Trends in children's surgery in England

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It is important to plan for the future provision of paediatric surgery and anaesthesia

The 1989 report of the National Confidential Enquiry into Perioperative Deaths (NCEPOD)¹ recommended that surgeons and anaesthetists should not undertake occasional paediatric practice and that consultants who take responsibility for the care of children (particularly in district general hospitals (DGHs) and in single surgical specialty hospitals) must keep up to date and competent in the management of children. A relationship between surgeon volume and operative mortality in adult surgery is recognised.² In 1998, Arul and Spicer³ argued persuasively in this journal that paediatric surgery and anaesthesia should be concentrated in specialist centres. They included in this recommendation both specialist (neonatal surgery, complex surgical conditions, straightforward surgical conditions in children with associated disorders, and urology) and non-specialist (such as inguinal hernia, hydrocoele, circumcision, correction of torsion of the testis) paediatric surgery. Whilst there was agreement that neonatal and complex surgery should be centralised, commentators pointed out that most children's surgery in DGHs is in ear, nose and throat (ENT), orthopaedics and ophthalmology. Centres would be overwhelmed if all this activity transferred to them and families would have to travel further for treatment.

Anaesthetists also responded to the NCEPOD report by recommending that fewer anaesthetists should be involved in paediatric care.⁴ There were reports of an increased rate of complications for infants anaesthetised by non-paediatric anaesthetists and for groups performing fewer than 100 paediatric anaesthetic procedures a year, quoted in Tomlinson.⁵ Lunn⁶ suggested a minimum paediatric anaesthetic workload to maintain competence, which was unattainable by the majority of DGH anaesthetists.

These considerations led to a movement of children's surgery away from DGHs to paediatric surgical centres, to the extent that the 2003 report of NCEPOD commented that "many consultants, both anaesthetists and surgeons, are gaining little exposure to the care of young

children" and quoted the view of the Specialist Advisory Committee in General Surgery that the need to "stem the flow of the general surgery of childhood out of district general hospitals into specialist paediatric surgical units that are having difficulty coping has been recognized".⁷

A joint statement from the Colleges refers to a crisis in general paediatric surgery (GPS) training.⁸

The reduction in opportunities for anaesthetists in DGHs to maintain their skills in managing small children had two consequences: a reluctance to perform elective children's surgery and an unwillingness to be involved in the resuscitation of critically ill or injured children. The Royal College of Anaesthetists responded to the latter situation in August 1992 by issuing a flyer reminding departments of anaesthesia in all hospitals receiving emergency paediatric admissions that on-call anaesthetists may be required to help in resuscitation and stabilisation and that such help should always be available. Tomlinson⁵ commented that 20 years ago it would have been unthinkable that such a flyer was necessary. Following discussions between the Colleges and the Department of Health in 2004, a working group considered arrangements for the care of the critically ill or injured child in the DGH. Their report, *The acutely or critically sick or injured child in the district general hospital: a team response*, was published in November 2006.⁹

Trends in children's surgery: evidence from hospital episode statistics

To inform the working group, and in response to concerns about surgical training, an attempt to quantitate the flow of children's surgery out of DGHs was made using hospital episode statistics (HES) data for the 11 year period April 1994 to March 2005. Finished consultant episodes (FCEs) for children <18 years of age for whom there was a procedure recorded in the OPCS4 range A01–X59 were extracted.¹⁰ The methodology and results of this exercise are published on the Department of Health website.¹¹ The limitations of this approach are recognised. HES data are only

as good as the data entered by Trusts and are imperfect. For example, a handful of cases each year had a recorded consultant specialty of geriatric medicine, which seems unlikely. The data are only for England, relate to FCEs rather than admissions, and give no measure of complexity, complications or outcome. Nevertheless, there were large, obvious, linear year-on-year trends (fig 1).

The number of FCEs for children with a procedure remained approximately constant in the range 534 775–576 835/year. The number of FCEs in DGHs (defined as in Cochrane and Tanner¹¹) fell by 9699/year (95% confidence intervals: –12 060 to –7337), whilst the number in centres rose by 7068/year (95% CI: 5933 to 8142). The apparent shift in activity from DGHs to centres was most marked in the 0–4 year old age group but also occurred in older children. The proportion of FCEs for children with an operation procedure carried out in specialist centres increased from 24% in 1994–95 to 39% in 2004–05. Despite this, 325 000 of the 543 000 FCEs in 2004–05 were carried out in DGHs. Of these 325 000 DGH FCEs, approximately 73 000 were ENT, 56 000 trauma and orthopaedics, 32 000 general surgery, 42 000 dental and related specialties, 15 000 plastic surgery and 10 000 ophthalmology. The remainder were mainly minor medical procedures. In 2004–05, therefore, 60% of procedures were carried out in DGHs and only 10% of these were in general surgery.

For trauma and orthopaedics, the fall in DGH FCEs (–885/year) approximately matches the rise in centre FCEs (+520/year), indicating a shift in activity. In ENT, by contrast, the fall in DGH FCEs (–6243/year) was not associated with a significant increase in numbers in centres, indicating a fall in overall numbers. In plastic surgery, the increase in centre FCEs (+906/year) exceeded the fall in DGH FCEs (–339/year); the centralisation of cleft lip services may have contributed to this.

The fall in DGH ENT FCEs was largely accounted for by falling numbers of tonsillectomies (from 56 000 in 1994–95 to 34 000 in 2004–05), adenoidectomies (from 16 000 to 7 000), and insertion of grommets (from 43 000 to 24 000). We may question the extent to which this represents a change in the epidemiology of upper respiratory tract pathology or a change in the indications for surgery. Putting it another way, we may question how many of the 65 000 tonsillectomies, adenoidectomies and insertions of grommets in 2004–05 were necessary. If the observed trends continue, and if they are accelerated by adopting more stringent criteria for operation, then DGH numbers

Figure 1 Numbers of children undergoing a procedure in district general hospitals (DGHs) and in specialist centres 1994–95 to 2004–05.

will fall even more substantially, with important implications for training and maintaining competence.

Similar considerations apply to circumcision. In 2004–05, 9899 foreskins were removed for medical reasons in England, 81% in DGHs, almost exactly half the number removed in 1994–95. The fall occurred between 1994 and 2000–01, after which numbers have remained static. Cathcart *et al*¹² made a similar observation and noted that the circumcision rate (2.1/1000 boys) remains five times higher than the reported incidence of phimosis. If circumcision were confined to boys with severe balanitis xerotica obliterans,¹³ phimosis unresponsive to topical steroids¹⁴ or recurrent urinary tract infection,¹⁵ this would further reduce DGH surgical numbers. Other procedures showing a fall in DGH numbers were orchidopexy (–402/year), surgery for squint (–447/year), herniotomy (–384/year), emergency appendicetomy (–355/year), pyloromyotomy (–70/year), operation for torsion of the testis (–25/year) and reduction of intussusception (–11/year).

Implications of diminishing DGH surgical activity

From the starting point that reduced anaesthetic involvement had led to reduced confidence and competence in managing the critically ill child, the DH/Collegiate working group took a “whole pathway, whole team” approach. The pathway starts from the presentation of the child to primary care or an emergency department, and includes resuscitation, stabilisation and transfer or retrieval to the paediatric intensive care unit. Consideration of prehospital care was timely, given the publication of the

second edition of Pre-Hospital Paediatric Life Support (PHPLS)¹⁶ and the revised guidelines from the Joint Royal Colleges Ambulance Liaison Committee (JRCALC).¹⁷ With regard to the team response, the group emphasised that skills and competencies are more important than professional labels, described the obligations of individuals, teams and organisations, and stressed that scenario practice is essential. From a wide-ranging report with 42 recommendations, the following points are particularly relevant to emergency surgery.

Skills

In a large paediatric centre, requesting a surgical opinion may be as easy as ordering a chest x ray. Not so in the smaller unit where paediatric surgical expertise is not available 24 h a day, and where surgery may require transfer. There, it is necessary for those consultants seeing emergencies, whether they be consultant paediatricians or emergency physicians, to develop and maintain the diagnostic skills to decide whether this abdomen requires surgery tonight, this fracture is causing neurovascular compromise, or this head injury requires a neurosurgeon. Paediatricians who have been used to the luxury of a surgical colleague may have to “skill up” on his (or possibly her) retirement.

Networks

This over-used word was interpreted quite simply (page 46 of the report) to describe clinical networks which may be informal or managed. Very good networking arrangements may self-generate in the clinician community, but require managerial “buy-in” to secure funding and governance. Top-down networking

arrangements imposed upon a reluctant clinical community are less likely to succeed.

Hub-and-spoke or partnership?

The concentration of expertise and facilities in a hub may induce a feeling of inferiority and resentment in the spokes. Memorably, one member of the working group said “We don’t mind being a spoke if the hub looks after us”. That looking after has many components, including: sharing protocols; ready availability of telephone contact; acceptance by the hub that they have a responsibility to accept patients from their spokes or find a bed elsewhere; sending the patient back as soon as dependency levels permit; providing rapid feedback; avoiding implied or explicit criticism; and sharing educational opportunities.

An enhanced role (partner rather than spoke) for a DGH paediatric surgical service may develop

A group of DGHs may agree that a surgical service will be developed in one. A centre may negotiate a franchising arrangement where components of its service are delivered in one or more of its partner DGHs, perhaps with joint consultant appointments. These arrangements require considerable trust between Trusts, willingness of consultants to work outside their centre, and willingness of managers to organise and fund the logistics. Pre-emptively established, however, they may prevent the drift of cases from DGHs to centres which will lead to a non-viable DGH and an overwhelmed centre.

Classifying and planning

The group considered the NCEPOD categories of urgency and attempted to apply them to paediatric surgical cases. Some are easy to categorise, for example an expanding intracranial haematoma is in the emergency category (operation within 1 h). For many, categorisation is qualified by the age of the child, the availability of a competent team, geography or response to initial treatment. Desktop scenario planning is vital and is a clear responsibility of the medical director or his/her deputy. The example is given of a 5 year old with appendicitis presenting to a hospital with two general surgeons and three anaesthetists who have maintained paediatric skills. The outcome is an algorithm deciding whether or not operation is done out of hours, variables being the clinical features and the availability of the competent surgeons, anaesthetists and supporting staff. The algorithm is shared with other units in the network and is audited.

Defining and planning for the true surgical emergency

The number of paediatric procedures in the emergency category is small (for example torsion of the testis, expanding intracranial haemorrhage, fracture with neurovascular compromise, upper airway obstruction), but they pose real training dilemmas. In 6 months' attachment to a centre, a surgical trainee might see only one or two acute scrotums, so might a training simulation be developed? Is it better to have an immediate operation by a relatively inexperienced surgeon or a slightly delayed one by a specialist? Could a televisual link between a centre and a DGH assist? There is a need both for high level discussion and local planning about each of these scenarios.

Using information technology

The ability to digitally transmit images means that an expert opinion should be available to the most remote clinician. The plain *x* ray and ultrasound of the child with suspected intussusception can be viewed by the distant radiologist to whom the child is to be transferred for hydrostatic reduction. One paediatric neuroradiologist could be on call to give an immediate opinion on a CT scan from anywhere in the UK.

Maintaining anaesthetic skills

For many ENT, orthopaedic and ophthalmological procedures, the constraint upon their being performed in the DGH is anaesthetic rather than surgical competence. Maintaining the skills and confidence of anaesthetists in managing children is helped by refresher weeks at a larger unit, a scheme which has run successfully at Yorkhill NHS Trust, Glasgow. Without being prescriptive, the group felt that an APLS refresher and a refresher attachment alternating at 18 month intervals would be sufficient.

Training in general paediatric surgery

In a joint Collegiate statement,⁸ concern is expressed at the future of GPS services in DGHs. General surgeons currently providing a paediatric service are not being replaced by appointees willing to continue it. The Joint Committee on Higher Surgical Training in 1999 defined the standards for optional GPS training for all new DGH general surgeons. It recommended a minimum duration of 6 months GPS training, in a recognised post, at year 4 or higher of the then Higher Surgical Training programme. This could be undertaken either wholly in a regional paediatric surgical unit or shared between such a unit and a DGH where there is an experienced trainer and

a sufficient volume of GPS cases to maintain competence. The latter was quantified as one operating list exclusively for children every 2 weeks. The objective was to provide a level of competency for general surgeons to manage GPS problems in children above the age of 1 year. They recommended that one or more nominated general surgeons with such training and experience should undertake GPS in a DGH. These surgeons were referred to as general surgeons with an interest in paediatric surgery. Since then there has been virtually no uptake of this GPS training option. A postal survey of 1044 DGH general surgeons in England and Wales in 2004, conducted by the Association of Surgeons of Great Britain and Ireland, indicated that only 18 (<2%) indicated a special interest in GPS. The model of having a nominated general surgeon with an interest in paediatric surgery who is responsible for providing the GPS in each DGH is not completely practical, as the surgeon cannot provide 24/7 cover for emergencies. This can only occur when all surgeons on call have the appropriate training and on-going experience in GPS.

The Senate of Surgery for Great Britain and Ireland recommended in April 2005 that all general surgical trainees should have a compulsory period of 6 months' training in GPS in the DGH under the supervision of an accredited general surgical trainer. This is planned to be a competency based training programme aimed at the generality of GPS, where the trainee could be expected to achieve a level of proficiency to deal safely with problems in children over the age of 5 years. The success of this initiative is critically dependant on sufficient numbers of adequately trained and experienced general surgeons in DGHs to train all new general surgical trainees in GPS. There are concerns that adequate numbers of appropriately trained and experienced general surgical trainers do not currently exist and that there are insufficient training slots in the tertiary centres to compensate for this deficiency.

If this new Senate Training Programme for General Surgeons is unsuccessful, it is likely that almost all children under the age of 5 years and most children under the age of 8 years with a GPS emergency will in the future be transferred from the DGH to a centre. Their management will then be largely undertaken by general paediatric surgeons who would, in addition, provide outreach services to local DGHs by undertaking outpatient clinics and day case lists of GPS. This would have the additional benefit of providing continuing education and training of DGH surgeons. This model, where children's day case operating lists

are retained in the DGH, would maintain anaesthetic and theatre personnel skills. In turn this would facilitate the retention of ENT, ophthalmology, dental, orthopaedic, plastic and maxillo-facial surgery in the DGH, services which might otherwise be threatened.

Inspection

The Healthcare Commission Improvement Review 2006¹⁸ examined services for children in hospital against the following criteria: children should have access to child-specific services; children should have access to care local to their homes; services should be staffed by appropriate levels of trained staff; staff should have child-specific training; and staff should have the opportunity to maintain their skills. These criteria derived from the National Service Framework (NSF) hospital standard,¹⁹ particularly paragraph 4.42: "children should only go to tertiary centres for complex/specialised treatment. Tertiary care should be delivered by outreach"; and paragraph 4.43: "need for tertiary/primary/secondary care to set up referral protocols and arrangements for local services; need for tertiary care to deliver outreach services; patients admitted to tertiary care only when local hospital alternative would not be safe". Against these criteria, emergency and elective surgery scored poorly; 8.3% and 17.2% of Trusts scored "weak" respectively, whilst 0% and 36.3% scored good or excellent. The review may be criticised for concentrating upon process rather than outcome, assessing staff skills by numbers of cases rather than quality of training, and lumping all children aged <12 years together rather than differentiating the needs of infants and older children. The review may have had a disincentivising effect upon DGH units who are considering whether to maintain children's surgery, exaggerating the flow of cases from DGHs to centres, an effect which is exactly opposite to the spirit of the NSF.

CONCLUSIONS

In planning for the future of children's surgical services, case load needs to be estimated as accurately as possible. The HES data quoted here are a starting point, despite their limitations. More detailed work might usefully concentrate upon the younger age groups. There is also a need to consider the indications for the common surgical procedures discussed. Are they all necessary? There is also a need to take into account changing surgical techniques. For example, if laparoscopic appendicectomy²⁰ is really superior to its conventional equivalent, then referral

patterns will change. The flow of surgery away from DGHs will continue and accelerate. Further consideration might usefully also be given to the definition of a centre. The DH/Collegiate group recognised that a sufficient workload to maintain competence might be achieved by a group of DGHs localising surgery to one location. As studies of the outcome of pyloromyotomy²¹⁻²² have shown, it is the skill and make-up of the team rather than its location in a teaching hospital which is important.

Given the huge variation between European countries in the numbers and training of paediatric surgeons and the number of "centres of paediatric surgery" per country,²³⁻²⁴ it is unlikely that international comparisons will give us easy answers.

We cannot dissociate surgical and anaesthetic issues. Whilst it was the anaesthetists who stimulated the formation of the Critical Care in the DGH working group, it is the depressing situation with regard to training in GPS which is now likely to drive change. It is possible that we will see a shift from surgery performed on children by general surgeons with paediatric experience to a service delivered mainly by paediatric surgeons. The implications of this with regard to numbers of paediatric surgeons and outreach arrangements, and to anaesthetic training, need to be thought through.

The NSF¹⁹ emphasised that care should be delivered as close to home as possible. For children's surgery, the trend is in the opposite direction. How much should we worry about this? Do parents object to travelling to a crowded specialist centre with inadequate car parking if they believe that the care their child receives is more expert? And how are they to obtain reliable data as to whether care in centres is better than in their local DGH?

*The acutely or critically sick or injured child in the district general hospital: a team response*⁹ report emphasises a whole team, whole pathway approach and stresses the need for forward planning. Whilst emphasising the responsibilities of professionals, it also explicitly states the responsibilities of employing Trusts to facilitate training, to provide time and training to maintain competence, not to

place staff in the position of acting beyond their competence, to support a member of staff who placed in a very difficult emergency situation has done his/her best, to establish clinical networks, and to promote education, audit and research.

Whatever new solutions are devised, it is essential that commissioners are actively involved. The West Midlands Strategic Commissioning Group provides an excellent example of leadership in its support of the *Standards for the care of critically ill & critically injured children in the West Midlands*.²⁵ Commissioners now need actively to consider the provision of children's surgery, rather than passively to watch a case-load migration which has important consequences for both DGHs and centres, and of course for patients and their families.

ACKNOWLEDGEMENTS

The help of Hugh Cochrane, Statistical Officer, Standards & Quality Analytical Team, Department of Health in extracting HES data is gratefully acknowledged.

Arch Dis Child 2007;**92**:664-667.
doi: 10.1136/adc.2006.099705

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Accepted 19 March 2007

Competing interests: None.

The opinions expressed in this paper are those of the author and not necessarily those of any institution.

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