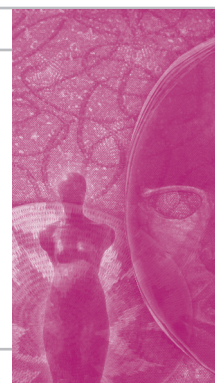


# Perinatal mortality at Frontier Hospital, Queenstown – a 6-year audit using the Perinatal Problem Identification Programme (PPIP)



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**Objectives.** To determine the perinatal mortality rate (PNMR), the neonatal mortality rate (NNMR), the major obstetric and neonatal causes of death, the occurrence of avoidable factors in perinatal deaths, and syphilis serology at the time of delivery at Frontier Hospital, Queenstown.

**Design.** The study was an audit of perinatal deaths with retrospective and prospective periods.

**Setting.** Frontier Hospital is a designated Regional Hospital in the Northern Region of the Eastern Cape, South Africa.

**Subjects.** All perinatal deaths of infants weighing more than 499 g occurring from 1 January 1995 to 31 December 2000.

**Methods.** A retrospective hospital records review from 1 January 1995 to 30 June 1996, and a prospective assessment of perinatal deaths from 1 July 1996 to 31 December 2000.

**Measures.** PNMR, NNMR, causes of perinatal and neonatal death, avoidable factors, and syphilis serology.

**Results.** The retrospective PNMR was 33/1 000 deliveries and the NNMR 7/1 000. The prospective PNMR started at 51/1 000 deliveries and the NNMR at 19/1 000. The prospective data then showed a downward trend. The leading obstetric cause of death was unexplained stillbirths and the leading neonatal cause of death labour-related hypoxia. Health personnel-related avoidable factors occurred frequently. Of these, intrapartum care-related avoidable factors made the largest contribution. Syphilis serology at delivery was unknown in over 80% of deaths and declined to 56% over the 6-year period.

**Conclusions.** Both the PNMR and the NNMR dropped during the audit period. This may have been due to the general audit and feedback process itself, as well as to specific responses to problems that were identified through the audit process.

Frontier Hospital in Queenstown is the designated Regional Hospital for the Northern Region of the Eastern Cape Province. It serves a population of approximately 810 000, 450 000 of whom live in the Queenstown district. The total number of women of childbearing age is 181 000.<sup>1</sup> Most deliveries in the region occur in hospitals, surrounding clinics providing antenatal services only. About 90% of women receive antenatal care (author's unpublished data, 1997 and 1998, Frontier Hospital Nursery Admissions Audit).

The hospital has 230 beds. During the audit period it had the ongoing budget and formal staffing establishment of a district hospital. In 1996, a South African registered paediatrician and 2 Cuban obstetricians arrived to become full-time staff members of the hospital's maternity unit. In August 1996 the

nursery developed into a unit with the capacity to provide ventilatory support to sick neonates. In 1998, 4 midwives successfully completed the Decentralised Programme for Advanced Midwifery. No one completed the distance-learning Perinatal Education Programme.

## Objectives

The objectives of the audit were to determine the perinatal and early neonatal mortality rates (PNMR and NNMR), the major obstetric and neonatal causes of death, the occurrence of avoidable factors (instances of suboptimal care) in perinatal deaths and maternal syphilis serology at the time of delivery, and to compare findings from retrospective and prospective data gathering methods. Where possible comparisons were

made with national averages for the year 2000 for similar hospitals, as reported in *Saving Babies: A Perinatal Care Survey of South Africa 2000*.<sup>2</sup>

## Design

The study was a descriptive audit with comparisons both over time and with national South African averages for hospitals in similar settings to Frontier Hospital.

## Methods

The 6-year audit period was from 1 January 1995 to 31 December 2000. All perinatal deaths (stillbirths and early neonatal deaths) of infants weighing more than 499 g were assessed using the Perinatal Problem Identification Programme (PIIP), a computer programme developed by the University of Pretoria that provides both conceptual and statistical structure to the data gathering and analysis.<sup>3</sup>

Results are given for babies weighing more than 999 g, which allows for wider comparison.

From 1 January 1995 to 30 June 1996 a retrospective hospital folder review was performed using the maternity register to find the deaths and using the PIIP system to code and analyse the variables. From 1 July 1996 to 31 December 2000 a prospective assessment of the deaths was done using the PIIP structure and monthly perinatal mortality meetings attended by maternity doctors and nurses. Before each meeting, cases were selected, primarily on the basis of how instructive they would be, by a small group of midwives and doctors for presentation at the meeting. The same group reviewed cases that were not presented. In the perinatal mortality meeting, the previous month's statistics were presented, followed by the case presentations, usually by midwives. Ensuing discussions focused on lessons to be learned and problems to be solved, paying particular attention to the avoidable factors identified in each case. Minutes of perinatal mortality meetings were taken, and task allocation and completion was tracked. All deaths were coded for cause of death and avoidable factors using PIIP, and the data were sent regularly to the national PIIP database.

From early in the audit it was noted that low rates of antenatal screening for syphilis was a major problem. Peripartum in-hospital testing for mothers with unknown syphilis serology was instituted and this was audited from 1997.

## Measures

Measures recorded included: PNMR, NNMR, causes of perinatal death as a percentage of all deaths, causes of neonatal death as a percentage of all neonatal deaths, avoidable factors as frequency per 100 deaths, and syphilis serology status as a percentage of all deaths, for stillbirths and early neonatal deaths of infants weighing

> 999 g. The PNMR and NNMR were measured over 6-month periods, while the other variables were measured over one-year periods ending in December. National data were obtained from *Saving Babies: A Perinatal Care Survey of South Africa 2000*.<sup>2</sup>

## Results

The findings are summarised in Tables I and II.

## Mortality rates

The perinatal and neonatal mortality rate trends are shown in Fig. 1.

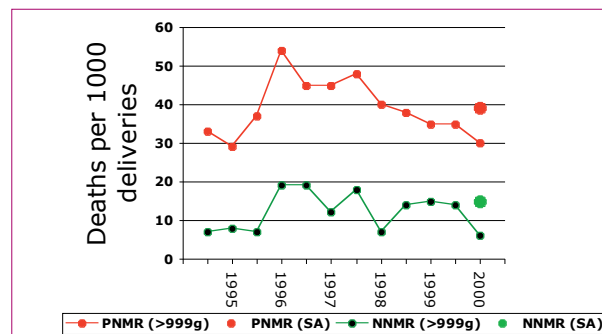


Fig. 1. Perinatal and neonatal mortality rates at Frontier Hospital compared with the national average for the year 2000 (PNMR = perinatal mortality rate, NNMR = neonatal mortality rate).

The retrospective PNMR started at 33/1 000 deliveries. The prospective PNMR started at 54 and showed a downward trend. The retrospective NNMR started at 7/1 000 deliveries and remained relatively low. The sharp rise in both rates in 1996 coincided with start of the prospective use of the PIIP. Thereafter there were declines in both rates to below the national averages for hospitals similar to Frontier Hospital.

## Obstetric causes of death

Unexplained stillbirth was the largest single cause of death (there was no systematic assessment of stillbirths or placentas). The contribution of hypoxia as the second most important cause of death is striking. In the *Saving Babies* report, perinatal hypoxia was far less prominent than at Frontier Hospital.

In the normal birth weight category, i.e. babies weighing 2 500 g or more, labour-related hypoxia was by far the most common cause of death, with unexplained stillbirths coming second and antepartum haemorrhage and hypertension making a much smaller contribution.

## Neonatal causes of death

Hypoxia and immaturity were the predominant causes of death of babies born alive and dying in the early neonatal period, with infection and congenital abnormalities being less common. In the *Saving Babies*

Year	1995	1996	1997	1998	1999	2000	SA composite
Deliveries per year	2 755	2 374	2 164	2 309	2 457	2 503	45 327
Average deliveries per day	8	7	6	6	7	7	
Perinatal deaths	97	104	116	119	108	93	1 785
Stillbirths	75	73	81	89	72	68	1 131
Early neonatal deaths	19	31	35	30	36	25	654
PNMR (> 999 g)	31	46	45	44	36	33	39
SBR (> 999 g)	24	33	29	31	21	23	24
NNMR (> 999 g)	7	13	16	13	15	10	15
Stillbirth/neonatal death ratio	3.2:1	2.1:1	1.6:1	2.5:1	1.5:1	2.0:1	1.7:1
Low-birth-weight rate (%)	13.8	12.3	14.6	13.9	12.7	17.5	17.1

*\*The table also shows, where obtainable, comparative data from Saving Babies: A Perinatal Care Survey of South Africa 2000. During this 6-year audit period there were over 14 000 deliveries and over 650 deaths.*

Year	1995	1996	1997	1998	1999	2000	SA composite
OCD (%)							
Unexplained stillbirths	33	43	29	34	22	31	27
Labour-related hypoxia	33	19	25	22	28	22	15
Antepartum haemorrhage	11	16	12	9	10	15	11
Hypertension	0	10	11	12	8	18	13
Preterm labour	4	7	4	10	18	7	18
Congenital abnormality	6	1	12	4	2	4	5
NCD (%)							
Perinatal hypoxia	65	47	55	46	40	52	29
Immaturity	5	13	12	21	34	36	42
Infection	20	7	6	11	11	4	14
Congenital abnormality	10	3	27	11	3	4	7
Avoidable factors (%)							
Patient	25	8	13	19	15	21	36
Health system	25	40	25	12	9	6	7
Medical personnel	50	41	63	49	55	68	29
Health personnel (%)							
Antenatal care	33	8	17	11	6	13	
Intrapartum care	17	29	41	34	31	41	
Neonatal resuscitation	0	0	0	1	7	8	
Neonatal care	0	0	0	1	7	3	
Syphilis serology (%)							
Positive	4	4	5	3	5	4	
Negative	14	7	22	28	32	44	
Unknown	81	90	72	70	63	52	
Syphilis serology at discharge (%)							
Negative	N/A	N/A	10	8	10	5	
Unknown	N/A	N/A	50	31	31	13	

*OCD = obstetric cause of death; NCD = neonatal cause of death; syphilis serology 'Unknown' = test not done or result not available.*

report hypoxia was less prominent than at Frontier Hospital. For babies of normal birth weight, hypoxia overshadowed all other causes.

### Avoidable factors

The PPIP categorises avoidable factors into:

- patient-related factors, e.g. not booking for antenatal care, or presenting late in labour
- system-related factors, e.g. transport or staffing shortages, and
- personnel-related factors, e.g. not using the partogram or a doctor not coming when called.

Over the 6-year period, medical personnel-related avoidable factors occurred in about 50% of deaths. In 2000, personnel-related factors occurred in almost 70% of deaths. In the national data patient-related factors were more prominent and personnel-related factors were less prominent. At Frontier Hospital, if personnel-related factors are analysed further, intrapartum care-related avoidable factors made the largest contribution. Failure to use, and incorrect use of, the partogram accounted for most of these deaths.

## Syphilis serology

Syphilis serology at delivery was unknown in over 80% of deaths in 1995/1996, and for the audit period there was a downward trend to 56%. More than half the mothers of babies that died had no known syphilis serology at the time of delivery at Frontier Hospital. Because of the low rates of syphilis screening in pregnancy for mothers, a policy was introduced that no mother should leave Frontier Hospital after delivery without a syphilis test. This was audited from 1997. The results showed that in 1997 more than half the mothers of babies who had died left the hospital without a syphilis test result. By 2000 this had dropped to 13%.

## Discussion

This 6-year study describes a process of audit and feedback, and its findings and trends. In their review 'Audit and feedback: effects on professional practice and health care outcomes' Jamtvedt *et al.*<sup>4</sup> define audit and feedback as 'any summary of clinical performance of health care over a specified period of time'. The review concludes that 'the relative effects of audit and feedback are more likely to be larger when baseline adherence to recommended practice is low' and also that 'the effects of audit and feedback might be larger when health professionals are actively involved and have specific responsibilities for implementing change'.

The downward trend in the PNMR at Frontier Hospital in the latter 4½ years of the study coincided with the prospective PPIP-based audit, and this trend may have been related to both of these conclusions. Many avoidable factors were related to basic essentials of antenatal, intrapartum and neonatal care, and in addressing these through the audit and feedback process, the involvement of all 'health professionals' – nurses and doctors – was actively encouraged.

By introducing the PPIP system of audit, it was possible to understand the medical reasons for why babies died, as well as to identify remediable problems in maternal and infant care. By addressing the quality of intrapartum

care in particular, it was possible to reduce deaths from labour-related hypoxia and therefore to reduce the PNMR. The drop in the PNMR may therefore have been both due to the general audit and feedback process itself, as well as to specific responses to problems that were identified through the audit process.

The rise in the PNMR from the retrospective to prospective periods is striking. The birth register may not have recorded all the stillbirths and neonatal deaths in this period. This suggests that the birth register may be an unreliable source of data. This is an important finding, as the birth register is the usual source of labour ward statistics used for service delivery planning.

Syphilis serology status at delivery indicates problems with the effective implementation of national policy on syphilis screening in pregnancy in the Queenstown district. By addressing antenatal syphilis screening, it may be possible to improve the overall package of antenatal care services.

There appears to be little evidence to support the use of mandatory audit and feedback.<sup>4</sup> The process at Frontier Hospital was not mandatory and depended for sustainability on a group of committed enthusiasts consisting of advanced midwives, a paediatrician and an obstetrician. The obstetrician left in 2000 and the paediatrician in 2001. PPIP perinatal mortality data have not been submitted since.

The author thanks the former Medical Superintendent, Dr A Jeyaprakash, for authorising the perinatal mortality auditing process, and Mrs L Lourens for providing monthly tallies and for many hours of searching for missing folders.

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