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Classification of perinatal deaths

Before considering how we may classify perinatal deaths it is important to consider why we need to classify them. We may think of a number of reasons for classification. These might include the need to audit the quality of maternal and perinatal care services, the desire to investigate changes in mortality over time or variations by locality or the desire to locate areas of potential improvement in perinatal outcome by defining avoidable deaths. However we phrase the question the underlying aim in classifying perinatal deaths is always to improve perinatal mortality rate (PNMR).

To consider how PNMR should be classified we need first to think about the components of perinatal death and those factors that may have major influences on perinatal mortality.

Figure 1 shows estimated fetal loss rates throughout pregnancy. Although loss in the stages during or soon after implantation is enormous it can be seen that for the period from 22 weeks until term mortality has reached a minimum of about 0.1% per week.

The size of the population of dead babies is influenced by our definitions of perinatal mortality, particularly the number of weeks gestation that is considered the lower limit of viability (recently altered from 28 weeks to 24 weeks in the UK). It may be difficult to decide whether a case of missed abortion or an acardiac twin fetus delivered within the perinatal period should be included in the statistics. In addition the mortality rate will be influenced by various forms of obstetric or neonatal management. Many terminations are now performed for congenital anomaly before the start of the official perinatal period. Table 1 shows the numbers of such terminations performed for a series of specific conditions in the North-West Thames Region in 1990–91. In the Northern Region at least 50% of the fall in perinatal mortality rate over the past 10 years has been attributed to terminations for malformation (Dr. E. Hey personal communication). As the perinatal mortality period only includes the first week after birth any increase in the rate of resuscitation of very small (previable) fetuses will increase the PNMR if they die within 7 days but will decrease it if they survive beyond that period. Neonatal care that leads to prolonged survival of sick or malformed neonates may decrease the PNMR but cause an increase in either the late neonatal death rate or the infant death rate according as to whether the infant dies within the first month after birth or later in the first year.

In any consideration of perinatal mortality we also have to remem-

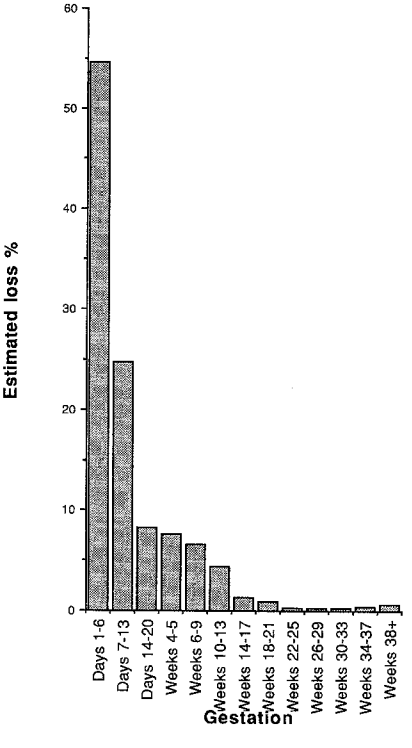

Figure 1. *Estimated fetal loss rate throughout pregnancy. Adapted from data quoted in Berry CL (ed). Paediatric Pathology, second edition, London, Springer-Verlag, 1989.*

Terminations for congenital anomaly NWTR 1990–91

Trisomy 21	59
Trisomy 18	25
Trisomy 13	11
Spina bifida	41
Anencephaly	41
Encephalocele	16
Cystic hygroma	15
Exomphalos	16
Gastroschisis	2
Total	226

(This figure does not include all terminations for congenital anomaly or potential pregnancy failure). *National PNM for anomalies in 1990 = 0.5/1000*

Table 1. *Terminations performed for specific congenital anomalies in the North-West Thames Region 1990–1991.*

ber how mortality varies with birth weight and gestation. This is illustrated in Figure 2. In any normal birth population some 95% of infants are born with a weight of 2.5 kg or more and only 5% at lower weights. PNMR acts in the opposite direction with a high proportion of deaths in the lower weight or gestation categories. The effect of a high death rate in a low population of small babies plus a low death rate in the high population of large babies is that crude numbers of perinatal deaths are distributed fairly evenly throughout the whole range of birth weight or gestation.

This also means that a slight shift in the population basis (eg a rise in preterm multiple births due to infertility treatment) can cause a major change in PNMR. It is important to take the pattern of background population in terms of birth weight and gestation (the denominator) into consideration in any interpretation or comparisons of PNMR.

Classification systems

We would like to classify perinatal deaths by cause. However causation in this area of life is very complex and requires consideration of factors that may act directly on the fetus or infant or indirectly by way of the mother and placenta (Figure 3). Multiple factors may operate in parallel in a single case.

There are 2 detailed classification systems that can be used to code all features of individual cases.

The WHO International Classification of Diseases (ICD)[1] is a single axis classification comprising lists of 3 digit codes with fourth and fifth digit subcategories accessed through an alphabetical index.

The Systematised Nomenclature of Medicine (SNOMED)[2] has 6 different fields: – topography, morphology, aetiology, function, disease and procedure. Anything coded in any of the five subordinate fields must be linked to a topographic site, although this could be the whole body. Table 2 shows an example coded by each system.

The problem with any comprehensive classification system designed to take all influences into consideration is the very variable quantity of information available in any one case. Thus pathological data are not always available so cannot be used as a basis for classification in an individual institution let alone for National or International purposes. Therefore it is important to have classification systems that have been designed in terms of the data that is available, or obtainable, in a form that allows subsequent analalysis in terms of the questions most likely to be put.

Two classification systems designed in the UK that may be mentioned are the modified Aberdeen classification based on maternal factors[3] and the classification based on fetal and neonatal factors[4]. A problem with the Aberdeen classification is the large number of cases which cannot be explained in terms of maternal factors and are thus coded as "unexplained" even if the cause of fetal death is in fact known with precision. The causal classification of Hey et al.[4] can often be used even without postmortem as modern investigation techniques often allow accurate diagnosis in life. However the detail available is very variable from case to case or hospital to hospital. The use of excessive detail may also result in the impor-

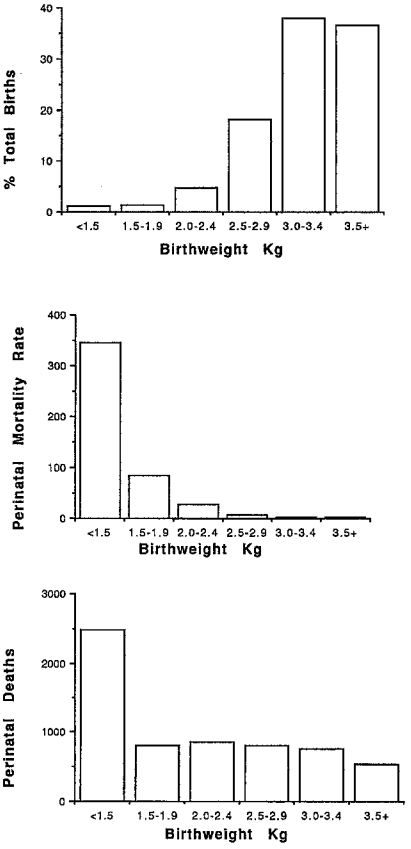

Figure 2. *Frequency distributions of total births, perinatal mortality by birth weight and numbers of perinatal deaths by birth weight. Figures derived from Office of Population Censuses and Surveys DHS no. 20. 1986 Mortality Statistics, Perinatal and Infant: Social and Biological Factors, HMSO, London, 1988.*

Causation of fetal and perinatal death

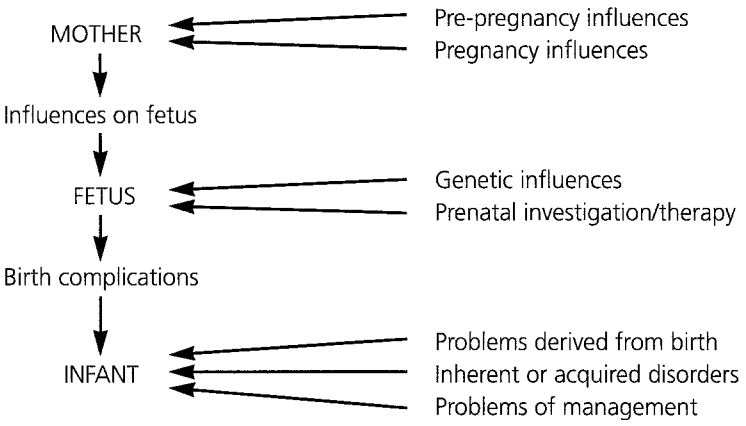

Figure 3. *Sites of action of various causes of fetal and perinatal death.*

ICD versus SNOMED-example

A female fetus of 520 g weight with pregnancy terminated for Campomelic dysplasia at 22 weeks gestation.

ICD	Termination of pregnancy-fetus;	779.6
	Osteodystrophy-unspecified;	756.59
SNOMED	Stillborn;	T89000
	Induced Abortion;	P1755
	Immature female fetus 0.5 – 0.99 kg;	F35310
	22 weeks gestation;	F31022
	Campomelic dysplasia;	D5206

Table 2. *A fetal death coded by ICD and SNOMED systems.*

tant birth weight and gestation variables mentioned above being overlooked.

My own simple coding system[5] was developed from the analysis I undertake routinely when performing a perinatal autopsy. Before commencing an internal examination I consider the external appearances of the fetus or infant in conjunction with the history I have been given. My thoughts on the conditions to be looked for follow readily from the information available.

The 4 initial categories I recognise are:

– Macerated normally formed stillborn infants
– Congenital anomalies – stillbirth or neonatal death
– Conditions associated with prematurity – neonatal deaths
– Fresh stillbirths/early neonatal deaths – presumed asphyxial.

A fifth category comprises those infants suffering from specific conditions other than the above – eg a known specific fetal infection such as toxoplasmosis. The value of this type of very simple coding is that perinatal deaths can be classified in a reasonably consistent way irrespective of whether a formal post mortem examination has been performed or not. Proper use of the classification requires that maternity staff examine stillborn infants externally and record whether they are macerated or have externally recognisable anomalies. There are potential problems in coding that have to be overcome by adopting some standard rules. Thus a small preterm infant who died at 2 hours of age might be coded as having a condition associated with prematurity or as having died a presumed asphyxial death. Appropriate rules for handling this type of problem are discussed elsewhere[6].

The value of this type of approach becomes apparent when it is combined with birth weight and/or gestation breakdowns of the dead and total birth populations.

Thus an analysis of the birth weight distribution in an academic mater-

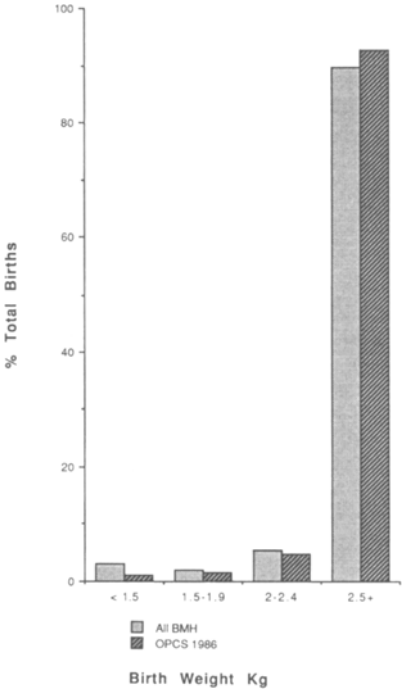

Figure 4. *Birth weight distribution of infants born at a hospital in the West Midland Region of the UK 1988 as compared with OPCS National figures for 1986 (see figure 2).*

Birthweight specific/Wigglesworth classification: BMH 1988

Weight Gp.	< 0.5 kg	0.5–0.9	1–1.4	1.5–1.9	2–2.4	2.5+	PNM Rate
Weight Distr.	6	59	86	101	266	4478	
Macerated	1	2	5	2	4	7	4.2
Lethal Anom.	0	4	3	2	2	10	4.2
Immaturity	3	29	5	2	0	0	7.8
Asphyxia/Tr.	0	0	1	3	4	5	2.6
Other	0	0	1	0	0	0	0.2
PNM Rate	667	593	174	89.1	37.6	4.91	19.0

Table 3. *Numbers of perinatal deaths at the hospital referred to in figure 6 classified by "Wigglesworth" and plotted against birth weight groups.*

nity hospital with a large number of emergency preterm admissions showed a very high proportion of unduly low weight births (Figure 4). When the deaths were classified into "Wigglesworth" groups and set against the birth weight breakdown it became apparent that the very high total PNMR was very largely due to early neonatal deaths in infants below 1 kg birth weight (Table 3). Finally I would recommend the following as an approach to perinatal death classification.

- Maintain an accurate record of birth weight and gestational age distributions of the whole birth population.
- Use a simple classification system such as "Wigglesworth" that can be applied easily at any hospital level irrespective of whether post mortem is performed or not.
- Use the simple classification correlated with birth weight/gestation data of dead and live populations for primary audit of figures.
- For detailed local records and research into problem areas use ICD or SNOMED coding.[1,2]

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1 World Health Organisation. Manual of the International Statistical Classification of Diseases, Injuries and Causes of Death, 9th Revision, Vol. WHO, Geneva, 1977.

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