

## ORIGINAL ARTICLE

# Perinatal transport: problems in neonatal intensive care capacity

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**Objective:** To assess the quantity and nature of transfers within the Yorkshire perinatal service, with the aim of identifying suitable outcome measures for the assessment of future service improvements.

**Design/Setting:** Collection of data on perinatal transfers from all neonatal and maternity units located in the Yorkshire region of the United Kingdom from May to November 2000.

**Patients:** Expectant mothers (in utero transfers) and neonates (ex utero transfers).

**Interventions:** None

**Main Outcome Measures:** Quantification of in utero and ex utero transfers; the reasons for and resources required to support transfers; the nature of each transfer (acute, specialist, non-acute, into or out of region).

**Results:** In the period studied, there were 800 transfers (337 in utero; 463 ex utero); 306 transfers were "acute" (80% of transfers in utero), 214 because of specialist need, and 280 "non-acute". Some 37% of capacity transfers occurred from the two level 3 units in the region. Of 254 transfers out of the 14 neonatal units for intensive care, 44 (17.3%) were transferred to hospitals outside the normal neonatal commissioning boundaries.

**Conclusions:** The study highlights a continuing apparent lack of capacity within the neonatal service in the Yorkshire region, resulting in considerable numbers of neonatal and maternal transfers.

It has been reported<sup>1</sup> that most major perinatal centres in the United Kingdom are regularly unable to meet in house demand. Attempts to maintain high levels of average occupancy in this high cost, low volume environment make the transfer of some mothers or babies between units inevitable. Transfers are resource intensive, taking considerable organisation, and consuming the time of nursing/medical staff who accompany patients during transfer. Reliable data on levels of demand for perinatal services could help to conserve resources and minimise parental distress by avoiding excessive rates of transfer. However, as noted by Parmanum *et al.*,<sup>1</sup> to date attempts to quantify demand for neonatal intensive care in the United Kingdom have been few.<sup>2–5</sup>

At the regional level, within the Yorkshire region of the United Kingdom, the transfer of neonates between hospitals has always been necessary, with regional neonatal units transferring out many of their mothers/babies because of a shortage of neonatal intensive care cots.<sup>1</sup> A shortage of intensive care facilities is not the sole reason for maternal or neonatal transfer, but to date, there has been a paucity of accurate information on the reasons for and number of transfers, which is clearly necessary for the planning of neonatal services. Our objective was to record this information, in a systematic study of transfers from and to neonatal units within the Yorkshire region with the aim of identifying suitable outcome measures for the assessment of future service improvements.

Within Yorkshire there are 15 neonatal units, providing different categories of care (British Association of Perinatal Medicine categories 1–3<sup>6</sup>) plus three further delivery units with no on site obstetric or neonatal service. We surveyed all mothers and babies presenting to 17 of the 18 units within the region in order to inform discussions on service planning by examining neonatal service capacity. One unit, North Allerton, was excluded from the survey because it has a neonatal intensive care contract outside the Yorkshire area,

with South Cleveland Hospital. The specific aims of the survey were to quantify transfers within the perinatal service in Yorkshire, to identify the geographical location of the transfers, and to examine the process and reasons behind the transfers.

## METHODS

### Data collection

The survey was carried out from May to November 2000. Table 1 lists the participating sites. Each site was supplied with study specific questionnaires requesting data on transfers, which were placed in neonatal units, delivery suites, antenatal wards, and antenatal clinics. Separate forms were supplied for in utero and ex utero transfers. In utero transfer was defined as the transfer of a mother to another hospital for maternal care or predicted neonatal care for her newborn(s). Ex utero transfer was defined as the transfer of a baby to another hospital for care.

An attempt was made to identify as precisely as possible the reason for each transfer. Staff were instructed to identify the primary reason for the transfer. For in utero transfers the reasons were identified as: maternal need, predicted neonatal cot need, and specialist assessment of fetal malformation or fetal growth restriction. For ex utero, the reasons were identified as: nursing shortage, medical staff shortage, unit normally transfers, unit full (totally or intensive care only), equipment shortage, plurality, and transfer back. Data were requested for transfers in or out of a participating site. Therefore, for each transfer within the studied region, both donor and recipient site completed questionnaires. For transfers to or from hospitals outside the Yorkshire region, only one questionnaire was completed.

Regular visits were made to all participating sites, and source data checks made on ward logs to identify any unreported transfers. Missing data were retrieved retrospectively from ward logs and medical/nursing records. For each reported transfer, donor and recipient questionnaires

**Table 1** Participating units by British Association of Perinatal Medicine category

Level 3 units	Level 2 units	Level 1 units	Delivery units
Leeds General Infirmary St James University	Airedale General Hospital Bradford Royal Infirmary Dewsbury General Hospital Halifax Royal Infirmary Harrogate General Hospital Huddersfield Royal Infirmary Hull Maternity Hospital Pontefract Royal Infirmary York General Hospital	Castle Hill (Hull) Scarborough Wakefield General Hospital	Bridlington Whitby Malton

were compared and any discrepancies resolved by reference to source records. Where a difference could not be resolved, the data submitted by the donor site were accepted as correct.

### Analysis

All data were entered on to a study specific database. No formal statistical analyses were performed. Each transfer was categorised as follows:

- Acute: defined as an immediate requirement to move either the mother (in utero) or baby (ex utero) to another hospital for more appropriate care
- Specialist: the infant or mother was transferred for a specialist service such as neonatal surgery or fetal growth assessments
- Non-acute: for example, the baby or mother was transferred back to their "home" hospital

All transfers out of hospitals that should theoretically have been able to provide the necessary care were considered to represent capacity problems within that hospital (transfers that were part of unit protocols or were transfers for specialist maternal/neonatal care were excluded from this category). The percentage of capacity transfers, assuming an admission rate of 10% of births to neonatal units,<sup>6</sup> was also calculated. An attempt was also made to subdivide capacity transfers into those made for intensive care and special care.

## RESULTS

### Nature of transfers

Between 3 May and 3 November 2000, there were 800 transfers in and out of hospitals in the Yorkshire region; 337 in utero and 463 ex utero. The number of transfers per month ranged from 118 to 154 with no notable monthly variations. Table 2 outlines the primary reason for each in utero and ex utero transfer. Of the in utero transfers, 73% were due to the predicted need for an appropriate neonatal cot. Ex utero transfers accounted for 53–64% of each monthly total. Of the total of 463 ex utero transfers, 44% (204) of cases were transferred within seven days of birth. Of these 204 cases, 95% (194) were transfers for either an appropriate neonatal cot or specialist service.

Within the specialist service group (151), there were infants who were moved into an intensive care cot—for example, a ventilated preterm infant who developed a surgical condition. As only the primary reason for transfer was recorded, it is not possible to identify exact numbers in this group. These cases were considered to be acute transfers (see below).

### Category of transfer

There were 306 acute, 213 specialist, and 280 non-acute transfers during the study period. Most (80%; 246/306) acute transfers occurred in utero. Of the non-acute ex utero

**Table 2** Primary reasons for transfers

Reason for transfer	Number
In utero transfers	
Maternal indication	54
Predicted requirement for intensive care	246
Unit does not provide intensive care	(125)
Unit intensive care facility at capacity	(121)
Known fetal malformation	4
Fetal growth retardation requiring evaluation	4
Other	29
Total	337
Ex utero transfers	
Return transfer to "home" hospital	229
Requirement for specialist service	151
Unit classified as level 1	26
Lack of appropriate neonatal cot	22
Lack of nursing resource to provide adequate level of care	5
Unit protocol mandates transfer	7
Twins/triplets required to be sited in same hospital	1
Other	22
Total	463

transfers, 91% (229/251) were return transfers to their "home" hospital.

Table 3 presents the proportion of the outward transfers arising from each category of unit, along with details of the number of capacity transfers. Capacity transfers out of level 2 and 3 units numbered 152 (from a total of 11 units). Thirty seven percent of capacity transfers were out of the two level 3 centres. Transfers of mothers or babies of more than 33 weeks gestation, which fell outside normal protocols for transfer in all units, were examined separately. Such transfers represented 20% (31/152) of transfers out of level 2 and 3 units. Of these 31 transfers, 26 occurred in utero. As the risk of these infants requiring intensive care is generally small, in these instances the requirement for transfer appeared to stem from reduced special care capacity. Of the 254 transfers out of the total of 14 neonatal units for intensive care, 44 (17.3%) were transferred to hospitals outside normal neonatal commissioning boundaries.

The effect of multiple births was also studied. Overall, 82 sets of twins (48 in utero; three in utero) and two sets of triplets (one in utero; one ex utero) were transferred because of lack of capacity in the "home" hospital. Where the reason for transfer was a requirement for intensive care, no enforced separation of ex utero twins or triplets was required.

The survey recorded a number of multiple in utero transfers. Twenty two women were transferred from their "home" hospital more than once during pregnancy. This group accounted for 50 (15%) of all in utero transfers, with 17 women undergoing two transfers and five women three/

**Table 3** Analysis of outward transfers (n = 744)

Total transfers from:	
Level 3 units (n=2)	174/744 (23%)
Level 2 units (n=9)	320/744 (43%)
Level 1 (n=3)	139/744 (19%)
Delivery units (n=3)	111/744 (15%)
Capacity transfers from level 2 and 3 units:*	
Level 3 units (2)	56 (13.5)
Level 2 units (9)	96 (7.7)
Multiple transfers:	
From home hospital to another unit and return	10 (in 4 women)
From maternity unit to level 1 unit followed by onward transfer to level 2/3 unit	6 (in 2 women)
From home hospital to level 2 unit followed by transfer to an alternative level 2/3 unit (because of lack of capacity in first unit)	6 (in 2 women)

\*n (% of expected admissions at a rate of 100 per 1000 (10%) live births).<sup>6</sup>

four transfers. Table 3 gives further details of multiple transfers.

### Resourcing of transfers

The time taken to organise each transfer was recorded for 51% (170) of in utero transfers. The median time required was 15 minutes (range 1–245), with 78% of in utero transfers being arranged within 30 minutes. There was a paucity of recorded information relating to time taken to organise the 60 acute ex utero transfers, and these data have been excluded from this report as being of limited value. Data on personnel undertaking ex utero transfers were recorded in 79% (370/463) of cases. Staff from the referring unit accompanied 248 transfers. Remaining transfers were staffed by the receiving unit (73/370), the regional transport team (35/370), or the parent(s) (10/370).

### DISCUSSION

Results of this first survey of perinatal transport within the Yorkshire region of the United Kingdom show a considerable number of transfers, equivalent to 1600 per annum, during the period studied. This represents an appreciable investment of time by healthcare professionals arranging and accompanying transfers. The region as a whole proved to be a net exporter of mothers and babies requiring, or predicted to require, a neonatal intensive care cot. Although we accept that occasional out of region transfers are probably unavoidable, our data appear to reflect an unacceptable volume of such transfers arising from an apparent lack of sufficient staffed neonatal intensive care cots to meet local demand. It is not clear from the study whether all intensive care capacity within Yorkshire was in fact in use at the time of these transfers, or was reduced by below establishment staffing levels or by non-operational equipment. This issue could usefully be explored by future, prospective, data collection.

Thirty seven percent of capacity transfers to other units, within or outside the Yorkshire region, derived from the two level 3 units, implying a specific problem with the provision of neonatal cots within these centres. Indeed, individually the two level 3 units were the largest exporters of mothers/babies requiring a neonatal intensive care cot, in breach of the Clinical Standards Advisory Group recommendations that tertiary neonatal units should not transfer out their own high risk mothers and infants.<sup>7</sup> This finding is consistent with findings nationally, reported by Parmanum *et al*,<sup>1</sup> and we feel that this needs to be addressed urgently. Further, 20% of all capacity transfers were for mothers/babies for whom a special care cot was required and unavailable in the “home”

hospital. Most transfers for special care cots were, again, from the four largest units. In our opinion, these transfers are unacceptable and should be addressed in future service planning.

It was encouraging to find that twins and triplets were not being separated during transfers. However, to achieve this, the infants may have been transported further afield in order to find a hospital with sufficient capacity to receive the siblings together.

Trained nursing staff accompanied most ex utero transfers from the local referral unit. The use of parents to transfer newborns seems surprising, but simply reflected the fact that the neonatal surgical unit accepted infants up to 6 weeks of age, from their general practitioner, for which a transfer form was completed. Clearly, centralised control of these transfers could reduce the need to commit trained nurses, which places a temporary drain on the resource of the donor or recipient unit. As the time taken to arrange transfers was only sporadically recorded, it is difficult to draw conclusions from these data on the resources required to organise transfers. For example, although most (80%) in utero transfers for which data were recorded were organised within 30 minutes, organisation occasionally took up to four hours, presumably reflecting major problems if the nearest hospital did not have an available cot. The relatively short time taken to arrange most transfers was in contrast with the pre-conceptions of clinicians within the specialty. This may be because clinicians' perceptions are coloured by stronger recollections of occasions when difficulties were encountered than by more straightforward transfers. It is also conceivable that organisational difficulties may have deterred staff from recording the time taken to organise transfers in the 49% of cases for which no data were recorded. If the latter is true, then it is likely that, overall, a much smaller percentage of transfers were in fact arranged within 30 minutes.

Most acute transfers occurred in utero, which is in accordance with the recommendations of the British Association of Perinatal Medicine and Clinical Standards Advisory Group on neonatal transfers.<sup>6,7</sup>

Our survey has highlighted a shortfall in capacity in local perinatal services, as evidenced by the large number of acute transfers from units that should have been able to provide intensive care. Historically, capacity has been limited primarily by the availability of nursing staff. It was surprising therefore that in this survey very few units cited lack of nursing staff as the reason for transfer. It is possible that units are calculating their “capacity” on the basis of actual nursing numbers per shift, rather than against their nursing or the physical capacity of the unit when fully staffed. If so, units may have considered themselves full against their calculated capacity rather than any predetermined theoretical capacity, in which case, nursing numbers would not have been recorded as the primary reason for transfer.

Intuitively, it might have been expected that smaller units would be those in which peaks in demand would produce a strain on resources. Our results show that, on the contrary, it appears to be the larger units that are struggling to cope with local demand. This may reflect changes in referral patterns, with more complex neonatal cases being referred to larger centres, thus blocking their available capacity. Falls in neonatal nursing numbers may also disproportionately affect the larger units. Further work is required to explore in detail the reasons for the problems experienced in the larger centres.

In this survey, we were unable to gather information on the consistency of neonatal intensive care delivered by the participating units. This was for two reasons. Firstly, most acute transfers occurred in utero. In these cases, where the reason for transfer was recorded as the referring unit being

full, there was no record of the babies subsequently receiving intensive care. Secondly, the capacity for intensive care is not simply related to the number of infants receiving care but to the complexity of cases, available nursing numbers, predicted deliveries, and viability of equipment. Information on consistency of services will only be gleaned from a prospective, daily, collection of data on intensive care capacity and occupancy for individual units.

This survey examined numbers of transfers and not babies. The numbers of babies was not recorded because the study focused on the delivery of neonatal care around the need to transfer mothers and babies. For the ex utero transfers, it is hard to estimate accurately the numbers of babies as some will have died, been transferred more than once (for surgical treatments, for example), or been discharged home rather than returning to their local hospital. For in utero transfers, where the need for a neonatal cot was the reason, it would have been helpful to identify those that did not deliver. The complexity of the study (44 study folders in all neonatal, delivery suites, and antenatal wards) and the lack of consistent data capture of these women made it impossible to record accurately. In reality, the blocking of neonatal cots invariably occurs for a period of time even if delivery does not take place during these transfers. It is hoped that future studies could examine these transfers in more detail.

In summary, we have found that the present structure of the neonatal service in Yorkshire results in a large number of transfers out of units that should be able to retain most of their patients, and that transfers are taking place over considerable distances. We hope that the information presented here and in a previous survey<sup>1</sup> will help to inform future planning decisions for neonatal services, as we doubt that the situation nationally is very much different from that

presented here. Improvements to services need to be assessed against defined outcome measures, and we propose that the inappropriate transfer of babies/mothers should be incorporated as a valuable outcome measure.

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