

Prospective survey of neonatal surgery referrals

01/11/2008 – 28/02/2009

Purpose of study

- To assess problems associated with accessing neonatal surgical services in England

Study design

A prospective survey was undertaken of neonatal referrals to paediatric surgical centres in England over the 4 month period 1st November 2008 – 28 February 2009. The intention was to include all neonates (ie babies < 44 weeks post conceptual age) including those admitted to venues other than neonatal units (eg paediatric wards) in order to capture conditions such as pyloric stenosis and inguinal hernia.

Inclusion criteria: all babies < 44 wks post-conceptual age (PCA) transferred to a neonatal surgical service from English networks.

Exclusion criteria:

- cardiac and ENT conditions
- In-house transfers (ie medical to surgical care in same centre)

Data collection

Patients were registered using a commercial (QuestionPro[®]) on-line data entry from (Appendix A). The questionnaire had been reviewed and agreed by the members of the NHS/Department of Health Neonatal Taskforce Surgery working group. The URL link to this form was sent to all 24 Neonatal Network leads and all BAPM members.

Results

A total of 317 patients were entered onto the survey. 72 patients were excluded for the following reasons:

- 2 from outside England
- 6 cardiac
- 1 “test” patient
- 10 > 44 wks PCA
- 2 outside dates of study
- 38 in-house NU to surgical bed transfers
- 13 duplicates

This left 245 patients for analysis. This is a small number and probably reflects that patient ascertainment is incomplete.

Question 2: Referrals by Network

The number of transfers per network and the percentage of the total are shown in Table 1 and further analysis of this data in Table 2.

Network	n	%
Beds/Herts	12	4.90%
Cheshire/Mersey	32	13.06%
Essex	5	2.04%
Greater Manchester	15	6.12%
Kent	17	6.94%
Lancs/South Cumbria	1	0.41%
London – North Central	5	2.04%
London – North East	2	0.82%
London – North West	16	6.53%
London – South East	4	1.63%
London – South West	7	2.86%
Midlands – Central	16	6.53%
Midlands – North	14	5.71%
Midlands – South West	15	6.12%
Norfolk, Suffolk & Cambridge	8	3.27%
Trent North	12	4.90%
Northern	3	1.22%
South Central – North	1	0.41%
South Central – South	7	2.86%
South West	17	6.94%
Surrey/Sussex	9	3.67%
Trent		2.86%
Western		2.04%
Yorkshire	15	6.12%
Total	245	100%

Table 1

	referrals/network	Annual equivalent
mean	10	30
median	9	27
range	1 - 32	3 - 96

Table 2

Two networks contain 2 surgical centres, Norfolk, Suffolk and Cambridgeshire (Cambridge and Norwich) and South East London (King's College Hospital and Lewisham).

Six networks do not contain a surgical centre. The centres accessed for surgical beds during this survey are shown in Table 3.

Network	Surgical centres accessed
Bedfordshire & Hertfordshire	Leicester, Lewisham, GOS, St George's. Royal London
Essex	Cambridge, St George's, Royal London
Kent & Medway	Kings, Lewisham, GOS, Brighton, Southampton
Lancashire & South Cumbria	Liverpool, Manchester
South West Peninsula	Bristol
Midlands – North	Birmingham, Liverpool, Sheffield, Nottingham, Leicester

Table 3

Analysis of Network activity

It was not possible to validate the data. The variation in the number of patients reported by each network is likely to reflect data acquisition rather than true surgical referral variation.

Question 4 & 5: Transfer to surgical centre

The time between decision to transfer to a surgical centre and the transfer occurring is shown in Table 4 and Figure 1. Data on the transfer delay and reasons for the delay are shown in Table 5.

Time	n	%
< 2hrs	44	17.96%
2 - 4 hrs	77	31.43%
4 - 8 hrs	50	20.41%
8 - 12 hrs	15	6.12%
12 - 16 hrs	9	3.67%
16 - 20 hrs	8	3.27%
20 - 24 hrs	13	5.31%
> 24 hrs	29	11.84%

Table 4

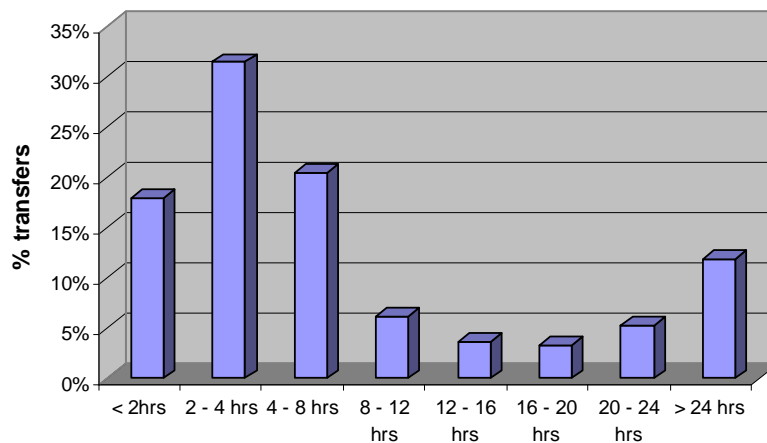


Figure 1. Time between decision to transfer and transfer occurring

	n	%
No delay	138	56.33%
Delay finding surgical bed	30	12.24%
Transport delay	25	10.20%
Delay awaiting bed availability	18	7.35%
Clinical decision to delay transfer - stable patient	12	4.90%
Clinical decision to delay transfer - patient unstable	10	4.08%
Elective transfer	6	2.45%
Multiple reasons for delay	4	1.63%
Awaiting surgical review	2	0.82%
Total	245	100%

Table 5

Analysis of transfer issues

Nearly 50% of transfers took place within 4 hours of the decision to transfer being made. However a delay in transfer was reported in 44% of cases. This was usually due to a delay in locating a centre with an available surgical bed (12%) or waiting for a bed to become available in the accepting centre (7%). In 10% the delay occurred in transport services. In 25% of the patients in whom there was a transfer delay were preterm infants with NEC or perforation.

Question 7 & 8: Patient demographics

Data on gestation at birth, postnatal age and PCA at transfer to a surgical unit of the 245 patients are shown in Table 6. The number of transfers by birth gestation and PCA are shown in Figures 2 and 3.

n=245	Gestational age at birth (weeks)	Postnatal age (days)	PCA (weeks)
mean	33	18	36
median	33	5	37
range	23 – 42	0 -126	24 – 44

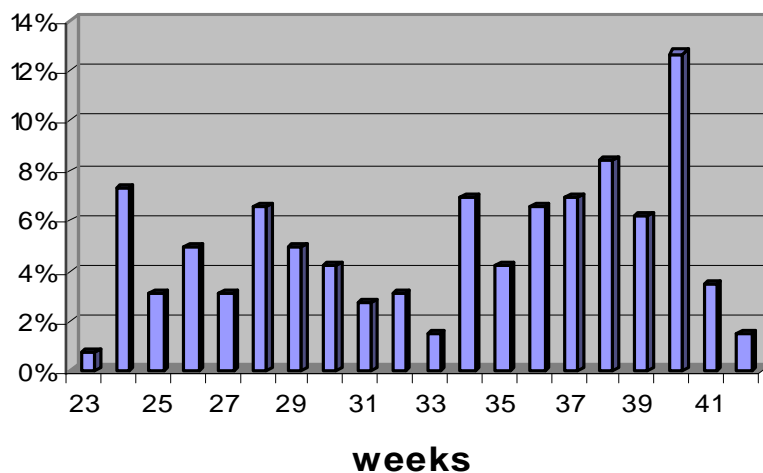


Table 6

Figure 2. Gestational age at birth of surgical transfers

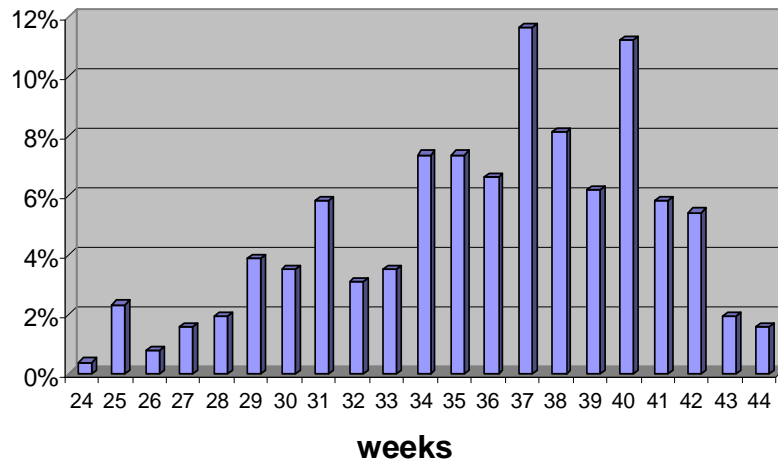


Figure 3. PCA of surgical transfers

Analysis of demographic data

Although many surgical referrals are either term babies or have reached term PCA at the time of transfer, 48% of transfers were preterm (< 37 weeks PCA) and 11% were < 30 weeks. This indicates the significant number of small, vulnerable babies who require transfer to a surgical centre.

Question 9: Surgical diagnosis.

The most commonly reported provisional surgical diagnoses at referral are listed in Table 7. A full list is found in Appendix B.

Diagnosis	n	%
Intestinal obstruction	64	26.12%
NEC/perforation	62	25.31%
Anorectal anomaly	19	7.76%
Gastroschisis	16	6.53%
Central line	10	4.08%
Miscellaneous	9	3.67%
Oesophageal atresia	9	3.67%
Diaphragmatic hernia	8	3.27%

Table 7

Analysis of diagnoses

The term intestinal obstruction includes babies with firm diagnoses prior to transfer (eg duodenal atresia) and those with suspected diagnoses (eg Hirschsprung's disease). NEC/perforation accounted for 25% of referrals and confirms the importance of acute intestinal pathology in preterm infants in neonatal surgical practice. It is somewhat surprising that 16 babies were transferred with gastroschisis as most babies are diagnosed prenatally and are born at a tertiary perinatal centre with direct access to neonatal surgery. On review, 9 of these babies were born in networks in which surgical services are provided by a Children's hospital without maternity services and thus

required postnatal transfer. The small number of referrals of conditions normally diagnosed postnatally (eg oesophageal atresia) suggests data acquisition has been incomplete.

Question 10, 11 & 12: Finding a surgical bed

The ease with which referring units were able to locate a surgical bed is shown in Table 8 and Figure 4.

Number of centres contacted to locate a surgical bed	n	%
1	193	79%
2	23	9%
3	12	5%
4	9	4%
5	3	1%
6	2	1%
>6	3	1%
	245	100%

Table 8

Only 5 of the 24 networks transferred all their referrals to one centre

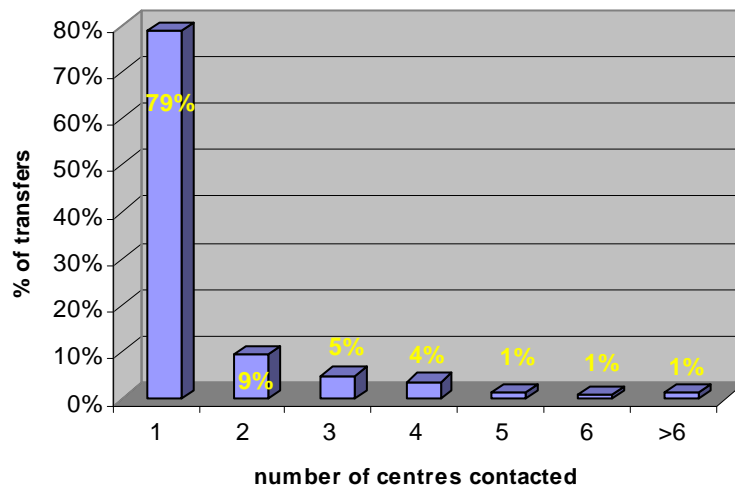


Figure 4. Number of centres contacted to locate a surgical bed

Data on the surgical centre accessed for transfers are shown in Figure 5.

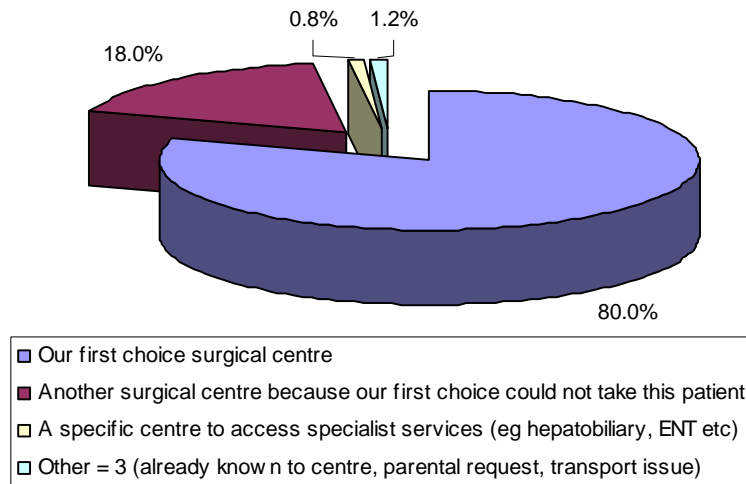


Figure 5. Surgical centre accessed at transfer

The satisfaction that referring clinicians felt with the ease of locating a surgical bed is depicted in Table 9.

	n	%
Very Unsatisfied	30	12.24%
Unsatisfied	26	10.61%
Neutral	17	6.94%
Satisfied	68	27.76%
Very Satisfied	104	42.45%

Table 9

Analysis of data on ease of accessing surgical services

There were considerable problems encountered by referring units in locating a neonatal surgical bed. In 21% of referrals the clinical team had to contact >1 surgical centre to locate a bed. On occasion it was necessary to contact > 6 surgical centres before transfer could be arranged. This resulted in a similar proportion of babies (18%) being transferred out of network, or in networks without a surgical centre, to a more distant surgical centre than usually used. It is therefore not surprising that 23% of referrals were associated with referring clinicians being unsatisfied with access to surgical services.

Discussion

The considerable variation in the number of reported referrals from different networks suggests that data acquisition has been incomplete. Using oesophageal atresia as an example of a condition not usually diagnosed prenatally and therefore usually born locally, there were 9 patients transferred with this diagnosis. During 4 months about 50 babies would have been born with this condition in England. Indeed there were 42 admissions with this condition in the parallel survey of surgical centres. This must cast some doubt about the validity of the subsequent data and its interpretation. It is possible that clinicians will have been more motivated to enter patients for whom they have had difficulty accessing surgical services. However the difficulty finding a surgical bed identified in this survey mirrors the findings of a previously

published report⁽¹⁾ and the findings of the prospective surgical admissions survey conducted in parallel with this survey. This tends to add validity to the data reported here.

Delay in locating a surgical centre with a bed to accept the transfer, or delay in the accepting centre providing the bed, was responsible for a transfer delay in nearly 20% of referrals. It is of concern that 25% of the 105 patents with transfer delay were preterm infants with necrotising enterocolitis and/or intestinal perforation. The preterm population constitute a considerable proportion of neonatal surgical referrals and the acute abdominal pathologies of prematurity make up a quarter of all transfers. On-going neonatal medical support for these infants should be provided at a surgical centre.

This survey provides further evidence that there is inadequate provision of neonatal surgical beds in England. Although there could be some bias to the enrolment of patients for whom bed access has been a problem, the finding that 21% of referrals required contact with more than one surgical centre is in keeping with previous studies⁽¹⁾ and with the parallel surgical admissions survey. It is very concerning that 18% of babies required to be transferred out of network or to a more distant centre than normal and that on some occasions numerous surgical centres had to be contacted, wasting valuable clinical time. This is reflected in the finding that 22% of referrals were associated with dissatisfaction in the referring team.

David Burge
March 2009

References

- (1) An audit of transfers for neonatal surgical care in England in 2007 Burge DM, Youle L, McIntosh N. Arch. Dis. Child. Fetal Neonatal Ed., Nov 2008; doi:10.1136/adc.2008.145102

Appendix A

PROSPECTIVE NEONATAL SURGERY AUDIT 1st November 2008 - 28 February 2009

Q1: Name of your hospital

Q2: Which Neonatal Network (or Region if outside England) is your unit in?

1. Beds/Herts
 2. Cheshire/Mersey
 3. Essex
 4. Greater Manchester
 5. Kent
 6. Lancs/South Cumbria
 7. London- North Central
 8. London- North East
 9. London- North West
 10. London- South East
 11. London- South West
 12. Midlands - Central
 13. Midlands - North
 14. Midlands - South West
 15. Norfolk, Suffolk & Cambridge
 16. Trent North
 17. Northern
 18. South Central - North
 19. South Central - South
 20. South West
 21. Surrey/Sussex
 22. Trent
 23. Western
 24. Yorkshire
 25. Region (outside England)
-

Q3: Date and time of transfer

___/___/___ __:___

Q4: How long after the decision to transfer did the transfer occur?

1. < 2hrs
2. 2 - 4 hrs
3. 4 - 8 hrs
4. 8 - 12 hrs
5. 12 - 16 hrs
6. 16 - 20 hrs
7. 20 - 24 hrs
8. > 24 hrs
9. If > 24 hrs, time in days

Q5: Transfer delay

1. No delay
2. Delay finding surgical bed
3. Transport delay
4. Delay awaiting bed availability
5. Clinical decision to delay transfer - stable patient

6. Clinical decision to delay transfer - because patient unstable

7. Other _____

Q6: Please indicate the surgical centre that the baby was transferred to

Q7: Gestational age of baby at birth (completed weeks)

Q8: Age of baby on transfer to surgical centre (days)- (First day of life = day 1)

Q9: Main provisional surgical diagnosis

Q10: How many surgical centres did you have to contact to find a surgical bed for this baby?

1. 1
2. 2
3. 3
4. 4
5. 5
6. 6
7. >6

Q11: Which of the following best describes the surgical centre to which you have transferred this patient?

1. Our first choice surgical centre
2. Another surgical centre because our first choice could not take this patient.
3. A specific centre to access specialist services (eg hepatobiliary, ENT etc)
4. Other _____

Q12: How satisfied are you with the ease of locating a surgical bed for this patient?

Very Unsatisfied	Unsatisfied	Neutral	Satisfied	Very Satisfied
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Appendix B

Diagnosis on transfer to surgical centre

Diagnosis	n	%
Intestinal obstruction	64	26.12%
NEC/perforation	62	25.31%
Anorectal anomaly	19	7.76%
Gastroschisis	16	6.53%
Central line	10	4.08%
Miscellaneous	9	3.67%
Oesophageal atresia	9	3.67%
Diaphragmatic hernia	8	3.27%
Inguinal hernia	8	3.27%
Pyloric stenosis	7	2.86%
Urology	6	2.45%
Exomphalos	5	2.04%
Hydrocephalus	5	2.04%
Stoma closure	4	1.63%
Testicular torsion	4	1.63%
Spina bifida	3	1.22%
Airway	2	0.82%
Biopsy (metabolic)	2	0.82%
Abdominal cyst	2	0.82%
Retinopathy for laser	2	0.82%
Total	245	100%