- 6 Batter V, Matela B, Nsami M, Manzila T, Kamenga M, Behets F, *et al.* High HIV-1 incidence in young women masked by stable overall seroprevalence among childbearing women in Kinshasa, Zaire: estimating incidence from serial seroprevalence data. *AIDS* 1994;8:811-7.
- 7 STD/AIDS Control Programme. *HIV/AIDS surveillance report, March 1995*. Entebbe: Ministry of Health, Uganda, 1995.
- 8 Allen S, Tice J, Van der Perre P, Scrutivili A, Hudes E, Nsengumuremyi F, *et al.* Effect of serotesting and counselling on condom use and seroconversion among HIV-discordant couples in Africa. *BMJ* 1992;304:1605-9.
- 9 Willerford DM, Bwayo JJ, Hensel M, Emonyi W, Plummer FA, Ngugi EN, *et al.* Human immunodeficiency virus infection among high-risk seronegative prostitutes in Nairobi. *J Infect Dis* 1993;167:1414-7.
- 10 Laga M, Alary M, Nzila N, Manoka AT, Tuliza M, Behets F, *et al.* Condom promotion, sexually transmitted disease treatment, and declining incidence of HIV-1 infection in female Zairian sex workers. *Lancet* 1994;344:246-8.
- 10a Grosskurth H, Mosha F, Todd J, Mwijarubi E, Klokke A, Semkero K, *et al.* Impact of improved treatment of sexually transmitted diseases on HIV infection in rural Tanzania: randomised controlled trial. *Lancet* 1995;346:530-6.
- 11 Wagner HU, Kamali A, Nunn AJ, Kengeya-Kayondo JF, Mulder DW. General and HIV-1 associated morbidity in a rural Ugandan community. *AIDS* 1993;7:1461-7.
- 12 Mulder DW, Nunn AJ, Wagner HU, Kamali A, Kengeya-Kayondo JF. HIV-1 incidence and HIV-1 associated mortality in a rural Ugandan population cohort. *AIDS* 1994;8:87-92.
- 13 Mulder DW, Nunn AJ, Kamali A, Nakiyingi J, Wagner HU, Kengeya-Kayondo JF. Two-year HIV-1 associated mortality in a Ugandan rural population. *Lancet* 1994;343:1021-3.
- 14 Nunn AJ, Kengeya-Kayondo JF, Malamba S, Seeley JA, Mulder DW. Risk factors for HIV-1 infection in adults in a rural Ugandan community: a population study. *AIDS* 1994;8:81-6.
- 15 Malamba SS, Wagner HU, Maude G, Okongo M, Nunn AJ, Kengeya-Kayondo JF, *et al.* Risk factors for HIV-1 infection in adults in a rural Ugandan community: a case-control study. *AIDS* 1994;8:253-7.
- 16 Wagner HU, Van Dyck E, Roggen E, Nunn AJ, Kamali A, Scott Schmid D, *et al.* Seroprevalence and incidence of sexually transmitted diseases in a rural Ugandan population. *Int J STD AIDS* 1994;5:332-7.
- 17 Nunn AJ, Biryahwaho B, Downing RG, Van der Groen G, Ojwiya A, Mulder DW. Algorithms for detecting antibodies to HIV-1: results from a rural Ugandan cohort. *AIDS* 1993;7:1057-61.
- 18 Nunn AJ, Biryahwaho B, Downing RG, Ojwiya A, Mulder DW. Computer-assisted quality assurance in an HIV serology laboratory. *Methods Inform Med* 1994;33:170-3.
- 19 Seeley JA, Wagner HU, Mulemwa J, Kengeya-Kayondo J, Mulder DW. The development of a community-based HIV/AIDS counselling service in a rural area in Uganda. *AIDS Care* 1991;3:207-17.
- 20 Nunn AJ, Wagner HU, Kamali A, Kengeya-Kayondo JF, Mulder DW. Migration and HIV-1 seroprevalence in a rural Ugandan population. *AIDS* 1995;9:503-6.
- 21 Kengeya-Kayondo JF, Malamba SS, Nunn AJ, Seeley JA, Sali A, Mulder DW. Human immunodeficiency virus (HIV-1) seropositivity among children in a rural population of south-west Uganda: probable routes of exposure. *Ann Trop Paediatr* 1995;15:115-20.
- 22 Heyward WL, Osmanov S, Saba J, Esperza J, Belsey E, Stoneburner E, *et al.* Preparation for phase III HIV vaccine trials: methods for the determination of HIV incidence. *AIDS* 1994;8:1285-91.

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Morbidity and severity of illness during interhospital transfer: impact of a specialised paediatric retrieval team

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Abstract

Objective—To evaluate the morbidity and severity of illness during interhospital transfer of critically ill children by a specialised paediatric retrieval team.

Design—Prospective, descriptive study.

Setting—Hospitals without paediatric intensive care facilities in and around the London area, and a paediatric intensive care unit at a tertiary centre.

Subjects—51 critically ill children transferred to the paediatric intensive care unit.

Main outcome measures—Adverse events related to equipment and physiological deterioration during transfer. Paediatric risk of mortality score before and after retrieval. Therapeutic intervention score before and after arrival of retrieval team.

Results—Two (4%) patients had preventable physiological deterioration during transport. There were no adverse events related to equipment. Severity of illness decreased during stabilisation and transport by the retrieval team, suggested by the difference between risk of mortality scores before and after retrieval ($P < 0.001$). The median (range) difference between the two scores was 3.0 (–6 to 17). Interventions during stabilisation by the retrieval team increased, demonstrated by the difference between intervention scores before and after retrieval, median (range) difference between the two scores being 6 (–8 to 38) ($P < 0.001$).

Conclusions—Our study indicates that a specialised paediatric retrieval team can rapidly deliver intensive care to critically ill children awaiting transfer. Such children can be transferred to a paediatric intensive care unit with minimal morbidity and mortality related to transport. There was no deterioration in the clinical condition of most patients during transfer.

Introduction

The improved outcome of critically ill children managed in paediatric intensive care units has increased the pressure to transfer such patients to a

tertiary centre.¹ The risk of deterioration from the primary illness, complications of treatment, and the transfer process itself make the interhospital transfer potentially hazardous.²⁻⁴ Unfortunately, despite recommendations, many critically ill children in the United Kingdom are still being transferred by non-specialised staff.⁵⁻⁷

There are no published data on the morbidity associated with transfer by a specialised paediatric retrieval team in the United Kingdom.

Patients and methods

This prospective, descriptive study at St Mary's Hospital, London, evaluated 78 consecutive patients transferred to the paediatric intensive care unit between October 1993 and May 1994. Fifty one patients were included in the study. Insufficient data from before retrieval prevented analysis of severity of illness in the 27 patients excluded from the study. In none of the patients excluded from the study was there any morbidity or mortality during transport.

The retrieval team consisted of a paediatric intensivist (senior registrar or consultant grade) and an experienced intensive care nurse.

ASSESSMENT OF MORBIDITY

Morbidity during transport was documented by using the criteria of Kanter and Tompkins (box).² Transport was defined as the period between leaving the referring hospital and arrival of the patient at the paediatric intensive care unit.

QUANTIFYING SEVERITY OF ILLNESS AND THERAPEUTIC INTERVENTIONS

To assess changes in severity of illness we used the paediatric risk of mortality (PRISM) score.⁸ This score has been used as an index of severity of illness during interhospital transfer.^{2,9-11}

For each child we computed the score at three points in time:

- The admission score by using values obtained on admission to the referring hospital

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Morbidity during transport^a

Physiological deterioration

Respiratory arrest or cyanosis, or both
Cardiac arrest
Systolic hypotension (child <65 mm Hg, infant <55 mm Hg)
Cardiac arrhythmia including tachycardia (child >200/min, infant >220/min) or bradycardia (child <40/min, infant <50/min)
Loss of consciousness (Glasgow coma scale <7)
Loss of brainstem reflexes
Core temperature (<34°C)
Hypoglycaemia (<2.5 mmol/l)

Equipment related

Occluded endotracheal tube
Accidental tracheal extubation
Loss of intravenous access
Pulmonary aspiration
Loss of monitoring
Malfunction of ventilator
Exhaustion of oxygen supply

● The score before retrieval by using values obtained before stabilisation by the retrieval team at the referring hospital

● The score after retrieval by using values obtained after stabilisation and transport.

The score on the therapeutic intervention scoring system (TISS) was used as a quantitative measure of interventions performed.¹² The score before retrieval measured interventions performed before the arrival of the retrieval team, and the score after retrieval measured interventions performed by the retrieval team.

STATISTICAL METHODS

The Wilcoxon matched pairs signed ranks test was performed to compare the two types of score at different time points, and the comparisons were preceded by the Friedman two way analysis of variance by ranks test.

Results

Table I shows the diagnoses of the 51 patients in the study.

MORBIDITY

Two patients had preventable physiological deterioration during transport. One infant with bronchiolitis developed apnoea and cyanosis, and another child with meningococcal shock developed hypoglycaemia. There were no instances of adverse events related to equipment.

SEVERITY OF ILLNESS

There was a decrease in the severity of illness before arrival of the retrieval team, suggested by the differ-

ence between paediatric risk of mortality scores on admission and before retrieval ($P < 0.001$). The median (range) difference between the scores on admission and before retrieval was 1.0 (0 to 24). The severity of illness worsened in none, remained unchanged in 23, and decreased in 28 patients before arrival of the retrieval team.

There was a further decrease in severity of illness during stabilisation and transport by the retrieval team, suggested by the difference between scores before and after retrieval ($P < 0.001$). The median (range) difference between these scores was 3.0 (-6 to 17). The severity of illness worsened in six, remained unchanged in 11, and decreased in 34 patients.

INTERVENTION SCORE

There was an increase in therapeutic interventions during stabilisation by the retrieval team, demonstrated by the difference between therapeutic intervention scores before and after retrieval ($P < 0.001$). The median (range) difference between these two scores was 6 (-8 to 38). Interventions decreased in two, remained the same in four, and increased in 45 patients.

INTERVENTIONS PERFORMED AND TREATMENT INITIATED (TABLE II)

Airway intervention—Forty three patients (84%) required endotracheal intubation. Fifteen underwent rapid sequence tracheal intubations by the retrieval team.¹³ Of the 28 patients already intubated at the referring hospital, the retrieval team had to reintubate 14 (50%). Airway intervention by the retrieval team was therefore required in 29 of the 51 patients (57%) transferred. There were no instances of accidental extubation or blockage of endotracheal tubes during transport.

Ventilatory intervention—All intubated patients were mechanically ventilated. In the 28 patients already intubated the retrieval team initiated mechanical ventilation in five, used controlled hyperventilation in three, and applied or withdrew positive end expiratory pressure in five. Ventilatory intervention was therefore modified in 13 (26%) patients by the retrieval team.

Vascular access—There were no complications associated with either central venous or arterial catheterisation.

Vasoactive drugs—Vasoactive drugs (dopamine, dobutamine, adrenaline, epoprostenol) were used singly or in combination in 22 (43%) patients. On 24 occasions a vasoactive drug was started by the retrieval team.

Colloid treatment and metabolic corrections during retrieval—The retrieval team gave ≥ 20 ml/kg of colloid to 28 (55%) patients and corrected hypokalaemia in 16 (31%), hypocalcaemia in 15 (29%), metabolic acidosis in 15 (29%), and hypoglycaemia in nine (18%) patients.

OPERATIONAL DATA (TABLE III)

The median distance travelled to a referring hospital was 22.2 (range 5.0-218.0) km.

TABLE I—Patients, diagnostic groups, median scores for paediatric risk of mortality (PRISM) and therapeutic intervention (TISS)

Diagnosis	No (%) of patients (n=51)	Median (range) PRISM on admission	Median (range) PRISM before retrieval	Median (range) PRISM after retrieval	Median (range) TISS before retrieval	Median (range) TISS after retrieval
Meningococcal disease	24 (47)	19.5 (1-45)	12.5 (0-40)	9 (0-23)	20.5 (7-43)	36.5 (8-48)
Bronchiolitis	12 (24)	13.5 (1-19)	6.5 (1-19)	4 (0-13)	10 (5-19)	20 (8-28)
Central nervous system disease	6 (12)	12.5 (7-18)	8 (6-14)	7 (6-13)	24 (12-36)	34 (27-42)
Other sepsis	3 (6)	37 (31-41)	30 (20-35)	17 (17-18)	30 (20-49)	40 (37-49)
Pneumonia	2 (4)	14 (11-17)	14 (11-17)	5.5 (2-9)	6.5 (6-7)	26 (24-28)
Myocarditis	1 (2)	13	13	8	30	40
Head injury	1 (2)	10	6	6	22	24
Near miss sudden infant death syndrome	1 (2)	34	13	13	34	40
Tricyclic antidepressant with overdose	1 (2)	31	7	6	32	38
All patients	51	14 (1-45)	11 (0-40)	8 (0-23)	18 (5-49)	30 (8-49)

TABLE II—Major interventions carried out before and after arrival of retrieval team at referring hospital

Intervention	Referring hospital (No/total (%))	Retrieval team (No/total (%))	Total (No/51 (%))
Endotracheal intubation	28/43 (65.1)	15/43 (34.9)	43/51 (84.3)
Central venous access	5/37 (13.5)	32/37 (86.5)	37/51 (72.5)
Arterial access	12/44 (27.3)	32/44 (62.8)	44/51 (86.3)
Colloid therapy*	32/40 (80)	28/40 (70)	40/51 (78.4)
Vasoactive therapy	16/22 (72.7)	6/22 (27.3)	22/51 (43.1)

*Colloid therapy ≥ 20 ml/kg; 22 patients received this volume of colloid from both referring hospital and retrieval team.

TABLE III—Operational time intervals (minutes) in transfer of children to tertiary referral centre

	Mobilisation*	Journey out†	Response‡	Stabilisation§	Journey in	Retrieval¶
Median	65	27.5	100	162.5	35	310
Range	32-155	10-140	45-225	40-525	15-140	130-615

*Referral to departure of team from tertiary centre.

†Departure of team from tertiary centre to arrival at patient's bedside.

‡Referral to arrival of team at patient's bedside.

§Arrival of team at patient's bedside to departure from referring hospital.

||Departure from referring hospital to arrival at tertiary centre.

¶Referral to arrival of patient at tertiary centre.

Discussion

MORBIDITY DURING TRANSPORT

A recent study in the United Kingdom by Barry and Ralston highlighted the dangers of non-specialised paediatric transfers. Three quarters of patients transferred suffered serious clinical complications, nearly a quarter of which were defined as life threatening.⁷ These figures, although alarming, are not surprising considering that in most patients there was no monitoring of blood pressure, temperature, and blood sugar, and in 27% of patients oxygen saturation or electrocardiography were not monitored. On arrival at the paediatric intensive care unit 11% of their patients needed immediate endotracheal intubation and ventilation, and 9% were hypotensive.⁷ In a study in the United States of non-specialised transfer by Kanter and Tompkins the occurrence of both physiological deterioration and adverse events related to equipment were each 10.2%.²

By using the criteria of Kanter and Tompkins, a recent study in the United States by Edge *et al* comparing specialised (n=47) and non-specialised (n=92) paediatric retrieval demonstrated that the specialised team significantly reduced the occurrence of adverse events related to equipment (from 20% to 2%) but not the occurrence of physiological deterioration (12% to 11%) during transport.¹⁰ In our study physiological deterioration during transport occurred in 4% of patients, and there were no instances of adverse events related to equipment. The use of a control group in our study would have been unethical, but comparisons of our results with published data on non-specialised transfers demonstrates that a specialised paediatric retrieval team can transport patients with minimal physiological deterioration and morbidity related to equipment.

SEVERITY OF ILLNESS

Studies of non-specialised retrieval have not assessed the change in severity of illness during transport. In the absence of a control group in our study we cannot make comparisons nor reach any definite conclusions as to what effect a non-specialised team would have had on the severity of illness during transfer. The significant decrease in the severity of illness, however, measured by the paediatric risk of mortality score clearly demonstrates that there was no deterioration in the clinical condition of most of our patients during transfer.

INTERVENTIONS

There are several settings in which intervention by

the retrieval team during stabilisation could lead to a decrease in morbidity during transport.

In the study by Fuller *et al* of transportation of critically ill children in Canada 43% of patients required some form of airway or respiratory intervention.¹⁴ In our study 57% (29) required airway intervention and 26% (13) needed ventilatory interventions.

Loss or lack of intravenous access during transport by non-specialised teams occurs in 3.4% to 10% of patients.^{2,3,7,10} Central venous catheters were inserted in 37 (73%) of our patients. There were no instances of loss of intravenous access during transport. Forty four (86%) of our patients underwent arterial catheterisation and direct monitoring of blood pressure.

The objectives of a retrieval team are to treat the underlying cause and to achieve physiologically normal haemodynamic and metabolic parameters.¹⁵ To this end, half of our patients received ≥ 20 ml/kg of colloid from the retrieval team. On 24 occasions a vasoactive drug was started by the retrieval team. Hypokalaemia, hypocalcaemia, and metabolic acidosis were corrected in 29% of our patients by the retrieval team.

RESPONSE TIME

Our median response time of 100 minutes compares with the average response time of another specialised paediatric team in Glasgow, reported as 121 minutes.¹⁶ The immediate institution of therapeutic measures by the referring hospital while awaiting the arrival of the retrieval team is more crucial to patient outcome than the rapidity with which the retrieval team reaches the patient's bedside.¹⁷ It is essential therefore that the response time be used by the retrieval team to give advice regarding management of the patient.

STABILISATION TIME

The concept that a retrieval team must "swoop and scoop" is no longer considered appropriate.^{18,19} The level of treatment and monitoring by our retrieval team, measured by the therapeutic intervention scores, increased significantly during stabilisation. The median stabilisation time in our study was 162.5 minutes, which compares with the stabilisation time of other specialised paediatric retrieval teams reported as 74.4-156 minutes.^{4,7,20} The new ethos of mobile intensive care implies that intensive care is firmly established at the patient's bedside at the referring hospital.¹⁸⁻²⁰

CONCLUSIONS

Our study indicates that a specialised paediatric

Key messages

- The improved outcome of critically ill children managed in paediatric intensive care units has increased the pressure to transfer such patients to a tertiary centre with these facilities
- The transfer of a critically ill child is inherently risky; up to 75% of patients transferred by non-specialised teams can suffer from serious clinical complications
- These risks can be considerably reduced if a specialised retrieval team stabilises the patient and establishes intensive care at the referring hospital before transfer
- In this study physiological deterioration occurred in only two of 51 patients during transport, and there were no instances of adverse events related to equipment
- There was no deterioration in the clinical condition of most patients during transfer

retrieval team can rapidly deliver intensive care to critically ill children awaiting transfer. Such children can be transferred to a paediatric intensive care unit with minimal morbidity and mortality related to the transfer. Furthermore, there was no deterioration in the clinical condition of most patients during transfer.

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- 1 Pollack MM, Alexander SR, Clarke N, Ruttimann UE, Tesselar HM, Bachulis AC. Improved outcomes from tertiary centre pediatric intensive care. A statewide comparison of tertiary and nontertiary care facilities. *Crit Care Med* 1991;19:150-9.
- 2 Kanter RK, Tompkins JM. Adverse events during interhospital transport: physiological deterioration associated with pretransport severity of illness. *Pediatrics* 1989;84:43-8.
- 3 Henning R. Emergency transport of critically ill children: stabilisation before departure. *Med J Aust* 1992;156:117-24.
- 4 Macnab AJ. Optimal escort for interhospital transport of paediatric emergencies. *J Trauma* 1991;31:205-9.
- 5 British Paediatric Association. *The care of critically ill children. Report of the multidisciplinary working party on paediatric intensive care.* London: British Paediatric Association, 1993.
- 6 NHS Centre for Reviews and Dissemination. *Which way forward for the care of critically ill children?* York: University of York, 1995. (CRD Report No 1.)
- 7 Barry PW, Ralston C. Adverse events occurring during inter-hospital transfer of the critically ill. *Arch Dis Child* 1994;71:8-11.

- 8 Pollack MM, Ruttimann UE, Getson PR. Pediatric risk of mortality (PRISM) score. *Crit Care Med* 1988;16:1110-6.
- 9 Kanter RK, Edge WE, Caldwell CR, Nocera MA, Orr RA. Mortality probability estimated from pre-ICU severity of illness [abstract]. *Crit Care Med* 1993;21:S265.
- 10 Edge WE, Kanter RK, Weigle CGM, Walsh RF. Reduction of morbidity in interhospital transport by specialised pediatric staff. *Crit Care Med* 1994;22:1186-91.
- 11 Orr RA, Venkataraman ST, Cinoman MI, Hogue BL, Singleton CA, McCloskey KA. Pretransport pediatric risk of mortality (PRISM) score underestimates the requirement for intensive care or major interventions during interhospital transport. *Crit Care Med* 1994;22:101-7.
- 12 Keene AR, Cullen DJ. Therapeutic intervention scoring system: Update 1983. *Crit Care Med* 1983;11:1-3.
- 13 McDonald TB, Berkowitz RA. Airway management and sedation for pediatric transport. *Pediatr Clin North Am* 1993;40:381-406.
- 14 Fuller J, Frewen T, Lee R. Acute airway management in the critically ill child requiring transport. *Can J Anaesth* 1991;38:252-4.
- 15 Wetzel RC, Tobin JR. Shock. In: Rogers MC, ed. *Textbook of pediatric intensive care.* Baltimore: Williams and Wilkins, 1992:563-613.
- 16 Robb HM, Hallworth D, Skeoch CH, Levy C. An audit of a paediatric intensive care transfer unit. Examining the workload and practice of the medical team. *British Journal of Intensive Care* 1992;2:371-9.
- 17 Black RA, Mayer T, Walker ML, Christison EL, Johnson DG, Matlak ME, et al. Air transport of pediatric emergency cases. *N Engl J Med* 1982;307:1465-8.
- 18 McCloskey KA, Orr RA. Pediatric transport issues in emergency medicine. *Emerg Med Clin North Am* 1991;9:475-89.
- 19 Orr RA, McCloskey KA, Britten AG. Transportation of critically ill children. In: Rogers MC, ed. *Textbook of Pediatric Intensive Care.* Baltimore: Williams and Wilkins, 1992:1571-87.
- 20 Whitfield JM, Buser NNP. Transport stabilisation times for neonatal and pediatric patients prior to interfacility transfer. *Pediatr Emerg Care* 1993;9:69-71.

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Commentary: Evaluation of specialist paediatric retrieval teams

Stuart Logan

In 1993 a British Paediatric Association working party concluded that care for critically ill children should be concentrated in paediatric intensive care units.¹ This report was criticised in a response by the NHS Centre for Reviews and Dissemination for relying too heavily on opinion rather than evidence,² but two independent reviews commissioned by the centre,³ while critical of some recommendations, did agree on the need for the most severely ill children to be cared for in dedicated paediatric intensive care units. Despite a lack of randomised controlled trials it seems likely that the weight of professional and public opinion will drive the NHS towards centralisation, resulting in many extremely ill children being transported long distances.

In 1991, only around a third of paediatric intensive care units provided specialised retrieval services.¹ A study at Birmingham Children's Hospital, which relied on referring hospitals to provide transfer to the intensive care, found that a significant adverse clinical event occurred during transfer in three out of four children, with events described as life threatening in 20%.³ By contrast, Britto *et al* report in this issue that adverse events occurred in only two of 51 children transferred to a London intensive care unit by their specialist team.⁴

On the basis of these and other reports⁵ the need for specialised retrieval teams seems incontrovertible. Closer examination of the studies, however, reveals the difficulties associated with the interpretation of observational data. Nearly two thirds of patients in the Birmingham study³ were neonates, most with major congenital anomalies, while around 80% included in the London study had meningococcal disease or other infections. These differences in the patient population and the lack of easily interpretable measures of severity make any estimate of the magnitude of the benefits likely to be unreliable.

Health planners need to estimate the magnitude of

potential benefits of expensive interventions to carry out cost-benefit calculations that take account of opportunity costs. Although better care during transfer may lead to decreased morbidity and mortality, the benefits are difficult to quantify from present data. There are those who would argue that this points to the need for a randomised controlled trial to compare specialist retrieval teams with transfer by doctors from referring hospitals. It is difficult to suggest in the face of these studies or indeed on the basis of clinical experience, however, that specialist teams do not provide some advantage. A trial would require parents to agree to randomisation not because there is genuine uncertainty as to which intervention is better for their child but because there is an overall benefit to the community in estimating the magnitude of the benefit provided by the more expensive option.

In these circumstances a trial would be impractical and indeed unethical. A more appropriate way forward would be to ensure that the introduction of specialised retrieval teams is accompanied by an evaluation planned at the outset. The development of more sophisticated severity scores for critically ill children to allow better comparison between units and careful costing and evaluation of newly established teams could lead to a more evidence based approach to policy making in this subject.

- 1 British Paediatric Association. *The care of critically ill children. Report of the multidisciplinary working party on paediatric intensive care.* London: British Paediatric Association, 1993.
- 2 NHS Centre for Reviews and Dissemination. *Which way forward for the care of critically ill children?* York: University of York, 1995. (CRD Report No 1.)
- 3 Barry PW, Ralston C. Adverse events occurring during interhospital transfer of the critically ill. *Arch Dis Child* 1994;71:8-11.
- 4 Britto J, Nadel S, Maconochie I, Levin M, Habibi P. Morbidity and severity of illness during interhospital transfer: impact of specialised paediatric referral team. *BMJ* 1995;311:836-9.
- 5 Edge WE, Kanter RK, Weigle CGM, Walsh RF. Reduction of morbidity in inter-hospital transport by specialized pediatric staff. *Crit Care Med* 1994;22:1186-91.