

# Audit incorporating avoidability and appropriate intervention can significantly decrease perinatal mortality

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**Objective.** To evaluate the role of the ICA (Identification, Cause, Avoidable factor) Solution method of perinatal audit in reducing perinatal mortality.

**Design.** Retrospective audit of 1 060 perinatal deaths between 1 January 1991 and 31 December 1992.

**Setting.** Livingstone Hospital Maternity Service.

**Subjects.** One thousand and sixty perinatal deaths, where the gestational age exceeded 28 weeks or, when gestational age was unknown, the birth weight was equal to or exceeded 1 000 g.

**Main outcome measures.** All perinatal deaths were identified and classified by primary obstetric cause for perinatal loss. In the second year of the study avoidable factors were sought and, if found, graded and categorised.

**Results.** The major primary obstetric causes of perinatal loss identified and amenable to intervention were intrapartum trauma, intrapartum asphyxia and infection. In the second year of study potentially avoidable factors were sought and identified in almost 50% of perinatal deaths. Appropriate intervention lowered the perinatal mortality rate by 23% ( $P < 0,05$ ; odds ratio 0,76; 95% confidence interval 0,67 - 0,86).

**Conclusion.** The ICA Solution method of perinatal audit identified problems in overall obstetric care, facilitating a significant fall in perinatal mortality.

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The Cape Province was the only province in South Africa to audit and publish perinatal mortality (PNM) rates by geographical area. Table I shows the Eastern Cape, with Port Elizabeth as its capital, as one of the areas with the highest PNM rate in the province.<sup>1</sup> As Livingstone Hospital is the major referral centre for the region it was decided to investigate the causes of PNM in the obstetric population served by the hospital.

**Table I. Comparative PNM rates among hospital-born babies — Cape Province, 1989**

Region	PNM per 1 000 deliveries
Lower Orange River	49,46
Upper Karoo	42,20
Port Elizabeth area	38,22
Northern Cape	34,71
Griqualand West	33,90
Namaqualand	21,54
Eastern Cape	18,34
Cape Metropolis	18,17
Overberg	17,88
West Coast Region	12,08
Overall Cape Province	25,96

Only pregnancies where the gestational age exceeded 28 weeks were included, or when the gestational age was unknown, the birth weight was equal to or exceeded 1 000 g.

The hospital's perinatal losses are reported annually and had remained unchanged for the previous triennium.<sup>2</sup> Information identifying the primary obstetric cause of each death was unavailable and the major factors responsible for perinatal loss in the population served remained unrecognised. Annual audit had led to no improvement in the perinatal statistics.

Perinatal audit should not only be utilised to reflect the performance of an obstetric service but also act dynamically to allow for improvements in the system. To fulfil this goal the ICA Solution system of audit was utilised.<sup>3</sup> All perinatal deaths were identified (I), the primary obstetric cause (C) initiating the sequence of events leading to the perinatal death designated, avoidable (A) factors sought and if found, graded and categorised. Audit of the information allows for formulation of relevant Solutions.

## Patients and methods

Livingstone Hospital is a 1 200-bed hospital situated in Port Elizabeth. The obstetric service is responsible for referred obstetric complications from Dora Nginza and Motherwell hospitals. The three hospitals perform a total of 12 000 deliveries a year on a 6:3:1 ratio. During the study the full-time obstetric staff complement at Livingstone Hospital consisted of three permanent consultants, seven medical officers (who remained in the department for a minimum of 6 months) and seven interns.

The study was performed between 1 January 1991 and 31 December 1992. All deliveries were included, as well as those at the two referral hospitals, where the gestational age exceeded 28 weeks or, when gestational age was unknown the birth weight was 1 000 g or more. Rural referrals were excluded. PNM was defined as all stillbirths and early neonatal deaths.

All perinatal deaths were identified, the patients' case records scrutinised and presented by a single individual (H. R. G. W.) at a monthly combined obstetric and paediatric PNM meeting. The combined input of the obstetricians and paediatricians was used in the classification of each perinatal loss. During the first year of the study the primary obstetric cause of the sequence of events leading to each death was classified according to the criteria described by Whitfield *et al.*<sup>4</sup> It was realised during the first year of the study that there were often missed opportunities for intervention that might have prevented perinatal death.<sup>5,6</sup> We decided formally to audit these missed opportunities and, in the second year of the study, each perinatal death was also assessed for potentially avoidable factors. Avoidable factors, if found, were graded, categorised and subdivided as described by Pattinson *et al.*<sup>3</sup> To avoid potential medicolegal implications, patients' names were not identified during case discussions.

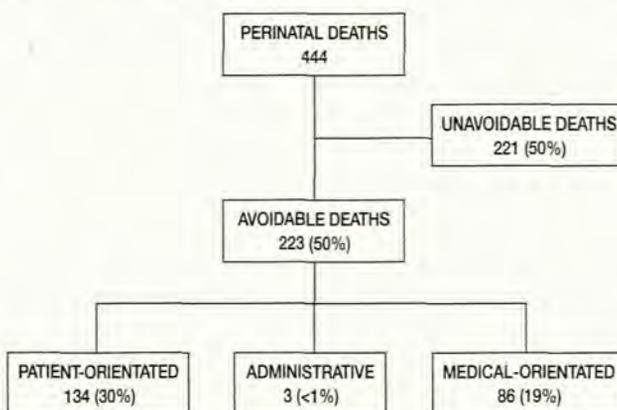
Statistical analysis was performed using the  $\chi^2$ -test;  $P < 0,05$  was taken to indicate statistical significance. Odds ratios (ORs) and 95% confidence intervals (CIs) were also calculated.

## Results

There were 11 660 and 10 925 deliveries respectively in the 2 years studied. The PNM rate fell significantly by 23% from 52,8/1 000 to 40,6/1 000 ( $P < 0,05$ ; OR 0,76; 95% CI 0,67 - 0,86). In both years of the study 20% of the patients were unbooked, and almost 50% of all perinatal losses occurred in the unbooked patients. The high percentage of unexplained losses may be a reflection of the high percentage of unbooked patients.

The major primary obstetric causes responsible for initiating the sequence of events leading to perinatal deaths in each year are shown in Table II.

In an attempt to decrease PNM, audit of avoidable factors was initiated in 1992 and categorisation of avoidable factors is shown in Fig. 1.



**Fig. 1. Categorisation of deaths in 1992**

In 1991 intrapartum complications were responsible for 20% of the perinatal deaths. This figure dropped to 9% in 1992; however, medical-oriented avoidable factors were still identified in 60% of these patients. The commonest

**Table II. Primary obstetric factors responsible for perinatal losses**

Primary obstetric factors	Losses 1991	Losses 1992	P	ORs	95% CIs
Unexplained deaths	176 (29%)	123 (28%)	0,014*	0,74	0,59 - 0,94†
Hypertension	80 (13%)	61 (14%)	0,27	0,81	0,57 - 1,5
Asphyxia	78 (13%)	29 (7%)	0,000002*	0,4	0,25 - 0,61†
APH	67 (11%)	68 (15%)	0,7	1,08	0,76 - 1,54
Preterm labour	46 (7%)	43 (10%)	0,92	1	0,64 - 1,54
Trauma	44 (7%)	8 (2%)	0,000004*	0,193	0,08 - 0,43†
Infection	44 (7%)	47 (11%)	0,6	1,14	0,74 - 1,76
Abnormality	35 (6%)	26 (6%)	0,44	0,8	0,46 - 1,35
Other	46 (7%)	39 (8%)	0,72	0,9	0,58 - 1,41
Overall	616 (100%)	444 (100%)	0,00002*	0,76	0,67 - 0,86†

There was a total of 11 660 deliveries in 1991 and 10 925 deliveries in 1992. Percentages show the percentage of losses where a primary obstetric factor was responsible.  
 \* Statistical significance =  $P < 0,05$ . ORs and CIs are also shown.  
 † Confidence intervals do not cross unity.

problems were non-evaluation of fetal well-being during labour, ignoring or incorrect use of the partogram and traumatic assisted delivery that led to perinatal death.

Infection was responsible for 44 perinatal deaths in 1991. In 1992 infection was responsible for 47 deaths, syphilis being responsible for 37 (79%) of these. In 1992 syphilis serology was available in 80% of cases, unfortunately often only after perinatal death had occurred.

## Discussion

Accurate perinatal audit requires identification of all perinatal deaths. This may be extremely difficult at a busy non-academic unit. A motivated individual who understands the importance of perinatal audit needs to be made responsible for the identification of all stillbirths and all early neonatal deaths. Regular perinatal mortality meetings, where both senior obstetric and paediatric staff are present, need to be held to identify the cause of the perinatal loss and the identification of avoidable factors in each case. Regular assessment of PNM statistics and avoidable factors identifies areas where appropriate intervention may help. The advantage of ongoing audit is that it allows for evaluation of the interventional programmes initiated.

Mere collection of PNM statistics does not guarantee an improvement in obstetric care, as reflected in the constant fetal wastage rate that preceded the initiation of the study. Perinatal audit should not only be utilised to assess the performance of an obstetric service, but also act dynamically to allow for improvements in the system. All perinatal deaths should be subjected to the ICA Solution system of audit. Identification of perinatal deaths allows for accurate statistics and comparison of services, while classification of primary obstetric factors identifies the community's obstetric problems and highlights research and interventional priorities. Avoidable factor identification recognises deficiencies in overall obstetric care at the level of the patient, the system and medical care. Improvement at any one of these levels may decrease PNM. With all this information, solutions can be sought. The 'ICA Solution' approach identifies priorities, so that effective, dynamic intervention programmes can be initiated.

Before the initiation of this audit the PNM rates of the two referring hospitals were unreported. Livingstone Hospital's perinatal loss was reported as a fetal wastage rate, with a

poorly defined numerator and denominator. Fetal wastage for the 3 years preceding the study remained at a constant 80/1 000.<sup>2</sup> It is important when reporting perinatal loss to use accepted definitions to allow for comparison of outcome between different services. It is for this reason that we used the PNM rate for all deliveries exceeding a gestational age of 28 weeks or, when the gestational age was not known, with a birth weight of 1 000 g or more. PNM was defined as all stillbirths and early neonatal deaths in this group.

To decrease PNM, the major causes of loss have to be identified.<sup>4</sup> Documentation of the primary obstetric cause initiating the sequence of events leading to stillbirth or neonatal death is of the utmost importance. Following identification of the primary causes, preventative measures can be instituted, facilitating a drop in PNM. Since the primary obstetric causes responsible for perinatal loss had not been documented previously, we sought a primary obstetric cause responsible for each loss in 1991. These causes were then documented and are shown in Table II.

In the present study 20% of the patients were unbooked and almost 50% of perinatal losses occurred in this group. In the unbooked patient it is often difficult to identify a primary obstetric cause responsible for perinatal loss and this would explain why unexplained perinatal loss was so prevalent. It has previously been documented that the unbooked patient is at increased risk for perinatal loss and the reason for such patients being unbooked into the hospital system needs to be urgently addressed.<sup>7</sup> It is possible that many such patients are followed up antenatally by private practitioners and only report to hospital when in labour. If this is found to be the case, introduction of a patient-carried card may improve communication between the two health care systems.<sup>9-10</sup> Reduction of financial barriers to antenatal care and expansion of the capacity of the system by decentralisation of antenatal clinics may improve antenatal clinic attendance.<sup>11-13</sup> Improved clinic attendance may allow for patient education and better patient response to obstetric complications, resulting in improved perinatal outcome.

The 1991 perinatal audit revealed that the major areas potentially amenable to intervention were intrapartum asphyxia, intrapartum trauma and infection, mainly syphilis. Having identified these problem areas, we needed to initiate appropriate intervention. Audit of avoidable factors highlighted missed opportunities that tended to recur and we concentrated our intervention on these problems.

Intrapartum asphyxia and trauma were responsible for 20% of losses in 1991; this dropped to 9% in 1992, but avoidable factors were still identified in 60% of these cases in 1992, indicating a need for improved intrapartum care. An intense training programme was established among the medical and nursing personnel advocating the correct use, interpretation and management of the partogram. The importance of regular evaluation of fetal well-being in labour was also emphasised. In addition all assisted deliveries were meticulously discussed, as many of the deaths had followed poorly performed assisted deliveries. In addition, each peripartum death was discussed and on-site training given.

The increase in deaths attributable to infection, mainly syphilis in 1992, is disappointing. Before and during the audit, antenatal acquisition of syphilis serology was poor. In 1992 syphilis serology was eventually available in 80% of cases, unfortunately often only after perinatal death had occurred. On-site syphilis serology testing is to be introduced and will allow early initiation of treatment in the booked patient.<sup>14,15</sup> No unbooked patient or patient with unexplained intra-uterine death or neonatal death will be discharged after delivery, before her syphilis serology is known. The anticipated improved recognition of syphilis may result in a decrease in the number of unexplained deaths, with a corresponding rise in deaths from infection.

It is possible that the Hawthorne effect is responsible for the significant improvement in perinatal outcome; however, careful audit and increased vigilance are in themselves an intervention of value.

In conclusion, the study allowed standardisation of perinatal audit using internationally accepted definitions. In addition, during the first year of audit the primary obstetric factors responsible for loss were identified. The study demonstrated that identification of avoidable factors, and appropriate intervention facilitated the significant 23% fall in PNM between 1991 and 1992. Ongoing use of the system may result in further improvement.

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