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 transfers occurred in 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.

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 transfers, 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...
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, 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 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/
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 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.

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 practitioners, 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 was for two reasons. Firstly, most transfers were for mothers/babies for whom a special intensive 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.

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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

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<tr>
<th>Table 3 Analysis of outward transfers (n = 744)</th>
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<tr>
<td>Total transfers from:</td>
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<tr>
<td>Level 3 units (n = 2)</td>
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<td>Level 2 units (n = 9)</td>
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<td>Level 1 (n = 9)</td>
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<td>Delivery units (n = 3)</td>
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<td>Capacity transfers from level 2 and 3 units:*</td>
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<tr>
<td>Level 3 units (2)</td>
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<td>Level 2 units (9)</td>
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<tr>
<td>Multiple transfers:</td>
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<tr>
<td>From home hospital to another unit and return</td>
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<td>From maternity unit to level 1 unit followed</td>
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<td>by onward transfer to level 2/3 unit</td>
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<td>From home hospital to level 2/3 unit followed</td>
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<td>by transfer to an alternative level 2/3 unit</td>
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<td>(because of lack of capacity in first unit)</td>
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*a (%) of expected admissions at a rate of 100 per 1000 (10%) live births.*
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 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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REFERENCES