

A survey of current facilities for neonatal surgery in the UK

Purpose of study

To determine the current organisation of neonatal surgical facilities in the UK.

Study design

An on-line survey (QuestionPro[®]) was sent to one surgeon in each of 26 UK neonatal surgical centres in October 2008 (Appendix A). The questionnaire had been reviewed and agreed by the members of the NHS/Department of Health Neonatal Taskforce Surgery working group.

Results

Of the 26 centres approached 23 returned data. The 3 centres not responding were in Scotland.

Question 1 & 2: Demographics

Responding centres are listed in Table 1 along with annual birth rates for their catchment area as determined either by response from the centre or from Neonatal Network data. The number of surgeons who undertake neonatal surgery per centre is also shown along with the number of births per surgeon.

Centre	Annual births	Number of surgeons performing neonatal surgery	Annual births per surgeon
Belfast	25000	6	4167
Birmingham	70000	5 gen + 3 urol + 2 liver	14000
Brighton	20000	4	5000
Bristol	50000	6	8333
Cambridge	25000	6	4167
Cardiff	30000	5	6000
Chelsea and Westminster	24000	5	4800
Great Ormond Street	25000	5	5000
Hull	6000	2	3000
Kings College Hospital	22000	4	5500
Leeds	40000	6(gen)+3(urol)	6667
Leicester	28000	4	7000
Lewisham	22000	5	4400
Liverpool	30000	9	3333
Manchester	83000	8	10375
Newcastle	33047	6	5508
Norwich	25000	4	6250
Nottingham	30000	6	5000
Oxford	30000	4	7500
Royal London	25000	5	5000
Sheffield	23000	6	3833
Southampton	35000	4	7500
St Georges Hospital	40000	5	8000

Table 1

Analysis of demographics

Neonatal medical services in England are currently organised into 24 Managed Neonatal Networks. Precise calculation of the annual birth rate served by any one centre is made more difficult by 2 network factors.

1. Two English neonatal networks contain 2 surgical centres: Norfolk, Suffolk and Cambridgeshire contains Cambridge and Norwich whilst South East London contains King's College Hospital and Lewisham.
2. The 6 neonatal networks without a surgical centre tend to refer to neighbouring surgical centres in adjacent networks. The surgical centre used appears to vary with bed availability, the proximity of the patient's home to the centre and local clinical arrangements.

It is clear that the size of population managed by a surgical centre undertaking neonatal surgery varies considerably. Although the average sized centre has an annual birth rate of approximately 30,000 per year, has five surgeons who undertake neonatal surgery and therefore has one surgeon for 6000 births, there is considerable variation around this average. In some centres there is one surgeon for 3000 births.

Questions 2 - 6. Configuration of neonatal surgical beds

The number of ward areas used by different centres to admit surgical neonates is shown in Figure 1 and the designation of these areas in Table 2. Detailed breakdown of beds available for neonatal surgery is shown in Appendix B and this information summarised in Table 3.

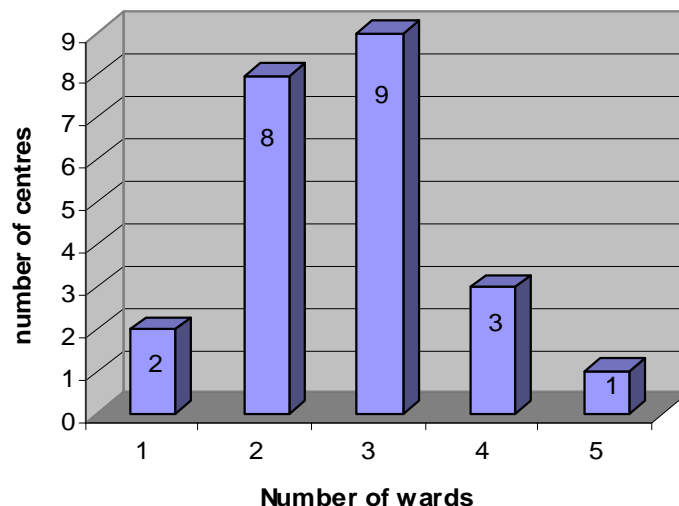


Figure 1. Number of wards admitting surgical neonates per centre

Ward types used for surgical neonates	Number of centres
Surgical beds in neonatal medical unit	20
Stand-alone neonatal surgical unit (NSU)	8
PICU	18
Paediatric ward (medical/surgical)	16
HDU	2
Total	64

Table 2

Description of bed usage	Number of centres
Fixed number of neonatal surgical beds	1
Flexible use of eg NNU, PICU beds	15
Fixed NSU beds + flexible use of others	7

Table 3

Analysis of bed usage

Only 2 centres admitted patients to a single ward area. Most centres have 2 or 3 wards that can admit neonates and in 23 centres there are 64 such wards. This must have implications for staff experience and education. Conversely having access to a number of wards with beds available on a flexible basis should help bed availability. Given the relatively small number of patients admitted by each centre, staffing a fixed number of beds without flexibility may not be efficient.

Question 7 & 8. Admissions and operations

The number of annual admissions and operations reported by each centre are shown in Figures 2 and 3. Figure 4 reflects the estimate of the number of referrals that were refused admission in 2007 and Figure 5 the percentage of referrals refused annually.

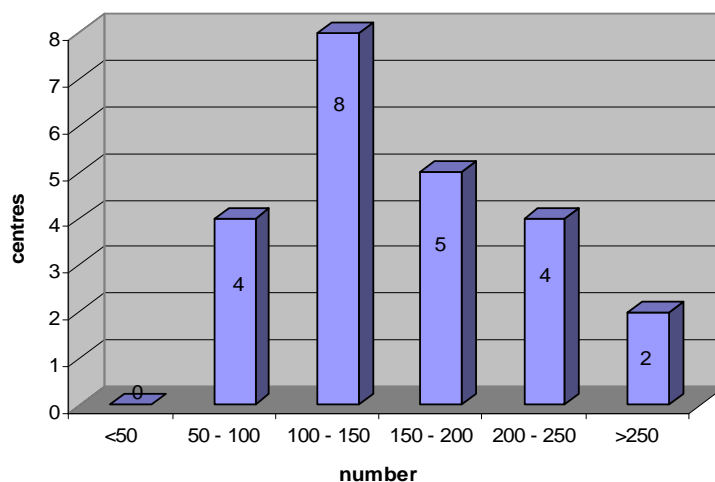


Figure 2. Annual number of admissions

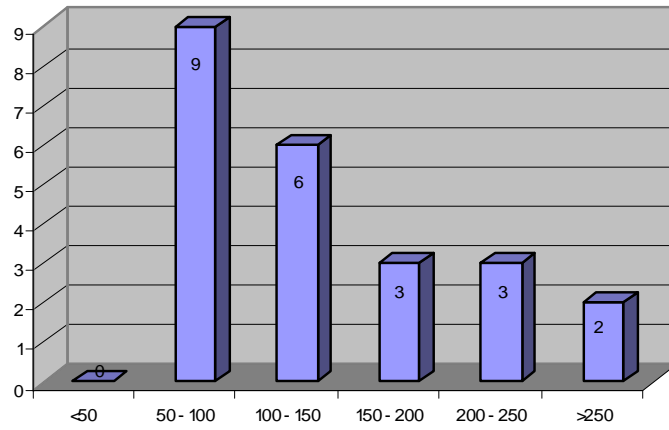


Figure 3. Annual number of operations

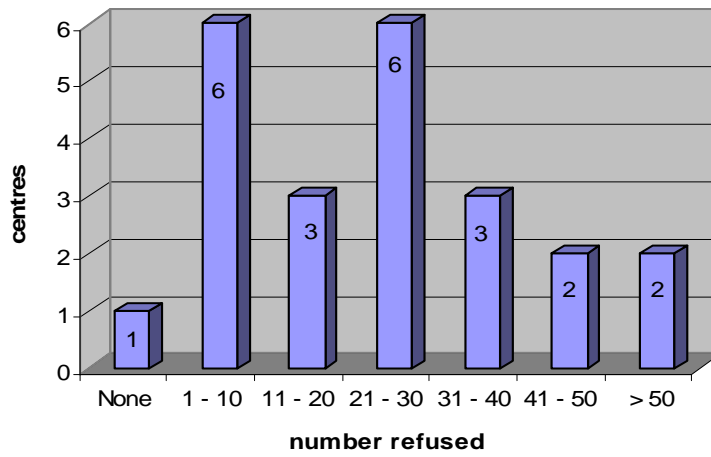


Figure 4. Annual number of referrals refused admission

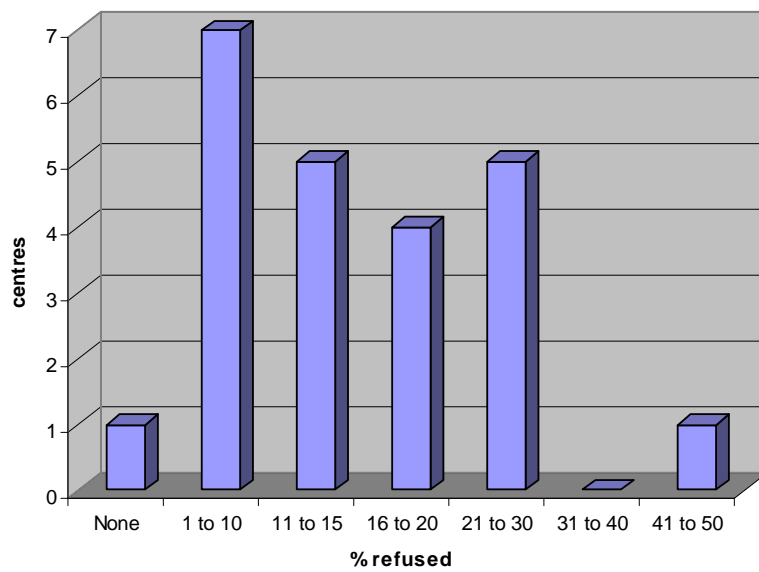


Figure 5. Percentage of referrals refused annually

Table 4 indicates how often centres refuse admissions.

Frequency admission refused	n	%
Never	1	4%
Occasionally	9	40%
Regularly	10	43%
Constantly	3	13%

Table 4

Analysis of admissions data

Most centres admit 100 – 150 patients annually although the busiest admit 3 – 4 times the number admitted by the smaller units. Operation figures mirror this. The frequency with which admissions are refused is concerning. Only 1 unit in the UK (Belfast) does not experience this problem whilst for 50% of units this is a regular or constant issue. One centre had to refuse admission to over 60 patients in 2007 and most centres are refusing about 10 – 20% of referrals.

Question 11 – 15. Patient care and facilities

The specialists involved in the ventilation and post-operative care of surgical neonates are shown in Table 5. More than one group are involved in many centres.

Specialists	Ventilation	Post-op care
Neonatologists	18	16
Paediatric intensivists	14	10
Paediatric anaesthetists	4	4
Paediatric surgeons	-	23

Table 5

The response to the question about the management of a 26 week gestation infant with intestinal perforation is shown in Table 6.

Care description	n
Baby managed in on-site neonatal surgical bed for duration of surgical care	2
Baby managed in on-site neonatal medical unit with surgical input	18
Baby transferred for surgery and returned to off-site neonatal unit for post operative care	3

Table 6

On-site neonatologists are present in 20/23 centres and obstetrics in 19/23. 3 centres, all Children's hospitals, had neither of these. High frequency ventilation was available in all centres and inhaled nitric oxide in all but one. Only 2 centres had ECMO available on-site.

Analysis of patient care and facilities.

Ventilatory management of surgical neonates is spread amongst 38 specialist groups in the 23 centres. Paediatric surgeons are not involved in this

management now. Many different groups are also involved in post-operative care. The scenario reported in Table 6 indicates that most centres are able to manage very sick preterm infants in a neonatal setting. However 3 centres, all Children's hospitals require the infant to be transfer from a neonatal unit for surgery and returned for post-operative care.

Question 16 & 17. Theatre facilities

Venues in which neonatal operations are performed and their proximity to neonatal beds are shown n Tables 7 and 8. More than one venue was available in many centres.

Operating venues	n
On-site neonatal theatre	10
On-site paediatric theatre	20
Cot-side surgery	11
Off-site theatre	1
Shared adult theatre	1
Total	42

Table 7

Theatre proximity to neonatal beds	n
Corridor on same floor	7
Same building, different floor	13
Same site, different building	9
Different site	1

Table 8

Analysis of theatre facilities

All but 2 centres had a theatre on the same site as neonatal surgical beds. Eleven centres practice cot-side surgery on the neonatal unit thus avoiding the need to transfer ventilated infants to theatre. Ten centres appear to have a neonatal theatre available.

Question 18: Admin activities

Administrative activities of the 23 surgical units are shown in Table 9.

Activity	n	%
Annual neonatal surgical report - stand alone	2	10%
Annual neonatal surgical report as part of unit/service report	10	45%
Neonatal surgical database - stand alone	7	32%
Neonatal surgical database as part of unit/service database	11	50%
Neonatal surgical guidelines for doctors	15	68%
Neonatal surgical guidelines for nurses	14	64%
Neonatal surgical audits	17	72%
Family information leaflets for surgical conditions	15	64%
None of the above	0	

Analysis of admin activity

80% of units maintain a database either specifically for surgical patients or in combination with the host unit. Two thirds maintain medical and nursing guidelines and provide family information leaflets. However only half produce an annual report.

Question 19: Designated neonatal surgery staff

Specialist surgical staff	n	%
Lead consultant surgeon for neonatal surgery	9	36%
Specialist or consultant nurse for neonatal surgery	7	32%
None of the above	11	50%

Half of centres do not have either a specialist nurse or lead consultant for neonatal surgery. 4 centres had both these posts.

Question 20: Neonatal screening

Retinopathy and Guthrie screening occurred in all units and audiology screening in 22/23 units.

Discussion

There is considerable variation in the size of centres providing neonatal surgery identified by this survey. Although the average centre serves 30,000 live births there are a number of centres much smaller than this. However for a paediatric surgical centre to remain viable it is necessary to have a sufficient number of consultant surgeons on the on-call rota to avoid onerous out of hours activity. As a result of this the number of live births per surgeon varies considerably. Given the incidence of many of the congenital abnormalities requiring neonatal surgery the experience of individual surgeons will be diluted. For example with an incidence of one in 3000 for oesophageal atresia, some surgeons will only see one case a year and the average surgeon in an average centre will see two cases per year. Although this issue was not examined as part of this survey, it is apparent that some centres are trying to address this by restricting the number of surgeons that operate on specific conditions. However it can be argued that there are too many centres performing neonatal surgery and that the numbers of surgeons per centre that are involved in neonatal surgery should be reduced. Consideration could also be given to encouraging collaboration between neighbouring centres to broaden experience or to establish supra-regional centres for certain conditions.

Given the very specialist nature of neonatal surgery and in particular the pre- and post-operative care involved, it is concerning to see that there are so many different ward areas that may be used for the admission of surgical neonates. In the 23 centres surveyed there were 64 different ward areas used. There is only one centre with a fixed number of neonatal surgical beds, which were effectively ring fenced. In all other centres there is flexible use of beds on the neonatal unit or other areas such as paediatric intensive care.

Whilst this may be an efficient use of resources, because staffing ring fenced neonatal surgical beds may be an expensive option, it is difficult to maintain high levels of medical and nursing experience and expertise in so many different ward areas. This may in part be overcome by identifying senior surgical and nursing staff with particular responsibility to neonatal surgery.

The number of admissions and operations performed in each centre approximately mirrors the birth rate served by those centres. There is clearly a considerable problem with regards to refused admissions. All centres experience this to a greater or lesser extent. Virtually all centres are refusing 10 to 20% of referrals and some centres considerably more than this. Over half the centres surveyed commented that they regularly or constantly had to refuse admissions. This is further evidence that the provision of neonatal surgical beds is inadequate. It should be borne in mind that the centres performing neonatal surgery are largely based in major regional hospitals and that refusal of admission from the local area will result in the patient and the family being required to travel considerable distance to access neonatal surgical care. This issue has also been highlighted by other surveys in this report and by previous publications⁽¹⁾.

These survey results regarding the specialist involved in ventilation and post-operative care approximately mirrors the findings of the ward areas in which sick patients are managed. Few would argue that the most appropriate specialist to manage a very low-birth-weight preterm baby will be a neonatologist. It is reassuring to see that the majority of centres have indicated by their response to the scenario of a 26 weeks gestation infant with intestinal perforation that neonatal expertise would be used for the care of this infant. Some children's hospitals are not able to provide on-site specialist neonatal care and that this may result in sick preterm babies being admitted by ambulance to a children's hospital to surgery with immediate transfer back to their referring neonatal unit. This is not an ideal situation as it involves the immediate pre-and post-operative transfer of small sick infants. Some units are considering travelling out to perform cot side surgery in neonatal units to avoid this problem.

The availability of operating facilities for neonates is also very variable. It is concerning that there are 10 of the 23 centres where neonates required to be transferred to a different building or a different site within the hospital complex first surgery to be performed. Cot side surgery appears to be becoming more common with 50% of units now performing this.

Although about two thirds of centres report the use of medical and nursing guidelines and family information leaflets and 80% of units maintain a database of neonatal surgical patients, only half the units produce an annual report in any form. Most centres practice audit of neonatal surgical conditions. Only one centre performed all these activities.

The identification of designated senior neonatal surgery is a concept that appears to be becoming more popular. Nine centres reported that they have a lead consultant and seven that they had a specialist or consultant nurse for

neonatal surgery. Only four centres had both these posts. Given the large number of ward areas admitting surgical neonates, the rarity of many conditions and the dilution of experience amongst growing numbers of consultant surgeons it is very difficult to maintain experience and provide education for medical and nursing staff. Lead consultants and specialist nurses have a major role to play in these areas and in ensuring consistent high quality care.

David Burge
March 2009

References

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- (2) Neonatal Intensive Care Review: Strategy for Improvement, Department of Health, 2003.
- (3) Caring for Vulnerable Babies: The reorganisation of neonatal services in England. National Audit Office December 2007
- (4) Standards for Hospitals Providing Neonatal Intensive and High Dependency care (Second edition). British Association of Perinatal Medicine 2001
- (5) A Review of Capacity for Neonatal Surgery. The Audit, Information & Analysis Unit for London, Kent, Surrey, Sussex, Essex, Beds & Herts 2006
- (6) Surgery for Children. Delivering a first class service. Report of the Children's Surgical Forum, Royal College of Surgeons of England 2007

BAPS/Department of Health survey of Neonatal Surgical Facilities 2008

Q1. CENTRE RESPONDING

Please indicate the centre your are reporting from

Q2. GENERAL DATA

Number of live births annually in your Network/catchment area

Number of consultant surgeons performing neonatal surgery

Q3. NEONATAL SURGERY WARD AREAS

In your centre, how many different wards have neonatal surgical beds?

1. 1
2. 2
3. 3
4. 4
5. 5

Q4. SERVICE CONFIGURATION(Select as many as apply)

What type(s) of facilities do you have for surgical neonates?

1. Surgical beds in neonatal medical unit
2. Stand-alone neonatal surgical unit
3. PICU
4. Paediatric ward beds
5. Other _____

Q5. BED NUMBERSPlease enter number of beds on NU/NSU or PICU

	Total	Available for neonatal surgery (enter number or flexible)
Neonatal unit		
Stand alone neonatal surgical unit		
PICU		

Q6. RINGFENCING

Which of the following best describes you beds?

1. Fixed number of neonatal surgical beds
2. Flexible use of eg NNU, PICU beds
3. Other _____

Q7. ADMISSIONS

How many neonatal surgical admissions were there in 2007? (excluding pyloric stenosis, minor conditions eg abscess etc)

1. <50
2. 50 - 100
3. 100 - 150
4. 150 - 200
5. 200 - 250
6. >250

Q8. OPERATIONS

How many neonatal surgical operations were performed in 2007?

1. <50
2. 50 - 100
3. 100 - 150
4. 150 - 200
5. 200 - 250
6. >250

Q9. REFUSED ADMISSIONS

How many neonatal surgical admissions did you refuse in 2007 (actual or estimate)?

1. None
2. 1 - 10
3. 11 - 20
4. 21 - 30
5. 31 - 40
6. 41 - 50
7. > 50 (enter number/estimate)

Q10. How often do you have to refuse admissions?

Never .	Occasionally .	Regularly .	Constantly .
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Q11. VENTILATION MANAGEMENT(please tick as many as apply)

Who is responsible for ventilatory management?

1. Neonatologists
2. Paediatric intensivists
3. Paediatric anaesthetists
4. Paediatric surgeons
5. Paediatricians
6. Other _____

Q12. POST-OPERATIVE MANAGEMENT(please tick as many as apply)

Who is responsible for post-operative management?

1. Neonatologists
2. Paediatric intensivists
3. Paediatric anaesthetists
4. Paediatric surgeons

5. Other _____

Q13. PRETERM PATIENT MANAGEMENT

If you were to admit a 26 week gestation infant with intestinal perforation for surgery, which of the following best describes the care pathway for this baby:

1. Baby managed in on-site neonatal surgical bed for duration of surgical care
2. Baby managed in on-site neonatal medical unit with surgical input
3. Baby transferred for surgery and returned to off-site neonatal unit for post operative care

Q14. ON-SITE SERVICES

Which of the following do you have on site?

1. Neonatology
2. Obstetrics
3. Neither

Q15. INTENSIVE CARE FACILITIES

Which of the following facilities do you have on-site for surgical neonates?(Please tick as many as apply)

1. High frequency ventilation
2. ECMO
3. Inhaled nitric oxide
4. None of the above

Q16. THEATRE FACILITIES

What theatre facilities do you have?(Tick all that apply)

1. On-site neonatal theatre
2. On-site paediatric theatre
3. Cot-side surgery
4. Off-site theatre
5. Other _____

Q17. THEATRE SITE

How far are the theatres from the patient care area?(Tick as many as apply if you have babies in more than one area)

1. Corridor on same floor
2. Same building, different floor
3. Same site, different building
4. Different site
5. Other _____

Q18. REPORTS/GUIDELINES/AUDIT

Which of the following do you produce or maintain?(Tick as many as apply)

1. Annual neonatal surgical report - stand alone
2. Annual neonatal surgical report as part of unit/service report
3. Neonatal surgical database - stand alone
4. Neonatal surgical database as part of unit/service database
5. Neonatal surgical guidelines for doctors
6. Neonatal surgical guidelines for nurses
7. Neonatal surgical audits
8. Family information leaflets for surgical conditions
9. None of the above

Q19. LEAD SPECIALISTS

Do you have the following?

1. Lead consultant surgeon for neonatal surgery
2. Specialist or consultant nurse for neonatal surgery
3. None of the above

Q20. SCREENING

Which of the following are provided for your surgical neonates?(Tick as many as apply)

1. Retinopathy screening
2. Audiology screening
3. Guthrie screening
4. None of the above

Q21. CONTACTS FOR FURTHER INFORMATION

We will be gathering further information about nursing staff numbers, amenities contracting arrangements etc. Please could you provide us with the email addresses of the appropriate contacts below:

Medical neonatal unit manager

Surgical neonatal unit manager

PICU manager

Other source of information

Appendix B

Neonatal surgery bed availability.

	Neonatal unit		NSU*	PICU	
	Total	Available for neonatal surgery	Total	Total	Available for neonatal surgery
Belfast	16	flexible	5	8	flexible
Birmingham			15	16-20	flexible
Brighton	24	flexible		3	flexible
Bristol	25	flexible		15	flexible
Cambridge	13	flexible		8	flexible
Cardiff	26	flexible		8	flexible
Chelsea and Westminster	32	flexible			
Great Ormond Street	10	Flexible		12	flexible
Hull	30	flexible		?	flexible
Kings College Hospital	35	flexible			
Leeds	34	flexible	10	13	flexible
Leicester	20	flexible		8	flexible
Lewisham	23	flexible		3	flexible
Liverpool			12	21	flexible
Manchester	31	flexible	14	15	flexible
Newcastle	12	flexible	7	14	flexible
Norwich	31	flexible			
Nottingham	20	flexible		6	rarely used
Oxford	34	flexible		7	flexible
Royal London	16	2	7	6	flexible
Sheffield			9		
Southampton	36	flexible		10	flexible
St Georges Hospital	35	flexible		8	flexible

*NSU = neonatal surgical unit