
Contemporary Themes

Costs and benefits of a community special care baby service

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Abstract

Between January 1981 and December 1986 3829 low birthweight (<2500 g) infants and 1980 other high risk infants were cared for at home after they were discharged from hospital by a specialist neonatal nursing service. Of the infants who were referred to this service, 720 (12%) weighed under 2000 g and 1919 (33%) under 2250 g at the time of discharge home. The infants were visited by the community neonatal sisters on an average of 11 occasions, but the number of visits varied from six to over 100 depending on the needs of the child and parents. There was close liaison with other community and hospital staff. Two hundred and thirty (4%) referred infants were readmitted to hospital while under the care of the specialist nursing service. In 1985 the cost of the service was £127 000, or £123 for each infant referred. Providing this specialist support at home allowed much earlier discharge of low birthweight infants from hospital. When compared with the cost of providing continuing inpatient neonatal care earlier discharge was estimated to have saved roughly £250 000 in 1985.

Low birthweight infants have an increased risk of serious illness or death that extends beyond the neonatal period. Many are born to young and socially disadvantaged parents who can benefit from expert guidance and support at home. A community neonatal nursing service has advantages for high risk infants and their parents, is cost effective, and allows more efficient use of limited hospital resources.

Introduction

Infants of low birth weight (<2500 g) and other infants who have required prolonged admission to a special care baby unit have a greater risk of developing problems after discharge home than most infants. Infants of low birth weight are more likely to require admission to hospital in the first year of life, particularly for lower respiratory tract infections.¹ Sudden unexpected deaths in infancy ("cot deaths") are more common,² and the rate of death from all causes between 4 weeks and 1 year of age is 14.9 per 1000 live births for low birthweight infants compared with 3.9 per 1000 for all live births.³ Neurological and developmental problems occur more often in infants who have been under neonatal intensive care,⁴ and these problems may become evident only months after discharge home. Non-accidental injury and failure to thrive occur more often in babies who have required admission to a special care baby unit.⁵ There is still controversy about the psychological effects of prolonged separation of parent and baby,⁶ but problems with the development of the normal relationship between parent and child are not uncommon after such separation.⁷

It seems apparent that infants who have needed to stay in hospital for a long time after birth and their parents may benefit from close observation and support in the community after discharge. We describe the organisation, experience, and costs of a specialised nursing service for such high risk infants in Manchester.

Manchester Community Special Care Baby Service

The Manchester Community Special Care Baby Service was established in 1945 because of concern about infant mortality, which was substantially higher in Manchester than in Britain as a whole. The government recommended that hospitals should establish premature baby units and that the community should provide specialist nurses to care for small and sick babies who were born at home. At that time most babies were delivered at home. During the past four decades the special care baby service has evolved so that now with the integration of hospital and community

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maternity services it provides care at home for low birthweight infants and for other infants at high risk after discharge from hospital.

The service is available for infants of mothers who are resident within the boundaries of North, Central, and South Manchester District Health Authorities. In this area there are four general hospitals, four children's units, and four maternity units. The regional neonatal medical and neonatal surgical intensive care units are based at St Mary's Hospital in the Central District. The population of 450 000 served by the three health authorities is characterised by high unemployment. There are 7000 births each year, and in 1985 over 38% of babies were born to unmarried mothers (England and Wales 19.2%) and 16% to teenage mothers (England and Wales 8.7%).⁸⁻¹⁰ In 1985 a tenth of the babies born in the three Manchester districts weighed under 2500 g (England and Wales 7.1%).⁸ These factors highlight a population of infants who are more vulnerable and of mothers who are more in need of support than those in many other parts of Britain.

The following categories of babies are routinely referred to the service: (a) all babies with a birthweight under 2500 g; (b) all babies who have been nursed on a special care baby unit for more than 48 hours; and (c) all babies discharged from the neonatal surgical unit. In addition, any baby who has caused concern on the postnatal wards may be referred. This includes babies with chromosomal anomalies and major congenital malformations, and those who are vulnerable because of adverse social circumstances.

ORGANISATION OF THE SERVICE

The special care baby service consists of 10 specialist nursing sisters who hold the qualifications of registered general nurse and state certified midwife and have a certificate in neonatal nursing. All have postgraduate experience in midwifery and neonatal care and training in family planning. Some staff are also registered sick children's nurses or have health visitor training. When joining the service nurses are given a detailed induction course, and regular refresher courses in midwifery and neonatal care are also given.

The service is based at St Mary's Hospital in Central District but also has an office in a local child health clinic. The sisters work in three teams with primary responsibility for a particular geographical area. There is a daily meeting attended by all staff to exchange information and to maintain continuity. The service operates seven days a week between 9 am and 5 pm. All staff carry a radiotelephone so that they can be contacted while on duty, and parents are given a telephone number which is staffed 24 hours a day through the hospital switchboard.

The nursing staff have close links with different branches of the obstetric and neonatal services. They regularly attend neonatal ward rounds and develop a close working relationship with the staff on postnatal wards. They are also in contact with the staff of local child health clinics, general practitioners, and some specialist paediatric clinics. There is close liaison with the community midwives and the health visitors, who often already know the family. Joint visits are often made with the health visitors, who take over responsibility for the infant when it is discharged from the community special care baby service.

The community sisters visit the special care baby units and the postnatal wards daily and are notified soon after birth of all babies who will require referral to the service. The medical history is obtained from the ward sister and particular emphasis put on present or expected social problems. The community sister introduces herself to the mother and explains that she has a dual role, acting as a specialist home nurse for the baby and as community midwife for the mother. Mothers are visited regularly while they remain in hospital to promote a good relationship.

Where possible a home visit is arranged with the mother before the baby's transfer home. This is to ensure that the parents have made adequate preparations for the baby, such as providing suitable feeds, clothing, and adequate heating. The visit is also a useful time to give advice to the parents about how they will manage to care for the child after it is discharged from the hospital. This is particularly

important with very small infants where there is often concern about hypothermia. If the home assessment is unsatisfactory the medical social workers and social services with whom the community sisters work are contacted to try to improve the situation. Occasionally the community sister may advise delaying the baby's discharge from hospital until a better standard is achieved.

The nurses visit all babies on two consecutive days after discharge home to assess progress and to give reassurance and advice. After this all babies who are discharged weighing under 1800 g are visited on alternate days, and those weighing 1800-2200 g are visited at least twice a week until they weigh at least 2600 g or are 28 days old. Other visits are made at the discretion of the community sister. A record of the child's progress is left with the parents. A more comprehensive file is kept by the staff of the progress of the mother and baby, the mother's obstetric history, home conditions and family composition, and any social problems.

ANALYSIS OF ACTIVITY 1981-6

We analysed the activity of the community special care baby service from 1 January 1981 to 31 December 1986. Prospective data were collected weekly and included the numbers and sources of all referrals, birth weight and weight at discharge from hospital of all infants referred, the number of visits made by the special care sisters to mothers, babies, hospitals, and clinics, and the number of home assessments. Because of concern about the complications that might occur in babies who were discharged relatively early we also collected data on infants who required readmission to hospital while still under the care of the service.

A total of 5809 babies were referred to the service over the six years, which represents almost 14% of all live births in Manchester. At birth 1159 (20%) of the referred infants weighed under 2000 g, and 3829 (66%) weighed under 2500 g. There was little yearly variation in the numbers of infants referred or in the distribution of their weights when they were discharged from hospital (table I). Of all referrals, 720 (12.4%) babies weighed under 2000 g, 1919 (33%) under 2250 g, and 3796 (65%) under 2500 g when discharged from hospital. The babies of unmarried mothers, many of whom were still teenagers, accounted for 2440 (42%) of the referrals.

TABLE I—Weight of babies at time of discharge to community special care baby service

Weight (g)	No of babies (% of yearly referrals)					
	1981	1982	1983	1984	1985	1986
<2000	90 (9)	128 (14)	128 (14)	108 (12)	130 (13)	136 (13)
2001-2250	196 (20)	208 (22)	186 (20)	182 (19)	207 (20)	220 (22)
2251-2500	330 (34)	296 (32)	311 (33)	300 (32)	343 (33)	297 (30)
>2500	357 (37)	302 (32)	303 (33)	350 (37)	350 (34)	351 (35)
Total	973	934	928	940	1030	1004

Nearly all of the babies (5577; 96%) were referred from the maternity units; 83 (1.4%) were referred from the neonatal surgical unit. Other babies were referred by community midwives when problems developed for the first time at home. Referrals from health visitors or general practitioners were rare.

The total number of visits made to mothers and babies at home and in hospital varied from 10 760 in 1981 to 11 279 in 1986. On average each referral resulted in 11 visits, but there was a wide range in the number of visits to individual babies, from six to over 100.

During the six years 230 babies (4% of all referrals) were readmitted to hospital while under the care of the service. Readmission was related to birth weight: 134 out of 720 (19%) infants with a birth weight of 1500 g or less needed to be readmitted while under the care of the service compared with 168 of 5089 (3.3%) infants with a birth weight of over 1500 g ($\chi^2=166$, df 1, $p<0.001$). Some infants were readmitted with complications of conditions that had been present in the neonatal period, such as

heart failure in congenital heart disease, but many had illnesses that occur in babies of all birth weights, such as respiratory and gastrointestinal infections or failure to thrive (table II). Only two babies required admission to hospital because of hypothermia (rectal temperature <35°C).

We reviewed the circumstances of the deaths of infants who were still under the care of the service at the time of their death between January 1985 and December 1986. There were four deaths in 1985 and none in 1986. All four infants had severe congenital or perinatal problems (table III). Several other infants died at different times after being discharged from the service, but details on these were not complete.

COSTS

We quantified the annual costs of the service for 1985. The main expenditures (£108 381) were on salaries and related employers' costs such as national insurance and superannuation contributions. Staff provided their own vehicles but were given car allowances which had a total cost of £13 057 in 1985. A sum of £5200 was spent on disposable medical items such as dressings and equipment for taking blood samples. The total cost of the service in 1985 was £126 638. As 1030 babies were referred the cost of the service for each child was £123. Each baby was visited on average 11 times by the service, and the cost of each visit was therefore £11.18.

Discussion

The Community Special Care Baby Service is an integral part of the perinatal services in Manchester and provides support to 1000 babies and their families each year. With the improving survival rate for low birthweight infants¹¹ and with the growing recognition that they have an increased risk of dying or becoming seriously ill far beyond the neonatal period,^{13,12} the case for providing continuing support for these vulnerable infants after they are discharged from hospital has become clearer.

The criteria for discharge from a special care baby unit vary widely. It is still common practice to wait until babies have achieved an arbitrary weight, usually 2000-2300g, before they are allowed home. We believe that provided community support is available such a policy can no longer be justified, is often detrimental to the infants and their families, and prevents efficient use of the limited

resources available on many units. Our experience has shown that low birthweight infants can be discharged home irrespective of their weight provided they are feeding well, they have stable temperature and cardiorespiratory control, the home circumstances are satisfactory, and home nursing support and advice is available after discharge.

Randomised controlled studies in Canada¹³ and Leicester¹⁴ compared the "early" discharge of groups of low birthweight infants who satisfied the above criteria with control groups of babies who were discharged only when they had attained a weight of at least 2200 g. There were no differences in growth, episodes of illness, or number of admissions to hospital between the two groups, but abandoning the set weight at discharge resulted in the "early" group returning home on average seven to 12 days earlier and 200-300 g lighter than babies in the control group. A further study from Pennsylvania confirmed these observations and in addition gave a calculation showing a financial saving from earlier discharge of 22-27% of the normal costs of caring for such low birthweight infants.¹⁵ All of these studies emphasised the importance of assessing the home circumstances before discharging babies and of the need for increased community support after discharge by either a specialist nurse^{13,15} or a health visitor.¹⁴

The lack of a clearly defined and comparable control group prevented us from accurately quantifying the effect of the special care baby service on discharge. But our experience has shown that infants who weigh under 2250 g whose mothers are resident in the area covered by the community service are discharged on average two weeks earlier than similar infants whose mothers live in areas without specialist community support for small babies. Two weeks is similar to that reported in the small controlled studies described above.¹³⁻¹⁵

Some health visitors and community midwives are reluctant to accept the return of small babies to their care because these infants might be at an increased risk of becoming seriously ill. This is understandable if they have little experience of caring for such small infants. Between 1981 and 1986 4% of babies who were referred to the service were readmitted to hospital while still under the care of the service. We know of no evidence that delaying the discharge of these infants would have decreased the risk of their developing problems that would require admission to hospital. A particular concern among health visitors is the risk of hypothermia. Only two out of almost 6000 babies required readmission because of a body temperature of under 35°C. If parents are given advice about hypothermia the risk of it occurring is minimal and should not influence decisions about discharge.

Early discharge from the special care baby unit is an advantage to infants and their families. Despite efforts by the staff of these units to meet the emotional needs of parents many mothers and fathers feel frightened by, and uninvolved with, their babies. These anxieties may persist for months after the baby is discharged from hospital and can interfere with the development of the normal parent-child relationship.⁷ The special care baby service not only helps to shorten the period of separation but can also provide support and reassurance at home. A disproportionate number of the mothers of low birthweight infants who are referred to the service are young, unmarried, and unsupported, and are poorly educated in child and general health care. They thus need support and advice.

Frequent visits by the family to the special care baby unit are expensive in time and money, particularly if the baby has been transferred to a distant unit for intensive care. Parents can experience conflict between the needs of their sick infant and older siblings at home. Prolonged separation may be associated with

TABLE II—Number of infants requiring readmission to hospital before discharge from community special care nursing service

Reason for admission	1981	1982	1983	1984	1985	1986
Apnoeic/cyanotic episodes	2	2	4	0	5	5
Gastroenteritis	6	5	5	1	5	5
Meningitis	2	2	0	2	0	0
Respiratory infection	8	6	8	5	7	9
Other infections	0	6	7	1	1	6
Congenital abnormalities	10	6	9	6	10	1
Failure to thrive	5	6	5	2	3	5
Jaundice	5	1	3	4	1	4
Hypothermia	0	1	1	0	0	0
Surgical	0	0	2	6	4	3
Non-accidental injury	0	0	0	0	3	0
Others	4	0	1	0	3	2
Total (% all referrals)	42 (4.4)	35 (3.7)	45 (4.8)	27 (2.9)	42 (4.1)	40 (4.0)

TABLE III—Details of infants dying while under the care of community special care baby service, 1985-6

Infant	Birth weight (g)	Gestation (weeks)	Perinatal problems	Age at death (weeks)	Cause of death
1	3500	40	Down's syndrome; necrotising enterocolitis; congenital heart disease	19	Meningitis
2	1400	30	Necrotising enterocolitis; ?fetal alcohol syndrome	12	Cot death ?milk aspiration
3	2500	38	Klippel-Feil anomaly; interrupted aortic arch, ventricular septal defect; microcephaly	35	Cardiac failure
4	1100	27	Respiratory distress syndrome; intraventricular haemorrhage; septicaemia; recurrent apnoea	16	Septicaemia and pneumonia (salmonella)

behavioural problems in siblings. Separation of mother and baby also interferes with the establishment of breast feeding,¹⁶ and an unnecessarily prolonged stay on a special care baby unit increases the risk of serious cross infection.¹⁷

Many units have insufficient trained nursing staff because of either difficulties in recruitment or underfunding.^{18,19} Babies requiring the most basic neonatal care need four hours of nursing time a day,¹⁴ so earlier discharge of healthy babies frees limited nursing resources.

In 1985 the average cost of the Community Special Care Baby Service was £123 for each patient referred. Sandhu *et al* have calculated the costs of providing various levels of care for very low birthweight (<1500 g) infants in a regional neonatal intensive care unit.²⁰ The most basic nursing care costs £71 a day at 1984 prices. If, as our experience suggests, providing the community service results in infants weighing under 2250 g being discharged on average two weeks earlier considerable savings can be made. In 1985 337 babies weighing under 2250 g were discharged into the care of the service. If we assume that because of their smaller size these infants were visited more often and that the cost of providing the service for them was twice the average cost—that is £246—then the savings associated with their shortened stay on the neonatal unit would have been roughly £250 000 in 1985 ((337 × 14 × 71) – (337 × 246)).

The results of this study suggest that a community specialist nursing service for low birthweight infants and infants at high risk has many advantages for babies and their families. It allows more efficient use of overstretched hospital neonatal services and is therefore highly cost effective. This service is not unique to Manchester, nor is the way in which it is organised the only way of providing support for small infants, but we hope that our experience will stimulate debate about the way in which the special needs of these vulnerable infants can best be met.

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New Drugs

Practical clinical pharmacology: drug handling and response

JOHN FEELY, MARTIN J BRODIE

Throughout this series we have presented important new drugs and reconsidered some older ones where recent information has led to a reappraisal of efficacy or toxicity. Over 500 pharmacological agents have come on to the market in the past 25 years, and more than 100 are currently being developed. The production of hormones and regulatory peptides through recombinant deoxyribonucleic acid technology heralds another therapeutic revolution. Despite the

increasing adoption of postmarketing surveillance we rely heavily on perceptive observations by practising doctors not only for the early detection of adverse events but also for the recognition of unanticipated additional benefits that come to be regarded as secondary indications—for example, intraocular β blockers for glaucoma, topical minoxidil for baldness.

An increasing amount of assessment of new drugs will be undertaken by family doctors. This development is important, as many drugs are used almost entirely in general practice. In the final analysis the prescriber has to judge from available information whether or not to try a new treatment for the patient. For many, the interpretation of the clinical data, often presented in indigestible pharmacokinetic terms and as complicated clinical trials, is hindered by a lack of familiarity with the jargon and methods. These two articles will consider some basic principles in clinical pharmacology, an appreciation of which will facilitate better use of the available drugs and proper evaluation of newly introduced therapeutic agents.

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