

A Case Series Of Critically Ill Children Within A District General Hospital

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Abstract

BACKGROUND

The centralisation of paediatric intensive care services, along with the development of regional retrieval teams, was designed to optimise patient care through the concentration of specialist skill. There has been concern that as a consequence this would lead to a reduced ability of referring hospitals to carry out primary critical care intervention measures prior to transfer, as well as having a significant impact on families.

OBJECTIVES

To identify the nature of critically ill children presenting to a typical district general hospital (DGH) to ascertain whether DGHs are capable of becoming paediatric critical care providers with established paediatric intensive care units.

METHODS

This was a retrospective study of critically ill children presenting to a DGH in Essex between September 2013 and March 2014. A telephone survey was conducted with the parents and tertiary centres where each child was transferred. Data collected included the current state of the child (well/deceased/symptomatic), the maximum cardiorespiratory support delivered and the final diagnosis.

RESULTS

Thirteen of the fourteen cases were intubated by the referring hospital. Only three cases required high frequency oscillatory ventilation, although none with a complex medical history of congenital disease. Ten cases were simple respiratory diagnoses including croup, bronchiolitis and pneumonia.

CONCLUSION

Whilst these findings are a small snapshot, they imply that DGHs are capable of managing the majority of critically ill children. Re-establishing paediatric intensive care units in DGHs is a financially viable solution that would ensure opportunities for maintenance of paediatric resuscitation skills, whilst avoiding the hazards of transfer.

INTRODUCTION

The centralisation of paediatric intensive care (PIC) has been a fiercely debated issue over the last few decades. This movement was an attempt to concentrate the highly specialised clinical skills and multidisciplinary team required to optimally treat critically ill children, whilst avoiding the extreme cost that a more geographically-widespread service would incur. A growing body of

evidence has supported a reduction in mortality with a tertiary, integrated service provision versus a more fragmented system^{1,2}.

The landmark case of the 10 year old boy, Nicholas Geldard, who died following a cerebral haemorrhage during transfer in 1995, called for a review of the PIC service. Following transfer to a second hospital for radiological imaging, his clinical condition deteriorated and he died en route to a third

centre, when it was discovered that no paediatric intensive care unit (PICU) beds were available at the second institution³. This laid the foundation for the development of the Department of Health's 'Paediatric intensive care: a framework for the future'; a report which proposed a strategy and timetable to integrate PIC into a more regionalised service⁴. Recommendations included a 24-hour specialist retrieval service for each geographical area. This policy would revolutionise the future of PIC.

Prior to regionalisation of PIC into a 'hub-and-spoke' model, the paediatric retrieval team was usually comprised of specialist staff from the PICU itself. Consequently, the transfer of a critically ill child would be subject to delays depending on high bed-occupancy and demand at the receiving institution or a shortage of experienced transfer staff, leading to an unpredictable service delivery⁵.

The implementation of regional retrieval services throughout the UK, each with a body of committed, trained staff separate to the PICUs, was designed to overcome the aforementioned issues, but furthermore, to have the capacity to deliver 24-hour advice to the referring hospital as well as help with stabilisation of the child prior to transfer⁶. However, studies have shown that the majority of key stabilisation interventions, including tracheal intubation and cardiovascular procedures, are still performed by the referring district general hospital, and not the expert retrieval team⁷. Furthermore, this system is still subject to long waiting times as a consequence of limited PICU bed availability and high demand on the retrieval services⁸, which could potentially have significant consequences in time-critical cases such as neurosurgical head injuries. Therefore the onus on the referring hospital to retain their skills and clinical expertise in order to resuscitate and stabilise children is greater, despite the removal of PIC services from their hospitals to tertiary centres. Concern is growing that the centralisation of PIC would lead to reduced exposure within district general hospitals (DGH) and a loss of these vital skills, although some studies have contradicted this theory⁹.

There are currently 9 regional retrieval services operating within the UK¹⁰. The Children's Acute Transport Service (CATS) is one of the largest of the regional paediatric retrieval services in Europe, operating in the North Thames, Essex, Hertfordshire, Bedfordshire and East Anglia regions in England. Queens Hospital, Romford is one of the 50 hospitals it serves¹¹.

The objective of this study was to identify the nature of critically ill paediatric cases presenting to a typical DGH and to examine the support and management delivered by PICUs following transfer by a paediatric retrieval service.

METHODS

Details of all the paediatric cases presenting to Queens Hospital, a busy DGH in Essex, that required anaesthetic intervention and subsequent transfer to regional PICUs, were recorded in a Paediatric Intervention Register by the operating department practitioners (ODPs). This data includes details of the medical professionals present, the presenting complaint and the initial management, including airway and cardiovascular support.

Cases between September 2013 and March 2014 were reviewed retrospectively and a telephone survey conducted to the respective parents and PICUs of each child to assess their current state, their final diagnosis and cardiorespiratory support delivered by the tertiary centres. On 2 occasions the parents could not be contacted and one child was excluded, as no record could be located at the PICU. Any children who were not transferred to a second institution, as they were solely managed at Queens, Hospital were also excluded.

The following questions were posed:

To the parents: 1. What was the outcome of the child?

2. Which PICU were they transferred to?

3. What was the working diagnosis?

To the PICU: 1. What was the maximum level of cardiovascular support?

2. What was the maximum level of respiratory support?

3. What was the final diagnosis?

RESULTS

In the Paediatric Register, the names of the multi-disciplinary team (MDT) attending to the child before arrival of CATs, were recorded, including the consultant anaesthetist, any secondary anaesthetists, the ODP, the lead paediatrician, as well as the paediatric nurse. All members of the team were in attendance at all cases.

All patients were intubated and ventilated prior to transfer, with one exception; a patient requiring CPAP who then went on to requiring conventional ventilation at their tertiary

centre. Three out of fourteen cases progressed to high frequency oscillatory ventilation in order to meet demand for increased respiratory support. Inotrope requirements to maintain cardiovascular stability occurred in four cases, all post-transfer. One case was transferred with a central venous catheter and arterial line in situ. Only one child died post-transfer.

DISCUSSION

Within Queens Hospital, representative of a typical DGH, it is apparent that the majority of critically ill children are presenting with simple respiratory issues, and of these cases only a few have complex medical backgrounds. Of those known to have complicated congenital conditions (Table 1), none of them have required increased levels of support after transfer to the PICU. The final diagnosis made by the tertiary centre was identical to the working diagnosis of the primary team at the DGH in most of the cases (Table 1).

Furthermore, the staff in attendance at each case, offering their specialist advice and skills, closely resembles that of an MDT who would eventually manage the child at their destination PICU.

It can be argued, therefore, that this DGH was able to deliver appropriate initial diagnostic and therapeutic care to the majority of critically ill children it received. Whilst only a snapshot of the overall picture, this small study represents the potential of DGHs to deliver critical care to children.

Whilst not in the remit of this study to investigate waiting times for retrieval services, and thus delay in receiving further care, this study contributes to the reasoning that recalling PIC back to DGHs could not only avoid the hazards of transfer, but also avoid the prolonged time in A&E departments, awaiting 'definitive management'. From this small set of data, it appears well within the capabilities of typical DGHs to deliver definitive management to these children, the majority of whom have simple respiratory conditions.

There are substantial reasons to advocate the establishment of small PICUs or paediatric respiratory units within DGHs. These resources are readily available to provide immediate management for the adult population so the question must be asked why this is not also true for children. The answer, which is the rationale for most resource insufficiencies within the healthcare system, is the cost that such a venture would incur.

Adult intensive care units cater for both medical and post-surgical patients. Establishing PIC facilities within a DGH would be more worthwhile if it also provided care for both of these groups, thereby increasing the ease of access for critically ill children. Is it fair that a child suffering from complications due to elective surgery is required to 'join the queue' and wait for a retrieval team and a PICU bed elsewhere?

However, a resultant problem may be the provision of surgeons for a full paediatric service in a DGH. Specialist paediatric surgeons may argue that the optimum training and experience would be best acquired from tertiary paediatric centres. Surgeons within DGHs may be reluctant to operate on children if there were no immediate PIC facilities available, and there may also be some concern on the subsequent impact on their morbidity data following any intra-operative complications.

A solution would be to appoint lead paediatric surgeons within DGHs, who could take overall responsibility for paediatric surgery, thereby upholding their skills and offering training for junior surgeons. As with adult care, this could encourage private paediatric surgery to flourish within the DGH, hence providing sufficient funds for the maintenance of the PICU. The 1989 National Confidential Enquiry into Patient Outcome and Death, which investigated deaths in children younger than eleven, stated that 'surgeons and anaesthetists should not undertake occasional paediatric practice'¹². Some evidence has shown the benefits of having a trained paediatric surgeon within a DGH, including reduced morbidity and hospital stay post-operatively¹³. This suggests that established paediatric surgery and a nominated lead paediatric surgeon within a DGH, could provide sufficient experience and maintenance of skill to meet the 1989 NCEPOD recommendation.

There is a considerable lack of data published about PICU admissions, making it difficult to judge the volume of paediatric patients a typical DGH caters for, and the proportion of those who then require PIC. However, one can assume a seasonal variation to be likely, with a higher intake during the winter months as a result of increased respiratory infections¹⁴. A possible solution would be to have adaptable cubicles within paediatric wards that are capable of being transformed into PIC areas when times of high demand occurs, as was done in Northampton General Hospital in the past¹⁵. Paediatric high-dependency units established in some DGHs are already seeing advantages in patient care. An increase in on-site extubation for patients requiring short-

term ventilation (e.g. post-seizures), thus reducing the risks of transfer and prolonged ventilation, has been demonstrated¹⁶.

The emotional factor for families is often overlooked. Currently, there are no tertiary paediatric centres in Essex and so parents living in the north of Essex will suffer huge disruption and stress when travelling back and forth to a tertiary paediatric hospital in central London, thus having significant impact on any siblings remaining at home.

Training prospects have been significantly affected within DGHs. The absence of PIC facilities denies physicians the chance to practice and improve certain skills. Furthermore, it is good medical practice to follow a child throughout their patient journey, from the time of sickness to wellbeing. At present there is no system in place to follow-up a child transferred from Queens Hospital to a tertiary centre and as such the primary team are denied a key learning opportunity. Many of the parents who were consulted during this survey expressed much appreciation that the team at Queens Hospital were still monitoring their children, despite no longer being involved in their care.

It is important to also consider the preparation required to ensure that all DGHs would be equipped to manage critically ill children. For instance, an appropriate level of training for the staff is necessary. The Paediatric Intensive Care Society recommends that every hospital have a nominated anaesthetic and intensivist lead for paediatric services⁶. One of their roles could be to ensure that all staff that treat these children, including nurses and doctors, are certified in Advanced Paediatric Life Support. Another issue would be ensuring nurses had sufficient intensive care training, as currently within Queens Hospital, the paediatric experience is varied amongst the nursing staff. It could be argued that not all physicians may be comfortable providing this level care to children. However, this fear can probably be attributed to lack of regular paediatric contact. The Royal College of Anaesthetists attempts to overcome this barrier by recommending the use of paediatric anaesthesia refresher weeks, whereby consultant anaesthetists who do not regularly deal with children can maintain their skills through supervised work with a paediatric anaesthetic colleague¹⁷. This could be a consideration for physicians of all specialties who were not confident with the management of children. However, it is important to emphasise that any PIC services at DGH should be multi-disciplinary, with joint care from paediatric and anaesthetic services, allowing the two specialties to complement each other in order to deliver

optimal care. Another argument that could be made against the re-introduction of PIC at DGHs would be that they would not have the means to provide intensive care for many children for an indefinite period. One solution would be to have a fixed term, whereby any children still requiring organ support after this period could be transferred to tertiary centres for continuing care. This could be a fixed number of days that would provide ample time to allow children requiring short-term ventilation to be extubated, and offer a greater chance of improvement and stabilisation for the remaining children, thus either minimising risk of transfer or avoiding it altogether.

We recommend that a national database should be implemented where all paediatric cases involving resuscitation are documented so that patterns of presentation within the UK can be identified. With this information, guidelines can be composed for management of children with complex illnesses, including congenital heart disease so that those with simple respiratory conditions, such as pneumonias can still be cared for within DGHs. The guidelines can illustrate what is within the remit of a DGH's capacity to manage and when transfer to a tertiary centre is appropriate.

Paediatric intensivists, anaesthetists, surgeons and nurses should be encouraged to work in DGHs, or else the speciality of paediatrics will be confined to tertiary centres. A trained paediatric multi-disciplinary team in a DGH should be as effective as within tertiary centres.

The belief that PICUs would not provide sufficient income and are therefore not worth investment needs to stop immediately. Our case series has demonstrated that the majority of critically ill children can be managed successfully within a DGH, with a basic MDT. Hospital Trusts should encourage their general surgical colleagues to apply for jobs with a paediatric interest, to initiate the development of a specialist paediatric team. The potential for DGHs to deliver a functional, economical and efficient paediatric service with PIC is plausible but only after thinking has changed within the healthcare system.

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Table 1

Summary of paediatric cases presenting to Queens Hospital between September 2013 and March 2014. Abbreviations: GOSH, Great Ormond Street Hospital; SMH, St. Mary's Hospital, Paddington; RLH, Royal London Hospital; LRTI, lower respiratory tract infection; RSV, respiratory syncytial virus; OOH, out of hospital; HFOV, high frequency oscillatory ventilation *Premature infant with known chronic lung disease ** Child with history of situs inversus and previous liver transplant *** Infant with known global developmental delay and congenital hydrocephalus, presented with seizures, still under investigation

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