

Evolution of neonatal intensive care in a district general hospital

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SUMMARY Before 1975 in Blackburn in the Premature Baby Unit monitoring facilities were limited. Ambient oxygen monitoring, blood gas analysis, and ventilation were not being performed. Gradually, special care was introduced and from 1978–80 all babies requiring intensive care and long term ventilatory care were transferred to the Regional Neonatal Intensive Care Unit. Not all babies with incipient or established respiratory failure, however, could be accepted, and those declined had unfavourable outcomes. In 1981 local intensive and ventilatory care was begun, and since then the survival of all babies has improved considerably. Our early neonatal mortality and neonatal mortality have fallen below the regional levels. In a district general hospital it is possible to achieve survival figures comparable with those of a regional centre.

Several reports have drawn attention to deficiencies in standards of perinatal care in Britain and have recommended improvements.^{1–5} Regional organisation of neonatal intensive care has been widely developed in this country, and some large districts have also developed intensive care facilities.⁶ Some regional centres accept all low birthweight babies, whereas others accept mainly babies with respiratory failure.⁷ One author in a leading article questions the advisability of providing intensive care in most special care units: 'A conventional special care unit cannot become an intensive care unit overnight by the purchase of one or two mechanical ventilators'.⁸

A service directed towards incipient or established respiratory failure has its limitations, for when sick neonates requiring mechanical ventilation cannot be accepted, then their outcome is unfavourable.⁹ This report examines the parallel development of a district neonatal intensive care unit alongside the regional intensive care unit and evaluates the results of such a policy.

Patients and methods

Blackburn, Hyndburn, and Ribble Valley Health District covers an area of 305 square miles. The total estimated residential population in 1983 was 272 900. Consultant maternity and special care are provided at Queen's Park Hospital. There are three

general practitioner maternity units six to 10 miles from the main unit.

There is one special care unit with 20 cots. In 1977 it was known as the Premature Baby Unit. Monitoring facilities were very limited. Intubation, continuous monitoring of apex, respirations, ambient oxygen concentration, and blood gas analysis were not carried out. The Unit, however, had a high occupancy, and our early neonatal mortality (deaths within the first week) and neonatal mortality (deaths in the first 28 days) were higher than the North West Region.

The initial priority was to provide special care, with basic nursing and medical care—for example, more efficient resuscitation, better monitoring of vital functions, ambient oxygen concentration, and temperature control—together with close biochemical monitoring and early feeding.

Although the Regional Intensive Care Unit at St Mary's Hospital, Manchester, was keen to assist district hospitals with ventilatory support, we were able to transfer only babies who were robust enough to survive locally without early ventilatory support. By 1978 special care was well established and in 1979 we were able to offer some intensive care but we were relying on the Regional Centre to provide long term ventilatory support. Also from 1978 onwards we were able to transfer babies weighing less than 1000 g. In 1979 ventilation was first introduced. In 1979 most babies were ventilated for less than 24

hours. This was given either as a temporary support before the regional flying squad arrived or as a last ditch effort when the baby had reached end stage respiratory failure.

By 1980 it became obvious to us that the Regional Centre could not accept all the babies requiring ventilatory care. Hence in 1981, with the appointment of a third paediatrician, we embarked on long term intensive care. Now the only indication for transfer to the Regional Centre is shortage of nursing staff, or when all four ventilators are in use. In utero transfer is only undertaken when the Unit is full, or there is a very unusual problem such as severe Rh disease. This is done after discussion with local paediatricians and the Regional Unit. Babies with major surgical conditions are all dealt with at the Regional Centre.

Results

The annual total births in the district has varied from 3716 in 1975 to 4005 in 1984. Of the 11 923 total births in 1982-84, 9.5% (1129) were below 2500 g (regional percentage 7.8) and 21.7% (2585) were to Asian mothers (regional percentage 12). In the years 1976 and 1977, while special care was being

developed, only seven babies weighing more than 1000 g were transferred to the Regional Centre for ventilation, and none below 1000 g were transferred. From 1978-80, 46 babies were transferred, 12 of whom were below 1000 g. From 1981 onwards only an occasional baby has been transferred for the reasons already stated.

With the introduction of intensive care the workload of the Unit has increased several fold. In spite of this, the total number of admissions to the Unit has progressively fallen. In 1975 roughly 15% of all births were admitted to the Unit. The figure for 1984 was 6.3% (251). Figure 1 shows how the workload of the Unit has steadily increased. Initially, ventilation was provided only for terminal respiratory failure. But as our experience grew babies with deteriorating blood gases were ventilated without hesitation. The number of intravenous infusions increased as more peripheral veins were used for parenteral nutrition. The average length of stay went up from 8.6 days in 1977 to 16.3 days in 1984. This is due to the increased length of stay of very low birthweight babies. Now the average length of stay of babies weighing less than 1000 g is 104.6 days, of babies weighing 1000-1500 g is 51.8 days, and of babies weighing more than 2500 g is 5.2 days.

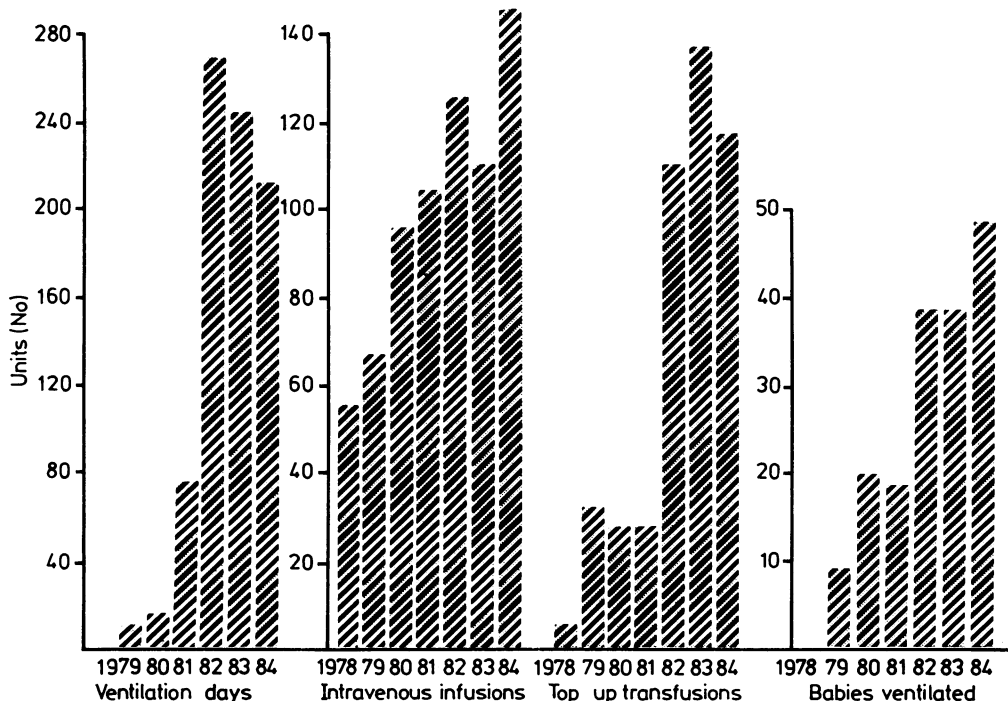


Fig. 1 Distribution of the yearly workload in the Unit for the years 1978-84.

Table 1 shows the percentage survival for ventilated babies of different weight groups. In 1979, 11 of our babies weighing greater than 1000 g were ventilated at the Regional Unit, of whom eight (73%) survived, whereas of the five babies ventilated locally only one (20%) survived. In 1981 (first year of local long term ventilatory care) our survival rate of all babies ventilated was similar to 1980 when most babies were transferred to the Regional Centre. Of the 56 babies over 1000 g ventilated locally for respiratory failure in the years 1983-84, 46 (82%) survived. With experience our survival rate for ventilated babies weighing less than 1000 g has improved considerably. The survival rate of babies weighing 1000 g or less transferred to Manchester was 33% (1979) and 25% (1980), and none of the babies ventilated locally survived until 1982 when the survival rate was 45% (11 babies). Of the 17 babies ventilated weighing 1000 g or less in the years 1983-84, 10 (59%) survived.

Ventilatory care is only one aspect of intensive care, and when the Unit is geared to providing intensive care in all its aspects the survival of all babies improves dramatically. Our survival rate of all babies weighing 750-1000 g was only 44% in 1978. In the years 1983-84 this had reached 78%, and the survival rate of babies weighing 1001-1500 g in 1983-84 was 87%. Although the workload of the staff has increased considerably in looking after very immature babies, this has not adversely affected the survival of larger babies (Table 2).

Our survival figures for babies weighing below 750 g remains poor (Table 2). Two babies below 750 g (both weighing 720 g) were ventilated in 1982, one for 55 days and the other for 58 days. To date both are developing normally except that one of them has sensory neural deafness, though her speech is normal. In 1984 a baby weighing 600 g was ventilated for 50 days. It is too early to predict her outcome.

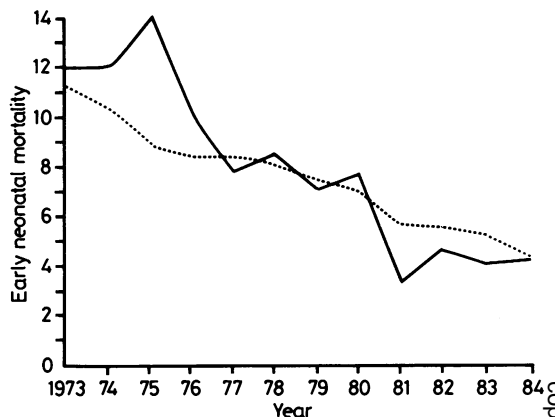


Fig. 2 Comparison of early neonatal mortality in Blackburn District Hospital and the North West Region for the years 1973-84 (—=Blackburn; - - - - =North West Region).

Table 1 Number (percentage) survival of ventilated babies, excluding those with lethal congenital malformations

	All babies			Babies weighing ≤1000 g			Babies weighing > 1000 g		
	RNICU	Blackburn	Total	RNICU	Blackburn	Total	RNICU	Blackburn	Total
1978	16 (50)	—	16 (50)	5 (60)	—	5 (60)	11 (45)	—	11 (45)
1979	14 (64)	6 (17)	20 (50)	3 (33)	1 (0)	4 (25)	11 (73)	5 (20)	16 (56)
1980	16 (62)	7 (57)	23 (60)	4 (25)	1 (0)	5 (20)	12 (75)	6 (66)	18 (72)
1981	3 (67)	13 (61)	16 (62)	0 (0)	3 (0)	3 (0)	3 (66)	10 (80)	13 (77)
1982	3 (33)	13 (70)	36 (67)	0 (0)	11 (45)	11 (45)	3 (33)	22 (81)	25 (76)
1983	1 (100)	31 (77)	32 (78)	0 (0)	8 (62)	8 (62)	1 (100)	23 (83)	24 (83)
1984	0 (0)	42 (76)	42 (76)	0 (0)	9 (56)	9 (56)	0 (0)	33 (82)	33 (82)

RNICU=Blackburn babies transferred to Regional Neonatal Intensive Care Unit for ventilation.

Table 2 Percentage survival of babies of various birthweights (values are total No of live births (% survival))

	Weight groups (g)							Total
	<750	750-1000	1001-1500	1501-2000	2001-2500	>2501		
1975-76	—	19 (15.8)	45 (60.0)	86 (76.7)	440 (96.1)	6690 (99.5)	7280	
1977-78	1 (0)	16 (31.2)	31 (58.0)	114 (90.4)	401 (97.5)	6656 (99.7)	7219	
1979-80	13 (0)	16 (43.8)	58 (79.3)	107 (93.5)	496 (98.8)	7269 (99.7)	7959	
1981-82	11 (27.2)	14 (57.1)	47 (78.7)	117 (98.3)	479 (99.2)	7280 (99.8)	7948	
1983-84	6 (16.7)	18 (77.7)	63 (87.3)	139 (95.0)	509 (99.0)	7124 (99.8)	7859	

Our neonatal mortality in 1975 was 17 (North West Region 10.7). In 1983 it was 5.6 (North West Region 6.5), and in 1984 it was 5.4 (North West Region 5.3). Our early neonatal mortality in 1975 was 14 (North West Region 10.2). In 1983 it was 4.1 (North West Region 5.3), and in 1984 it was 4.3 (North West Region 4.4) (Fig. 2). Today, the commonest causes of our neonatal mortality are lethal congenital malformations (51.2%), babies weighing less than 1000 g (21%), and asphyxia (11.6%)

Discussion

Several reports have drawn attention to deficiencies in standards of perinatal care in Britain.¹⁻⁵ Very ill, low birthweight babies require a high standard of care with scrupulous attention to nursing and medical care. Regional intensive care units have been established in all regions, but the pattern of referral of these units varies. In the North West Region St Mary's Hospital, Manchester, provides a pattern of referral that is essentially crisis orientated and directed towards babies with incipient or established respiratory failure.⁷ The demand for this service is increasing and many babies for whom transfer is required cannot be accommodated. The percentage of requests for transfer that were declined to individual hospitals ranged from 17-73%.⁹ The neonatal survival of babies declined transfer compared unfavourably with the babies who were transferred.⁹ During 1979-80 we found that if babies were declined transfer they not only stretched our resources but also that those babies that were offered long term ventilation did rather badly.

From 1981 long term ventilatory and intensive care has been provided locally. This was made possible by the establishment of an additional consultant paediatrician with experience in neonatal intensive care. Over the course of time the nursing staff establishment was increased. In 1975 there was only one sister in the Unit, but by 1984 this had been increased to nine. It was important for nurses to receive adequate training, and hence in 1977 a sister was seconded to a regional unit for the Joint Board for Clinical Nursing Studies Course 400 (now named 405). From then onwards each new sister appointed has been seconded to a regional unit for further training. By 1984 we had six sisters with such qualifications. The District Authority has accepted the importance of trained neonatal nurses and has funded all the secondments. Initially, the number of junior paediatric staff was small, but by 1980 we had two senior house officers wholly working with neonates. By 1981 we had two second on call senior house officers, and these with the registrar have

provided one in three intermediate resident cover. The second on call also provides cover for general paediatrics.

Initial equipment for the Unit was provided by voluntary bodies, but the Health Authority has also provided equipment from the end of year unused money. We still rely heavily, however, on the generosity of local voluntary organisations who raise money for the Unit.

Babies can with efficient transport techniques receive care in the regional centre. The District Special Care Baby Unit can provide a good level of anticipatory care for high risk neonates. This requires a doctor with neonatal experience to be available at short notice (registrar or senior house officer). Facilities for monitoring heart rate, skin temperature, ambient oxygen concentrations, arterial blood gases, effective management of apnoea, and intervention before the baby deteriorates too far should now be available in all special care baby units, but this is no longer sufficient in some regions. Many referral units cannot accept all babies,⁹ even though they may have established respiratory failure.

In Blackburn we have managed to progress from premature care in 1975 to long term intensive care within five years. Our survival rate of all babies ventilated has steadily improved from 60% in 1980 when most babies were transferred to the Regional Centre to 76% for all babies ventilated and 82% for babies ventilated weighing greater than 1000 g when all babies were ventilated locally. The most striking improvement has been in the survival of babies weighing 750-1000 g (survival rate 78%), 1001-1500 g (survival rate 87%) and 1501-2000 g (survival rate 95%), although this has not occurred at the expense of larger babies. The causes of neonatal death have altered, and now most babies die of lethal congenital malformations, extreme prematurity (weight below 1000 g), or asphyxia.

Greatly increased survival of immature babies, however, means increased facilities will be required outside the neonatal intensive care. Many of these babies will have readmissions, especially in the first year of life, to the children's ward. They also need careful developmental surveillance, including search for learning difficulties at school age.

Unless many subregional centres are to be established as recommended by the report of the House of Commons Social Services Committee on perinatal and neonatal mortality,⁵ the only solution lies in encouraging large districts to carry out their own intensive care and relying on regional units to help out small units. This will encourage recruitment and improve the morale and training of staff employed in large district general hospitals. Close liaison with

the regional unit and regular visits from regional neonatologists to the district hospital, however, is essential. In this respect we have been fortunate in establishing very close links with the regional centres and have had helpful criticisms in the management of our babies.

Besides the inability to accept all babies there are other disadvantages in regionalising intensive care. Parents have great difficulty in visiting babies at regional centres, both in terms of distance and expense. Low birthweight babies stay in the Intensive Care Unit for considerable periods. This has obvious implications for bonding and breast feeding.

We certainly agree with Congdon and Lelman that large districts can provide satisfactory intensive care for low birthweight babies.⁶ The development of large regional intensive care units is not the only answer for all regions, as has been pointed out by the Maternity Services Advisory Committee.¹⁰ The size, birth rate, and distribution of hospitals and their facilities differ among regions, and there is no one blue print for organisation of neonatal intensive care.

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