screening all women for HIV is becoming very important, as monitoring the HIV rate in pregnant women is one of the best ways of documenting the spread of HIV in a community. The use of antiretrovirals to reduce the risk of mother to child transmission of HIV must be encouraged while the management of pregnancy, labour and delivery, and the newborn infant may need to be changed in HIV positive women.

A high rate of HIV counselling and screening indicates a good antenatal care service.

1-38 What is the use of documenting the caesarean section rate?

The caesarean section rate in a developing country should be about 15%. It will be much higher in a referral hospital. A low rate may indicate

inadequate care in labour and can be associated with an increased number of intrapartum deaths due to labour complications. A very high rate usually indicates that many unnecessary caesarean sections are being done.

1-39 Why is it important to document whether the mother has been referred?

This information helps to establish the referral pattern. In turn this is important in planning good perinatal services.

A high rate of infants 'born before arrival' (BBA) indicates poor communications and transport services.

1-40 What is the use of knowing the rate of asphyxiated infants?

The percentage of infants with a low 1 minute Apgar score (i.e. neonatal asphyxia) is a useful index of care in labour. Many asphyxiated infants usually indicates poor labour care. The percentage of asphyxiated infants who die gives an idea of the standard of newborn resuscitation.

Low birth weight

1-41 How may infants be divided into groups by their birth weight?

It is very useful to divide infants into birth weight categories. This requires little extra effort. Usually 500 g categories are used. The commonly used birth weight categories are 500–999 g, 1000–1499 g, 1500–1999 g, 2000–2499 g and 2500 g or more.

Birth weight categories can be used to investigate stillbirths, neonatal deaths and perinatal deaths.

1-42 What is a low birth weight infant?

All infants weighing less than 2500 g at birth are called low birth weight (LBW) infants. This includes all live born and stillborn infants weighing between 500 and 2499 g. Both preterm delivery and slow intrauterine growth can result in a low birth weight infant.

NOTE Infants weighing less than 1500 g are classified as very low birth weight (VLBW) infants while infants weighing less than 1000g are called extremely low birth weight (ELBW) infants.

1-43 Why is it important to identify all low birth weight infants?

Because they commonly have problems in the first weeks of life and, therefore, need to be assessed for additional care. They often need more than primary care and are transferred to a level 2 or 3 nursery.

1-44 What is the low birth weight rate?

The low birth weight rate is the percentage of infants with a birth weight less than 2500 g. The low birth weight rate is expressed per 100 births (as a percentage), unlike perinatal mortality rates, which are expressed per 1000 births. The low birth weight rate is calculated as follows:

$$\frac{\text{Number of infants weighing less than 2500 g at birth}}{\text{Total number of infants delivered}} \times 100$$

1-45 What is the importance of the low birth weight rate?

The low birth weight rate varies widely between different communities and is a very sensitive marker of the socioeconomic status of that community. In an industrialised country the low birth weight rate is usually around 7%. However, in a poor country the low birth weight rate is usually 15% or more (e.g. 30% in India). Knowing the low birth weight rate of different communities helps to identify those communities in greatest need of socioeconomic support.

.....
The low birth weight rate reflects the socioeconomic status of the community.
.....

1-46 What is the low birth weight rate in South Africa?

The average low birth weight rate for South Africa is about 15% which is typical for a poor country. In some very poor areas the low birth weight rate is as high as 25%.

.....
In South Africa the low birth weight rate is about 15%.
.....

1-47 How does the low birth weight rate influence the perinatal mortality rate?

The perinatal mortality rate is higher for infants who weigh less than 2500 g at birth.

Case study 1

All the perinatal deaths during a 2 year period in a small town are recorded. An attempt is also made to discover the cause of each death. There were 25 perinatal deaths out of a total of 500 deliveries in the 2 years. Ten years before, the perinatal mortality rate was reported to be 75.

1. What is the present mortality rate?

Twenty five deaths out of 500 deliveries, i.e. 25/500. As the perinatal mortality rate is usually expressed per 1000 births, the rate is 50 per 1000. Knowing the mortality rate is more helpful than simply knowing the number of perinatal deaths.

2. Should the rate be expressed over the two year period?

The number of deaths can be counted over any period of time but the rate is usually expressed per year. Therefore, the annual perinatal mortality rate in this small town is 50/1000. It is far better to know the annual mortality rate for the whole town than just in a clinic or hospital as it gives a more accurate indication of what is happening in the community.

3. What is the value of knowing the perinatal mortality rate ten years earlier?

As the perinatal mortality rate has fallen from 75 to 25 per 1000 over 10 years, either the health of pregnant women and their newborn infants has improved or the standard of health care is better. This is a most important way of documenting changes in a health care service. A comparison of the perinatal mortality rate with that of neighbouring towns would also be very useful in assessing whether the town's rate was higher or lower than expected.

4. Why would it have been important to know if the perinatal mortality rate had increased over 10 years?

Because it would draw the attention of the health care authorities to a serious deterioration in health or health care services or both in the town over the past ten years.

5. Why is it also important to document the cause of perinatal deaths?

Only if the common causes of perinatal deaths are known can plans be made to prevent those deaths. It is very difficult to reduce the mortality rate if the causes of death are not known. Therefore, it is very important to establish the causes of perinatal death in each health district.

6. What is the difference between the primary and final cause of death?

The primary cause of death is the medical condition that lead to that death while the final cause is the

complication which actually caused the death. For example, in a pregnant woman, hypertension may be the primary cause of death but a cerebral haemorrhage would be the final cause of death. Correct diagnosis and management of hypertension would prevent the primary cause of death. Failing this, the correct treatment of the haemorrhage may prevent the final cause of death.

Case study 2

At a regular monthly perinatal mortality meeting in a regional hospital, the information from the birth register is used to present an audit of maternal and perinatal care provided. Important items from the minimal data set are discussed.

1. What is a monthly perinatal mortality audit?

It is an assessment of all the stillbirths and early neonatal deaths which have occurred during the past month. It is important that regular audits of both maternal and perinatal deaths be conducted in all health facilities.

2. What is a birth register?

This is a book which is kept in each labour ward where daily records of all births are kept. The birth register is very important, as it is the formal record of what happens to all mothers and their infants who are cared for in that service.

3. What is the minimum data set?

This is the most important information which must be recorded in the birth register. It includes the number of maternal deaths, live births, stillbirths and early neonatal deaths, together with the method of delivery and important details of each woman, such as her age and VDRL status. The birth register also includes other less important information, which is usually not given in the minimum data set, such as the gender (sex) and Apgar score of each infant.

4. What useful information can be calculated from the birth register?

The information from the birth register can be used to calculate important rates, such as the maternal, stillbirth, early neonatal death and perinatal mortality rates. Other analyses include the caesarean section, low birth weight and teenage pregnancy rates.

5. What is the value of knowing the rate of women who attend for antenatal care?

Good antenatal care is most important as it lowers both the maternal and perinatal mortality and morbidity rates. If many women are not attending antenatal care, every effort must be made to find out why they are not attending and make plans to increase the attendance rate.

6. What does morbidity mean?

While mortality means death, morbidity means illness and clinical problems which are still important problems but are not severe enough to

cause death. Morbidity would include problems such as antepartum and post partum haemorrhage where the mother does not die. The causes of mortality and morbidity are the same. Therefore, high rates for morbidity are of great concern as they suggest that problems, which could be fatal, are occurring frequently.

Case study 3

In a health service consisting of one hospital and five clinics, the results of each monthly mortality audit are used to write an annual mortality report. As there were a number of maternal deaths during the year, a confidential enquiry is requested.

1. When are the monthly mortality reports written?

After all the deaths are discussed at the monthly mortality meeting. At the meeting the number and causes of the deaths are discussed. The mortality report is a summary of the mortality meeting.

2. What is an annual mortality report?

It is a report which is written each year and is based on the monthly mortality reports. The annual mortality report summarises the causes of death and indicates which factors associated with the deaths that they could have been avoided. For example, improving the attendance at antenatal clinics may have reduced the deaths due to syphilis. The annual mortality report is

useful in planning ways to improve the perinatal care provided by the service.

3. What are the steps of a mortality audit?

The information about each death has to be collected and the important mortality indices calculated. Then the cause and possible avoidable factors for each death must be looked for. Finally, ways of avoiding similar deaths are discussed.

4. How can the cause of death be determined?

By documenting and discussing the results of the history, examination and special investigations, together with the result of the and post mortem examination, if this has been done.

5. What is a confidential enquiry into a maternal death?

This is a detailed investigation into the cause and possible avoidable factors in a maternal death. It is confidential as the names of the staff who cared for the patient are kept secret. By keeping the personal details of the investigation and the staff involved confidential, it is more likely that the true findings will be uncovered.

Case study 4

The birth weight of each infant is recorded in the labour ward register. At the monthly perinatal mortality meeting, the number of low birth weight infants delivered are counted and the low birth weight rate calculated.

1. What is a low birth weight infant?

Any infant that weighs less than 2500 g at birth.

2. What is the low birth weight rate?

The percentage of all infants born who have a low birth weight.

3. Why is it important to know the low birth weight rate?

Low birth weight infants have a high risk of morbidity and mortality and, therefore, often need more than just primary care. The low birth weight rate is increased in poor communities and is a sensitive marker of the socioeconomic status of that community. The low birth

weight rate often varies widely between different communities, regions and countries.

4. What are the low birth weight rates in poor and industrialised countries?

Most poor countries have a low birth weight rate of 15% or more while the rate is usually about 7% in industrialised countries.

5. What is the low birth weight rate in South Africa?

South Africa has a low birth weight rate of 15%. This suggests that most of the communities in the country are poor.

2

Maternal mortality

Before you begin this unit, please take the corresponding test to assess your knowledge of the subject matter. You should redo the test after you've worked through the unit, to evaluate what you have learned.

Objectives

When you have completed this unit you should be able to:

- Define and calculate maternal mortality ratio.
- List the important causes of maternal mortality.
- Interpret maternal mortality rates.
- Separate direct and indirect causes of maternal death.
- Describe the confidential enquiry into maternal deaths.

Mortality ratio

2-1 What is maternal mortality?

Maternal mortality means the death of a woman during pregnancy (i.e. conception to delivery) and the puerperium (i.e. up to 42 days after delivery). It includes deaths due to miscarriages (abortions) and ectopic pregnancies.

.....
A maternal death is defined as the death of a woman at any time between the conception of her infant and 42 days after the delivery of the infant.
.....

2-2 What is the maternal mortality ratio?

The maternal mortality ratio (MMR) is defined as the number of women dying between conception and 6 weeks (42 days) after delivery per 100 000 deliveries. The maternal mortality ratio is calculated as follows:

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

The maternal mortality ratio is usually given for a specific area and a specific period of time. For example, if 10 women die in Cape Town where the annual delivery rate is 50 000, then the maternal mortality rate is:

$$\frac{10}{50\,000} \times 100\,000 = 20$$

Note that the maternal mortality ratio is expressed per 100 000 deliveries.

.....
The maternal mortality ratio is the number of maternal deaths per 1000 000 deliveries.
.....

NOTE 'Ratio' rather than 'rate' used as the denominator does not include all pregnancies or deliveries, only livebirths.

2-3 Why does maternal mortality include the deaths of women during the first few months of pregnancy?

Because pregnancy affects the mother's body soon after the start of pregnancy. Problems which occur early in pregnancy, such as ectopic pregnancies and septic abortions, can result in the mother's death.

2-4 Why does the maternal mortality ratio include the deaths of women during the 6 weeks after delivery?

Because the effects of pregnancy on the mother's body take up to 6 weeks to disappear. Deaths during the puerperium (6 weeks after delivery) are often as a result of complications of pregnancy.

2-5 What is the importance of the maternal mortality ratio?

It is a very important method of assessing both the standard of health of pregnant women and the standard of care being provided to pregnant women. The maternal mortality ratio can also be compared between different areas or between different periods of time in the same area.

A high maternal mortality ratio usually indicates either poor maternal health or

inadequate care during the pregnancy and puerperium or both. In contrast, a low maternal mortality ratio indicates that both maternal health and health care are good.

.....
The maternal mortality ratio reflects both the general health of women as well as the standard of care during pregnancy and the puerperium.
.....

2-6 What is the maternal mortality ratio in industrialised countries?

In industrialised countries, or privileged areas in poor countries, the maternal mortality ratio is usually about 10 per 100 000 deliveries. Therefore, it is very uncommon for a woman to die during pregnancy or the puerperium.

NOTE For example, in 1994–1996 the MMR for the United Kingdom was 12.2 / 100 000.

2-7 What is the maternal mortality ratio in poor countries?

In poor countries the maternal mortality ratio is usually above 50 per 100 000 deliveries. The maternal mortality ratio varies widely between poor countries with some very undeveloped communities having a ratio as high as 1000 per 100 000.

In many poor areas of industrialised countries the maternal mortality ratio is also increased. Worldwide, most maternal deaths occur in poor countries where the death is usually

related to poverty and inadequate access to good health care services.

In most poor developing countries the collection of mortality information is very incomplete, making it difficult to calculate the accurate maternal mortality rate.

2-8 What is the maternal mortality ratio in South Africa?

The exact maternal mortality ratio in South Africa is not known, as many maternal deaths are still not registered. However, the estimated maternal mortality ratio is about 200/100 000 deliveries. The maternal mortality ratio varies between different districts from as low as 50 to as high as 300. Unlike many other developing countries, the maternal mortality ratio has increased over the past few years.

.....
The estimated maternal mortality ratio for South Africa is 200 / 100 000.

NOTE Estimates of maternal mortality in South Africa vary widely but suggest 200 to 400 / 100 000. An accurate ratio will only be known when most pregnancies and maternal deaths are recorded. It is important to know the maternal mortality ratio in the country where you work.

Causes of maternal death

2-9 When are the causes of a maternal death determined?

Each maternal death must be discussed in detail to determine the cause and decide whether it could have been prevented. This is usually done at the regular 'perinatal mortality meeting' which also includes any maternal deaths. It is important to discuss the maternal death as soon as possible while the details of the clinical problems and care are still remembered. The findings of each death must be carefully summarised and included in the maternal mortality report. This is usually prepared annually for each health region.

2-10 Are maternal deaths notifiable?

Yes. All maternal deaths are notified by law in South Africa. This includes maternal deaths at home and in private institutions. It is important to include maternal deaths which occur outside the maternity services, e.g. women who have not yet started antenatal care and women who die in medical, surgical or emergency departments.

NOTE In South Africa in 1977 all maternal deaths were made notifiable.

2-11 What are primary and final causes of maternal death?

The primary cause of maternal death is the obstetric factor or condition which lead to the death, i.e. it is the reason why the death occurred. Knowing the primary causes of death helps to

identify clinical practices which need to be improved. Deaths can be prevented if the primary causes are well managed.

The final cause of maternal death is the event which actually caused the death (a final complication of the disease process), i.e. how the patient died. Knowing the final causes of death helps to identify facilities and resources which need to be improved. It also helps to prevent or improve the management of conditions which can be final causes of death.

For example, if a pregnant woman has a severe antepartum haemorrhage from a placenta praevia and dies of hypovolaemic shock, the primary cause of death is antepartum haemorrhage and the final cause of death is hypovolaemic shock. Similarly, if a woman has eclampsia and dies of a brain haemorrhage, the eclampsia is the primary cause and the brain bleed is the final cause of death.

.....
The primary cause of maternal death is the obstetric factor or condition which lead to the death.
.....

2-12 How can the primary causes of maternal deaths be subdivided?

The primary causes of maternal deaths are subdivided into 3 groups:

1. Direct.
2. Indirect.
3. Fortuitous.

Usually a fourth group called 'Unknown' is added. These are maternal deaths

where the cause of death cannot be identified.

2-13 What are direct causes of maternal death?

These are deaths which are a direct result of the woman being pregnant. They result from complications of pregnancy or the puerperium, or the management of the pregnancy or puerperium. These deaths would not have happened if the woman had not been pregnant. An example of a direct cause of maternal death is eclampsia.

NOTE Direct deaths result from obstetric complications of the pregnancy state, from interventions, omissions, incorrect treatment or from a chain of events of any of these.

.....
A direct cause of maternal death would not have happened if the woman had not been pregnant.
.....

2-14 What are indirect causes of maternal death?

These are deaths are caused by diseases that existed before the pregnancy or developed during the pregnancy or puerperium. Although not a result of pregnancy or puerperium complications, the pregnant state aggravated the condition. If the woman had not been pregnant, she may not have died from the disease. An example of an indirect cause of maternal death is rheumatic heart disease which became worse during the pregnancy, leading to heart failure.

NOTE Indirect deaths result from previous existing disease or disease that developed during pregnancy which were not due to direct obstetric causes but which were aggravated by the physiological effects of pregnancy.

.....
A woman may have died of an indirect cause even if she was not pregnant.

2-15 What are fortuitous causes of maternal death?

These are deaths that were unrelated to the pregnancy or puerperium and just happened to occur at this time. The condition causing the death was not aggravated by the pregnancy and would have killed the women even if she had not been pregnant. Examples of fortuitous causes of maternal death include motor vehicle accidents and assault.

Although fortuitous causes of maternal death are recorded in South Africa, they are not included in calculating the maternal mortality rate. Fortuitous deaths are counted to document the extent of violence against women, accidents and suicides.

2-16 Is a cause found for all deaths during pregnancy and the puerperium?

No. Unfortunately the underlying cause sometimes is unknown. This is often because the history is incomplete and a post mortem examination was not done.

2-17 What are the important direct causes of maternal death in South Africa?

1. Hypertension.
2. Postpartum haemorrhage.
3. Antepartum haemorrhage.
4. Pregnancy related infection, such as septic abortion and puerperal sepsis

NOTE Other causes are anaesthetic related, acute collapse and pulmonary embolism, abortion and ectopic pregnancy.

Most maternal deaths are due to direct causes, especially the hypertensive disorders, haemorrhage and infection.

NOTE The common final causes of death in the hypertensive category are cerebral haemorrhage and pulmonary oedema.

.....
The commonest direct causes of maternal death in South Africa are hypertension, haemorrhage and infection.

2-18 What are the important indirect causes of maternal death in South Africa?

1. Non pregnancy related infections, such as AIDS, TB and malaria.
2. Pre-existing maternal disease, such as cardiac disease.

AIDS is the commonest indirect cause of maternal death in South Africa.

NOTE The common final causes of deaths in women with AIDS are pneumonia, meningitis and tuberculosis.

.....

Non-pregnancy-related infection is the commonest indirect cause of maternal death in South Africa.

.....

2-19 What are the most common causes of maternal death in South Africa?

When all direct and indirect causes of maternal death in South Africa are considered together, the following are the commonest (the 'big five' causes) in order of frequency:

1. Non-pregnancy related infection, especially AIDS.
2. Complications of hypertension in pregnancy.
3. Obstetric haemorrhage, including antepartum and postpartum haemorrhage.
4. Pregnancy related infection, especially septic abortions and puerperal sepsis.
5. Non-pregnancy related diseases (pre-existing medical conditions), especially heart disease.

These five causes are responsible for 85% of all maternal deaths. In South Africa in 1999 the most common single cause of maternal death was AIDS.

NOTE Many women who died of pregnancy related sepsis were not screened for HIV/AIDS. It is highly likely that many were positive. Therefore, many deaths classified as pregnancy related infection, non-pregnancy related disease and possibly post partum haemorrhage should probably be re-classified as non-pregnancy related infection.

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AIDS is the commonest cause of maternal death in South Africa.

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2-20 Which causes of maternal deaths are most common at different levels of care?

Non pregnancy related infections were the commonest cause of death at all levels of care. However:

1. Obstetric haemorrhage, especially post partum haemorrhage, as a cause of maternal death was most common in level 1 hospitals (small hospitals staffed by doctors but without any full-time obstetric specialists) or clinics where there are no doctors.
2. Complications of hypertension in pregnancy resulting in maternal death was most common in level 2 hospitals (staffed by full-time specialists) and in level 3 hospitals (having intensive care facilities).

2-21 Why do so many pregnant women still die in poor countries?

The high maternal mortality rate in poor countries is not due to the lack of knowledge of how to manage ill pregnant women, but due to women not being able to receive adequate care.

2-22 Why do many pregnant women in poor countries not have access to adequate care?

Although some reasons may be obvious, this question is often not easy to answer unless a detailed investigation into causes of maternal death is carried out. Such as investigation is best done as a confidential enquiry. Important reasons why some women do not have

access to good care are distance to the nearest clinic or hospital, lack of transport and inadequate staffing or equipment at health care facilities.

Confidential enquiry

2-23 What is a confidential enquiry into maternal deaths?

In a confidential enquiry of maternal deaths, the deaths of as many pregnant women as possible are identified by an appointed committee. The case record of each woman is then carefully investigated by an independent team of experts to identify the likely cause and reason for the death. This information is kept confidential to protect the staff involved with the care of the case. If this were not done, it would be difficult to obtain the full story.

NOTE The aim of a confidential enquiry is to reduce maternal mortality by collecting, analysing and interpreting information, reporting findings and making recommendations for evidence based decisions.

2-24 Is there a confidential enquiry into maternal deaths in South Africa?

Yes. This is a most important enquiry into the number and causes of maternal death in South Africa. It attempts to identify avoidable factors, missed opportunities and substandard care, and gives recommendations as to how these causes can be prevented or effectively managed. The aim of the report is to make recommendations aimed at reducing the maternal mortality rate. It is important that the findings and

recommendations of the confidential enquiry are made available to all services and health care workers responsible for maternal care.

NOTE In South Africa a National Committee on Confidential Enquiries into Maternal Deaths is responsible for reviewing all maternal deaths.

2-25 What is the Saving Mothers report?

The Saving Mothers report is the official report of the confidential enquiry into maternal deaths in South Africa. The first Saving Mothers Report to be published in South Africa reviewed maternal deaths in 1998.

NOTE The first interim report on maternal deaths in South Africa was published in 1988. This was followed by the first comprehensive confidential enquiry into maternal deaths in South Africa, conducted in 1998 and published as the 'Saving Mothers: Report on Confidential Enquiry into Maternal Deaths in South Africa 1998'. It is planned to produce a full report every 3 years. In addition there will be annual interim reports to track changes in the number and causes of maternal death at different levels of care in each province. The information for these reports, and practical and affordable recommendations based on the reports, are produced by the National Committee for Confidential Enquiries into Maternal Deaths.

Avoidable factors

2-26 What are avoidable factors, missed opportunities and substandard care?

An **avoidable factor** is something which could have caused the maternal death and yet was potentially avoidable. If that event or condition was not present, the death may not have occurred.

A **missed opportunity** is a potentially avoidable maternal death where an opportunity was present to prevent the death but the opportunity was missed.

Substandard care is poor care which may have resulted in the woman's death.

In any enquiry into a maternal death, it is very important to identify possible and probable avoidable factors and missed opportunities as much can be learned from these events. This knowledge helps to avoid similar deaths in future.

.....
Avoidable factors, missed opportunities and substandard care must be looked for in each maternal death.
.....

2-27 Which maternal deaths are potentially avoidable?

Maternal deaths where avoidable factors, missed opportunities or substandard care was present. Maternal deaths are not classified into avoidable or not, only into deaths where avoidable factors were or were not present.

Therefore, the report identifies deaths which were potentially avoidable.

2-28 What are the categories of avoidable factors for maternal mortality?

Avoidable factors can be grouped into the following 3 categories:

1. Patient related problems.
2. Administrative problems.
3. Health worker related problems.

In South Africa, avoidable factors due to patient related problems were present in half, administrative problems were associated with a third, and health worker related problems with a quarter of the maternal deaths. Many deaths had more than one avoidable factor. Therefore, all three categories of avoidable factors are commonly associated with maternal deaths.

.....
In South Africa, avoidable factors associated with patient, administrative and health worker related problems are commonly associated with maternal deaths.
.....

2-29 What patient related problems contribute to maternal mortality?

These include:

1. Not attending or booking late for antenatal care.
2. Not recognising important warning symptoms and signs such as a severe headache or vaginal bleeding.
3. Not seeking help when warning signs were present.

In South Africa the commonest patient related problem associated with maternal death is not attending antenatal care or only attending late in pregnancy. This probably true for in many other developing countries.

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Poor attendance for antenatal care is the commonest patient related factor associated with maternal death in South Africa.

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2-30 Are patient related problems the fault of the patient?

There are many underlying social factors to patient related problems such as poor education of women, women not being allowed to decide for themselves whether to report to clinic or hospital, fear and ignorance, and traditional taboos on disclosing a pregnancy. Many women do not seek care because care is not easily available. They may have to travel long distances, face long queues and be turned away from overcrowded clinics.

While some patients may not seek care because they are lazy or disinterested, usually there are social conditions which prevent or do not encourage access to health care. Perhaps patient related problems should be called community related problems.

2-31 What administrative factors contribute to maternal mortality?

These include:

1. Lack of staff.
2. Lack of availability of adequate training.

3. Lack of adequate transport.
4. Lack of good clinics and hospitals close to the community.
5. Lack of intensive care facilities for seriously ill women.

Problems resulting in these administrative factors include poor planning and supervision of maternal services, little emphasis on health funding for women and a general lack of funds. In rural areas, deliveries are often conducted by untrained members of the family. Having a skilled assistant to monitor labour and conduct the delivery is important.

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Lack of well trained midwives is an important administrative related factor in maternal mortality.

.....

2-32 Why is lack of staff a common problem?

1. Funding is often not available. Often this is because maternity care is not viewed as a priority.
2. Suitably qualified staff may not be available due to inadequate numbers of staff being trained, staff moving from the state into the private service or staff leaving to work in other countries.
3. Staff do not want to work in some areas far from towns and cities, areas with a high crime rate or areas with poor transport and few facilities such as schools.

2-33 Why is a lack of adequate training a common problem?

1. School education and basic nurse training may be poor.

2. Medical school training may not include enough time in maternal care.
3. Opportunities for continuing training or special (advanced) courses for both nursing and medical staff are often not available.
4. Obstetric specialists or medical officers, general practitioners with additional training in maternal care, and advanced midwives are often not available to teach their junior colleagues.
5. Nursing staff who have attended advanced courses are often placed in areas where this knowledge cannot be best used.
6. Routine staff rotation prevents individuals acquiring enough experience in maternal care.

2-34 Why is transport often inadequate?

1. Transport is often not available to get patients to antenatal clinic or to a clinic or hospital when labour starts or danger signs present.
2. Patient transport is often worse in poor or rural areas and at night.
3. Transport is often expensive.
4. Transport to move patients from a clinic to hospital or between hospitals is often not available or the delay time is very long. This may be due to lack of vehicles, lack of staff, or due to maternity cases being viewed as less important than other cases such as trauma.
5. Telephones may not be available to call for transport.
6. It may be dangerous to go to clinic or hospital at night in areas with a lot of crime.

2-35 Why are clinics and hospitals often not available?

1. It is very expensive to provide enough clinics and hospitals within easy reach of all pregnant women, especially in very mountainous areas or areas with a low population density.
2. Clinics and hospital are often built far from the community they serve.

2-36 Why are intensive care facilities often not available?

1. The equipment is expensive and needs skilled and costly maintenance. Often the equipment is available but not kept in good working order.
2. It is expensive to employ staff who are adequately trained and regularly attend further training courses.

As a result, level 3 (intensive) care is often not available to very ill women.

2-37 What health care worker related problems contribute to maternal mortality?

These include:

1. Negligent or substandard care (they knew what to do but did not do it).
2. Honest errors.
3. Lack of appropriate training (they did not know what to do).

Major health care worker related problems include:

1. Not recognising clinical problems.
2. Delay in referral or not referring.
3. Not following standard protocols.
4. Inadequate monitoring of sick women after admission.

The administrative problems of staff shortages and excessive patient load often contribute to problems experienced by health care workers (both nursing and medical staff).

2-38 Why are health care workers sometimes negligent or offer substandard care?

Negligence, laziness and an attitude of not caring are very complex problems which are influenced by attitudes in the home, community, schools, tertiary education centres and places of employment. Social and environmental problems affect the way health workers relate to both their work and their patients. Salaries, management styles, opportunities for further training and promotion, and personal beliefs all influence the motivation of health workers. A caring attitude is often not rewarded and encouraged at all levels of society. Understaffing and overwork are important causes of poor care.

Substandard care may be the result of inadequate training or a lack of personal motivation and commitment to patient care.

2-39 What are honest errors?

An honest error is a mistake in management of the patient where the health worker has done his or her best but it was not the correct diagnosis or treatment and, as a result, the woman died. Honest errors are often the result of an excessive patient load and inadequate staffing. Examples of honest errors are forgetting to enter an important observation on

the partogram or forgetting to give a newborn infant vitamin K after delivery.

2-40 What training may be inappropriate?

Many health workers are not appropriately trained for the work they are expected to perform. This is often due to a lack of suitable training opportunities. Basic midwifery and medical training may not equip the nurse or doctor to function in a primary care situation where supervision by an experienced person is not available. Most advanced courses are expensive and require the health worker to leave their home and place of employment to travel to a regional centre for a period of time. Few distance-learning courses are available which enable health workers to take responsibility for some of their own continuing education.

2-41 What is a 'near miss'?

A 'near miss' occurs when a woman is very ill and almost dies of one of the conditions which can cause maternal death. The avoidable factors in a near miss are usually the same as those where the patient dies. There are more near misses than maternal deaths in a service. As with an audit of causes of maternal deaths, an audit of near misses can also be very useful in identifying avoidable factors and substandard care.

NOTE A 'near miss' is more correctly referred to as severe acute maternal morbidity (SAMM).

2-42 What is the maternal mortality index?

$$\text{Maternal mortality index} = \frac{\text{Number of maternal deaths}}{\text{Number of maternal deaths and near misses}}$$

The maternal mortality index gives a measure of the standard of care of women who present with serious complications. With good management, most severely ill women will be near misses rather than deaths. Therefore, a low maternal mortality index indicates a high standard of care while a high index suggests poor care.

At present the maternal mortality index for the whole of South Africa is not known.

NOTE The maternal mortality index for the Bloemfontein, Pretoria and Soweto areas are 22.8, 14.0 and 30.8 respectively.

2-43 Are the causes of maternal death in South Africa changing over time?

Yes. There is a reduction in the direct causes and an increase in the indirect causes of maternal death. The increase in indirect causes is due to more deaths resulting from AIDS. As the testing for HIV increases in patients where there has been maternal death, the percentage of HIV positive maternal deaths will probably increase. In 1999, two thirds of HIV tests in maternal deaths were positive.

2-44 What is the role of the Perinatal Problem Identification Programme in recording maternal deaths?

The Perinatal Problem Identification Programme (PPIP) is a software package used mainly for recording data on perinatal deaths. However PPIP is also very useful to record information and analyse maternal deaths. PPIP data helps to collect the documentation needed for the national confidential enquiry into maternal deaths.

Case study 1

In a large maternity service consisting of one small hospital and six clinics, there have been 10 000 liveborn deliveries and 35 maternal deaths in the past year. These deaths include women who died as a result of septic abortions as well as women who died of sepsis following delivery.

1. What is the definition of maternal mortality?

Maternal mortality consists of all the women who died between conception and the end of the puerperium (6 weeks after delivery).

2. Why are abortions and postpartum deaths also included in maternal mortality?

Because both conditions are related to pregnancy. Neither would have occurred if the women had not been pregnant. Maternal deaths are, therefore, all deaths where the cause of death is related to pregnancy. Deaths after 6 weeks are excluded as the physiological changes of pregnancy

have returned to the pre-pregnancy state by 6 weeks after delivery.

3. What is the maternal mortality ratio in this health service?

There were 35 maternal deaths out of 10 000 livebirths. The maternal death ratio is traditionally expressed as a proportion of 100 000 deliveries. Therefore, the maternal mortality ratio is $35/10\ 000 \times 100\ 000 = 350/100\ 000$. Usually maternal mortality is expressed as an annual ratio and it is best expressed for a whole health region.

4. How do you interpret this maternal mortality ratio?

The maternal mortality ratio in industrialised countries is usually about 10/100 000 while that in poor countries is usually above 50/100 000. Therefore, this maternal mortality ratio of 350/100 000 is high, even for a poor country.

5. What is the maternal mortality ratio in South Africa?

The exact maternal mortality ratio is not known as accurate mortality statistics as many maternal death are still not reported, especially in rural areas. The estimated maternal mortality ratio is 200/100 000. However, it is probably much higher than this in many poor areas.

6. Why is it important to know the maternal mortality ratio in a health service?

Because it gives a good idea of both the standard of maternal health during

pregnancy and the puerperium, as well as the standard of health care available for pregnant women in the community.

Case study 2

In a large maternity hospital in a city, both the number and causes of maternal deaths are carefully recorded after they have been discussed at the monthly mortality meeting. The primary and direct cause of each death is noted in order to find the commonest causes of death at the hospital.

1. Are maternal deaths notifiable?

Yes. All maternal deaths must be notified. This includes not only deaths in the state health service but also deaths at home and in private hospitals.

2. What are primary causes of maternal death?

The primary cause of death is the obstetric factor or condition which lead to the death. In other words, it is the reason why the death occurred. Important primary causes of death include pre-eclampsia, antepartum and post partum haemorrhage, and pregnancy related infection such as septic abortion and puerperal sepsis.

3. Why is it important to know the common primary causes of maternal death?

Because steps can then be made to avoid these primary causes by managing them better. By doing this, many maternal deaths can be prevented. It is difficult to reduce the

maternal mortality if the primary causes are not known.

4. What are final causes of maternal death?

The final cause of maternal death is the event which actually resulted in the death. In other words, it is the final complication of the disease process which killed the woman. For example, the final cause of death in antepartum or post partum haemorrhage is usually hypovolaemic shock while the final cause in eclampsia may be a brain haemorrhage.

5. Why is it important to identify the final cause of maternal death?

Because the final cause of death can often be prevented with adequate facilities and the correct management of these complications. For example, death from hypovolaemic shock can often be avoided if women with severe antepartum haemorrhage are correctly managed in an intensive care unit which has adequate staffing and facilities.

6. What are fortuitous causes of maternal death?

Fortuitous causes are not related to pregnancy at all but just happened to occur during pregnancy or the puerperium. Examples are motor car accidents, assault and suicide. Fortuitous causes are not included when the maternal mortality rate is calculated.

Case study 3

In recent years the main causes of maternal death have become better known in each province. Information is also being collected on the main causes at each level of care within health districts and regions. The findings of the Confidential Enquiry into Maternal Deaths are presented in the Saving Mothers report. From this publication, funding is being made available to address specific problems in the care of pregnant women.

1. What are the four main causes of maternal death in South Africa?

1. AIDS.
2. Complications of hypertension in pregnancy.
3. Antepartum and post partum haemorrhage.
4. Infections such as septic abortion and puerperal sepsis.

AIDS has become the leading cause of maternal death in the past few years.

2. What is the commonest cause of maternal deaths at all levels of care?

Non pregnancy related infection (i.e. AIDS).

3. What is the commonest direct cause of maternal death in primary care clinics?

Obstetric haemorrhage, especially post partum haemorrhage.

4. What is the commonest direct cause of maternal death in level 2 and 3 hospitals?

Complications of pregnancy related hypertension such as eclampsia.

5. Why is the notification of all maternal deaths and the Confidential Enquiry into Maternal Deaths so important?

Because accurate information on the number and causes of maternal death in South Africa is now available for the first time. This will result in better planning of maternity services.

6. What is the Saving Mothers Report?

This is the official report of the Confidential Enquiry into Maternal Deaths.

Case study 4

During a monthly mortality meeting in a regional hospital, all the maternal and perinatal deaths are presented. The possible avoidable factors and missed opportunities associated with each of the two maternal deaths are discussed and documented in the mortality report. A near miss maternal death was also described. Neither the medical superintendent of the hospital nor the maternity matron was at the meeting.

1. What are avoidable factors in maternal deaths?

These are factors, events or conditions which may have prevented the maternal death if they had not been

present. For example, if fast, efficient transport had been available a mother might not have died from a post partum haemorrhage.

2. What is a missed opportunity?

This is an opportunity for providing good care which was missed and, as a result, led to the woman's death? For example, not testing a woman's urine for sugar during antenatal care was a missed opportunity which may have prevented her dying from a complication of diabetes during labour.

3. Which maternal deaths are potentially avoidable?

Deaths where avoidable factors, missed opportunities or substandard care were present.

4. What are the three categories of avoidable factors in maternal mortality?

1. Patient related factors.
2. Administration related factors.
3. Health worker related factors.

5. Can you give an example of each of the three categories?

The commonest patient related factors are not attending antenatal care or booking late, not recognising important warning signs and not seeking help when warning signs are present.

The commonest administrative related factors are lack of staff, inadequate staff training, poor transport, lack of primary care clinics and hospitals in the community, and inadequate intensive care facilities for seriously ill women.

The commonest staff related factors are poor care, honest errors and lack of appropriate training.

6. What common errors are made by health care workers?

Not recognising problems, a delay or failure in referring sick patients, not following standard protocols of care, and inadequate monitoring of ill patients.

7. What is a 'near miss'?

A very ill woman who nearly died from a condition which often causes maternal deaths. Good lessons on how to improve maternal care can be learned from near misses.

8. Why do so many mothers still die in poor countries?

Many women still die in poor countries, not because of the lack of knowledge of how to manage ill pregnant women, but due to women not being able to receive adequate care. This is usually due to great distances to the nearest clinic or hospital, lack of transport and inadequate staffing, equipment and training.

9. Should the medical superintendent and maternity matron attend mortality meetings?

Yes. As the managers of the service, it is very important that they are aware of problems, avoidable factors and recommended ways of improving the service and preventing further maternal deaths.

PIIP classification of maternal deaths

These are included as a reference only.

Primary causes of maternal death

The most important subdivisions are:

1. Abortion

- Septic abortion.
- Uterine trauma.

2. Ectopic pregnancy

3. Antepartum haemorrhage

- Abruptio placenta.
- Abruptio placenta with hypertension.
- Placenta praevia.

4. Hypertensive disorders of pregnancy

- Chronic hypertension.
- Proteinuric hypertension.
- Eclampsia.
- HELLP syndrome.
- Ruptured liver.

5. Pregnancy related sepsis

- Amniotic fluid infection with ruptured membranes.
- Amniotic fluid infection without ruptured membranes.
- Puerperal sepsis following normal delivery.
- Puerperal sepsis following caesarean section.

6. Non-pregnancy related sepsis

- AIDS.
- Pneumonia.
- Tuberculosis.
- Bacterial endocarditis.

- Pyelonephritis.
- Malaria.

7. Pre-existing maternal disease

- Cardiac disease e.g. rheumatic valve disease.
- Endocrine e.g. diabetes.
- Central nervous system e.g. epilepsy.
- Skeletal e.g. kyphoscoliosis.

8. Postpartum haemorrhage

- Retained placenta.
- Uterine atony.
- Ruptured uterus.
- Inverted uterus.

9. Anaesthetic complication

10. Embolism

11. Acute collapse – cause unknown

12. Non obstetric cause

- Motor vehicle accident.

- Assault.
- Suicide.

Final causes of maternal death

1. Hypovolaemic shock.
2. Septic shock.
3. Respiratory failure.
4. Cardiac failure.
5. Renal failure.
6. Liver failure.
7. Cerebral complication.
8. Disseminated intravascular coagulation.
9. Multiorgan failure.

A more detailed classification of primary causes of maternal death is given in the Perinatal Problem Identification Programme. Each subdivision is given a specific code.

NOTE Codes and descriptions of causes of maternal death can be viewed at and downloaded from www.ppip.co.za.

3

Perinatal mortality

Before you begin this unit, please take the corresponding test to assess your knowledge of the subject matter. You should redo the test after you've worked through the unit, to evaluate what you have learned.

Objectives

When you have completed this unit you should be able to:

- Define the perinatal mortality rate.
- List the primary causes of perinatal death.
- Define the stillbirth and early neonatal mortality rates.
- Understand the importance of knowing the stillbirth and early neonatal mortality rates.
- List the common causes of stillbirth and early neonatal death.
- Calculate the stillbirth to early neonatal death ratio.
- Define the early neonatal care index.

Perinatal mortality

3-1 What does perinatal mean?

Perinatal means 'around the time of birth'. Perinatal usually applies to the last months of pregnancy and the first week after delivery.

3-2 What is a perinatal death?

Perinatal deaths are made up of infants that are born dead plus infants that are born alive but die within the first 7 days after delivery, i.e. stillbirths and early neonatal deaths.

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Perinatal deaths include both stillbirths and early neonatal deaths.
.....

3-3 What is the weight cut off for perinatal deaths?

In industrialised (developed) countries, all infants weighing 500 g or more are included in the definition of perinatal deaths. However, in many poor countries, only infants weighing 1000 g or more are included, as infants that are born alive, but weigh less than 1000 g, usually do not survive.

Therefore, in many hospitals small infants are not weighed and simply are regarded as miscarriages, especially if they are not born in a labour ward. As a result, these infants are not counted as perinatal deaths. This practice of excluding infants below 1000 g may have a marked influence on the perinatal information being collected.

In most developing countries the accurate gestational age of many

small infants is not known. Therefore it is better to use birth weight than gestational age in defining perinatal deaths. The World Health Organisation (WHO) recommends that all births weighing 500g or more should be counted. As a result, in South Africa, every effort should be made to include all infants weighing 500 g or more as many very small infants can survive with good basic care. To avoid confusion, it is important when discussing perinatal deaths to state whether the perinatal deaths include infants of 500 g or more, or only infants of 1000 g or more.

All liveborn and stillborn infants weighing 500 g or more at birth should be included when perinatal data is recorded.

NOTE The perinatal period is strictly defined from the beginning of fetal viability until the end of the sixth day after birth. Defining fetal viability is difficult as it depends on the gestational age and the special care facilities available. Therefore, it is easier to use birth weight to define viability. In industrialised countries, infants may survive from 22 weeks gestation (500 g) while in developing countries infants are only expected to survive from 28 weeks (1000 g).

3-4 What is the perinatal mortality rate?

The perinatal mortality rate (PNMR) is the number of stillbirths plus the number of early neonatal deaths per 1000 total deliveries. Note that the

perinatal mortality rate is expressed per 1000 total births (i.e. stillbirths and live births).

The perinatal mortality rate is the number of stillbirths plus early neonatal deaths per 1000 total births.

3-5 How is the perinatal mortality rate calculated?

The perinatal mortality rate is determined over a specific time period and calculated as follows:

$$\frac{\begin{array}{l} \text{The number of stillbirths} \\ + \text{the number of early} \\ \text{neonatal deaths} \end{array}}{\begin{array}{l} \text{The number of live born} \\ + \text{the number of stillborn} \\ \text{infants} \end{array}} \times 1000$$

For example, in a health care district with 5000 deliveries in a year, there were 4800 live births, 200 stillbirths and 50 early neonatal deaths (i.e. 250 perinatal deaths). Therefore, the annual perinatal mortality rate for that district is:

$$\frac{200 + 50}{4800 + 200} \times 1000 = 50$$

3-6 What is the perinatal mortality rate in industrial countries?

Most industrialized countries (and affluent communities in poor countries) have a perinatal mortality rate of about 10/1000 for infants weighing 500 g or more.

3-7 What is the perinatal mortality rate in poor countries?

In poor (developing) countries the perinatal mortality rate is at least 70/1000 for infants weighing 500 g or more. This is about seven times higher than that in industrialised countries. In some poor African countries, the perinatal mortality rate is as high as 300/1000.

3-8 What is the perinatal mortality rate in South Africa?

As representative perinatal mortality data are not available for all regions of South Africa, the exact perinatal mortality rate is not known. However, information from many sites suggest that the overall perinatal mortality rate in South Africa, for infants of 500 g or more, is approximately 36/ 1000. This varies widely between different areas from 35 /1000 in metropolitan areas, such as Cape own, to over 50/1000 in some poor, rural areas.

The perinatal mortality rate for most of South Africa is, therefore, typical of a developing country while the rate in metropolitan regions is still about three times higher than that of industrialised countries.

.....
The perinatal mortality rate in South Africa, for infants weighing 500 g or more, is about 36/1000 which is similar to many other poor countries.
.....

NOTE If only infants weighing 1000 g or more are included, the perinatal

mortality rate in industrialised countries is about 7/1000 while that in poor countries is about 50/1000. Therefore, the perinatal mortality rate is reduced by about a third. As a result, the perinatal mortality rate in South Africa for infants of 1000 g or more is about 30/1000.

3-9 Why is the perinatal mortality rate important?

Because it reflects the level of health in pregnant women and their infants, as well as the standard of health care provided. The perinatal mortality rate is also one of the best indicators of the socioeconomic status of a community, region or country. As the standard of living of a region improves, the perinatal mortality rate falls. Following the perinatal mortality rate over a number of years gives a good idea of the progress of a community.

Communities with a high perinatal mortality rate also have a high maternal mortality rate as both reflect poor living conditions and inadequate health care services. In South Africa, there are about 27 perinatal deaths for each maternal death.

.....
The perinatal mortality rate reflects the health of a community.
.....

The perinatal mortality rate can be used to identify problem districts where health authorities need to turn their attention.

3-10 How are perinatal deaths classified?

Perinatal deaths can be classified by their primary causes, i.e. the underlying clinical (obstetrical) problem during pregnancy or delivery which resulted in, or was associated with, either a stillbirth or an early neonatal death. If this problem had not occurred these infants would probably have survived.

Primary causes are important because many of them can be avoided.

Management protocols to reduce the risk of perinatal deaths are usually aimed at preventing or treating these primary causes.

The primary causes of stillbirth and early neonatal death are very similar and, therefore, best considered together.

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The primary cause of perinatal death is the clinical problem during pregnancy, labour or delivery which resulted in the death of the fetus or infant.

.....

In addition to the primary cause of death, a final cause of death is used for neonatal deaths. The primary cause explains why the infant died while the final cause explains how the infant died.

3-11 What are the primary causes of perinatal death?

In South Africa the common identifiable primary causes of perinatal death are:

1. Spontaneous preterm labour.

2. Intrapartum hypoxia.
3. Antepartum haemorrhage.
4. Hypertensive disorders.
5. Infections.
6. Fetal abnormalities.
7. Intrauterine growth restriction.
8. Birth trauma.
9. Maternal diseases.

A few perinatal deaths are due to less common conditions or problems not related to the pregnancy (e.g. motor car accidents or assault).

NOTE Most of the data on stillbirths and perinatal deaths in South Africa is taken from the Fifth Perinatal Care Survey of South Africa which covers the years 2003 to 2006.

3-12 Can a primary cause of perinatal death always be found?

Unfortunately, the primary cause of many perinatal deaths remain unknown. In South Africa about 25% of perinatal deaths have no obvious primary cause. The more thoroughly a perinatal death is investigated, the more likely a primary cause will be found. With better examination of the clinical details the percentage of unknown causes will fall.

3-13 What are the commonest primary causes of perinatal death in South Africa?

In South Africa (and many developing countries) the three most common primary causes of perinatal deaths are:

1. Unexplained intrauterine death.
2. Spontaneous preterm labour.
3. Intrapartum hypoxia.

Unexplained intrauterine deaths, spontaneous preterm labour and intrapartum hypoxia are the commonest primary causes of perinatal death.

3-14 Why is it important to find a primary cause of perinatal death?

Knowing the primary cause helps identify ways that the perinatal death may have been avoided.

Finding the primary cause of perinatal death helps to identify avoidable factors.

3-15 What causes spontaneous preterm labour?

Preterm labour (labour before 37 weeks gestation), which has not been induced artificially, may be caused by:

1. Chorioamnionitis (often asymptomatic).
2. Preterm prelabour rupture of the membranes (with or without obvious chorioamnionitis).
3. Cervical incompetence.

Mothers who are HIV positive are also at higher risk of preterm labour. Often no obvious underlying cause can be found.

3-16 What are the important causes of intrapartum hypoxia?

1. Labour related, especially prolonged labour, cephalopelvic disproportion and a hypertonic uterus.
2. Cord prolapse.

Except with cord prolapse, intrapartum, hypoxia is almost always the result of uterine contractions, especially if the uterus does not relax normally between regular contractions. Intrapartum hypoxia presents with signs of fetal distress during labour. The early diagnosis and correct management of fetal distress and prolonged labour is very important.

Intrapartum hypoxia is usually due to abnormal uterine contractions.

3-17 What are the likely causes of many unexplained deaths?

1. Intrauterine growth restriction.
2. Syphilis.

Almost all the unexplained stillbirths are macerated at delivery indicating that they probably died before the onset of labour. Careful measurement of the symphysis-fundus height during pregnancy, maternal awareness of the importance of reduced fetal movements, and routine screening for syphilis at booking for antenatal care will hopefully prevent many of these deaths.

Stillbirths

3-18 What is a stillbirth?

A stillbirth (SB), or stillborn infant, is an infant which is potentially viable but is born dead. Potentially viable means that the infant would have had a reasonable chance of surviving if it was born alive. Born dead means that the infant shows no sign of life at delivery.

.....
A stillbirth is an infant that is born dead.

NOTE Stillbirths are sometimes referred to as intra-uterine deaths or fetal deaths.

3-19 Which infants are potentially viable?

This depends on the level of maternal and neonatal care available. In many small hospitals, infants weighing less than 1000g, or with a gestational age of less than 28 weeks, are not regarded as potentially viable. However, in metropolitan areas, infants weighing less than 1000 g often survive. With good care (level 1 or 2 care) many of these small infants can also survive in a district hospital. Therefore, in South Africa all infants weighing 500 g or more at birth should be regarded as potentially viable and must be counted.

NOTE In some industrialized countries, infants born as early as 23 weeks may survive with intensive care.

.....
In South Africa all infants weighing 500 g or more must be counted as they are regarded as potentially viable.

3-20 What is the legal definition of stillbirth?

The legal definition of stillbirth in South Africa is an infant born dead after '6 months of intra-uterine life' (i.e. 28 weeks since the start of the last period or 26 weeks since conception). Infants that are born dead before

this time are legally regarded as miscarriages. If the gestational age is not known, a weight of 1000 g is used to legally define a stillbirth.

Only legally defined stillborn infants require a stillbirth certificate (i.e. infants weighing 1000 g or more, or with a gestational age of 28 weeks or more). In practice, infants born dead and weighing less than 1000 g do not need a death certificate. This can be issued by a doctor, nurse or midwife. Stillborn infants requiring a notification of death certificate have to be buried or cremated. Smaller infants can be incinerated if the parents agree.

.....
Stillborn infants weighing 1000 g or more require a stillbirth certificate and have to be buried or cremated.

However, for the collection of information on perinatal mortality for statistical purposes, the international rather than the legal definition of stillbirth should be used.

A stillbirth certificate can be issued by either a midwife or a doctor.

3-21 What is the international definition of stillbirth?

Any infant who is born dead and weighs 500 g or more is internationally defined as a stillbirth. Therefore, when the stillbirth rate is calculated, all infants who are born dead and weigh 500 g or more must be included. The normal fetus weighs 500g at about 22 weeks of gestation.

When the international definition of stillbirth (500 g or more) is used to collect perinatal data, the legal definition (1000 g or more) is still used to decide who needs a stillbirth certificate and requires to be buried or cremated. This saves the cost of burial or cremation for many parents.

For the purpose of collecting perinatal statistics, all infants weighing 500 g or more at delivery should be counted as stillbirths or liveborn infants.

3-22 What is a miscarriage?

When collecting perinatal data, infants born dead who weigh less than 500 g should be regarded as miscarriages. The word miscarriage is preferred to abortion as the latter suggests that the delivery may have been criminally induced.

A miscarriage is defined as an infant weighing less than 500 g at birth and showing no signs of life at delivery.

All infants showing signs of life at birth are called live born infants.

NOTE The definition for live born infants under 500 g is difficult if the international definition of stillbirth is used. If these infants only gasp a few times and die within minutes of delivery, they are usually regarded as miscarriages. However, live born infants under 500

g who breathe well and survive for a few hours, especially if they are moved from the labour ward to the nursery, are usually counted as live born infants..

3-23 What should be done when a stillborn infant weighing between 500 and 999 g is delivered?

In South Africa:

1. The parents may regard the pregnancy as ending with a miscarriage.
2. There is no legal need to issue a stillbirth certificate.
3. The body can be incinerated by the hospital if the parent's agree. However, if the parents want to bury the infant, it is often easier if a stillbirth certificate is issued by a midwife or doctor, even though this is not a legal requirement.
4. The infants should still be counted as a stillbirth for statistical purposes and entered in the birth register.

3-24 What is the stillbirth rate?

The stillbirth rate is the number of stillborn infants per 1000 total deliveries (i.e. live born and stillborn).

The stillbirth rate is calculated as:

$$\frac{\text{Total number of stillborn infants}}{\text{Total number of infants delivered}} \times 1000$$

3-25 What is the stillbirth rate in industrialised countries?

In an industrialised country the stillbirth rate is about 5 per 1000 for infant weighing 500 g or more.

3-26 What is the stillbirth rate in poor countries?

In poor countries the stillbirth rate is usually about 45 per 1000 for infants of 500 g or more.

Therefore the stillbirth rate in poor communities is much higher than that in high income communities.

3-27 What is the stillbirth rate in South Africa?

The information is not available to give an accurate stillbirth rate for the whole of South Africa. However, it is estimated that the stillbirth rate for South Africa, for infants weighing 500 g or more, is about 24 per 1000. The rate varies from about 23 in poor rural areas to about 25 in cities.

The stillbirth rate is about a third less if only infants of 1000 g or more are included.

NOTE For infants of 1000 g or more the stillbirth rate is about 3.5/1000 for industrialised countries and about 35/1000 in poor countries. In South Africa the estimated stillbirth rate for infants of 1000 g or more is 19/1000.

3-28 What determines the stillbirth rate?

The stillbirth rate is determined by both:

1. The health of women during pregnancy.
2. The quality and availability of antenatal and labour care.

The number of induced midtrimester abortions will also influence the stillbirth rate.

3-29 Why is it important to know the stillbirth rate?

Because the stillbirth rate gives a measure of the health of pregnant women and the standard of care they receive during pregnancy and labour. Therefore, a high stillbirth rate suggests a poor level of health or poor antenatal and labour care or both. The stillbirth rate is one of the best measures of the health of pregnant women. The stillbirth rate can be compared between different regions or in one region between different periods of time. The stillbirth rate helps to identify communities in particular need of better health care.

.....
The stillbirth rate is an indicator of maternal health and general obstetric care.

3-30 How can stillbirths be divided into groups?

Often stillborn infants are divided into two different groups as this helps identify the cause of a stillbirth and ways of preventing the stillbirth:

1. Stillbirth that occur before the onset of labour.
2. Stillbirths that occur during labour. Death may happen before or after arrival at a hospital or clinic.

Stillbirth before labour may indicate problems in the antenatal care of women. In contrast, infants that die during labour (intrapartum stillbirths) after the mother has been admitted to a clinic or hospital can often be avoided with good monitoring during labour.

Deaths during labour before the mother arrives at a hospital or clinic may be due to a delay in seeking help, often as the result of inadequate transport. Infants that die before labour are often macerated.

3-31 What is a macerated stillbirth?

The signs of maceration are discoloration and peeling of the skin leaving areas of raw tissue. The skull is usually soft, as the brain has become soft. The umbilical cord is usually stained a dark red or black. The amniotic fluid is usually darkly stained. Maceration is the result of the infant being dead for at least 12 hours. Most macerated infants have been dead for many days or even weeks. Macerated stillborn infants are assumed to have died before the onset of labour. Fresh stillbirths show no sign of maceration and have usually died during labour or shortly before the onset of labour.

Therefore the presence or absence of maceration helps to decide when the infant (fetus) died. Fresh stillbirths usually reflect the quality of intrapartum care (care in labour) while macerated stillbirths reflect the quality of antenatal care (care during pregnancy).

.....
Macerated stillbirths have usually died before the onset of labour while fresh stillbirths have usually died during labour.
.....

3-32 What are the primary causes of stillbirth?

The primary causes of stillbirth are very similar to the primary causes of perinatal death:

1. Hypertensive disorders.
2. Antepartum haemorrhage.
3. Intrapartum hypoxia.
4. Infections.
5. Fetal abnormalities.
6. Intrauterine growth restriction.
7. Birth trauma.
8. Maternal diseases.

In many stillborn infants the primary cause of death is not known, especially if the infant is macerated. In South Africa the primary cause of death is unexplained in 38% of stillbirths.

NOTE A final (pathological) cause of death is usually only given for early neonatal deaths and not for stillbirths. The final cause of death in most stillbirths is fetal hypoxia, fetal undernutrition, infection or a major congenital abnormality. Very little can be done to address the final cause of stillbirth. Therefore every effort must be made to avoid or treat the primary cause.

3-33 Is preterm labour a cause of stillbirth?

Although preterm labour is sometimes listed as a cause of stillbirth, this must be uncommon as preterm labour alone should not cause an intrauterine death. However, many of the reason for preterm labour can kill the fetus, e.g. antepartum haemorrhage, infection and congenital abnormality.

Neonatal mortality

3-34 What is a liveborn infant?

A live born infant is defined as an infant that is potentially viable (able to survive) and shows any sign of life at birth (i.e. breathes or moves). In practice, only infants weighing 500 g or more, are included as live born infants. Therefore every effort must be made to include all infants born alive and weighing 500 g or more in the definition of a live born infant in South Africa.

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A liveborn infant is an infant that weighs 500 g or more and shows signs of life at delivery.

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NOTE Live born infants below 500 g (or 22 weeks gestation) at birth who only live for a few minutes are usually regarded as miscarriages and are not issued with a notification of neonatal death certificate. Infants below 500 g at birth are usually regarded as live births rather than miscarriages only if they live for a number of hours after delivery. They should be issued with a notification of neonatal death certificate. Very uncommonly, even infants weighing less than 500 g can survive.

3-35 What is a neonate?

A neonate (or newborn infant) is a live born infant aged between birth and 28 completed days after delivery. Therefore, a paediatrician who specialises in the care of infants in the first month of life is called a neonatologist.

3-36 What is neonatal mortality?

This is the number of live born infants who die in the first 28 days of life. They are known as neonatal deaths. All live born infants who die in the first 28 days of life must be issued with a notification of death certificate by a doctor (often, but incorrectly called a death certificate). Nurses and midwives may not sign a notification of death certificate. Neonatal mortality can be divided into early and late neonatal mortality.

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Every liveborn infant that dies in the first 28 days of life must have a notification of death certificate signed by a doctor.

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3-37 What is early neonatal mortality?

An early neonatal death is a death which occurs in the first week of life. Therefore, early neonatal mortality is the number of infants who are born alive but die in the first 7 completed days of life (i.e. the first week after birth). Early neonatal deaths and stillbirths are added to give the perinatal mortality.

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Early neonatal mortality is the number of liveborn infants that die in the first week of life.

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NOTE It is very important to include all infants who die the first week after they have already been discharged from the hospital or clinic where they were born. Otherwise many

early neonatal deaths, especially those due to infection, are missed.

3-38 What is late neonatal mortality?

The late neonatal mortality is the number of live born infants who die after 7day but before 29 days of life(i.e. during the second, third and forth week of life). Neonatal mortality, therefore, consists of both early and late neonatal deaths.

3-39 What is the early neonatal mortality rate?

The early neonatal mortality rate is the number of live born infants that die in the first week of life per 1000 live born deliveries. Only live born infants are considered when calculating the early neonatal mortality rate.

The early neonatal mortality rate is calculated as:

$$\frac{\text{The number of early neonatal deaths}}{\text{The number of live born infants}} \times 1000$$

Note that early neonatal death rate is given per 1000 *liveborn* infants. This is different to the perinatal mortality rate and stillbirth rate which are expressed per 1000 *total* births (i.e. stillbirths plus live births).

The early neonatal mortality rate forms the greater part of the neonatal mortality rate (2/3) as most infants who die in the first month of life die in the first week. Most infants who die in the first week of life die on the first day.

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The early neonatal mortality rate is the number of liveborn infants who die in the first week per 1000 liveborn infants.

NOTE The late neonatal mortality rate is the number of infants who die from 8 to 28 days after birth per 1000 live born infants. An infant that dies on day 7 is an early neonatal death while an infant who dies on day 8 is a late neonatal death. The early plus the late neonatal mortality rate gives the neonatal mortality rate. The late neonatal mortality rate is not often calculated as many of these infants are no longer cared for by the neonatal services when they die. As a result the calculated late neonatal mortality rate is often incorrectly low.

3-40 What is the importance of the early neonatal mortality rate?

The early neonatal mortality rate is one of the most important measures of perinatal care. It is mainly a marker of the standard of health care given to the mother during labour and to the infant during the first week of life. The standard of care to the infant is the major factor determining the early neonatal death rate. A high early neonatal death rate strongly suggests a poor standard of newborn care.

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The early neonatal mortality rate is an indicator of care of the mother during labour and care of the infant during the first week of life.

3-41 What is the early neonatal mortality rate in industrialised countries?

About 5 per 1000 live births for infants weighing 500 g or more. This is very similar to the stillbirth rate in industrialised countries.

3-42 What is the early neonatal mortality rate in poor countries?

About 25/1000 live births for infants weighing 500 g or more, i.e. about half the stillbirth rate.

3-43 What is the early neonatal mortality rate in South Africa?

It is about 12/1000 for infants weighing 500 g or more, i. e. half the stillbirth rate.

NOTE The early neonatal death rate is about 8.5/1000 for infants of 1000 g or more in South Africa, i.e. about two thirds the rate for infants of 500 g or more. The early neonatal death rate for infants of 1000 g or more is about 35/1000 in industrialised countries and 15/1000 or more in poor countries.

3-44 How are the causes of early neonatal mortality classified?

1. As with stillbirth, it is important to identify the primary (obstetric) causes of early neonatal mortality. This is the problem or maternal illness during pregnancy, labour or delivery which resulted in the infant dying.
2. However, the final cause of early neonatal deaths must also be looked for. This is the clinical problem at the time of the infant's death.

The primary cause explains why the infant died while the final cause explains how the infant died. Therefore, both the primary and final cause of death should be established in each early neonatal death. For example, the primary cause of death may have been spontaneous preterm labour while the final cause of death was hyaline membrane disease.

NOTE Unlike early neonatal deaths, the final causes of stillbirth are usually not sought as very little can be done to address the final cause of stillbirth (fetal hypoxia or septic shock).

3-45 What are the primary causes of early neonatal mortality?

The primary causes of early neonatal death are the underlying clinical (obstetrical) problem during pregnancy or delivery which eventually in the infant's death. The primary causes of stillbirth and early neonatal death are the same with the exception that preterm labour is a very important primary cause of early neonatal death but not stillbirth. Knowing the primary causes should lead to a preventative programme.

3-46 What are the final causes of early neonatal death?

The final causes are the problems which actually killed the infant. The commonest final causes of early neonatal death are:

1. Immaturity related (born too soon).
2. Perinatal hypoxia (too little oxygen to the fetus or newborn infant).
3. Infection (both fetal and neonatal).

4. Congenital abnormalities.

Knowing the final causes helps identify the medical interventions needed to prevent the death. Less common causes include birth trauma, haemorrhagic disease of the newborn, Rhesus disease and cot death.

While most neonatal deaths have a primary cause during pregnancy and labour, some neonatal deaths are due to events which occur after a normal pregnancy and delivery, e.g. infection acquired in the nursery or haemorrhagic disease of the newborn. With these conditions there is often no primary cause.

3-47 What are the final causes of early neonatal death in South Africa?

Most early neonatal deaths in South Africa and other poor countries are due to:

1. Immaturity (born too soon).
2. Fetal hypoxia (too little oxygen to the fetus).
3. Infection (both fetal and neonatal).

In industrialised countries, immaturity, infection and congenital abnormalities are more common than fetal hypoxia.

The commonest final causes of early neonatal death are immaturity, fetal hypoxia and infection.

3-48 Are the final causes of early neonatal death always known?

No. Unfortunately the cause of early neonatal death is not always known.

However, with a careful obstetric and perinatal history and careful examination of the infant, a cause can usually be found. The gross and histological examination of the placenta is very useful when there is no obvious cause of death. Placental signs of poor maternal blood flow to the placenta (causing fetal hypoxia) and infection (especially chorioamnionitis and syphilis) are very useful. A full post mortem examination by a pathologist is indicated if no obvious cause of death can be found. With more detailed maternal history and careful examination of the newborn infant and placenta, the number of unexplained deaths will decrease.

Careful clinical examination of the infant and placenta helps identify the final cause of early neonatal death.

3-49 What are the primary causes of fetal hypoxia resulting in early neonatal death?

Fetal hypoxia means that the fetus does not receive enough oxygen. The common primary causes of fetal hypoxia resulting in early neonatal death are:

1. Antepartum haemorrhage, especially placental abruption.
2. Hypertensive disorders.
3. Intrapartum hypoxia, especially prolonged or obstructed labour or a prolapsed umbilical cord.
4. Intra-uterine growth restriction (severe fetal undernutrition).

NOTE As hypoxia may also occur after delivery if neonatal resuscitation is inadequate, some clinicians prefer to speak of perinatal hypoxia rather than just fetal hypoxia. It is best to avoid the confusing word 'asphyxia'.

3-50 How do these primary causes of early neonatal death result in fetal hypoxia?

1. With placental abruption part of the placenta separates from the uterine wall. In addition the uterus goes into spasm. Both reduce maternal blood supply to the placenta.
2. Prolonged or obstructed labour results in excessive uterine contractions with little relaxation.
3. A prolapsed cord is compressed and the umbilical arteries often go into spasm. Both reduce the blood flow between the placenta and fetus.
4. In the hypertensive disorders the maternal blood vessels to the placenta (spiral arteries) are partially or completely obstructed reducing maternal blood flow to the placenta. Similarly, with intrauterine growth restriction (IUGR), there is often reduced maternal blood flow to the fetus. This causes a lack of both oxygen and nutrition. As a result, these fetuses grow slowly and are wasted (fetal weight loss due to starvation). These infants are often underweight for their gestational age at birth (UGA).

Sometimes there is no obvious cause of the fetal hypoxia.

These primary causes may also result in a stillbirth.

3-51 What fetal infections cause early neonatal death?

The most important cause is congenital syphilis because it is common in many poor communities and yet can be easily diagnosed and treated. One of the most effective methods of reducing both the stillbirth and early neonatal mortality rates is to introduce early screening for syphilis in pregnancy and a reliable system of treating maternal syphilis.

Severe chorioamnionitis and malaria may also cause stillbirth or early neonatal death. In some countries malaria is a common cause of perinatal death.

NOTE Chorioamnionitis causes placenta oedema while malaria parasites obstruct the spiral arteries.

3-52 What serious congenital abnormalities may cause early neonatal death?

Usually chromosomal abnormalities (e.g. trisomy 18) or major brain or heart abnormalities.

The ratio of stillbirths to early neonatal deaths

3-53 What is the value of comparing the stillbirth and early neonatal mortality rates?

The stillbirth to early neonatal death ratio gives an idea of the standard of health care in a community. When ever possible, all deaths of 500 g or more should be included.

In an affluent community with good perinatal care the stillbirth and early

neonatal mortality rates are similar giving a stillbirth to early neonatal death (SB:ENND) ratio of about 1.

However, in a poor community, with inadequate perinatal care, the stillbirth rate is usually at least double the early neonatal death rate, i.e. the SB:ENND ratio is 2 or more. In South Africa the ratio is about 2 (i.e. SB rate is 24/1000, and ENND rate is 12/1000).

Usually, the higher the ratio, the poorer is the perinatal care. A low rate usually indicates good perinatal care.

Examining the individual stillbirth and early neonatal deaths rates is more important than simply looking at the SB:ENND ratio.

NOTE If the standard of neonatal care is very poor, the neonatal mortality rate may rise markedly and the stillbirth and early neonatal mortality rates may again become similar, giving a SB:ENND ratio of about 1. In addition, very good neonatal care may result in a high SB:ENND ratio. Therefore, the SB:ENND ratio must not be looked at in isolation.

Perinatal care index

3-54 What is the perinatal care index?

The perinatal care index is the ratio of the perinatal mortality rate to the low birth weight rate. The perinatal care index is calculated as follows:

$$\frac{\text{Perinatal rate}}{\text{Low birth weight rate}}$$

In addition, the early neonatal care index can be calculated by dividing the

early neonatal mortality rate by the low birth weight rate.

3-55 What is the importance of knowing the perinatal care index?

As with the stillbirth to early neonatal death ratio, the perinatal care index is a useful method of comparing the standard of health care between different areas.

The perinatal mortality rate reflects the standard of perinatal care while the low birth weight rate reflects the socioeconomic status of the community and is little influenced by health care. Therefore, an area with many low birth weight infants (i.e. a poor community) usually has a high perinatal mortality rate (poor care). In contrast, communities with few low birth weight infants (i.e. privileged communities) usually have a low perinatal mortality rate (good care).

If a community with few low birth weight infants has a high rate of perinatal deaths (i.e. a high perinatal care index), then the level of perinatal care is probably particularly poor. Even in poor communities, the perinatal care index can be low if perinatal care is good.

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The higher the perinatal care index the poorer is the perinatal care.

Similarly the early neonatal care index can be used to compare the quality of early neonatal care to the low birth weight rate.

NOTE Correcting for the LBW rate controls for environmental factors and, thereby, makes the comparison of the perinatal mortality rate more valid between different sites.

3-56 What is the perinatal care index in South Africa?

In South Africa, the perinatal mortality rate is about 36/1000 (for infants weighing 500 g or more) and the low birth weight rate about 15%. Therefore, the average neonatal care index is about 2.4 (i.e. 36/15). The perinatal care index varies widely from one area to another.

With the improvement of perinatal care, especially antenatal care and care of newborn infants, the perinatal care index will fall.

NOTE South Africa has an early neonatal care index of 0.8 (12/15) for infants of 500 g or more.

Case study 1

At regular perinatal mortality meetings during the year in a regional hospital, 200 stillbirths and 80 early neonatal deaths were discussed. Twenty thousand infants were delivered alive or dead in the same year.

1. What is a perinatal death?

Either a stillbirth or an early neonatal death.

2. What is the lowest cut off weight for perinatal deaths?

It is best to use 500 g. However, some countries still use 1000 g. In South

Africa all perinatal deaths of 500 g or above should be included as infants of 500 g or more are potential survivors with good care.

3. What is the perinatal mortality rate in this hospital?

All the stillbirths plus neonatal deaths expressed as a proportion of the 20 000 total births. By convention, perinatal deaths are given per 1000 births.

Therefore, the perinatal mortality is $200 + 80 = 280$ divided by 20 000 and then multiplied by 1000. This gives a perinatal mortality rate of 14/1000 for this hospital.

4. What is the perinatal mortality rate of poor and industrial countries?

In poor countries the perinatal mortality rate is usually 70/1000 or more while in industrial countries it is usually about 10. Therefore, a perinatal mortality rate of 14/1000 is very good and suggests a developed country or a privileged community in a poor country. It is essential to find out whether 500 g or 1000 g is being used as the cut off weight before comparing the perinatal mortality rate between two countries.

5. What is the perinatal mortality rate in South Africa?

The exact perinatal mortality rate is not known. However the estimated perinatal mortality rate is 36/1000. This is slightly less than that expected in poor countries but still six times that in industrialised countries.

6. Why is it important to know the perinatal mortality rate?

Because the perinatal mortality rate is a good measure of the standard of health in the community. Not surprisingly, the perinatal mortality rate also reflects the socioeconomic status of the community, as the standard of health is often low in poor communities and good in wealthy communities.

Case study 2

At a perinatal mortality meeting the most likely primary causes of all the stillbirths and early neonatal deaths are debated and then recorded. The commonest primary cause of death was spontaneous preterm labour.

1. What is a primary cause of perinatal death?

This is the underlying obstetric problem during pregnancy or delivery which resulted in the stillbirth or early neonatal death. The primary causes of stillbirths and early neonatal deaths are very similar and, therefore, are often considered together.

2. Is spontaneous preterm labour a common primary cause of perinatal death in South Africa?

Yes. Spontaneous preterm labour is a common primary cause of perinatal death in most poor and industrialised countries. In South Africa the commonest primary causes of perinatal death are spontaneous preterm labour, antepartum haemorrhage and intrapartum hypoxia.

3. Why is it important to look for the primary cause of perinatal death?

Because they can often be prevented. Management protocols during pregnancy, labour and delivery must aim at avoiding perinatal deaths.

4. What are the main causes of spontaneous preterm labour?

Chorioamnionitis, preterm rupture of the membranes and cervical incompetence. Preterm rupture of the membranes is often caused by chorioamnionitis. Unfortunately, many cases of spontaneous preterm labour are still unexplained.

5. Which type of antenatal haemorrhage is a common cause of perinatal death?

Placental abruption. Placenta praevia is a far less common cause of perinatal death.

6. What is the commonest cause of intrapartum hypoxia?

Labour, especially if it is prolonged, if cephalopelvic disproportion is present or if the uterus is hypertonic. Very often all three factors occur together. Less commonly intrapartum hypoxia is due to a prolapsed cord.

Case study 3

At a perinatal mortality meeting in a primary care clinic, there is disagreement about the definition of a stillbirth. Of the 250 deliveries during the past month, five infants were born dead and all weighed between 500 and 1000 g. Most of the staff believe that

all infants born dead and weighing less than 1000 g should be called miscarriages and need not be issued with a death certificate. Neither do they have to be cremated or buried.

1. What is the international definition of a stillbirth?

Any infant that is born dead and weighs 500 g or more is a stillbirth. Every effort must be made to use this definition in South Africa when perinatal death data are collected. In their mortality report, an infant which is born dead and weighs less than 500 g should be called a miscarriage. It is better not to call a miscarriage an abortion.

2. Should these five stillbirths be issued with stillbirth certificates and must they be cremated or buried?

No. In South Africa miscarriages or stillborn infants weighing less than 1000 g do not need a stillbirth certificate as they are legally miscarriages and not stillbirths. This is very confusing as the legal definition of a stillbirth and the international definition of a stillbirth are not the same. In the future, the legal definition of stillbirths in South Africa may be changed to agree with the international definition. However, at present we use the international definition for data collection and the South African legal definition for deciding who needs a stillbirth certificate and has to be cremated or buried.

3. What is the stillbirth rate at this perinatal mortality meeting?

Of the 250 deliveries there were five stillbirths. Therefore, the stillbirth rate is $5/250 \times 1000 = 20/1000$. Stillbirths are always expressed per 1000 total births (live births and stillbirths).

4. What is the stillbirth rate in industrialised and poor countries?

The stillbirth rate is about 5 industrialised countries and 45 in poor countries for infants weighing 500 g or more.

5. What is the stillbirth rate in South Africa?

It is estimated that the stillbirth rate in South Africa is 24/1000 for infants weighing 500 g or more at birth.

6. What is a macerated stillbirth?

A stillborn infant with discoloured, peeling skin, a dark red or black umbilical cord, a soft skull and darkly stained amniotic fluid. Maceration suggests that the infant has been dead for days or weeks and probably died before the onset of labour.

7. What are the primary causes of stillbirth?

These are the same as the primary causes of all perinatal deaths (i.e. both stillbirths and early neonatal deaths) and include intrapartum hypoxia, antepartum haemorrhage, hypertensive disorders and infection. Note that preterm labour is not a cause of stillbirth. In many stillbirths there is no obvious cause found.

Case study 4

Over six months 3000 live born infants are delivered in a busy hospital. Of these, 24 die during the first week of life. During the same period there are 20 stillbirths and 210 infants who weigh less than 2500 g at delivery.

1. What is the early neonatal death rate?

Eighteen infants died during the first 7 days. Therefore, there were 7 early neonatal deaths out of 3000 live born infants. As the early neonatal death rate is always expressed per 1000 live born deliveries, the early neonatal death rate in this hospital is:

$$24 \div 3000 \times 1000 = 8/1000$$

2. What is the estimated early neonatal death rate in South Africa?

It is about 12/1000 live births. This is much higher than about 5/1000 in industrialised countries but a lot lower than and not much less than about 25/1000 in most poor countries.

3. How are the causes of early neonatal death classified?

Causes of early neonatal mortality are divided into primary causes and final causes. As with stillbirths, the primary cause is the obstetric problem or illness during pregnancy, labour or labour

which led to the death. The final cause is the clinical problem at the time of the infant's death.

4. What are the four common final causes of early neonatal death?

Immaturity, perinatal hypoxia, infection or congenital abnormalities. The first three are the commonest final causes of early neonatal death in South Africa.

5. What are the common primary causes of fetal hypoxia?

Placental abruption, hypertensive disorders, intrapartum hypoxia and intra-uterine growth restriction.

6. What infection is a common primary cause of early neonatal death in South Africa?

Syphilis. A less common cause is severe chorioamnionitis.

7. What is the ration of stillbirths to early neonatal deaths in this hospital?

There were 20 stillbirths and 24 early neonatal deaths giving a stillbirth to early neonatal death ratio of 20/24, i.e. 0.8. This is typical of industrialised countries. In most poor communities there are more stillbirths than neonatal deaths giving a ration of 2 or more.

4

Maternal and perinatal mortality audits

Before you begin this unit, please take the corresponding test to assess your knowledge of the subject matter. You should redo the test after you've worked through the unit, to evaluate what you have learned.

Objectives

When you have completed this unit you should be able to:

- Understand the meaning of a mortality audit.
- Arrange and manage a perinatal mortality meeting.
- Write a perinatal mortality report.
- Use the Perinatal Problem Identification Programme (PPIP).

Audit

4-1 What is an audit?

An audit is a thorough assessment, count or evaluation of a situation. In an audit information is systematically collected and then presented in a manner that can be understood.

.....
An audit is a careful assessment of a situation.
.....

4-2 Why conduct an audit of health care?

With a health audit it is possible to identify problems and then make plans to find solutions. It is the best way to find out what is happening in a clinical service and why problems are occurring. If you do not know where the problems lie, it is very unlikely that you will be able to solve the problems. You may not even know that there is a problem. With a clear idea of the type and extent of a problem, steps can be taken to prevent or correct the problem.

Therefore, by auditing a health service one can get a clear idea of where problems lie. This will usually point one in the direction where solutions can be found. However, an audit alone does not solve the problems. To do this requires effort and commitment.

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An audit is often the best method of identifying problems.
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4-3 What is a mortality audit?

This is an audit of people who die. Death is a very definite end point for an investigation into health care. However

if the number of deaths can be reduced, the care of all mothers and infants who survive will also improve. A mortality audit therefore benefits many living people and reduces morbidity in the survivors.

A maternal mortality audit looks at the number and causes of maternal deaths. Only women who die between conception and 6 weeks after delivery are included in a maternal mortality audit.

A perinatal mortality audit looks at stillbirths and early neonatal deaths. A stillbirth is an infant born dead and weighing 500 g or more. An early neonatal death is a death occurring in an infant during the first week of life.

.....
By decreasing the number of mothers and infants dying, the care of all mothers and infants will be improved.
.....

4-4 Where and when is a mortality audit of a health care service carried out?

Usually an assessment of a health care service is done within a carefully defined area over a particular period of time. It is best if a mortality audit is done in a whole health region over a one year period. This would include all the clinics and hospitals in that region. However, an audit can be made of a single clinic or hospital or a single hospital together with the attached clinics.

4-5 Who conducts a mortality audit?

The responsibility for conducting an audit lies with the authority responsible for providing the service. However, everyone working in that service should be interested and involved in finding out where problems lie and in helping to find answers to those problems.

4-6 How is a mortality audit done?

1. The necessary information (data) must be collected.
2. The information must be analysed.
3. The information must be discussed and conclusions drawn.
4. Plans must be made to correct any problems which may have been detected.
5. A summary or report must be written.

4-7 What is a morbidity audit?

Morbidity is all the problems and illnesses which are not severe enough to cause death. Morbidity is more common than mortality, but the causes usually are the same. If mortality can be reduced, morbidity will also be less. It is important not to forget morbidity. Often morbidity can also be assessed as part of a mortality audit.

4-8 What is a maternal care audit?

This is an investigation to identify and solve problems which occur in providing care for pregnant women. A maternal care audit would include many aspects of maternal care, other than just deaths, such as the number of women who:

1. Receive antenatal care.
2. Deliver by various methods.

3. Have problems during pregnancy, delivery and the puerperium.

Once this information is collected and analysed, answers can be found to problems with maternal care.

4-9 What is a perinatal care audit?

This is an audit of care given to the fetus and newborn infant. Perinatal means before, during and after birth. A perinatal care audit would include many aspects of perinatal care, such as the number of:

1. Infants born alive.
2. Males and females.
3. Infants in different birth weight categories.
4. Deaths and the causes of these deaths.
5. Avoidable factors which may be associated with these deaths.

Once this information is collected and analysed, answers can be found to problems with perinatal care.

4-10 Can maternal and perinatal mortality audits be combined?

Yes. Maternal and perinatal care audits are often considered together as both reflect the standard of perinatal care. In practice, maternal and perinatal audits are done in the form of perinatal mortality meetings. However perinatal mortality audits are mainly about perinatal deaths as these are far more frequent than maternal deaths (about 25 perinatal to each maternal death in South Africa).

Perinatal mortality meetings

4-11 What is a perinatal mortality meeting?

This is a meeting to discuss all the aspects of recent stillbirths and neonatal deaths. It is a meeting where the extent of the problem is identified, causes and avoidable factors are looked for and likely answers are hopefully found. Studying deaths will give an idea of the major problems in the care of mothers and infants in the area. Regular meetings provide motivation for data collection and are associated with a fall in mortality rates. A perinatal mortality meeting is one of the most effective methods of conducting a maternal and perinatal audit.

.....
Regular perinatal mortality meetings can reduce both the maternal and perinatal mortality rates.

Regular mortality meetings are an excellent method of improving the standard of perinatal care and are a very effective way of teaching health care workers how to prevent maternal and perinatal deaths. They also provide an opportunity to acknowledge good care and management. Perinatal mortality meetings are essential in any perinatal service.

.....

Regular perinatal mortality meetings are a very effective method of identifying and solving many perinatal problems.

.....

4-12 Who should attend a perinatal mortality meeting?

If possible, all the staff, including doctors and nurses, who work in that service (hospital or clinic or a group of hospitals and clinics). Unfortunately, some staff on duty and most of the staff off duty will not be able to attend. The findings of the perinatal mortality meeting should be made known to all staff.

4-13 Who should arrange perinatal mortality meetings?

As perinatal mortality meetings are an integral part of a clinical service, the person in charge of the service or facility is responsible for the meetings. In practice, it is usually a senior doctor who arranges the perinatal mortality meetings. This is commonly an obstetrician or obstetric medical officer. However, it is important that a senior midwife and doctor involved with care of mothers and their infants are closely involved in arranging and managing the meetings. In a large hospital both an obstetrician and paediatrician, and sometimes a midwife, should jointly be responsible.

4-14 How is a perinatal mortality meeting arranged?

All the staff should be informed about the nature, importance and benefits of a perinatal mortality meeting. They

should then be invited by the person arranging the meeting. The most suitable time and venue should be decided upon after discussion with as many of the staff as possible. Usually a waiting room, lecture room or boardroom is most suitable. The most convenient time is often over lunch or in the late afternoon. Each service should agree on a time and venue where most staff can attend. The venue must be booked. Permission from the local health authorities may be needed.

4-15 How often should perinatal mortality meetings be held?

In big services with deaths every few days, perinatal mortality meetings are best held every week. In smaller hospitals and clinics with fewer deaths, meetings are usually held once a month. With weekly meetings, it is easier for the staff to remember the details of the patient's problem and management.

4-16 What information should be collected for a perinatal mortality meeting?

In addition to discussing any perinatal deaths, a perinatal mortality meeting is often used to review the delivery data since the last meeting. Therefore, usually two sets of information are discussed. Firstly the minimal data set collected from the labour ward register (basic delivery information) is presented and discussed, and secondly any perinatal deaths are reviewed.

The minimal data set usually presented includes:

1. Number of normal, assisted and caesarean deliveries.
2. Number of maternal deaths, if any.
3. Number of live born infants, stillbirths and early neonatal deaths.
4. The mortality rates.

NOTE Often the number of major complications during labour and delivery (abruptions, post partum bleeds, eclampsia, etc) and reasons for caesarean section (fetal distress, obstructed labour, failed induction, etc) are also presented.

4-17 How should a perinatal death be presented?

1. The clinical record must be carefully summarised.
2. The summary is presented at the meeting.
3. Any points of uncertainty are clarified.
4. Each death is then discussed.

4-18 How are the deaths discussed at a perinatal mortality meeting?

1. The primary cause of all perinatal deaths and final cause of early neonatal deaths should be identified.
2. Any avoidable factors, missed opportunities or substandard care should be identified and discussed. Could the death have been prevented?
3. A management plan must be discussed and agreed upon which could prevent a similar death in the future.

All participants of the meeting should together identify the problems and find the best answers.

4-19 Why are good patient notes important?

When assessing the causes and avoidable factors in a perinatal death, it is essential that detailed, accurate maternal and newborn notes are kept. It is always important to keep good notes. The labour chart (partogram) and details of attempts to resuscitate the infant are particularly important. Cardiotocograms (CTGs) must not be discarded or lost, as they are an essential part of the notes.

4-20 In summary, what are the steps in managing a perinatal mortality meeting?

1. A time and venue must be agreed upon and the venue booked.
2. All relevant staff should be invited and every effort made to ensure that they attend.
3. A chairperson must be chosen to lead the meeting.
4. All the stillbirths and early neonatal deaths (and maternal deaths if any) must be identified.
5. Someone must be responsible for preparing and presenting the cases.
6. The clinical records of patients who have died must be found, read and summarised.
7. Summaries of the cases must be prepared for the meeting. They may be written or typed out with a copy handed to each participant or presented with an overhead projector.
8. It is best to use a standard form to present the summary of each case.
9. The minimal data set is presented and discussed.

10. The deaths are discussed after any errors in the summary are corrected.
11. A summary or record should be kept of the cases discussed and the conclusions agreed upon.
12. It is important to discuss the problem and *not* the staff involved.

Note that any maternal deaths are usually discussed at a perinatal mortality meeting rather than holding separate meetings to discuss only maternal deaths.

4-21 What problems may occur with perinatal mortality meetings?

1. Some staff involved in particular cases cannot attend.
2. Individual staff may feel threatened if problems of management are discussed.
3. Problems of confidentiality may occur.
4. It can become a witch hunt to find the staff who made a mistake.
5. Patient notes cannot be found or are incomplete.
6. The cases and data are not prepared properly.
7. Lessons learned are not used to improve care.
8. A summary is not written.

4-22 Is confidentiality important in a perinatal mortality meeting?

The content and discussion at the meeting should be confidential. Usually the identity of the patient is made known. However, the identity of the health care worker involved should be withheld at the meeting. Any handouts

used in the meeting are usually destroyed at the end of the meeting.

4-23 Should morbidity also be discussed at a mortality meeting?

It is very useful to discuss a few seriously ill patients who survived (morbidity), i.e. a 'near miss', as a lot can be learned from these examples. A 'near miss' is a case where the patient was very ill and nearly died. It helps to discuss 'near misses' when there are only a few deaths to discuss at a mortality meeting. Infants who have survived severe intrapartum hypoxia (fetal distress) are particularly useful to discuss as 'near misses'.

4-24 At which perinatal mortality meeting should referred patients be discussed?

All patients who die at a hospital or clinic must be included. However, if a mother or child is referred from a clinic or hospital and dies at another, that death should also be discussed at the clinic or hospital who referred the patient. Often the cause and avoidable factors took place before referral.

Stillbirths are usually recorded at the hospital where they deliver but early neonatal deaths should be counted together with the deaths at the clinic or hospital where the infant was born rather than where it died. For example, if an infant is born at a clinic and then is referred to a hospital where it dies, the death should be discussed both at the clinic and hospital but the death should be listed with the clinic deaths.

4-25 Should all perinatal deaths be discussed?

It is important that the number of deaths be presented and the causes and avoidable factors in all deaths agreed upon. However, if there are many deaths, there is often not enough time to discuss each in detail. Deaths with obviously avoidable factors must be discussed. Deaths where important lessons can be learned must also be included.

4-26 What is a 'great save'?

This is when a good diagnosis was made and good care prevented a maternal or perinatal death. As perinatal mortality meetings can become very depressing, it is helpful to mention a few 'great saves' as part of the meeting to emphasise the good care that was given.

4-27 Is a perinatal mortality meeting a good opportunity for teaching and learning?

It is a wonderful opportunity and excellent method of teaching and learning. When the cases are presented, the participants at the meeting should identify problems and errors in the management. They should also suggest what should have been done to avoid the problem or manage the problem better. Learning from ones' mistakes is very effective.

Using case histories from previous perinatal mortality meetings are often used to teach students in the classroom.

.....
Attending perinatal mortality meetings is an excellent way of learning how best to care for mothers and infants.

Perinatal mortality reports

4-28 What is a perinatal mortality report?

A perinatal mortality report provides a summary of all the deliveries and the circumstances associated with each perinatal death. The number of deaths, the frequency of each cause of death, and the number of each avoidable factor give an excellent idea of the problems in the service. This in turn indicates where changes and improvements are needed. Without this information it is very difficult to improve the standard of care. The report must give clear indications of the changes that are needed.

A perinatal mortality meeting is the ideal time to record the most likely cause of each death and any avoidable factors which may have prevented the death. This very important information must be recorded at each mortality meeting and a summary written so that the mortality report can be prepared. Usually an annual report is written although reports may be needed more frequently. The report should be made available to all members of the staff, especially the management.

Perinatal mortality meetings are only of limited value if a report is not prepared, as action to improve specific

aspects of care are usually based on the recommendation in the report.

.....
Regular reports must be prepared, based on the findings in the perinatal mortality meetings.

4-29 How is a perinatal mortality report prepared?

A special form must be used to record the main findings for each perinatal death discussed at a mortality meeting. This information is then used to compile a summary of deaths. The form should detail:

1. The patient's name together a summary of the relevant history, examination and investigations as well as the course of events.
2. After discussion the primary cause of each perinatal death should be recorded (together with the PPIP code).
3. Again, after discussion the final cause of each early neonatal death should be recorded (together with the PPIP code).
4. Any avoidable factors should be recorded

A very useful method of summarising all the information collected from mortality meetings is the Perinatal Problem Identification Programme (PPIP). Whenever possible, the PPIP code should be added to the primary and final cause of death as well as any probably or possibly avoidable factor.

The data collection sheet used at perinatal mortality meetings looks like the data entry screen of PPIP. This

makes the transfer of data from the perinatal mortality data sheet to PPIP a very simple task.

Perinatal problem identification programme (PPIP)

4-30 What is the perinatal problem identification programme?

The Perinatal Problem Identification Programme (PPIP) is a simple, user-friendly computer-based programme which presents a summary of the problems related to maternal and perinatal deaths. PPIP aims to reduce perinatal mortality. Once the basic perinatal data is entered, PPIP calculates and provides the following:

1. Perinatal care indices (e.g. stillbirth, early neonatal death and perinatal death rates).
2. Avoidable factors.
3. Low birth weight rate.
4. Weight specific perinatal mortality rates.
5. Perinatal care index.
6. Stillbirth: early neonatal death rate.
7. Outcome by birth weight category.

Once the information, which has been discussed at the perinatal mortality meetings, has been entered, PPIP produces a summary which reports what has happened over a period of time. However, PPIP is only a diagnostic tool which identifies the number of perinatal, neonatal and maternal deaths, classifies the causes of death and analyses avoidable factors. It helps to point the way to finding solutions to clinical problems but, by

itself, it cannot improve the standard of patient care. This has to be done by the health workers themselves.

Note that maternal deaths can also be entered as PPIP data. Then they can be analysed in the same way as perinatal deaths.

NOTE PPIP was developed in the 1990s in South Africa by the Medical Research Council (MRC) Unit for Maternal and Infant Health Care Strategies and has been extensively tested since 1996. It is based on the ICA Solution audit system (Identification of all deliveries and deaths/ Cause of deaths/ Avoidable factors/ Solution). It is similar to the Confidential Enquiry into Stillbirths and Deaths in Infancy (CESDI) used in the United Kingdom.

4-31 How is the data entered onto the Perinatal Problem Identification Programme?

The data is collected from the minimal data set in labour ward and the data sheets completed at each perinatal mortality meeting. This data is then entered onto the data section of PPIP. The space for each piece of data is clearly indicated by the headings. Once the data has been entered, PPIP automatically calculates all the results. If there are errors or missing data, PPIP will indicate this to you. The results can be displayed as numbers on the screen, printed or presented as graphics. Entering data onto PPIP is quick and easy.

4-32 What are the goals of the Perinatal Problem Identification Programme?

1. To identify the perinatal mortality rates.
2. To determine the causes of perinatal deaths in order to establish the pattern of disease.
3. To look for avoidable factors by examining each death.
4. To seek solutions.

4-33 Why is it important to establish the pattern of disease?

The pattern of disease will indicate what the major causes of death are. Similarly it is important to establish the pattern of avoidable factors. This information should be used to:

1. Plan what management is needed most urgently.
2. Decide on the best allocation of funding and resources.
3. Direct research to answer the most important problems.

Therefore, once the pattern of disease and avoidable factors are known, the most effective way to reduce mortality can be sought.

4-34 What is a feed back meeting?

Knowing the cause of death and identifying probable avoidable factors does not, by itself, prevent a similar death occurring in future. It does, however, help to plan ways to improve maternal and perinatal care. The information provided by mortality meetings and PPIP must now be given to the staff and community by way of feedback meetings. These meetings are an essential part of the programme to

improve care through learning how to better manage mothers and infants.

Feedback meetings make a difference because they empower health workers to review their management of patients and to re-evaluate their management protocols. Simply knowing that your care is being monitored and reviewed and that you are accountable to your patients will improve care.

.....
Feedback to health workers is an essential part of improving service.

4-35 How are the data gathering sites grouped?

If all the data from one or more perinatal services are entered, PPIP can separate the results into individual sites (e.g. clinics or hospital) or pool the data into services, districts, towns, rural areas or even provinces or nationally.

The perinatal data is divided into the following sites:

1. Metropolitan (new mega-cities) with access to tertiary care (intensive care).
2. Cities and towns with access to secondary (level 2) care.
3. Rural areas where mainly primary (level 1) care is available.

Perinatal information is grouped into provinces. Once information has been collected for a few years, changes over time can be investigated to show improving or deteriorating care.

In only a few areas, such as the metropolitan area of Cape Town, are all

deliveries in the public sector included (i.e. population based data).

4-36 What problems remain with the use of the perinatal problem identification programme in South Africa?

1. Data are still incomplete and inaccurate from some provinces.
2. Most of the information is being collected in cities and towns with few reports from rural areas.
3. No information is available from the large numbers of poor mothers who deliver without skilled assistance at home.
4. Only limited data are available from private hospitals.
5. Most of the information is not population based, i.e. it does not include all the deliveries in the area.
6. Data is collected from the site of delivery only and not the place of residence.

As a result, it is not known how many infants are delivered annually in South Africa. There are probably a million births. As the number of sites providing perinatal data increases, a more accurate estimate of both maternal and perinatal deaths will be made. This information is vital for rational planning.

4-37 How do results compare between different areas?

The perinatal mortality results vary widely between sites indicating that socioeconomic conditions and the standard of health care are very different.

1. In rural sites intrapartum hypoxia is a common primary cause of perinatal death indicating poor labour management and probably inadequate facilities for caesarean section and infant resuscitation.
2. In towns and cities spontaneous preterm delivery is a common identifiable primary cause of perinatal death suggesting that facilities for neonatal care are inadequate. Many of these mothers may have been referred from rural areas because of preterm labour. There were also many infants where the cause of death was unknown suggesting that the infants and their placentas were not carefully examined for signs of syphilis and poor fetal growth.
3. In metropolitan areas antepartum haemorrhage and hypertensive disorders were important, suggesting that these mothers had been referred from rural areas and towns and cities. Deaths due to intrapartum hypoxia were much lower in metropolitan areas than towns and cities and rural areas suggesting better labour and neonatal care.

As would be expected, a common final cause of neonatal death in rural areas is perinatal hypoxia while that in cities, towns and metropolitan areas is prematurity related.

NOTE Because perinatal information is collected at the place of delivery rather than the home address, referral patterns can bias the results.

4-38 What is the Saving Babies report?

The Saving Babies report presents the results of annual meetings which were started in 2000 to collate PIPP data and identify major areas of concern from sites all over South Africa. The findings and possible solutions offered are presented in Saving Babies reports. The latest report covers the period 2003 to 2006. The information on causes of death and avoidable factors are divided into results for large metropolitan areas (where tertiary care is available), cities and towns (where secondary care is available) and rural areas (where only primary care is available). In time it is hoped to obtain complete data from all regions and provinces.

The findings of the Saving Babies reports stress the high perinatal mortality rates and high rates of low birth weight infants in many areas.

NOTE The latest Saving Babies report can be accessed at www.ppip.co.za

Case study 1

The first perinatal mortality meeting is arranged in a new hospital in order to audit the service. Only the doctors working in the labour ward are invited and it is decided to discuss stillbirths but not neonatal deaths. Soon after the meeting starts, an argument breaks out over the management of a patient. As the patient's record is not available at the meeting, no one is certain what treatment was given. The meeting ends early as most of the doctors feel that it is a waste of their time.

1. What is an audit?

This is a careful review, evaluation or assessment of the perinatal service at the hospital. What patients have been delivered, how were they delivered, what deaths occurred, why did the patients die and could these deaths be avoided?

2. Who should be invited to a perinatal mortality meeting?

All the staff (nurses and doctors) who work in that service. In a hospital the nurses and doctors working in labour ward, antenatal and postnatal wards and the newborn nursery should be invited.

3. Should only stillbirths be discussed?

No. It is important that both stillbirths and neonatal deaths are discussed.

3. How can you prevent one staff member accusing another of poor care?

It is important that the discussion should be about the care of the patient and not who was responsible for any incorrect care. Disciplining of staff, if it becomes necessary, must be done privately and never at a perinatal mortality meeting.

4. What is the aim of a perinatal mortality meeting?

It is a meeting where management problems are identified and avoidable factors looked for. The aim is to prevent

similar problems in other patients and, thereby, improve the standard of care.

5. Should maternal deaths also be discussed at a perinatal mortality meeting?

Yes. All maternal deaths and perinatal deaths (stillbirths and early neonatal deaths) should be discussed. Although the meetings are commonly called perinatal mortality meetings, they are in fact combined maternal and perinatal mortality meetings. Fortunately, maternal deaths are far less common than perinatal deaths, therefore perinatal meetings are mostly about perinatal deaths.

6. Why should the patient's notes be taken to the meeting?

It is important to have a record of management to avoid any uncertainty. A brief summary of the patient record should be made before the meeting and made available to all who attend. In this way, the management given is clear to all the participants.

Case study 2

A monthly perinatal mortality meeting is arranged at a busy urban clinic. At the meeting the cause of each death was looked for. However, avoidable factors were not discussed as some of the nurses felt threatened. It was decided that infants who were referred to hospital and died there need not be discussed. If there were no deaths during the month, the meeting was usually cancelled.

1. How often should a perinatal meeting be held?

It depends on the number and frequency of perinatal deaths. Most clinics and smaller hospitals hold monthly meetings. If the meetings are held less frequently, the staff often cannot remember the cases. In larger hospitals it is best to have a mortality meeting every week.

2. Why is it important to look for avoidable factors?

Because this is the best way of preventing similar deaths in future. Avoidable factors, missed opportunities and substandard care must be identified whenever possible. This the best way of learning how not to make mistakes.

3. Should the name of the staff member who cared for a patient be made known?

It is best not to mention the names of the staff involved. The aim is to find the cause of death and any avoidable factors and not to hold a 'witch hunt'. Otherwise the staff will not attend the meeting or co-operate. Disciplining of staff must never be done in front of their colleagues, especially not at a mortality meeting.

4. Should an infant who is born at a clinic, but dies after transfer to hospital, be discussed?

All infants who are born at a clinic or hospital but die after referral must be discussed at the clinic perinatal mortality meeting as the cause of the death and avoidable factors can often be found in the management before

transfer. These infants are counted with the clinic deaths. Usually they are also discussed at the hospital perinatal mortality meeting but their deaths are not counted with the hospital deaths.

5. Should the meeting be cancelled if no deaths have occurred?

It is important to hold regular meetings even if there are no deaths to discuss. Interesting problems, sick patients who survived (morbidity) or 'great saves' can also be discussed. Anyway, it is important to review all the referred infants and the delivery data since the last meeting.

6. Is there time to teach at a perinatal mortality meeting?

Just attending the meeting should be a learning experience, especially if the participants can jointly spot the clinical problems and management errors. All the staff can learn from the discussion. The meeting can be an opportunity for teaching, especially if there are topics which staff want to learn about.

Case study 3

During a perinatal mortality meeting the causes of death and avoidable factors are carefully recorded and entered onto the PPIP data sheets. The staff are told they will receive a summary of the PPIP data at a feedback meeting.

1. What does 'PPIP' stand for?

PPIP stands for the Perinatal Problem Identification Programme. This is a simple, user-friendly computer-based system where the important maternal

and perinatal data are entered and calculations, such as the perinatal mortality rate, avoidable factors and low birth weight rate are given. PPIP identifies the number of perinatal deaths, classifies the causes and analyses avoidable factors.

2. What is the aim of PPIP?

To lower the perinatal mortality rate. PPIP helps nurses and doctors find solutions to perinatal problems.

3. Can any clinic or hospital use PPIP?

Yes. Any clinic or hospital that delivers mothers and cares for their infants should use PPIP. It is easy to learn how to enter data with PPIP.

4. What is a feedback meeting?

The findings of the perinatal mortality meetings and the analyses made by PPIP must be made available to all the staff at a feedback meeting. Regular feedback to the staff should form part of the perinatal mortality meetings. Annually, or more frequently, a special feedback meeting should be arranged to review the service.

Case study 4

At a monthly mortality meeting the number of vaginal, assisted and caesarean deliveries is reported. In addition the indications for the caesarean sections are given together with the number of serious complications such as placental abruptions. One maternal death due to eclampsia, 6 stillbirths and 2 early

neonatal deaths are presented. One stillbirth was due to untreated syphilis, 2 due to fetal hypoxia during labour and the remaining 3 were macerated with no obvious cause. The 2 neonatal deaths were very immature infants weighing less than 1000 g.

1. Why is it important to present the number of deliveries at a perinatal mortality meeting?

Because it is important to review the workload and the method of deliveries. Too many or too few caesarean sections may indicate that the incorrect method of delivery is being offered to many mothers. This may be a cause of mortality or morbidity.

2. Should the indications for caesarean sections and major labour complications be discussed?

In a busy hospital it is important to be sure that the correct indications for caesarean and assisted deliveries are being used. The incorrect method of delivery may be a cause of perinatal death. Recurring pregnancy or labour complications, such as eclampsia, may indicate incorrect care.

3. Why is it important to identify the probable cause of stillbirth?

Because complications such as congenital syphilis are preventable. It is important to find out why this mother with syphilis was not correctly treated and what were the avoidable factors. In this way other deaths due to syphilis may be prevented.

4. What can be learned from a stillbirth due to fetal hypoxia in labour?

The details of the case should be described so that the participants at the mortality meeting can decide whether the fetal condition was correctly monitored and whether the death could have been avoided. For example, fetal heart rate deceleration may have been missed or meconium stained liquor ignored.

5. Can macerated stillbirth be prevented?

If all the information is available, avoidable factors such as no serology screening for syphilis, poor fetal movements for the past week or poor symphysis-fundal growth may be identified as avoidable factors. These are examples of how regular mortality meetings can improve patient care and also provide a very valuable learning opportunity for the staff.

6. Why is it important to discuss the early neonatal deaths of very small infants?

Because there may have been avoidable factors which resulted in preterm delivery. Complications of pregnancy such as diabetes or hypertension may have been responsible. If they were correctly managed, it may have been possible to continue the pregnancy until the infant was viable. It is only by discussing each perinatal death that complications of pregnancy and labour can be better diagnosed and managed in future.

PIIP classifications of perinatal deaths

These are included as a reference only.

The primary causes of stillbirth and early neonatal death

The most important subdivisions are:

1. Spontaneous preterm labour (labour before 37 weeks gestation)

- Idiopathic (no obvious cause found).
- Preterm labour with chorioamnionitis)
- Preterm prelabour rupture of the membranes (with no obvious chorioamnionitis).
- Preterm prelabour rupture of the membranes (with obvious chorioamnionitis)
- Cervical incompetence.

2. Infections

- Syphilis.
- Amniotic fluid infection (severe chorioamnionitis).
- Malaria.

3. Antepartum haemorrhage

- Abruptio placenta (without hypertension).
- Abruptio placenta (with hypertension).
- Placenta praevia.

4. Intrauterine growth restriction (infant underweight for gestational age, usually with wasting and fetal hypoxia)

- 'Idiopathic' (maternal underweight, smoking, alcohol,

or cause unknown but excluding hypertension).

- Post term (gestation beyond 42 weeks).

5. Hypertension

- Proteinuric hypertension (pre-eclampsia).
- Chronic hypertension.
- Eclampsia.

6. Fetal abnormality

- Subdivided into organ systems (e.g. central nervous system).
- Multiple abnormalities (may be recognisable syndromes)
- Chromosomal abnormality (e.g. Down syndrome).
- Non-immune hydrops.

7. Trauma

- Stuck breech (dies of hypoxia).
- Trauma due to assisted delivery (forceps or vacuum).
- Ruptured uterus.
- Motor vehicle accident or personal assault.

8. Intrapartum hypoxia

- Labour related (prolonged labour, cephalopelvic disproportion, hypertonic uterus).
- Meconium aspiration.
- Cord prolapse.
- Cord around the neck (3 or more times).

9. Maternal disease

- Diabetes mellitus.
- Cardiovascular.

10. Unexplained intra-uterine death

- Macerated.
- Fresh.

The final causes of neonatal death

The most common subdivisions are:

1. Prematurity related (born too soon)

- Extreme immaturity (less than 28 weeks or 1000 g and usually die of repeated apnoea).
- Hyaline membrane disease (died of respiratory distress).
- Necrotising enterocolitis (usually seen in preterm infants).
- Intraventricular haemorrhage.

2. Birth asphyxia (most have fetal hypoxia)

- Asphyxia (fail to breathe adequately after delivery).
- Hypoxic ischaemic encephalopathy.
- Meconium aspiration (resulting from fetal hypoxia).
- Persistent fetal circulation (persistent pulmonary hypertension).

3. Infection (acquired before, during or after delivery)

- Septicaemia.
- Pneumonia.
- Congenital syphilis.
- HIV infection/AIDS.

4. Congenital abnormalities

- Subdivisions into organ systems, e.g. central nervous system.
- Chromosomal abnormalities, e.g. Down syndrome.
- Biochemical abnormalities, e.g. severe hypoglycaemia.

5. Trauma (during delivery)

- Sites such as subaponeurotic haemorrhage.

6. Other

7. Unknown

A more detailed classification of primary causes of perinatal death is given in the Perinatal Problem Identification Programme (www.ppip.co.za). Each subdivision is given a specific code. Maternal mortality data can also be entered in a similar fashion.

5

Finding solutions to maternal and perinatal mortality

Before you begin this unit, please take the corresponding test to assess your knowledge of the subject matter. You should redo the test after you've worked through the unit, to evaluate what you have learned.

Objectives

When you have completed this unit you should be able to:

- Find solutions to the common causes of maternal and perinatal deaths.
- List the potentially avoidable causes of maternal death.
- Take steps to prevent maternal death.
- List the potentially avoidable causes of perinatal death.
- Take steps to avoid the primary causes of perinatal death.
- Improve the care of newborn infants.

Finding solutions

5-1 How can you find solutions to maternal and perinatal deaths?

There are a number of steps which are needed:

1. Specific avoidable factors, missed opportunities and substandard care have to be identified.
2. You need to know where and how to look for answers to these problems.
3. Answers have to be found.
4. Changes have to be introduced.

5-2 What is an avoidable factor?

An avoidable (or modifiable) factor is something which may have prevented the death, e.g. a woman not immediately going to a clinic or hospital when abdominal pain with vaginal bleeding occurs during pregnancy.

Many avoidable factors are due to missed opportunities.

.....
An avoidable factor may have prevented a death.
.....

5-3 What is a missed opportunity?

A missed opportunity is a chance to provide the correct care which was not taken. The opportunity was there to provide the correct management but the opportunity was missed, e.g. failing to measure the blood pressure at

an antenatal visit or not screening for syphilis.

NOTE A missed opportunity is when an action or omission by the patient, administration or health worker results in an adverse outcome for the mother or infant.

5-4 How can you recognise substandard care?

Substandard care means that the care that the patient received fell below the standard that should have been offered to her. It is necessary to know what correct care is before substandard care can be recognised. Care may be substandard because of any of the following:

1. The patient did not go for care.
2. The facilities were inadequate.
3. Shortage of staffing or poor staff training.
4. Staff did not provide the correct care needed.

Substandard care often leads to avoidable factors and missed opportunities. Therefore, substandard care, avoidable factors and missed opportunities are usually considered together as problems resulting in poor care. Typical examples of substandard care are not monitoring the fetal heart during labour and not suctioning the mouth of a meconium stained infant before delivering the shoulders.

5-5 How are problems and avoidable factors identified?

Answers cannot be found before the problems and avoidable factors are identified. As problems (i.e. causes of

maternal and perinatal deaths) differ between different services, hospitals or clinics, the particular problems have to be identified for each service, hospital or clinic. The avoidable factors associated with each problem may also vary between services, hospitals or clinics.

Regular mortality meetings are an excellent way of identifying problems and avoidable factors.

5-6 How can avoidable factors be classified?

Avoidable factors can usually be classified into one of three groups:

1. Patient related factors.
2. Health worker related factors.
3. Administrative related factors.

For example, if a fetus or newborn infant dies of congenital syphilis and the mother failed to attend antenatal care, then the avoidable factor would have been patient related. However, if the mother attended the antenatal clinic but the health care worker failed to screen her for syphilis or failed to collect the result and treat her, then the avoidable factor would have been health worker related. Finally, if the mother attended antenatal clinic and the health worker wanted to screen her for syphilis but either transport or the facilities to perform the test were not available, then the avoidable factor would have been administrative related.

Some avoidable factors are obviously the cause of a maternal or perinatal death while other avoidable factors may have contributed to the death. Therefore, avoidable factors can be divided into probable and possible factors. Probable

avoidable factors are most important. Often more than one probably avoidable factor will be present.

In addition, some substandard care may not be related to the death of an infant. This poor care can still be discussed at a perinatal mortality meeting although it will not be included as an avoidable cause of infant death.

5-7 How can avoidable factors related to health workers be subdivided?

1. An honest error, e.g. overestimating the gestational age.
2. An oversight, e.g. forgetting to measure the blood pressure.
3. A serious deviation from the accepted practice, e.g. failing to see the patient when called to do so.

5-8 Why is it important to identify the specific avoidable factor?

Only when the specific avoidable factor or missed opportunity has been identified can steps be taken to prevent similar deaths in future. If one does not know why the care was substandard, it would be very difficult to solve the problem. Finding avoidable factors is an important step in improving care.

5-9 Where can you look for answers?

There are many sources where answers can be found once the problem has been identified. Some answers are easy to find. Unfortunately some problems still do not have easy or effective answers, e.g. how to prevent pre-eclampsia.

Answers can usually be found:

1. By consulting colleagues, especially those at referral hospitals.
2. In standard textbooks or journals.
3. In training programmes, such as the Perinatal Education Programme.
4. By attending courses.
5. In local management protocols.
6. In provincial or national guidelines.
7. On the internet.

5-10 What changes should be made to reduce mortality rates?

Changes may be needed in a number of different areas:

1. Changes in the general community, e.g. better housing, education and income.
2. Changes may be needed in antenatal care, e.g. better booking rates, improved screening for hypertension and proteinuria.
3. Better patient education, e.g. the importance of being aware of fetal movements and danger signs in pregnancy.
4. Improved facilities and staff numbers.
5. More continuing training for health workers.
6. Adequate public transport and ambulance services.

5-11 How can these changes be made?

Once answers are found, there are number of steps which can be taken to introduce changes:

1. Notifying the health authorities.
2. Altering protocols in clinics and hospitals.
3. Improving the frequency and content of training programmes.

4. Involving the community.

However, it is not always easy to introduce the changes needed to reduce mortality. A clear idea of what changes are needed together with the ability to win the co-operation of the authorities and colleagues are essential.

Avoidable factors associated with maternal deaths

5-12 Can maternal deaths be prevented?

Yes. In almost half of the maternal deaths there was an avoidable factor (missed opportunity for preventing that death or substandard care). Avoidable factors were far more common for direct causes (e.g. postpartum haemorrhage) than indirect causes (e.g. AIDS). The maternal mortality rate is still far too high in South Africa.

NOTE Information on causes of maternal death and avoidable factors is taken from the *Saving Mothers 2002–2004: Third report on confidential enquiries into maternal deaths in South Africa*.

5-13 What specific patient related avoidable factors are associated with maternal death?

1. No, late or inadequate antenatal care.
2. Delay in seeking help during labour.
3. Not recognising danger signs and symptoms.
4. Self-induced termination of pregnancy.

5-14 What specific health worker related avoidable factors are associated with maternal death?

1. Failure to follow management protocols.
2. Failure to adequately resuscitate acutely ill women.
3. Inadequate anaesthetic experience.
4. Poor record keeping.
5. Delay in referral to a level 1 or 2 unit.

5-15 What specific administrative related avoidable factors are associated with maternal death?

1. Lack or delay of transport.
2. Lack of intensive care facilities and theatres.
3. Lack of enough, well trained midwives and medical officers.
4. Poor communication between health workers.
5. Lack of management protocols.
6. Inadequate supply of blood.

5-16 How can patient related factors be addressed?

Every effort must be made to get women to attend an antenatal care clinic from the time that pregnancy is confirmed. They must also be educated to recognise danger symptoms and signs and report immediately to a clinic or hospital as soon as these present:

1. All pregnant women should be referred to an antenatal clinic as soon as their pregnancy is confirmed. This message should be made known to all general practitioners and other health care professionals.

2. Pregnant women should plan to be delivered by a skilled attendant and not at home by a family member.
3. Schools, community organisations, radio, newspapers, magazines and TV should stress the importance of early antenatal care and the common danger signs in pregnancy.

Patient related factors often depend on the family and community. For example, a husband or mother-in-law may prevent a pregnant woman going to the clinic or hospital as soon as labour starts, or transport may not be available at night.

.....
Every effort must be made to provide good, early antenatal care to all pregnant women.

5-17 What can be done to improve the care provided by health workers?

1. Ensure patient access to adequately staffed and equipped maternity services.
2. Easily understandable management protocols are essential.
3. Simple referral guidelines are essential.
4. A culture of 'patient friendly' care must be developed in all health services.
5. A system of good record keeping is essential.
6. Basic training must be improved and on-going 'in-service' education provided.
7. Adequately staffed facilities for termination of pregnancy, antenatal and labour care must be made available in all districts.

8. Provide good patient transport and telephone or radio communication.

Preventing maternal deaths

5-18 What are the key recommendations to prevent maternal deaths?

1. Clearly understood protocols are needed to manage conditions which commonly result in maternal deaths.
2. A simple set of referral criteria is needed.
3. Adequate staffing and equipment norms are needed and must be implemented.
4. The partogram must be used to monitor every labour.
5. Blood and regional anaesthesia must be available at all institutions where caesarean sections are performed.
6. Midwife Obstetric Clinics (nurse base primary care clinics) must be established in urban areas.
7. Termination of pregnancy services must be expanded.
8. Family planning services must be supported especially for women over 30 years or with five or more children.
9. A national HIV/AIDS policy must be widely implemented.

5-19 Should every maternal death be reported?

Yes. The routine reporting and a confidential enquiry into maternal deaths must be expanded to include all maternal deaths, especially in districts,

regions and provinces where maternal deaths are still under reported. It is important to include all maternal deaths from private hospitals and the deaths that occur at home. Only when the majority of maternal deaths are reported can a reliable estimate of numbers, causes and avoidable factors be obtained.

5-20 What national HIV/AIDS policy is needed for pregnant women?

1. Guidelines on how to manage pregnant women who are HIV positive must be implemented in all districts.
2. HIV counselling, testing and prophylactic antiretrovirals must urgently be made available at all antenatal clinics in order to reduce the risk of mother-to-child transmission of HIV.
3. Contraceptive advice and the option of terminating the pregnancy should be available.
4. All clinics and hospitals have an obligation to their staff to ensure that the training and equipment is available to prevent HIV transmission to their staff (e.g. gloves, plastic aprons, glasses or masks, blunt-tipped needles, skin clips and sharps containers).
5. CD4 screening must be done on all pregnant women who are HIV positive
6. Combination antiretroviral treatment and prophylactic co-trimoxazole must be made available to all HIV positive pregnant women who meet the clinical or immunological criteria.

Avoidable factors associated with perinatal deaths

5-21 Can perinatal deaths be prevented?

Yes. In about a quarter of perinatal deaths there was a missed opportunity for preventing that death. The commonest avoidable factors are patient related. Unfortunately an avoidable factor often cannot be identified because of poor notes.

.....
The commonest avoidable factors in perinatal death are patient related.

NOTE In the 2003-6 Saving Babies report 16% of avoidable factors were patient related, 15% health worker related and 67% administrative related.

5-22 What are the important patient related factors associated with perinatal death?

The commonest patient related factors are:

1. No attendance, late attendance or irregular attendance for antenatal care.
2. Inadequate response to decreased fetal movements.
3. Inadequate response to rupture of the membranes.
4. Inadequate response to antepartum haemorrhage.
5. Delay in seeking medical attention in labour.

Failing to book early and then regularly attend antenatal care is the commonest patient related factor associate with perinatal death. Little understanding of the importance of antenatal care, long distances to the clinic and inadequate public transport all play an important role in poor attendance for antenatal care.

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Inadequate antenatal care is the commonest patient related factor associated with perinatal death.
.....

Because of poor antenatal clinic attendance, complications of pregnancy such as hypertension, decreased fetal growth and syphilis are not identified and managed.

5-23 What are the important administrative related factors associated with perinatal death?

1. Transport delays in getting the patient between health institutions, e.g. getting a patient from a clinic to a hospital.
2. Lack of adequate screening for syphilis.
3. Too few staff or inadequately trained staff.
4. Inadequate facilities, especially theatre and neonatal care facilities.

.....
Inadequate transport to hospital is the commonest administrative related factor associated with perinatal death.
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5-24 When are health worker related factors associated with perinatal death?

Health worker related factors may be divided into:

1. Antepartum factors (during pregnancy).
2. Intrapartum factors (during labour).
3. Neonatal care factors (care of the infant after delivery).

5-25 What are the important health worker related factors during antenatal care that are associated with perinatal death?

1. No response to a poor past obstetric history.
2. Over or underestimating fetal size.
3. No response to poor uterine growth.
4. No response to poor fetal movement.
5. No response to hypertension.
6. Multiple pregnancy not diagnosed.
7. No response to syphilis serology.
8. No response to glycosuria.
9. No response to post term pregnancy.

.....
No response by health workers to antenatal warning signs is a common avoidable factor associated with perinatal death.
.....

5-26 What are the important health worker related factors during labour that are associated with perinatal death?

1. Partogram not used.
2. Fetus not adequately monitored.
3. Signs of fetal distress not interpreted correctly or ignored.

4. No response to poor progress of labour.
5. Prolonged second stage not managed correctly.
6. Delay in calling a doctor or referring the patient.

.....

Inadequate fetal monitoring is the commonest health worker related factor associated with perinatal death during labour.

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5-27 What are the important health worker related factors during neonatal care that are associated with perinatal death?

1. Inadequate resuscitation.
2. Inadequate monitoring or management plan.
3. Delay in calling for assistance or transferring the infant to a level 2 or 3 unit.

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Inadequate resuscitation of the newborn is an important avoidable cause of perinatal death.

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5-28 Which primary causes of neonatal mortality urgently need solutions?

The three main primary causes of neonatal mortality are:

1. Spontaneous preterm delivery.
2. Intrapartum hypoxia.
3. Infection.

Preventing perinatal mortality

5-29 Can perinatal mortality be prevented?

Yes. Many perinatal deaths can be prevented:

1. We know that the perinatal mortality rate in South Africa is far too high.
2. We know what the major causes are.
3. We have identified many of the avoidable factors.
4. We know how to manage most of these problems.

All that we now need is a clear plan of action and the will to make the plan work.

.....

With simple, good management many of the perinatal deaths can be prevented.

.....

5-30 What should be done to reduce the perinatal mortality rate during pregnancy?

There are many avoidable factors which can be addressed to reduce the perinatal mortality. The most important are:

1. Early booking, preferably at the time that pregnancy is diagnosed.
2. On-site screening for syphilis and early treatment.
3. Clear protocols for good routine antenatal care and indications for referral.
4. Fetal growth monitoring using symphysis-fundal height measurements correctly.

5. Teaching mothers to monitor fetal movements.
6. Teaching mothers the danger signs of complications.

5-31 What should be done to reduce the perinatal mortality rate during labour?

1. Correct use of the partogram in all labours.
2. Correct method of monitoring the fetal heart rate.
3. Clear protocols of management.
4. Indications for referral.
5. Adequate equipment that is maintained in good working order.

5-32 What should be done to reduce the perinatal mortality rate after delivery:

1. Early diagnosis of birth asphyxia (not breathing well after delivery).
2. Knowledge, skills and equipment for good resuscitation.
3. Keep infants dry and warm.
4. Kangaroo mother care.
5. Weigh all infants to identify low birth weight infants.
6. Good basic newborn care.
7. Breastfeeding (preferably exclusive breastfeeding).

It is essential that the facilities, necessary equipment, management protocols and adequate numbers of well trained health workers are available at each clinic and hospital. It is every woman's right to have a safe delivery.

5-33 Why do some infants die of intrapartum hypoxia?

Intrapartum hypoxia means that the fetus did not receive enough oxygen

before delivery (usually during labour). The main reasons for fetal hypoxia are:

1. Placental abruption.
2. Prolonged or obstructed labour.
3. Fetal growth restriction or wasting (poor fetal growth or weight loss).
4. Maternal disease, e.g. pre-eclampsia, diabetes and syphilis.
5. Prolapsed umbilical cord.

The infant may also developed hypoxia after delivery if they breathe poorly and are not well resuscitated.

5-34 What can be done to reduce the risk of fetal hypoxia?

Every effort should be made to prevent fetal hypoxia, and detect fetal distress as soon as it develops. Careful monitoring of the fetal condition and the progress of labour is essential. The partogram must be used correctly to detect poor progress of labour.

Fetal hypoxia presents with the signs of fetal distress, i.e. meconium stained liquor and late fetal heart rate decelerations (and poor beat-to-beat variability on the cardiotocogram).

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Correct use of the partogram with careful fetal monitoring is essential.

5-35 How can monitoring of the fetal heart rate during labour be improved?

It is impractical to have a cardiotocograph (CTG) recorder in every labour ward. Therefore, the fetal heart must be monitored with an

ordinary stethoscope, a fetal stethoscope or a hand held Doppler ultrasound fetal heart rate monitor (a 'Doptone'). An ultrasound fetal heart rate monitor is by far the best as the fetal heart is often difficult to hear with an ordinary stethoscope or fetal stethoscope.

The fetal heart rate must be counted before contractions (to determine the baseline heart rate) and again during and at the end of a contraction (to detect any early or late decelerations). Late decelerations are caused by fetal hypoxia and indicate fetal distress. In a low risk labour, the fetal heart should be monitored every at least every hour.

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Late decelerations must be carefully listened for.

5-36 What can be done to prevent hypoxia after delivery?

The most important cause of hypoxia in the newborn infant is failure to establish good respiration after birth (neonatal asphyxia). This results in a 1 minute Apgar score of less than 7. It is essential to detect neonatal asphyxia early and to resuscitate the infant well. Everyone delivering a newborn infant must be able to provide basic resuscitation, especially bag and mask ventilation. Oxygen is not necessary for resuscitation.

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The most important step in newborn resuscitation is bag and mask ventilation.

5-37 What can be done to decrease the mortality of preterm infants?

While it is difficult to prevent preterm delivery, a lot can be done to prevent the early neonatal death of preterm infants:

1. Anticipation

- Giving betamethasone to the mother for 48 hours before delivery to promote lung maturity.
- Deliver the mother in a level 2 or 3 hospital.

2. Early recognition of neonatal asphyxia and good resuscitation

- Apgar score.
- Bag and mask ventilation if needed.

3. Initial newborn care

- Prevention of hypothermia by drying the infant and providing a warm environment.
- Routine use of vitamin K (Konakion) to prevent haemorrhagic disease of the newborn.
- Screen for hypoglycaemia with reagent strips.
- Sample gastric aspirate at delivery for bubbles test and Gram stain.

4. Ongoing care

- Prevent hypoglycaemia by early milk feeding (or intravenous fluids if necessary).
- Preventing infection by hand washing before handling infants.
- Use breast milk.
- Use of kangaroo mother care.
- Safe transfer to a regional neonatal unit if required.

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As the prevention of preterm labour is often not possible, every effort must be made to give preterm infants better care.

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5-38 How can Kangaroo Mother Care prevent neonatal deaths?

Kangaroo Mother Care (skin-to-skin care) keeps the infant warm, promotes bonding and breast feeding, reduces the risk of serious infection, and allows for earlier discharge. It is a simple, natural and cheap way of caring for small infants. It is very effective and significantly reduces the neonatal mortality of small infants, especially in poorly equipped facilities.

5-39 How can infection of the fetus be prevented?

1. On-site screening all pregnant women for syphilis at their first antenatal visit. Usually the syphilis rapid test or RPR card test is used to screen for syphilis. Treatment must be started immediately.
2. All young girls must be immunised against rubella before they reach puberty.
3. Every effort must be taken to prevent the heterosexual spread of HIV. There is a particularly high risk of spread of HIV to the fetus if the mother becomes infected during pregnancy.
4. Aseptic technique must be used during vaginal examinations.
5. Prolonged rupture of the membranes should be avoided if possible.

5-40 What can be done to prevent infection during labour?

1. Using an aseptic technique during vaginal examinations.
2. Do not perform unnecessary vaginal examination in labour.
3. Antiretroviral drugs for HIV positive women.

5-41 How can bacterial infection of the newborn infant be prevented?

1. Breast feeding, especially exclusive breast feeding from the time of delivery.
2. Wash or spray hands before handling an infant.
3. Kangaroo mother care.
4. Good cord care.
5. Prophylactic eye care with chloramphenicol (Chloromycetin) ointment after birth.
6. Discharge the infant home as soon as possible.

5-42 How can the risk of mother-to-child transmission of hiv be reduced?

1. Antiretrovirals (AZT plus nevirapine) can reduce the risk of HIV transmission to less than 5%. Use antiretroviral treatment when indicated.
2. The risk of passing on HIV after delivery can be prevented with formula feeds and significantly lowered with exclusive breast feeding.
3. HIV negative women must be warned against the danger of HIV infection during pregnancy and while they are still breast feeding.
4. Elective caesarean section reduces the risk of HIV transmission during labour and delivery. This is

usually not necessary with good antiretroviral prophylaxis.

5. Avoid prolonged rupture of the membranes when possible.
6. Avoid unnecessary episiotomies.

5-43 What can health administrators do to reduce perinatal mortality?

1. Ensure accessible maternity care facilities.
2. Basic equipment and facilities must be made available.
3. Adequate numbers of staff are essential.
4. Staff rotation must be stopped to build up a core of experienced midwives.
5. Doctors and nurses should work as a team with clear management protocols.
6. Midwives' opinions should be respected.
7. Continuing staff training is essential.
8. A minimal data set must be collected and regular perinatal audit meetings arranged.
9. A good transport and referral system must be set in place.

.....
An adequate number of well trained staff are essential to reduce both maternal and perinatal mortality.

Case study 1

A young woman presented at an antenatal clinic for the first time at 36 weeks of gestation, complaining of severe headache for two days. She was told to wait her turn but an hour later

had a generalised convulsion. When she was found to be hypertensive, eclampsia was diagnosed. She was given an injection of phenobarbitone and an ambulance was ordered to transfer her to hospital. The referral hospital was not contacted. Unfortunately the ambulance was delayed. While waiting for the ambulance she had another convulsion and died.

1. What patient related factors are associated with this avoidable maternal death?

The woman booked very late for antenatal care. If she attended antenatal care from early in her pregnancy, she may have learned that severe headache was a danger sign and that she should have reported immediately to the clinic. Hypertension and proteinuria may also have been detected at an earlier visit.

2. What errors did the staff make?

There were a number of health worker related factors which were associated with this woman's death. She should have been seen immediately but her severe headache was not recognised as a danger sign. The correct management protocol for convulsions was not followed and phenobarbitone was given instead. The staff should have discussed the problem with the referral hospital.

3. Were there any administration related factors associated with her death?

Yes. Transport was inadequate. The staff may also have been inadequately trained and there may not have been a management protocol for eclampsia.

4. How can early attendance for antenatal care be encouraged?

Schools, community organisations, radio, newspapers, magazines and TV should be used to inform the general public, and young women especially, about the importance of antenatal care.

5. What can be done to improve the care provided at an antenatal clinic?

The clinic staff must be well trained and must develop a culture of 'patient friendly' care. Clear management protocols and referral criteria are essential, and they must communicate with their referral hospital if patients need to be referred.

6. How can the administration prevent similar maternal deaths at clinics?

Adequate staffing and facilities, good communication and transport must be provided. Ideally, each community should be within reach of a clinic.

Case study 2

In a review of potentially avoidable causes of perinatal death in an urban health service, a case study is discussed. The woman presented in labour and reported poor fetal movements for the past two days. A partogram was not used as a short labour was expected. The fetal heart was recorded every 4 hours. After a prolonged second stage with meconium stained liquor, a fresh stillborn infant was delivered by the midwife. The doctor had not been called.

1. During this woman's pregnancy were there any patient related avoidable factors associated with the stillbirth?

Yes. The mother should have come to the clinic when she first noticed that the fetal movements had suddenly decreased. Failure to report important danger signs in pregnancy remains a common patient related factor in perinatal deaths.

2. Should a partogram have been used to monitor labour?

Yes. A partogram should always be used. Not using a partogram at all, or failing to use a partogram correctly, is a common health worker related factor in potentially avoidable perinatal deaths. The condition of the mother and fetus, as well as the progress of labour, should have been carefully assessed at regular intervals. If this had been done correctly the stillbirth may have been avoided.

3. During the second stage of labour, what were the health worker related factors associated with the stillbirth?

With meconium stained labour and a history of poor fetal movements, the fetal heart rate should have been very closely monitored (every half hour). In addition, the second stage of labour should not have been allowed to become prolonged. The doctor should also have been called. Important health worker related factors during labour, which are associated with perinatal deaths, include poor monitoring of the fetus, failure to detect fetal distress and poor response to fetal distress. Inadequate monitoring during labour

is the commonest health worker related factor associated with perinatal deaths.

4. What health worker related factors during neonatal care are associated with perinatal death?

Inadequate resuscitation, poor monitoring of the infant, no management plan and a delay in calling for help. Inadequate resuscitation is a major preventable cause of early neonatal death.

5. What are the three primary causes of neonatal death which urgently need to be addressed in South Africa.

Spontaneous preterm labour, intrapartum hypoxia and infection. The case is an example of intrapartum hypoxia.

Case study 3

After reading the summary of early neonatal deaths in a large teaching hospital, the doctor in charge of newborn care decided that something drastic had to be done to reduce the unacceptably high early neonatal mortality rate. He called all the nursing and medical staff together to discuss the problem and make suggestions to prevent further deaths.

1. Can early neonatal deaths be prevented?

Yes. With simple, good management many early neonatal deaths can be prevented.

2. What is needed to prevent most early neonatal deaths?

Common causes of death and the important avoidable factors need to be identified. Then a clear plan to manage these common problems must be drawn up. As these are already available, all that is now required is the will to make the plan work.

3. What can be done during pregnancy to reduce the early neonatal death rate?

1. Encourage early booking and practice good antenatal care.
2. Screen for and treat syphilis.
3. Monitor fetal growth and fetal movements.
4. Teach pregnant women the danger signs.

Good antenatal care to prevent, detect and manage problems with the fetus should be made available to all pregnant women. It is better and cheaper to prevent than to treat a neonatal problem.

4. What should be done after delivery to reduce the early neonatal mortality rate?

1. Diagnose and treat asphyxia.
2. Keep infants warm and dry, preferably with kangaroo mother care.
3. Weigh all infants to identify low birth weight infants who may need extra care.
4. Promote exclusive breastfeeding.
5. Provide good basic newborn care.

5. How can monitoring the fetal heart during labour be improved?

Staff must be taught to listen to and count the fetal heart rate between and immediately after the end of contractions in order to detect late decelerations. The fetal heart must be clearly heard, with a Doptone if necessary.

6. What simple steps can be done after delivery to prevent infection in the newborn infant.

1. Encourage exclusive breastfeeding.

2. Wash or spray hands before examining an infant.
3. Promote kangaroo mother care.
4. Give prophylactic cord and eye care.

7. How can the mother-to-child transmission of HIV be reduced?

1. Offer HIV screening to all pregnant women.
2. Antiretroviral drugs can halve the risk of HIV transmission to the infant.
3. Exclusive breast or exclusive formula feed.