

experienced resident paediatric cover being continuously available. Too often medical cover is provided wholly or in part by non-resident staff and by junior doctors obtaining their first experience of newborn care.

3.5 The registrar problem may be fundamental to the shortage of experienced resident neonatal staff. In contrast to Medicine and Surgery where the basic training posts are filled by junior house officers and SHOs provide a stratum of 'experienced' residents, the basic training grade in Paediatrics is usually that of SHO and it is to the registrar that one looks for a degree of 'experience'. It should also be recognised that an unusually high proportion of registrar posts in Paediatrics are held by married women doctors or overseas graduates who voluntarily leave the hospital training grades at that stage. In Paediatrics, therefore, it may well be possible to sustain a relatively high proportion of doctors in the registrar grade without distortion of the overall career prospects.

3.6 Part of the explanation for the shortage of neonatal staff may be found in the preceding sections. Furthermore, as the Court Report has pointed out, in 1972-73 only 9% of the total health expenditure in this country was spent on the children's health services, although they constituted 24% of the whole population.

3.7 The shortage of trained paediatric staff has led to the recommendation and practice of attempting to concentrate neonatal intensive care in Regional referral centres. Such practice has been shown to work well in some large conurbations, for neonatal surgery, and is likely to be increasingly required for those very small infants needing highly skilled and technically detailed ventilatory and metabolic support over long periods of time. However, problems of transport and separation of the infant from the mother have not been wholly resolved and it must be emphasised that any unit which can provide the skills necessary to resuscitate adequately babies at birth and provide special care, is to a large extent in a position to provide a measure of intensive care for the relatively short duration for which most infants require it.

3.8 In considering priorities and the distribution of paediatric resources it is important to bear the following statistics in mind: in 1973 245,980 in-patients were discharged from paediatric departments (non-psychiatric) in England and Wales. In the same year some 580,000 infants were born in hospital, 106,230 of whom were admitted to special care units. At the same time over half of all deaths in infancy and childhood took place within three days of birth, and two-thirds took place in the neonatal period.

4.0 RECOMMENDATIONS

4.1 The following summarised recommendations indicate some of the ways in which perinatal care might be improved in the near future at comparatively small cost (see Appendix A). They are not comprehensive. For example, they barely touch on the important areas of maternal health education and antenatal care. We have not discussed the fundamental importance of improvements in maternal health in its widest sense for all mothers and, in particular, for the most disadvantaged who nevertheless make the least call on the available services. We recognise that advances in this field are likely to lead to major improvements in perinatal mortality and morbidity. We would also like to acknowledge that many of the recommendations have already been made in the Sheldon, Oppé and Court Reports (see Appendix C).

4.2 Perinatal Paediatrics

(i) Perinatal paediatrics should be accepted as a sub-specialty as recommended by the BPA (Paediatrics in the Seventies, 1972) and by the Court Report (1976) (page 310).

(ii) There is an urgent need for a career structure in this new specialty in regional centres and for the creation of more consultant and senior registrar training posts in this specialty. However, senior registrar training should not be exclusively in this field.

4.3 Integration of Perinatal Care

(i) The obstetric and paediatric aspects of perinatal care should be integrated as much as possible by the organisation of joint meetings, and ward rounds of both special care baby units, and antenatal and postnatal wards.

(ii) The RCOG already encourages trainees to take a greater interest in neonatal paediatrics, not only as part of their ordinary obstetric training, but during their elective period. This admirable policy might be strengthened.

(iii) The BPA might like to consider whether paediatricians intending to specialise in perinatal paediatrics or to have a special interest in newborn care should not spend at least 6 months training in obstetrics.

(iv) The creation of one year rotation SHO posts with six months obstetrics and six months neonatal medicine would provide excellent training for either specialty and at the same time help to draw the two disciplines together.

(v) Attention is drawn to the need for combined study by the RCOG and BPA regarding the career structure and training programmes of those 'perinatal' obstetricians and paediatricians who in the future are likely to be working increasingly closely together at the interface between the two disciplines.

4.4 Responsibility for Newborn Care

(i) The care of all newborn infants in consultant units should normally be the responsibility of the paediatric staff from the time of birth. Flexibility is necessary with respect to responsibility for resuscitation in the labour wards.

(ii) The statement above requires some elaboration. The word paediatrician should be interpreted here as someone who has trained in newborn care and developed expertise in diagnosis and management. It may well be in future that more obstetricians will take a specific interest in the newborn (as well as the fetus); in which case a most valuable overlap of interest and responsibility will develop. The need for integration and partnership in perinatal care has already been mentioned (section 4.3) and it has been said elsewhere that "only by studying the fetus will paediatricians fully appreciate the problems of the newborn infants; and, conversely, obstetricians need to study the newborn infant if they are to assess properly the results of their own management of pregnancy and labour". Thus this recommendation should be seen as a recognition of the hazards of the neonatal period and the need for early diagnosis and prevention. Clearly, this is most likely to be achieved by staff who have specially trained in this work.

4.5 Provision of Special, Intensive Care and Observation Nurseries

(i) Special newborn care facilities should be available in all consultant obstetric units on the basis of 6 cots per 1,000 deliveries per year.

(ii) Special care units for newborn infants should be sited within or very close to maternity units.

(iii) Whenever possible maternity and paediatric departments should be sited close to one another so that resources and staff may be shared. This is particularly important with respect to obstetric units having less than 2,000 deliveries a year because of the difficulties of adequately staffing small SCBUs.

(iv) In major obstetric units one in every six SCBU cots should be designated for intensive care. In this context intensive care implies a critical status requiring constant observation and monitoring of vital signs. The list would include, among others, all infants of less than 1500 g, infants with marked respiratory distress or having apnoeic attacks, convulsing infants, infants with cyanotic heart disease or in cardiac failure, infants with severe erythroblastosis, and infants with serious congenital anomalies requiring immediate surgery.

(v) Although the aim should be to provide at least 'short-term' intensive care facilities in all major obstetric units, shortage of resources and staff require that these facilities be concentrated for the time being in one or two of the larger maternity units in each Area or Region. Certainly all local geographically constrained obstetric units with 3,000 - 4,000 deliveries or more a year should qualify for the immediate provision of full 'long-term' intensive care facilities including the appropriate nursing and resident paediatric staffing.

(vi) Observation nurseries should be provided in all maternity units not having paediatric staff and a SCBU. Their presence may also be of value in units having a special care nursery when the latter is sited away from the postnatal wards.

4.6 Equipment for Special and Intensive Care

(i) All SCBUs should be equipped with piped oxygen, air and suction.

(ii) Facilities should be available in or near the SCBU for measuring the blood gases and acid base status.

(iii) Biochemical and haematological facilities should include the provision of micro-techniques.

(iv) X-ray facilities should be available to the SCBU.

(v) Apparatus should be available for monitoring and recording the vital signs of sick children including heart rate, ECG, respiration, blood pressure, temperature and arterial oxygen tension, (see Appendix D).

(vi) Apparatus should be available to monitor the ambient oxygen concentration, and to provide continuous positive airway pressure and positive pressure ventilation, to infuse fluids and to provide light therapy (see Appendix D).

(vii) The services of an electronics technician and medical 'measurement' technicians should be available to nurseries providing intensive care.

(viii) Advice on the best available apparatus for special care should be provided (and constantly updated) by a panel of experts.

4,7 Paediatric Perinatal Care: Local Organisation and Staffing

(i) Within the framework of a Regional plan paediatric perinatal care should be organised locally. Whether this should be at Area or District level will depend on geographical factors, density of population, the number of births and the distribution and size of the maternity units. There are 90 Areas in England and Wales. In the average Area there are approximately 7,000 deliveries a year (range 3,000 - 11,000). While centralisation may provide the best solution in some large cities, it will often be impracticable in rural areas.

(ii) Paediatric staffing will depend to some extent on the factors just mentioned. To take a simple model, in an area with a population of 450,000 there will be approximately 5,000 deliveries a year of which 4,500 are likely to take place in consultant obstetric units and 500 in GP units or at home. There will be need for a special care baby unit of 30 cots, 5 of which will be designated for intensive care. The following paediatric staff will be necessary to provide cover for resuscitation at birth, routine examination and care on the postnatal wards, supervision of the SCBU, provision of intensive care, follow-up of ill and 'at-risk' infants, teaching, training and research.

2 x $\frac{1}{2}$ Consultant paediatricians (or equivalent)

1 Senior registrar (or equivalent)

2 Registrars

3 Senior House Officers

Provided that the registrars are prepared to work overtime this staffing permits the maintenance of the minimum requirement of one trained registrar and one in-training SHO in the hospital at all times.

(iii) The paediatric staffing requirements for 5,000 newborn infants per year outlined above require to be multiplied by 120 in order to meet the needs for England and Wales (at least 600,000 deliveries per year). Against the present paucity of paediatric staffing these logistics may at first sight seem unrealistic, if not excessive. In fact, they are not excessive. In a number of developed countries these staffing recommendations would be regarded as inadequate and, indeed, they represent the minimum requirement for the provision of a good newborn service.

(iv) Many District maternity units have only 2,000 - 2,500 deliveries per year. It is therefore advisable to consider a second smaller 'model' of this size with respect to staffing requirements. These should be:

1/2 and 1/5 Consultant Paediatricians

1/2 Senior registrar

1 Registrar

2 Senior House Officers

Such a staffing should ensure the minimum requirement of one resident paediatrician on site at all times, closely supported by more experienced non-resident cover.

(v) Consideration should be given to the economic practicality of providing the minimum required paediatric staffing (see (iv)) for consultant obstetric units not sited close to paediatric units and having less than 1,500 deliveries per year.

(vi) Study will be needed of ways in which the present deficiency in staffing may be rectified. Some suggestions follow:

a) More consultant (and senior registrar) posts should be created in perinatal paediatrics. There should be at least one of each (and preferably two) in every University Centre in order to organise training programmes in newborn medicine as well as provide care.

b) Where there are two paediatricians in a District (or Area) one should be encouraged to take a special interest in the newborn and have his main base in the District SCBU.

c) More paediatric registrar posts need to be created. The same applies to 'training' SHO posts.

d) Obstetricians in-training should be encouraged to spend six months in newborn medicine. The same might apply to (some) trainee community physicians.

e) GP trainee vocational courses might include six months of newborn care combined with developmental medicine. Alternatively GP obstetric trainee courses should include a component of neonatal care.

f) The current 'wastage' in paediatric registrars (see Section 3.5) should be explored and maximum use made of doctors with domestic commitments who are already trained (or prepared to train) in newborn care.

g) Many overseas doctors are keen to gain experience in newborn care. Their help should be encouraged.

h) Nursing staff experienced in newborn care should be trained and encouraged to participate in the more technical aspects of intensive care.

4.8 Nursing Staff for Special and Intensive Care and Observation

(i) There should be one nurse to one SCBU cot and at least three nurses to each intensive care cot.

(ii) At least two-thirds of the nurses should be experienced in newborn care and a substantial proportion should hold the certificate in special and intensive care for babies awarded by the Joint Board of Clinical Nursing Studies.

(iii) At least two experienced nurses able to resuscitate babies should be on duty in each shift.

(iv) The ratio of nurses to babies should not be allowed to fall below one per five special care infants and one per two intensive care infants during night time and weekends.

(v) There is frequently an 'overlap' in nursing shifts in the afternoon and a consequent excess of staff available at that time. Re-organisation of the timing of shifts will often lead to a greater availability of staff during the unsocial hours. Pay incentives might be provided to make these more attractive.

(vi) Nurses in charge of observation nurseries should be experienced in newborn care.

4.9 Maternal Education and Antenatal Care

(i) The need for special care in the perinatal period would be greatly reduced by education of the mother (and father) and by regular antenatal care.

(ii) Education in reproductive health should start in childhood and should include a knowledge of basic physiology, of the danger of venereal disease, of methods of birth control, of the hazards of the unwanted pregnancy and of therapeutic abortion, of the harmful effects of smoking, of excessive alcohol and of other drugs on the fetus, of the desirability of achieving an optimal reproductive pattern, of the advantages of breast feeding, of the value of protection against rubella, of the importance of keeping a menstrual record and early and regular attendance of antenatal clinics, and of having an adequate diet and sufficient rest during pregnancy.

(iii) Consideration might be given to providing inducements to persuade mothers to attend antenatal clinics regularly or to the provision of domiciliary antenatal services for mothers whose antenatal care might otherwise lapse.

(iv) Consideration might be given to the improvement and standardisation of the mother's personal maternity record card.

(v) Mothers likely to bear babies requiring special or intensive care need to be diverted to hospitals having such facilities including resident paediatric staff.

4.10 Amniocentesis and Cytogenetics Services

(i) The detection of major congenital anomalies early in the second trimester permits the possibility of termination.

(ii) 'Early' amniocentesis should, whenever possible, be undertaken by experienced obstetricians in centres having facilities for ultrasound estimation of gestational age and also localisation of the placenta and fetus in order to minimise traumatic complications.

(iii) Cytogenetic services and genetic advice should be available on (at least) a Regional basis.

4.11 Early Detection of the 'At Risk' Fetus

The detection of the 'at risk' fetus by good antenatal screening and by intensive care monitoring during labour is the foundation of good perinatal care. Ideally, all obstetric units should have resident obstetric staff and those with special care facilities for the infant should be staffed and equipped to provide intensive antepartum and intrapartum fetal monitoring.

4.12 Transfer of Mothers with an 'At Risk' Fetus

(i) However excellent the obstetric care, consultant units without resident paediatric staffing should not electively undertake the delivery of infants likely to require special or intensive care (eg infants anticipated to be of low birthweight, infants exhibiting antenatal distress, infants suspected of having rh haemolytic disease, etc). If possible, the mother should be transferred to a hospital with suitable infant facilities.

(ii) In order for the above recommendation to work in practice every effort should be made to ensure that all consultant obstetricians have access to an obstetric unit equipped to provide special newborn care.

4.13 Transfer of Sick Infants

(i) A paediatric flying squad should be organised on an Area or District basis and should consist of a paediatrician accompanied by a nurse trained in newborn care.

(ii) The team should be available to resuscitate sick infants and to accompany them during transport. In an emergency the team should also be available to smaller obstetric units not having paediatric staff to be present at delivery when a severe resuscitation problem is anticipated and it is not possible to move the mother.

(iii) The nursery responsible for providing intensive care in an Area should also be responsible for organising the transfer of babies to the nursery, including the provision and maintenance of the transport incubator, ventilator and other necessary apparatus, and also the provision of trained staff to accompany the infant.

(iv) Whenever possible the mothers of these infants should also be transferred. Accommodation should be provided for them near the SCBU.

(v) The transport vehicle should be adequately heated and lighted. There must be portable incubators, ventilator, a supply of oxygen, silver swaddlers, drug pack, and suitable suction apparatus. It is important to bear in mind the possibility of twins.

4.14 Mother-child Bonding

(i) Every effort should be made to ensure close mother-child contact, especially during the first hours and days following delivery.

(ii) Mothers should, whenever possible, have the opportunity of holding and examining their babies in the delivery room.

(iii) 'Rooming-in' should be encouraged and the necessary facilities provided.

(iv) Mothers (and fathers) should be encouraged to visit their infants transferred for special care as soon and as often as possible.

(v) Accommodation for mothers should be available in or near the SCBU, on the approximate ratio of one mother's bed per eight SCBU cots.

4.15 Breast Feeding

(i) Every effort should be made during pregnancy and after birth to encourage the practice of breast feeding.

(ii) In larger hospitals at least one senior midwife should be nominated to supervise the training of staff and instruction of the mothers. In some hospitals this role is filled by a married woman doctor.

(iii) Privacy should be available to mothers wishing to breast feed.

(iv) Modern electric breast milk pumps should be available in all obstetric units.

(v) Consideration should be given to the creation of human milk banks in larger centres.

4.16 Resuscitation at Birth

(i) All medical and nursing staff in maternity hospitals should be able to resuscitate newborn infants. Obstetric and paediatric staff in-training and senior midwives and SCBU nursing staff should be trained in endotracheal intubation and positive pressure ventilation.

(ii) A paediatrician or other doctor experienced in neonatal resuscitation should be available in the labour ward at the birth of infants likely to require resuscitation (eg all Caesarean deliveries, breech deliveries, cases of fetal distress, preterm infants, difficult forceps deliveries, etc).

(iii) The equipment used for resuscitation should be checked frequently and regularly. Resuscitation trolleys should be equipped with overhead heating. Transport incubators should be available.

4.17 Observation at Birth

(i) Most neonatal deaths occur on the first day of life. Many of these infants present with asphyxia at birth or with respiratory distress within the first four hours of life.

(ii) All infants not admitted to a SCBU should be closely observed during the first four hours of life, preferably without separating them from their mothers.

(iii) The importance of the early diagnosis of hypothermia, infection, hypoglycaemia, cyanosis, respiratory distress, haemorrhagic tendency, etc and the institution of early treatment cannot be over-emphasised.

4.18 Examination of the Newborn

(i) Every newborn infant should receive a full clinical examination at birth or within the first 24 hours by a doctor either trained in newborn care or 'in-training' and supervised by a paediatrician.

(ii) A second full examination should be undertaken within 24 hours of 'discharge' from neonatal care, either on leaving hospital or at the age of 8-10 days. Such an examination might come to be regarded as a major event in the child's health history and should take into account not only the present physical status of the infant, and medical, antenatal and perinatal history of the mother and the family, but also the social environment into which the child is now entering. The examination could also serve as the data base for the on-going medical record and alert the appropriate authorities to the proper deployment of any special services that the infant and his family may need.

(iii) The temperature of all newborn infants should be checked on arrival in the postnatal ward and at least daily for the first three days of life.

(iv) The hips of all newborn infants should be examined carefully for congenital dislocation at birth and again before discharge.

(v) It cannot be over-stressed that many serious conditions affecting newborn infants may be detected and successfully combated by a combination of careful examination and early treatment.

4.19 Neonatal Records

(i) Every newborn infant should have its own identification number and clinical record.

(ii) There is need for improvement and greater conformity in the neonatal records used throughout the country.

(iii) The results of the discharge examination should be recorded and communicated to all members of the primary health team as well as to the Area Health Authority in order to provide the basis of the future health record of the child.

(iv) The considerable documentation required for 'normal' newborn care should be recognised by the provision of the requisite number of ward clerks.

4.20 Perinatal Mortality

(i) There should be at least one pathologist in each Area with a special interest and experience in morbid perinatal pathology.

(ii) The new perinatal death certificate currently recommended by the WHO should be introduced as soon as possible (see Appendix E).

(iii) All infants dying in the perinatal period should have a postmortem examination (unless parental permission has been withheld).

(iv) Perinatal mortality (and morbidity) conferences should be held regularly in all major hospital units and attended by obstetricians, paediatricians, pathologists, midwives, nurses and, when possible, general practitioners and members of the community health team.

(v) The possibility should be explored of setting up confidential enquiries into the cause of perinatal death, along similar lines to that instituted so successfully by the RCOG with respect to maternal deaths. Because of the greater numbers involved it might be necessary initially to restrict study to non-malformed infants weighing more than 1 kg at birth. The form successfully used for the study of perinatal mortality in Quebec is attached (see Appendix F). The BPA/RCOG Liaison Committee might be the appropriate body to explore this suggestion, perhaps in conjunction with the newly formed DHSS/BPA/RCOG Perinatal Epidemiology Unit.

4.21 Perinatal Statistics

(i) Statistics on perinatal care, morbidity and mortality should be reported annually on an Area basis, with a breakdown for each obstetric unit and for domiciliary services.

(ii) The methodology of data collection and reporting should be standardised, including definitions and nomenclature (see WHO recommendations, Appendix E).

(iii) Perinatal mortality, stillbirth and neonatal death statistics should be subdivided into at least three groups: infants with lethal congenital malformations, infants weighing less than 1 kg at birth and infants without lethal malformations weighing more than 1 kg at birth.

4.22 Protocols for Perinatal Care and Reporting

(i) Standard protocols of operational procedures for perinatal care appropriate for each member of the health team and for the environment in which they are working (eg urban, rural, in hospitals or in the community) should be prepared, tested and made available to obstetricians, paediatricians, family doctors, midwives, nurses and other members of the health team. These might include records such as intensive care, growth charts, etc.

(ii) These protocols and charts should aim at facilitating and improving the efficiency, quality and standardisation of care. They should be advisory, not obligatory.

4.23 Site, Size and Design of Maternity Hospitals

(i) Maternity and paediatric units should be sited close together whenever possible.

(ii) The preferred size for a maternity unit in the UK is one having 2,000 - 5,000 deliveries a year. Smaller units tend to provide insufficient experience for the staff and also tend to lack expensive facilities. Larger units tend to become impersonal and inefficient. Good architectural design however can do much to preserve a feeling of identity even in large maternity units.

(iii) The design of maternity units should cater both for the majority of mothers anticipating a normal delivery who may benefit from a relaxed and 'homely' atmosphere, and also the minority who are a special risk and require intensive care monitoring throughout.

4.24 General Practitioner and Domiciliary Obstetrics

In those areas where domiciliary obstetrics still exist there would be advantages to the consultant obstetrician and paediatrician in the area having a greater involvement in the work undertaken.

4.25 Regional and Area Surveys of Perinatal Care

(i) Recent local surveys in two Regions and elsewhere have demonstrated numerous local deficiencies in paediatric staffing and in the facilities necessary for special and intensive newborn care. Some of these deficiencies were amenable to re-organisation.

(ii) Similar surveys need to be undertaken in all parts of the country as a matter of urgency.

(iii) The value of such surveys would be enhanced if the data was collected in a standard manner. The BPA/RCOG Liaison Committee might be the appropriate body to prepare such a protocol and advise on the setting up of survey teams.

(iv) Each visiting survey team should consist of at least one obstetrician and one paediatrician representing the RCOG and BPA. The team should report both its findings and recommendations.

(iv) Each Region, Area and District would then be in a position to examine its resources and facilities with a view to rationalisation and optimal usage.

4.26 Urgent Research Needs

(i) One-third of perinatal deaths and many long term handicaps involve infants with severe congenital malformations. Research is required into the aetiology and prevention, including early diagnosis.

(ii) 70% of perinatal morbidity and mortality is associated with the 7% of infants of low birthweight. The incidence has not fallen in the UK in recent years as it has in other developed countries such as Sweden. Research is required into the aetiology of premature delivery and fetal growth retardation, including methods of inhibiting labour and accelerating fetal lung maturation, and methods of diagnosing and improving impaired placental function and estimating gestational age.

(iii) About one-third of newborn infants receiving special care have required resuscitation at birth. Study is needed into the causes of birth asphyxia, especially those suspected to be due to drugs and techniques used during labour.

(iv) Research is required into improved methods of fetal monitoring during labour which do not distress the mother or interfere with the course of normal labour.

(v) Many aspects of the modern active management of labour require scientific evaluation in relation to maternal and infant morbidity as well as mortality.

(vi) Further research is required with respect to the importance of colostrum and breast milk.

(vii) Studies are required to evaluate the cost-effectiveness of preventing fetal and infant morbidity and mortality.

4.27 Assessment of Development and Handicap

(i) Whenever possible the paediatric staff in maternity hospitals should also participate in developmental assessment throughout infancy, working closely with the handicap assessment team. Every encouragement should be given to the forging of links between the District handicap team and those providing perinatal care in the District.

(ii) Consideration should be given to the advantages of having some Midwives/Health Visitors specialised in newborn care and helping to bridge the gap between special newborn care in hospital and after-care in the community.

(iii) Social problems are often identified for the first time when a mother has a baby. Such problems may have a direct bearing on child development and handicap. Close co-operation is required, particularly in hospital, between the medical staff and social worker.

4.28 Birth Rate Caveat

(i) A number of estimates respecting perinatal facilities in this paper are based on the current very low birth rate. If this rate increases, as seems likely, revision will be required.

(ii) It is important that provision should be such that variations of as many as 200,000 births per year such as have been seen in the last 20 years, may be contained without adversely affecting standards of care (see also Central Midwives Board Report, March 31, 1977).

4.29 Legal and Economic Aspects of Perinatal Care

(i) The standard of care in the perinatal period is increasingly becoming a subject of legal debate and litigation. A Congenital Disabilities (Civil Liability) Act became law in 1976.

(ii) A number of recent studies have demonstrated that the provision of special and intensive perinatal care has led to a marked reduction both in perinatal mortality and in the number of handicapped children among the survivors (see Bowes et al, 1978 Appendix G).

(iii) Another important aspect of perinatal care, requiring judgement of the highest order, is the deliberate withholding of intensive care in circumstances where the infant is already very severely handicapped at or soon after birth.

(iv) Intensive care may be required at any time of the night or day. Even a few minutes delay may be sufficient to cause irreversible brain damage and lifelong handicap.

(v) The economic implications to the State of a single long term handicapped child requiring institutional care throughout life must take into account:

- a) the cost of the ascertainment and diagnostic services;
- b) the cost of institutional care including supporting services;
- c) the cost to the family in distraction which may well impair earning capacity;
- d) the further cost to the country in that the handicapped individual does not himself work or pay taxes.

These economic implications do not express the personal and family suffering involved or the diversion of limited medical resources.

(vi) A number of countries such as France and Canada have made actuarial estimates of the subject. All reached the conclusion that the economic implications of failing to provide optimal perinatal care were quite unacceptable.

(vii) It has been suggested that the expense of caring for a single severely handicapped individual throughout a life of 50 years may be in the order of £250,000. Such a sum would pay for all the annual revenue expenses needed for optimal perinatal care throughout a District.

(viii) As has been already stated, the key to good newborn care is the provision of trained resident paediatric staff. There is an urgent need to explore ways of increasing the number presently available.

(ix) The newborn period not only offers the chance of preventing perinatal mortality and handicap, it also provides a unique opportunity for screening each new infant and his family for medical and socio-economic problems requiring further care and attention in the community. Such information should form the basis of the child's health record. We must not lose sight of the fact that most newborn infants eventually become old age pensioners.

4.30 In Summary

(i) We recommend that the ascertainment of current organisation and resources for perinatal care should be followed by rationalisation and the provision of adequate facilities and staffing, especially the availability of resident paediatric staff in all consultant units.

(ii) We have no doubt that good antenatal and perinatal care offer by far the best opportunity for the prevention of long term handicaps, with their costly toll of human misery.

(iii) We are conscious of the grave deficiencies in the perinatal services in many parts of this country, which have not been helped by the recent policy of curtailing the obstetric and paediatric budgets.

(iv) We are convinced that a joint approach between the Government, the BPA and RCOG to put into practice the proposals made in this document would be well advised from both economic and humanitarian standpoints and would result in a substantial reduction in handicap within the community.

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APPENDIX A

A1

The Lancet, 16 March 1974, page 437

The Price of Perinatal Neglect

The incidence of retrolental fibroplasia fell rapidly in the five years that followed publication of the classic work of Ashton et al (1) in 1953. However, there were soon indications that a price might have been paid for the indiscriminate restriction of the use of high concentrations of oxygen soon after birth.(2,3) Professor Cross (4) has drawn attention to the halt that took place between 1950 and 1965 in the previous steady decline in neonatal mortality in both Britain and the USA, and he and Dr Bolton present further evidence on page 445. Analysis revealed that the 'excess' mortality was mainly confined to infants of low birth-weight dying on the first day of life. Since respiratory distress and hypoxaemia are responsible for most such deaths, Cross argues that this 'excess' was likely to have been due to the restriction of oxygen, and further suggests that the prevention of each case of retrolental fibroplasia has been bought at the cost of 16 unnecessary deaths, amounting over the whole period to a total of more than 20,000 in England and Wales and in excess of 150,000 in the USA.

This is a thought-provoking hypothesis, though many may feel that it oversimplifies a very complex subject. Why, for instance, did the hump in first-day mortality in Britain antedate Ashton's publication by two to three years? (5) Also, has sufficient allowance been made for the now-recognised dangers of pulmonary oxygen toxicity? (6) What, too, about all the many other variables operating between 1950 and 1965? In retrospect this period must surely be regarded as the one in which modern neonatal iatrogenesis reached a peak. This was the period in which already overextended paediatricians found themselves increasingly responsible for neonatal problems of which in many cases they had had little previous experience. Almost every major error in newborn care was widely practised, at least for a time. Resuscitation at birth all too frequently involved the intravenous injection of large doses of nikethamide or the use of intragastric oxygen. Small and sick infants were exposed in incubators and often allowed to become chilled, while to reduce the danger of aspiration they were frequently starved for 2 to 5 days. This too was the period during which epidemics of kernicterus followed the use of excessive doses of vitamin K and the prophylactic use of sulphonamides and when chloramphenicol was shown to be the cause of the grey-baby syndrome. Nor were the obstetricians inactive. Increased efforts were being made to prevent fetal death by premature induction of labour and elective Caesarean delivery. In some instances the pendulum swung too far. Certainly in the case of maternal diabetes (7) and rhesus isoimmunisation (8) the increase in preterm neonatal deaths as a result of this policy seemed to significantly outweigh the fall in stillbirths. Part of the difficulty lay in correctly determining gestational age, a problem that was exacerbated in 1956 by the report (9) that pre-natal exposure of the fetus to X-rays might lead to later malignancy. Account must also be taken of trends in the use of maternal sedation during labour, because of its profound influence on neonatal adaptation and vitality on the first day of life. Above all, though, this period must be viewed in the context of the pitifully inadequate paediatric staffing in maternity hospitals (10) and the equally deplorable lack of equipment. It was against this background that the paediatrician had to lay down guidelines for the nursing staff on the use of oxygen. It is hardly surprising if the majority preferred to err on the side of avoiding iatrogenic blindness.

The fact that the first-day mortality among low-birth-weight infants in Britain has been falling since 1965 affords no grounds for complacency. Most of our nurseries for the newborn are still without the means of monitoring environmental and arterial oxygen, even though the necessary equipment has been available for at least a decade; and resident paediatric staffing of all but the largest maternity units is virtually non-existent. The facts are sombre. Each year in Britain more than 17,000 babies die in the perinatal period, a number equivalent to deaths from all causes over the next 28 years of life. (11) Almost as many deaths take place during the first week of life as during the whole of the remainder of childhood. Analysis suggests that this mortality might be reduced by at least a third and possibly by half if modern knowledge and resources in perinatal care were made generally available throughout the country. Moreover, mortality is only a fraction of total perinatal morbidity. In the past the fear has been expressed that better perinatal care might indeed lead to an increase in the number of severely handicapped survivors. Just the reverse is likely to be true. On the one hand, paediatricians are increasingly reluctant to provide intensive care for obviously brain-damaged and severely handicapped babies, while on the other hand, the introduction of intensive care for high-risk infants, and especially for those of very low birth-weight, has not only greatly lowered the mortality but has also resulted in a dramatic fall in the incidence of long-term handicaps such as mental subnormality, epilepsy, and cerebral palsy. (12,13) The cost of 50 years' institutional care for one severely handicapped survivor is likely to be in the order of £250,000, to which must be added £50,000 for loss of earnings. Surely the time has come to recognise on both humane and economic grounds that the cost of continued perinatal neglect is far too great.

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- 2 Avery M E, Oppenheimer E H (1960). *J Ped* 57, 553
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- 13 Prod'hom L S, Calame A, Steinhauer J. *ibid* page 171

APPENDIX A

A1

The Lancet, 16 March 1974, page 437

The Price of Perinatal Neglect

The incidence of retrolental fibroplasia fell rapidly in the five years that followed publication of the classic work of Ashton et al (1) in 1953. However, there were soon indications that a price might have been paid for the indiscriminate restriction of the use of high concentrations of oxygen soon after birth.(2,3) Professor Cross (4) has drawn attention to the halt that took place between 1950 and 1965 in the previous steady decline in neonatal mortality in both Britain and the USA, and he and Dr Bolton present further evidence on page 445. Analysis revealed that the 'excess' mortality was mainly confined to infants of low birth-weight dying on the first day of life. Since respiratory distress and hypoxaemia are responsible for most such deaths, Cross argues that this 'excess' was likely to have been due to the restriction of oxygen, and further suggests that the prevention of each case of retrolental fibroplasia has been bought at the cost of 16 unnecessary deaths, amounting over the whole period to a total of more than 20,000 in England and Wales and in excess of 150,000 in the USA.

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The fact that the first-day mortality among low-birth-weight infants in Britain has been falling since 1965 affords no grounds for complacency. Most of our nurseries for the newborn are still without the means of monitoring environmental and arterial oxygen, even though the necessary equipment has been available for at least a decade; and resident paediatric staffing of all but the largest maternity units is virtually non-existent. The facts are sombre. Each year in Britain more than 17,000 babies die in the perinatal period, a number equivalent to deaths from all causes over the next 28 years of life. (11) Almost as many deaths take place during the first week of life as during the whole of the remainder of childhood. Analysis suggests that this mortality might be reduced by at least a third and possibly by half if modern knowledge and resources in perinatal care were made generally available throughout the country. Moreover, mortality is only a fraction of total perinatal morbidity. In the past the fear has been expressed that better perinatal care might indeed lead to an increase in the number of severely handicapped survivors. Just the reverse is likely to be true. On the one hand, paediatricians are increasingly reluctant to provide intensive care for obviously brain-damaged and severely handicapped babies, while on the other hand, the introduction of intensive care for high-risk infants, and especially for those of very low birth-weight, has not only greatly lowered the mortality but has also resulted in a dramatic fall in the incidence of long-term handicaps such as mental subnormality, epilepsy, and cerebral palsy. (12,13) The cost of 50 years' institutional care for one severely handicapped survivor is likely to be in the order of £250,000, to which must be added £50,000 for loss of earnings. Surely the time has come to recognise on both humane and economic grounds that the cost of continued perinatal neglect is far too great.

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- 13 Prod'hom L S, Calame A, Steinhauer J. *ibid* page 171

What Future for Perinatal Care?

"Nowadays, thanks to antisepsis, death has practically been banished from our maternity hospitals and morbidity reduced almost to its minimum. Further, through the perfection of instruments and the advancement of operative technique, obstetrical interference has become much simpler and safer, so that the accoucheur, freed from anxiety as to the fate of the mother, can now devote his attention to the needs of the infant.

"Before parturition, he supervises the hygiene of the expectant mother so that she may arrive at term in a healthy condition; during delivery, he takes every precaution to ensure that the child will be born sound and viable; and throughout the first two years of life, he directs its feeding with the utmost interest."

Pierre Budin, 1907

The foundations of perinatal care in Britain, and for that matter of infant and child care too, were laid by the man-midwives of the 17th and 18th centuries. When towards the end of this period they achieved full professional recognition, their work was continued on through the 19th century by men such as Michael Underwood and Charles West styling themselves physician-accoucheurs. One of the greatest of their number was Pierre Budin of Paris. As the quotation (1) above shows, he was a perinatologist in the most modern sense. Unfortunately the very advances in anaesthesia and antisepsis that enables Budin, at the turn of the century, to concentrate on the welfare of the fetus and newborn infant, drew the overwhelming majority of his colleagues away towards surgery and gynaecology. Obstetricians in Britain now sought the FRCS in preference to the MRCP and the newborn infant was left increasingly in the care of the nursery nurse. For fifty years little was added to the knowledge of perinatal care, and much that had been known slipped from men's minds.

The reversal of this trend, pioneered in the 1930s by individual paediatricians and pathologists, received a great boost from the discovery of rhesus haemolytic disease and its treatment by exchange transfusion just after the 1939-1945 war. The creation of the National Health Service in 1948 also helped to lower interdisciplinary barriers and to permit the paediatrician to put his services at the disposal of obstetrician and newborn baby. During the past twenty-five years, with the help of physiologists, considerable progress has been made in unravelling the problems of the fetus and newborn. (2) Yet, sadly, the gap between knowledge and its application has remained almost as wide as ever. A third of all deaths in infancy and childhood in the UK continue to take place on the first day of life, while the perinatal mortality is as great as that for deaths from all causes during the next twenty-eight years (3); and the deaths give but an inkling of perinatal morbidity and long-term handicap. Yet there is evidence to suggest that perhaps half these tragedies are preventable. Since nearly all women are now delivered in hospital, perinatal care in Britain must leave much to be desired. In fact perinatal care as envisaged by Budin hardly exists, the baby normally being handed over by obstetrician to paediatrician at the moment of crisis, either at birth itself or after recognition of serious disease in the neonatal period. Clearly there is a need for obstetricians and paediatricians to train and work together as a perinatal team; for only by studying the fetus will the paediatrician fully appreciate the problems of the newborn infant, and, likewise, the obstetrician must study the newborn infant if he is to assess and improve his own management of pregnancy and labour.

Desirable though this joint approach seems to be, it is unlikely to come to pass unless suitable career structures and training programmes are devised by each discipline on a scale sufficient to meet the annual demands of more than 600,000 deliveries. The British Paediatric Association did in fact recognise perinatal medicine as a subspecialty in 1972. (4) However, apart from this, little progress has been made and there remain only a handful of perinatal paediatricians in the country today. Meanwhile the bulk of primary care of newborn infants is undertaken either by obstetric housemen, by general practitioners, or by junior paediatricians in training. This staffing belies the difficult nature of the clinical work, the subtlety of the early signs of disease, the importance of early diagnosis and prevention, and the technical skill and experience required for giving (and, on occasion, for withholding) intensive care to very small and sick newborn infants. Surely the time has come to acknowledge in action the fact that we can no longer afford financially or in terms of suffering the cost of failing to give each future generation the safest possible start in life. (3)

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APPENDIX B

The Lancet, 3 April 1976, page 729

Born in Britain 1970

After a prolonged gestation, the British Births Survey has been delivered safely of twin II dealing with the first week of life; (1) twin I reporting the obstetric care of the mother is still awaited. The study, undertaken in 1970, involves all 17,196 births in the United Kingdom during a week in April and was sponsored by the National Birthday Trust Fund and the Royal College of Obstetricians and Gynaecologists. The Director, Dr Roma Chamberlain, and her team, handicapped as they must have been by deficiencies in the design of the original questionnaire, are to be congratulated on their report whose value is enhanced by comparison with the previous, similar UK national cohort studies in 1946 (2) and 1958. (3,4)

The trend towards hospital delivery has continued with home confinements falling from 36.1% in 1958 to 12.4% in 1970. However, 76% of deliveries were still undertaken by trained or pupil midwives (1958: 80.2%). Induction of labour rose from 13% to 29.5%, while forceps deliveries increased by 68% (from 4.7% to 7.9%), Caesarean deliveries by 66% (from 2.7% to 4.5%), and breech delivery by 8% (from 2.3% to 2.5%). The use of inhalational analgesics fell from 79% to 61% of deliveries but 68% of women received pethidine with or without other drugs in 1970, and there was a more extensive use of local and regional anaesthesia. Only 0.5% of patients had a fetal-blood sample or a continuous fetal-heart-rate record during labour.

The perinatal mortality rate (PMR) fell from 33/1000 deliveries in 1958 to 23 in 1970, the reduction being greater for stillbirths (39%) than for first-week deaths (14%). The main improvements have been in pneumonia, down from 1.3 to 0.1; birth trauma, down from 3.0 to 0.4; massive pulmonary haemorrhage, down from 0.9 to 0.2; and haemolytic disease, down from 1.3 to 0.6/1000 deliveries. The main causes of death in the first week were the respiratory-distress syndrome and congenital malformation (3.2 and 2.5/1000 live births, respectively). These rates are identical with those of 1958. The other main causes of death were intrauterine anoxia (1.8/1000) and extreme immaturity (birthweight below 1 kg) (1.6/1000). These four groups accounted for over 80% of the first-week deaths, 68% of which occurred among the 6.8% of infants weighing less than 2.5 kg at birth (1958: 6.7%).

The 30% improvement in perinatal mortality between 1958 and 1970 should not lead to complacency, for there are many indications in the report of major deficiencies in perinatal care. For example, while the PMR for social class I was only 7.5, that for social class II was 15.8 and for classes IV and V no less than 26.8. The gap had also widened for single (5.5%) and unsupported (1.8%) women whose PMR of 37 was almost twice that of married women (20/1000). The mortality for twins at 100.5 showed little decrease from the figure of 109 in 1958 and was 4.7 times greater than the PMR for single infants in 1970. Despite the propaganda, as many mothers continue to smoke during pregnancy (42%) as did in 1958. The PMRs for home, GP, and consultant deliveries were 4.3, 6.1, and 27.8, respectively; 86% of all perinatal deaths occurred among the 66% of infants born in consultant units. In part the high PMR associated with these hospital deliveries may be explained by selection of at-risk cases. Unfortunately, it is impossible not to suspect that iatrogenic factors have also contributed. Nor is it possible to ignore the fact that the deficiencies in perinatal care revealed in the report apply to a major extent to the hospital service.

Onset of respiration was delayed by at least 1 minute in 22.9% of babies and more than 3 minutes in 4.7% (consultant, 6.2%; GP, 1.3%; home, 1.1%). A quarter of infants delivered by the breech or by Caesarean section belonged to the latter severely asphyxiated group, as did 53% of all first-week deaths. Yet while 87% of infants with a 3 minute delay in breathing were born in consultant units, only 37% of them were intubated at birth.

Although 72% of infants were examined on the first day of life, only 33% were seen by a member of the paediatric staff; 27%, including 7.3% of low-birthweight infants, received no examination on the first day and among their number were 15% of the infants born in consultant units that subsequently required admission for special care. This inexcusable state of affairs is highlighted by the fact that three-quarters of all first-week deaths occurred within 24 hours of birth. Nor did discharge from hospital reflect any credit, only one-third of infants being examined within the previous 24 hours and 9% on the actual day of move.

Neonatal care during the first week of life also left much to be desired. For example, only 39% of infants exhibiting signs of cerebral irritation, including fits, had a blood-sugar estimation. In nearly a fifth of the infants with jaundice due to blood incompatibility the bilirubin level was permitted to rise above 20 mg/dl. Vitamin K was administered to only 23% of all infants (48% of low-birth-rate infants): 47% of the infants with bleeding problems had had no vitamin K. No record was available in 33% of cases to indicate that the hips had been examined for congenital dislocation. Approximately 70% of babies were bottle fed by the tenth day, compared with 15% in 1946.

In 1974, over half the deaths in the whole of infancy and childhood took place within three days of birth. Perhaps half of these deaths were preventable. (5) However, as Professor W C W Nixon (3) wrote in 1958, "The perinatal death rate is also an index of the number of near-deaths which may have occurred, and present with defects, acquired in pregnancy, at a later date. Like an iceberg, we see only a proportion of the ill-results, the deaths. But we must not forget the submerged and larger fraction, the near-deaths and the harm which they cause". Long-term handicaps are most often caused in the perinatal period by hypoxia, hypoglycaemia, hyperbilirubinaemia, and haemorrhage. The British Births Survey reveals how inadequate our efforts were in 1970. In spite of the recommendations of an expert group on special care for babies in 1971, (6) relatively little progress has been made. (7) For example, a Department of Health working party report (8) in 1975 stated that a review of 43 special care baby units had revealed that only 8 were able to measure environmental oxygen reliably and only 2 measure arterial oxygen. There is also an acute shortage of trained senior paediatric staff able to devote most of their energies to the perinatal period - perhaps 12 in all to meet the annual demands of more than 600,000 deliveries in the UK. Of senior registrar training posts there are only two or three. As the economic crisis bites, the situation is likely to get worse rather than better, unless the Government can be persuaded to appreciate as, for example, those of Canada and France have, that the prevention of handicap is 100 to 1000 times cheaper than long-term treatment and care. (5)

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APPENDIX C

C1 Rep Publ Hlth Med Subj, No 127, HMSO 1971

Report of the Expert Group on Special Care for Babies (Chairman Sir Wilfrid Sheldon)

9 SUMMARY

9.1 The report reviews the development of special care for babies from simple management in the early years to the modern service which provides an intensive care element in some special care nurseries. Evidence is quoted which suggests that modern intensive care not only would reduce perinatal mortality still further but also would reduce handicaps among surviving babies. The deficiencies of the existing special care services are examined. The report considers the organisational aspects of an area special care service based on the general hospital having maternity and children's departments and in particular the full participation and co-ordination of hospital, general practitioner and local authority services.

9.2 The functions of special care nurseries and those where intensive care is provided are defined. Guidance is given on the number of special care, including intensive care, cots which are required. The medical and nursing staffing needs of special care nurseries and intensive care nurseries are discussed. The report gives special attention to follow-up, the regular review of perinatal mortality and morbidity, and to research.

The main recommendations are:

SECTION I - INTRODUCTION

9.3 The term low birth weight babies should replace that of 'premature' babies (paragraph 1.2).

SECTION II - BRIEF HISTORICAL REVIEW

9.4 The existing special care service for babies should be re-organised to take account of important recent advances which not only save infant lives but improve their chances of developing normally (paragraph 2.7).

SECTION III - THE IMPORTANCE OF SPECIAL CARE

9.5 Attention should be directed not only to the reduction of perinatal mortality but also to the reduction of handicaps among surviving babies (paragraphs 3.7-3.11).

SECTION IV - PRESENT FACILITIES FOR SPECIAL CARE BABIES

9.6 Deficiencies in the existing special care service should be remedied (paragraph 4.3).

SECTION V - FUTURE ORGANISATION OF SPECIAL CARE FOR BABIES

GENERAL

9.7 A special care service for newborn babies should comprise, anticipation and prevention of damage to the baby before and during birth, specialised observation and treatment for newborn babies, teaching and training of professional staff, follow-up and research (paragraph 5.1).

9.8 The special care service for the area should be based on the specialist maternity and children's department of the general hospital (paragraph 5.2).

9.9 The consultant paediatrician should have primary responsibility for the special care service and should work closely with the obstetric team (paragraph 5.3).

9.10 Area maternity liaison committees should formulate a plan to prevent or anticipate complications in the antenatal period (paragraph 5.5).

9.11 The general practitioner should not be penalised financially on account of seeking consultant help for his booked maternity patients (paragraph 5.5).

RESUSCITATION OF THE BABY

9.12 Written instructions detailing individual responsibility should be issued to all concerned with resuscitation of the baby (paragraph 5.9).

9.13 Obstetric and paediatric staff in training should be given the opportunity to become proficient in neonatal intubation (paragraph 5.8).

9.14 Midwives should be trained in resuscitation (paragraph 5.8).

INTENSIVE CARE

9.15 Intensive care facilities should be provided for a small proportion of babies such as those with severe respiratory problems or those who are born very early (paragraph 5.12).

TYPES OF NURSERIES

9.16 Two types of nurseries should be provided: (a) special care nurseries associated with specialist maternity departments of general hospitals, (b) combined special and intensive care nurseries associated with certain specialist maternity departments of general hospitals (paragraphs 1.5, 5.11-5.13).

TRANSPORT OF BABIES

9.17 Nurseries providing intensive care should be responsible for organising the transport of babies to the nursery (paragraph 5.19).

MEDICAL RECORDS

9.18 Babies receiving special care should have individual case records which should also bear the mother's case registration number (paragraph 5.21).