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Monitoring systems to evaluate the quality of perinatal care

In monitoring and surveillance of existing services it is usually impossible to evaluate their effectiveness using the agreed "gold standard" of a randomised controlled trial. Alternative forms of evaluation are necessary. In this paper three quite different approaches to evaluation will be described. All have been used in the same region within Australia. Each has its own strengths and limitations but in combination they complement one another.

The context for this paper is the State of Victoria, Australia. It is the smallest and most densely populated of the States, covering an area equivalent in size to England and Wales, with a population of just over 4 million people and around 65,000 births each year. Most of the population live in the capital city (Melbourne) and 75% of the births occur in this city. There are 145 maternity hospitals, half of them with fewer than 100 births a year. All specialised services, for example the four neonatal intensive care units (three in the obstetric teaching hospitals and one in the Paediatric teaching hospital), are in Melbourne. The population is very diverse: one quarter of women giving birth were themselves born outside Australia and there are substantial groups of both

refugees and migrants. About 15% of women giving birth do not speak English. The population of indigenous women (Aboriginal/Koori) is very small with fewer than 1% of all births in this group.

Monitoring systems

Confidential enquiries into perinatal deaths

There has been a system of confidential enquiries into perinatal deaths in Victoria since the 1960s. This developed out of confidential enquiries into maternal deaths, beginning with neonatal deaths and adding fetal deaths a few years later. In 1982 the process became formalised through legislation setting up a statutory body – the Consultative Council on Obstetric and Paediatric Mortality and Morbidity – of obstetricians and paediatricians nominated by the specialist colleges and the Universities, perinatal pathologist, midwife, nominees of the State Health Department and nominees of the Minister for Health. The proceedings of the Council are exempt from the Freedom of Information Act.

The Council reviews each death, or selected subgroups of cases, using perinatal death certificates,

autopsy reports and confidential medical reports. As the review findings may not be used in court, and the process is both anonymous and confidential, the reports and discussions are quite frank and detailed. A report is published each year which identifies "avoidable factors" on the part of those providing care, and sometimes on the part of the woman or her family, which *might* have contributed to the death¹. This report is distributed to all medical practitioners in the State.

The confidential enquiry process may also lead to the identification of general issues quite apart from sub-optimal care, requiring action by the Department of Health. Examples in Victoria have included facilitating high standards of perinatal autopsy by making it possible for infants who die in rural areas of the State to have a post mortem examination at one of the teaching hospitals at the Department of Health's cost, establishing a state-wide Newborn Emergency Transport system (NETS), and developing a Genetics Co-ordinating Committee for the oversight and planning of prenatal diagnostic services.

The strengths of this approach are apparent. There are, however, some limitations. First, during the

first 20 years of enquiries, information was available only about perinatal deaths. There was no parallel information on all births, that is, no denominators for the case numerators; something which hampered interpretation. Second, there was and is no equivalent detailed review of a series of “controls”—liveborn surviving infants. Although circumstantial evidence from the examination of a single case can occasionally be very strong inferences from case series without a control series can be misleading.

Third, it is unusual for information to be sought from parents in confidential enquiries so one important perspective on the events leading up to the death is almost always missing. Finally, the definition of “avoidable” factors or “sub-optimal care” is rarely based on strong evidence so that forms of care which have not been shown to be effective in randomised trials are treated as if they would have made a significant difference to the outcome.

Routinely collected perinatal data

The second approach uses information from *all* births to monitor trends and variations in practice and outcomes. A statutory perinatal data collection was established in Victoria in 1982. A single A4 sheet is completed for all births which occur at or after 20 completed weeks of gestation or where the fetus/infant weighs at least 400g. Infants (or mothers) transferred after birth to another place of care are followed up to discharge or death and the data system is linked to perinatal and infant death certificates.

Information is collected on the mother, the place of birth, pregnancy, labour, birth, postnatal period and the baby. Over 99.7% of births, including births outside hospital, are included. Three validation

studies of the quality of the data were completed from 1983 to 1993²⁻⁴. Annual analyses are included in the report of confidential enquiries into maternal and perinatal deaths¹ and a recent publication has summarised trends and topics of special interest over the decade 1983–1992⁵. The data make it clear that the incidence of preterm birth has been very stable over the decade with a marked fall in neonatal mortality and an increase in the demand for neonatal intensive care services. During this time, too, an increasing proportion of very low birthweight infants (<1500g) have been born in the three teaching hospitals; those with Level III perinatal services⁶.

Another example of the use of the data for monitoring perinatal services was an analysis of the safety of small hospitals. This took into account the birthweight of infants who delivered there, transfers in labour and after fetal death, and the presence of major malformations and was able to conclude that there were no reasons, in terms of safety, for these hospitals to be closed⁷.

The state’s prenatal diagnostic services have been monitored through record linkage with the perinatal data system plus follow-up of those pregnancies which did not reach 20 weeks gestation. The safety of these services has been documented⁸⁻¹⁰ as have the factors associated with utilisation and non-utilisation of services^{11,12}.

A key component of the system is to provide feedback to hospitals themselves, both of trends within hospitals and of comparisons with similar hospitals or the whole State. Each hospital is sent annually a set of tables summarising the main maternal and infant variables at that hospital, four graphs showing trends in selected factors of particular interest to the midwifery staff (e.g. caesarean delivery), and the hospital’s “profile” (Figs. 1 and 2).

The profile summarises four aspects of the hospital’s services. The first items describe the demographic features of the hospital’s obstetric population: the proportions of women who are <20 years, without a partner, >35 years or of non-English speaking background. The second group refer to the prevalence of medical/obstetric risk factors in the population. The third group refer to the management of labour and the fourth to neonatal outcome.

Each individual factor (e.g. births to women <20) is annotated with the *median* value among all hospitals with at least 100 births a year, and the *range* for this factor from the hospital with the lowest prevalence to the hospital with the highest. Values below the 10th percentile and above the 90th percentile are in black. The more the profile line is shifted away from the centre to the left, the lower risk the population: the more it is shifted to the right, the higher the risk status. The management of labour and the neonatal outcome need to be interpreted in the light of the hospital population’s risk status.

The profiles can identify important, and problematic, patterns of practice: the three teaching hospitals, for example, although they have the highest risk profiles, have caesarean delivery rates consistently below the 90th percentile and close to the median suggesting that some other hospitals may have rates that are inappropriately high. Across the state there are high rates of induction of labour (median 22%) and usage of oxytocin/prostaglandin (median 29%) but the hospitals at the high end of the range, not high-risk hospitals, induce 39% of labours and give oxytocin/prostaglandin to almost half their clients (47%). For several consecutive years there was a cluster of hospitals where the proportion of infants with Apgar scores <7 at five minutes seemed high in the context of the number of

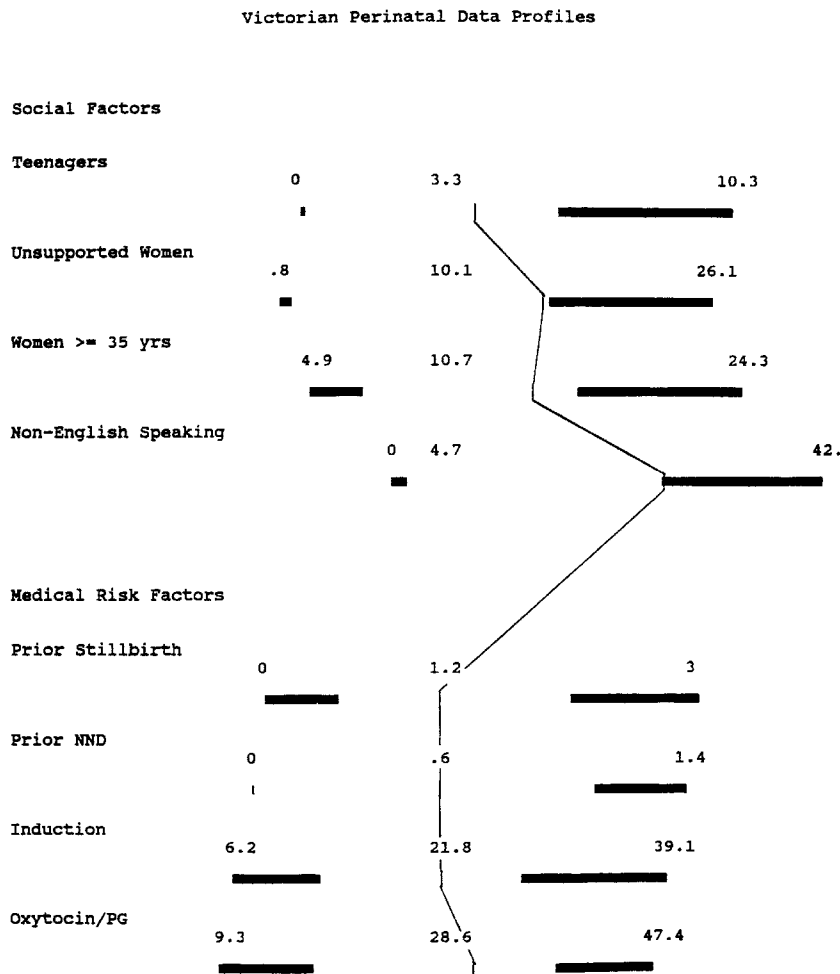


Figure 1. Hospital profile i.

infants born there who were pre-term or of low birthweight. Thus the profiles have the potential to draw attention to aspects of perinatal services delivery which should lead to further exploration by the hospital itself in terms of practices, procedures and policies. In the last eight years the larger hospitals have also been provided with an analysis of their perinatal mortality for the past year and for the past five years (pooled) compared with that for the whole State. The birthweight-standardised perinatal mortality ratio (SPMR) was devised to adjust for differences in birthweight distribution between hospitals, in the light of the crucial importance of birth-

weight as a predictor of infant death. There is a substantial literature, and some controversy, about its use¹³⁻¹⁵. The basis for the SPMR is the calculation of the *expected* number of perinatal deaths within each birthweight group (500-999g, 1000-1499g and so on) from birthweight-specific mortality rate for that group across the whole population. *Expected* deaths are summed across all weight groups and compared with the (summed) *observed* perinatal deaths. In recording the observed deaths it is important that deaths be attributed to the hospital of birth rather than the hospital where the death occurred. The ratio of observed to

expected ($\times 100$) will be below 100 where the outcome is better than the State average and greater than 100 if the outcome is worse than expected. The calculations can be repeated after excluding deaths from lethal malformations or infants from multiple gestations and confidence intervals can be calculated¹⁶. Indirect standardisation "rewards" hospitals with level I or II services who book appropriately low risk women and refer those who develop complications. Hospitals with a significantly raised SPMR can identify in which birthweight group(s) the discrepancy between expected and observed deaths occurred and, as with the profiles, review the policy and practice issues which are raised.

Satisfaction with care

One aspect of perinatal services rarely monitored systematically is the satisfaction of those who use the services with the care they receive. In 1989 all women who had given birth in one week in Victoria were sent a questionnaire, eight to nine months after the birth. Questions covered information about the baby, previous pregnancies, antenatal care, labour and delivery, postnatal care, demographic information about the mother and family as well as breastfeeding up to the time of the survey and a self-report scale designed to assess maternal depression¹⁷. The questionnaire was developed from the work of Dr. Ann Cartwright in the United Kingdom since she had completed substantial methodological work on the use of postal questionnaires to monitor maternity services¹⁸⁻²⁰. The availability of routinely collected perinatal data in Victoria meant that it was possible, while still ensuring anonymity and confidentiality, to characterise the extent to which those who respond-

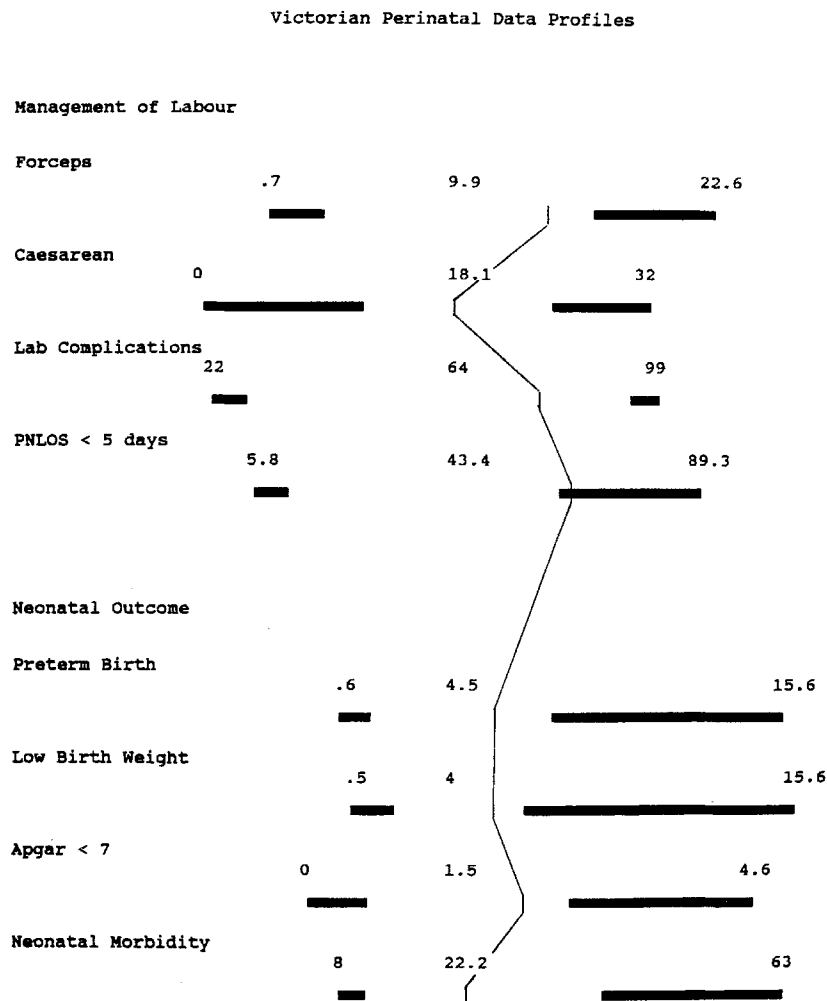


Figure 2. Hospital profile ii.

ed to the survey were representative of women giving birth. The other strengths of this method are its acceptability to women themselves²¹, its capacity to identify specific problems are areas of care which can be improved^{22–26} and its usefulness in setting priorities for service development²⁷. Repeating the survey some time later, as was been done in Victoria in 1993 (S. Brown Pers. comm), helps to evaluate the extent to which positive changes have been implemented. It is also relatively inexpensive. The limitations of the method are that it is not a good way to find out the views of young women, single women or women from minority

cultures. All these groups need a different approach.

Conclusion

Monitoring perinatal services is a complex and multifaceted matter. Case by case review has an immediate appeal because of the potential to identify simple clinical messages for practitioners, but interpretation is less straightforward than it might seem. Other non-experimental evaluations of perinatal care need to find ways of taking into account differences between hospitals, other than quality of care, which significantly influ-

ence outcome. These evaluations can be combined with the provision of information back to hospitals themselves from central health agencies. In addition to approaches using vital statistics and routinely collected data intermittent surveys of satisfaction with maternity care and preferences for care provide complementary information. The combination of several methods of monitoring perinatal services should enable hospitals and health planning agencies to work more effectively towards their shared goals.

References

- 1 Consultative Council on Obstetric and Paediatric Mortality and Morbidity. Annual Report on Maternal and Perinatal Deaths in Victoria, 1992. Melbourne: Department of Health and Community Services, 1994.
- 2 Lumley J, Baskin S, Rigoni S. Rights and wrongs: a validation study of the perinatal morbidity form. Melbourne: Perinatal Data Collection Unit, 1993.
- 3 Robertson H. A validation study of the Victorian Perinatal Data Collection forms 1986. Melbourne: Perinatal Data Collection Unit, 1986.
- 4 Robertson H. Poor knowledge and misunderstandings: a midwife-run project to assess and improve data quality on the Victorian perinatal morbidity statistics form. *Quality in Health Care* (in press).
- 5 Perinatal Data Collection Unit. Births in Victoria 1983–1992. Melbourne: Consultative Council on Obstetric and Paediatric Mortality and Morbidity, 1994.
- 6 Victorian Infant Collaborative Studies Group. Regional impact of improved perinatal care for infants of birthweight 500–999 g. *Archives of Disease in Childhood* 1991; 66:765–769.
- 7 Lumley J. The safety of small maternity hospitals in Victoria

- 1982–1984. Community Health Studies 1989; *XII*:386–393.
- 8 *Halliday J, Sheffield L, Danks D, Lumley J*. Complete follow-up in assessing fetal losses after chorion villus sampling [letter]. *Lancet* 1990; *1*:1156.
 - 9 *Halliday JL, Lumley J, Sheffield LJ, Robinson HP, Renou P, Carlin JB*. Importance of complete follow-up of spontaneous fetal loss after amniocentesis and chorion villus sampling. *Lancet* 1992; *340*:886–890.
 - 10 *Halliday JL, Lumley J, Sheffield L, Lancaster PAL*. Limb deficiencies, chorion villus sampling and advanced maternal age. *Am J Med Genetics* 1993; *47*:1096–1098.
 - 11 *Yates JM, Lumley J, Bell R, Bettio J*. Method for cohort and nested case-control studies: the prevalence, timing and effectiveness of obstetric ultrasound in Victoria 1991–1992. *Paediatric Perinatal Epidemiol.* 1995; *9*:225–240.
 - 12 *Halliday JL, Lumley J, Watson L*. Comparison of women who do and do not have amniocentesis and chorion villus sampling. *Lancet* 1995; *345*:704–709.
 - 13 *Knox EG, Lancashire R, Armstrong EH*. Perinatal mortality standards: construction and use of a health care performance indicator. *J Epidemiol Commun Health* 1986; *40*:193–204.
 - 14 *Williams RL*. Measuring the effectiveness of perinatal medical care. *Med Care* 1979; *17*:95–110.
 - 15 *Kiely JL, Kleinman JC*. Birth-weight adjusted infant mortality in evaluations of perinatal care: towards a useful summary measure. *Stat Med* 1993; *12*:377–392.
 - 16 *Vandenbroucke JP*. A short cut method for calculating the 95% confidence interval of the standardised mortality ratio. *Am J Epidemiol* 1982; *115*:303–304.
 - 17 *Cox JL, Holden JM, Sagovsky R*. Detection of postnatal depression: development of the 10-item Edinburgh Postnatal Depression Scale. *Br J Psych* 1987; *150*:782–786.
 - 18 *Cartwright A*. Some experiments with factors that might affect the response of mothers to a postal questionnaire. *Stat in Med* 1986; *5*:607–617.
 - 19 *Cartwright A*. Interview or postal questionnaires. Comparison of data about women's experiences of maternity services. *Milbank Memorial Fund Quarterly* 1988; *66*:172–189.
 - 20 *Jacoby A, Cartwright A*. Finding out about the views and experiences of maternity service users. In: *Garcia J, Kilpatrick R, Richards M*. The politics of maternity care services for childbearing women in twentieth century, Britain. Oxford: Oxford University Press, 1990; 238–255.
 - 21 *Mason V*. Women's experiences of maternity care – a survey manual. London: HMSO, 1989.
 - 22 *Brown S, Lumley J*. Antenatal care: a case of the inverse care law? *Australian J Public Health* 1993; *17*:95–102.
 - 23 *Astbury J, Brown S, Lumley J, Small R*. Birth events, birth experiences and social differences in depression after birth. *Australian J Public Health* 1994; *18*:176–184.
 - 24 *Lumley J, Brown S*. Attenders and non-attenders at childbirth education classes in Australia: how do they and their births differ? *Birth* 1993; *20*:123–129.
 - 25 *Brown S, Lumley J*. Satisfaction with care in labor and birth: a survey of 790 Australian women. *Birth* 1994; *21*:4–13.
 - 26 *Small R, Lumley J, Brown S*. To stay or not to stay. Are fears about shorter postnatal hospital stays justified? *Midwifery* 1992; *8*:170–177.
 - 27 *Having a baby in Victoria*. Final Report of the Ministerial Review of Birthing Services in Victoria. Melbourne: Health Department Victoria, 1990.

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