South West Audit of Critically Ill Children

Annual Report
April 2007 – March 2008

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1. Executive Summary & Recommendations

Executive Summary

The South West critically ill children's network involves a systematic approach to critically ill children throughout the region that endeavours to deliver the best possible outcome for this most vulnerable group of patients. It is analogous to a hub and spoke arrangement, in which the regional PICU in Bristol represents the hub and a network of general ICUs, high dependency units and paediatric wards in hospitals across the region represent the spokes. Good quality data is essential to inform our decisions concerning service delivery, and the South West Audit of Critically Ill Children is unique within the UK in providing such data. As a region, we should be proud that our reported mortality rates are low, but as this report outlines, there are still many areas for improvement.

General

- As defined by our criteria, there were 2294 children admitted with critical illness to the South West region between April 2007 and March 2008. Across the region, critically ill children accounted for an average of 4.4% (denominator = 51,570) of all paediatric inpatient admissions. The burden of critical illness equates to 0.22% of the paediatric population in the South West, or 2 admissions per 1000 children per year.

- Compared with last year, there was a 4% increase in the number of children admitted with critical illnesses (2294 vs 2212). The major reasons for this were approximately 10% increases in the numbers of critically ill children with respiratory, neurological and general surgical diagnoses, whilst at the same time there was a 10% reduction in critically ill patients with neurosurgical and infectious diagnoses compared to last year (2006/7).

- During the last 4 years, a plateau has been reached in the percentage of critically ill children managed in district general hospital ICUs, a reduction in paediatric wards and a progressive increase in the percentage of children looked after within paediatric HDUs.

- Critical illness predominantly affects a population of young children ~ median age 5.1 years with 50% less than 5 years of age. There continues to be a slight male predominance. Respiratory (33%), neurological (20%), neurosurgery (10%), and metabolic/endocrine (9%) are recurrently the main causes of illness.

DGH General Intensive Care Units

- 190 children were admitted to a general ICU during the last 12 months. This accounts for 0.3% of all paediatric admissions (excluding Bristol Royal Hospital for Children), and equates to 2 admissions per 10,000 of the paediatric population per year.

- The overall median length of stay in ICU is 13 hours. The median duration of ventilation is 4 hours. 13% of children admitted to adult ICUs stay longer than 24 hours (compared with 18% last year) and 19% stay longer than 48 hours (17% last year). When detailed analysis of children staying in a district general hospital ICU for longer than 24 hours is performed, 17% of these admissions (10 patients) might have been expected to have been managed in the regional paediatric intensive care unit, according to the regional policy.

- Mortality for this population of patients remains low with a crude mortality rate of 3.3% and a standardised mortality ratio (SMR) of 0.40. This figure will be influenced by a significant proportion of mortality being exported to the PICU.

Frenchay Peri-anaesthetic Care Unit (PACU)

- Paediatric neurosurgery, burns and complex orthopaedic patients are jointly managed between the Bristol Children's and Frenchay hospitals. Regional operational policies relating to the management of these patients have been drawn up. In 2004, two PACU beds providing short-term post operative ventilation opened. Three specialised HDU beds have been operational since 2003 on the Barbara Russell Children's Unit.

- During 2007/08 the PACU admitted 96 patients, whose median length of stay 24 hours and of those ventilated, a median length of ventilation of 31 hours. This is a 28% reduction in admissions on the previous year.

Paediatric High Dependency Units

- 1559 children were admitted to 8 PHDUs during the last 12 months, accounting for ~3% of inpatient paediatric admissions in those hospitals. Where designated paediatric HDU beds exist, it is seen that there are significantly fewer admissions of critically ill children to the paediatric ward.

- Bed occupancy in PHDU varies between 30 and 50% and the median length of stay in these units is 1 day or less.

- 2 new designated PHDU beds opened in December 2007 in North Devon. Despite national standards demanding that all hospitals admitting children should provide designated PHDU facilities, there remains inequitable provision of paediatric HDU beds across the region. A modelling exercise projects that, using an average bed occupancy of 40%, the South West requires 24 PHDU beds across the region to satisfy demand 95% of the time. There are currently 19 beds.

Bristol Children's Hospital Paediatric Intensive Care Unit

- In 2007/08, the Bristol PICU treated 701 patients with an average bed occupancy of 73%.

- Outcome continues to be excellent. In 2007/08 the overall survival rate for children was 94% (SMR 0.83).

Paediatric Wards and Retrievals

- 739 children were managed on paediatric wards. This represents 1.4% of inpatient paediatric admissions to those hospitals

- 213 children in the region were retrieved by the BCH south west retrieval team during the last 12 months. An additional 9 were retrieved by PICU teams from outside the South West region. A further 197 critically ill children were transferred around the region by non-specialist teams: 46% of these transfers took place outside normal working hours which undoubtedly stretches district general hospital clinical teams' ability to cover services.

Mortality

- 32 children died and were reported to the Regional Audit, of which 47% died in Emergency Departments, 25% died in PHDU/ward, 28% died in the ICU. 47% had failed CPR, whilst 34% had treatment withdrawn or limited. A post mortem was known to have occurred in 59% of cases. Data is not captured on deaths in neonatal units or children who died out of hospital.

- This is an underestimate of hospital deaths within the region. A formal trial by the Confidential Enquiry into Maternal and Child Deaths (CEMACH) has been completed and it is hoped that this will provide a comprehensive understanding of the factors involved. Following this study Local Safeguarding Children's Boards have been developed across the region and nationally to review child deaths.

Recommendations

1. Numbers of critically ill children admitted to general ICU remains relatively stable across the region. There are significant differences according to hospital, with higher numbers in hospitals in the peninsula as compared to the rest of the region. The number of children staying on general ICUs for greater than 24 hours also remains similar year on year.
All clinicians are encouraged to inform the regional centre of any child admitted to their general ICU as early as possible, to potentially allow for transfer of children to the regional centre within approved.

2. The number of children staying beyond 24 hours on the Peri-Anaesthetic Care Unit (PACU) at Frenchay Hospital remains very high, contrary to the unit's Operational Policy. Of those children requiring ventilation on PACU, the median length of ventilation is now significantly longer than 24 hours. Of children reaching requiring Level 3 care (invasive ventilation and inotropic support) during their stay on PACU, 95% stayed longer than 24 hours, as did 44% of those requiring Level 2 care (invasive ventilation).
A thorough review of the Operational Policy is required, including an investigation into the worsening compliance with the Policy, and if necessary additional resources instituted.

3. The Peri-Anaesthetic Care Unit (PACU) at Frenchay Hospital remains an interim solution to the regional problem of providing peri-operative critical care to children undergoing paediatric neurosurgery, scoliosis surgery, plastic surgery and burns surgery, on a separate site from the Paediatric Intensive Care Unit at Bristol Royal Hospital for Children.
Efforts should continue to ensure that all children's services in Bristol are centralised at the earliest opportunity.

4. As of 2008, 3 district general hospitals in the South West region with in-patient paediatric beds still do not have designated and staffed paediatric high dependency facilities, despite clear Department of Health guidance on this issue.
There is a need for effective commissioning of paediatric high dependency beds to allow for equitable provision across the region.

5. Large numbers of critically-ill children, particularly those meeting Level 1 i.e. high dependency care, are moved around the region without the expertise of a specialist transport service, which in some instances, may constitute a significant clinical risk. Many of these transfers are at night and this can also significantly impact upon local hospital teams in terms of both medical and nursing cover at the transferring hospital.
A co-ordinated regional solution to the inter-hospital transfer of sick children should be investigated and where necessary additional resources instituted.

6. The number of children supported with long-term ventilation in the region continues to rise at a steady pace. In an attempt to reduce the length of stay on PICU of children started on long-term ventilation, initiatives have been instituted to care for these children outside of PICU and potentially closer to home, once their ventilatory requirement has stabilised. However continued delays in arranging home care packages of just a few children is now having a significant impact both on high dependency units in the region and on ward beds at the Children's Hospital in terms of bed usage and availability. Similarly acute re-admissions of this expanding group of children to hospital puts an additional burden on PICU bed availability.
Consideration should be given to an integrated solution to the problem of long-term ventilated children, including a potential increase in the provision of high-dependency beds in hospitals across the region, and to potential expansion of the PICU bed base by 1 bed to provide additional intensive care capacity.

7. Significant variation in data collection and reporting practices to SWACIC exists between hospitals, such that for certain hospitals, there is an issue of potential major under-reporting of critical illness in children. Accurate data collection of critically-ill children seen in emergency departments remains a major area of concern within many hospitals.
All hospitals in the region to review practices regarding data collection and to continue to provide accurate and timely data on critically-ill children to SWACIC.

8. Following a review of audit practice of SWACIC by the Audit Commission, concerns were raised regarding data security during the submission process. Recommendations for improving data security and compliance with the Data Protection Act were given.
All hospitals to provide data to SWACIC either electronically via secure email submission or on paper via Registered Mail / Recorded Delivery.

9. SWACIC continues to provide the only comprehensive data on critically-ill children across a whole region of the United Kingdom, as recommended in the "Paediatric Intensive Care: A Framework for the Future" document of 1997. These data are now nationally available on the Paediatric Intensive Care Audit Network website. They are of use to both clinicians and commissioners alike, and should inform strategy relating to service provision for critically-ill children across the region.
South West Specialist Commissioning Group to fully support SWACIC financially.

2. Introduction and methodology

National standards give clear guidance on where and how critically ill children should be appropriately managed ("A Bridge to the Future" and "A Framework for the Future", NHS executive 1997). The purpose of the South West Audit of Critically Ill Children is to ensure that the entire pathway of care from arrival at the local hospital to eventual outcome at the tertiary paediatric intensive care unit is properly audited. Such data collection is mandatory and should inform strategic decision making on the optimal configuration of children's services both locally and across the region.

This audit was historically supported and funded by the South West Regional Children's Planning Group, and it is now planned that it should report to the South West Specialist Commissioning Group. The audit process has been developed in close collaboration with clinicians throughout the region, and the team comprises a designated lead clinician and nurse in each hospital, and a full-time regional audit co-ordinator.

The audit provides information for both providers of care and commissioners and its aims are to:

1. Give an overview of the provision of care available to critically ill children.
2. Establish how many critically-ill children are admitted to general ICU, HDU and paediatric wards.
3. Report on diagnostic case-mix, length of stay and outcome of children admitted to each of these areas.
4. Establish the numbers of referrals and transfers of critically ill children occurring between hospitals.
5. Provide individual hospitals with reports and feedback relating to their own activity.
6. Identify issues requiring action by commissioners and/or Trusts.

In the South West region, data has now been collected on all children admitted to general intensive care and paediatric high dependency units, and on children who meet pre-defined criteria of critical illness admitted to the paediatric wards, since November 2000. This report summarises data collection for the period 1st April 2007 until 31st March 2008.

The ***inclusion criteria*** for audit entry are as follows:

- All children admitted to an intensive care or a designated paediatric high dependency unit
- All critically ill children admitted to a paediatric ward who meet pre-defined diagnostic, intervention or nursing criteria - these criteria have been agreed upon by paediatricians throughout the region and were derived from the DOH guidelines published in 1996[1] (see **Appendices A & B**).
- No upper age limit except that children must be under the care of a hospital paediatrician
- No lower age limit except children must have been discharged from neonatal care

Data protection issues: Forms are assigned a unique identifier by the local audit nurse, who then returns them to the Regional Audit Co-ordinator. They are then assigned a study number and entered on a secure database. The Caldicott Guardian at each participating NHS trust has been informed of the audit process and the arrangements for data protection. Following a recent review of practice by the Audit Commission, all data must be supplied to SWACIC in a secure manner, consistent with the Data Protection Act. Data can either be provided on paper and sent by Registered Mail / Recorded Delivery or electronically by secure email to the Audit Co-ordinator.

Data validation process: A validation process is necessary to add credibility to the audit.
The annual validation process is as follows:

- The regional audit co-ordinator and link nurse from a neighbouring Trust complete the validation process with the host link nurse.
- For each hospital, during one random period over the winter months, 10 consecutive sets of notes are chosen. If the expected number of critical illness admissions is greater than 200 patients then a larger sample of 10% will be chosen.
- The independent auditor will cross-check the completed audit form with the available set of notes.
- Paediatric Intensive Care Unit data is validated at the point of entry and through the national PICANet process, while data quality is addressed through site visits.

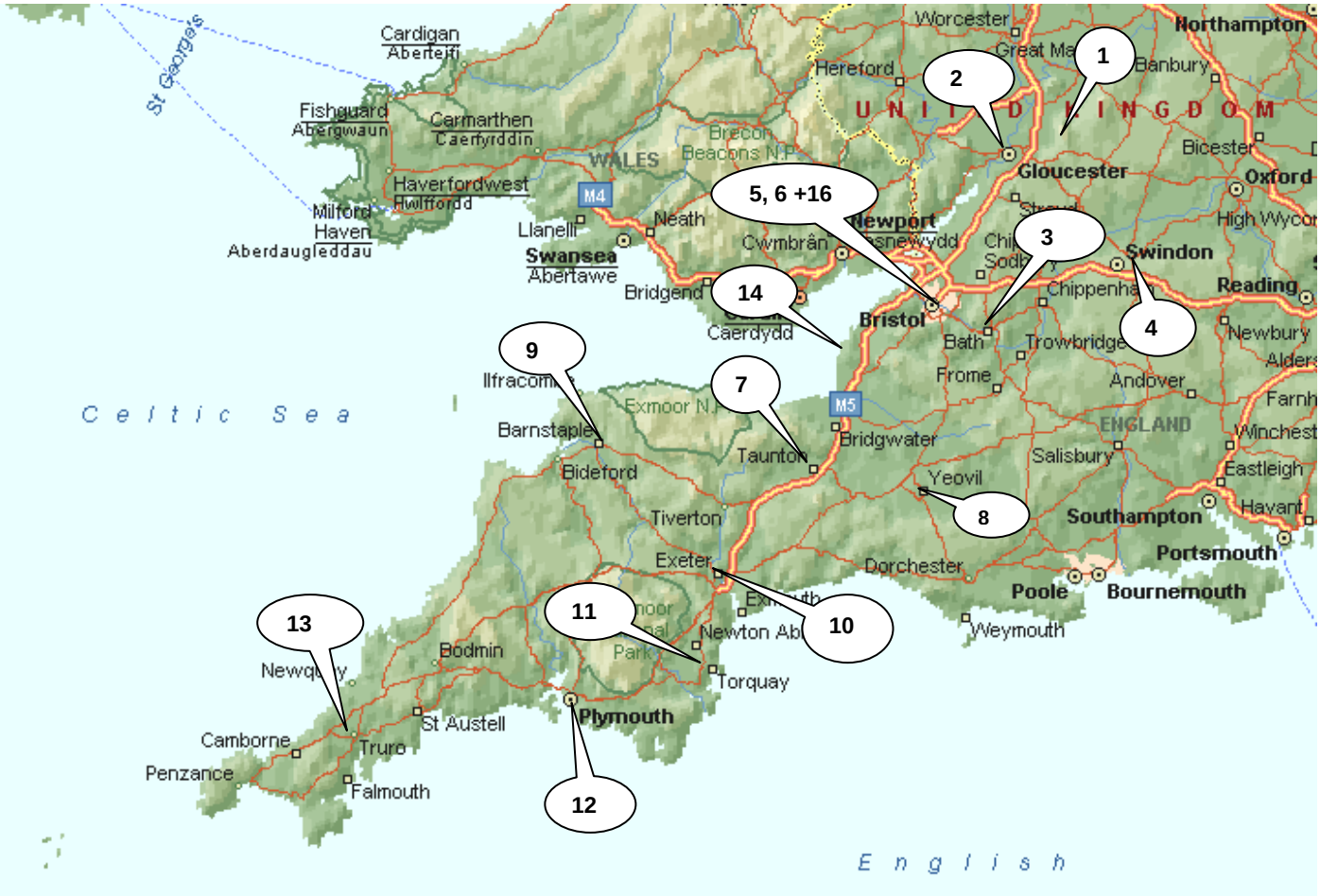
We would like to encourage this practise in other hospital areas.
Within the SouthWest this process is still underway and results will be reported separately. This validation process does not address the issue of potential under-reporting of critical illness episodes. This would need to be done by an independent auditor visiting each centre for a week and checking all ward admissions against our inclusion criteria for accuracy of capture. This cannot be achieved within current available resources.

[1] *Guidelines on admission to and discharge from Intensive Care and High Dependency Units - Department of Health – NHS Executive 1996*

3. Regional setting

The South West region encompasses 14 district general hospitals, 1 specialist neuro-surgical and burns unit (Frenchay), and 1 tertiary children's hospital with a paediatric intensive care unit (Bristol Royal Hospital for Children).
The under 15 year old population of the South West region as of mid 2007 was approximately 725,700[1]
The under 20 year old population was approximately 1,010,600[1]. The geographical distribution of these hospitals means that the tertiary PICU is up to 172 miles away from the furthest district general hospital (Royal Cornwall). Gloucester, Frenchay, Taunton, North Devon, Exeter, Torbay, Plymouth and Royal Cornwall all have designated paediatric high dependency beds. There are only 3 other district general hospitals with inpatient paediatrics remaining to put bids together for the development of paediatric high dependency provision in the South West region.
Each of the hospitals differs in the variety and number of paediatric beds they provide and the size of the population they serve. In the majority of the hospitals Level 2 children are admitted to their own hospital general intensive care unit for stabilisation prior to transfer or retrieval to the tertiary PICU.

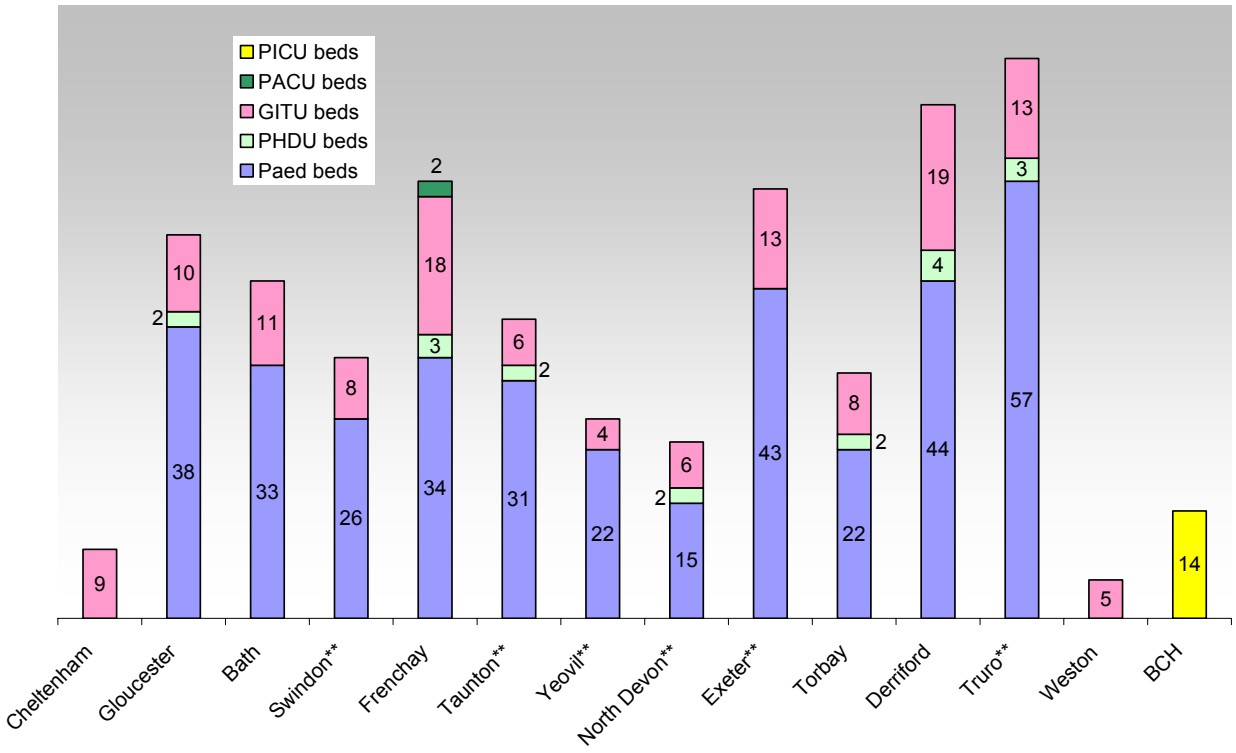
[1] This data is derived from the Office of National Statistics (ONS) Population estimate mid 2007 and includes the populations of Avon, Gloucestershire, Wiltshire (excl Salisbury), Somerset and the South West Peninsula.
http://www.statistics.gov.uk/statbase/Product.asp?vlnk=15106



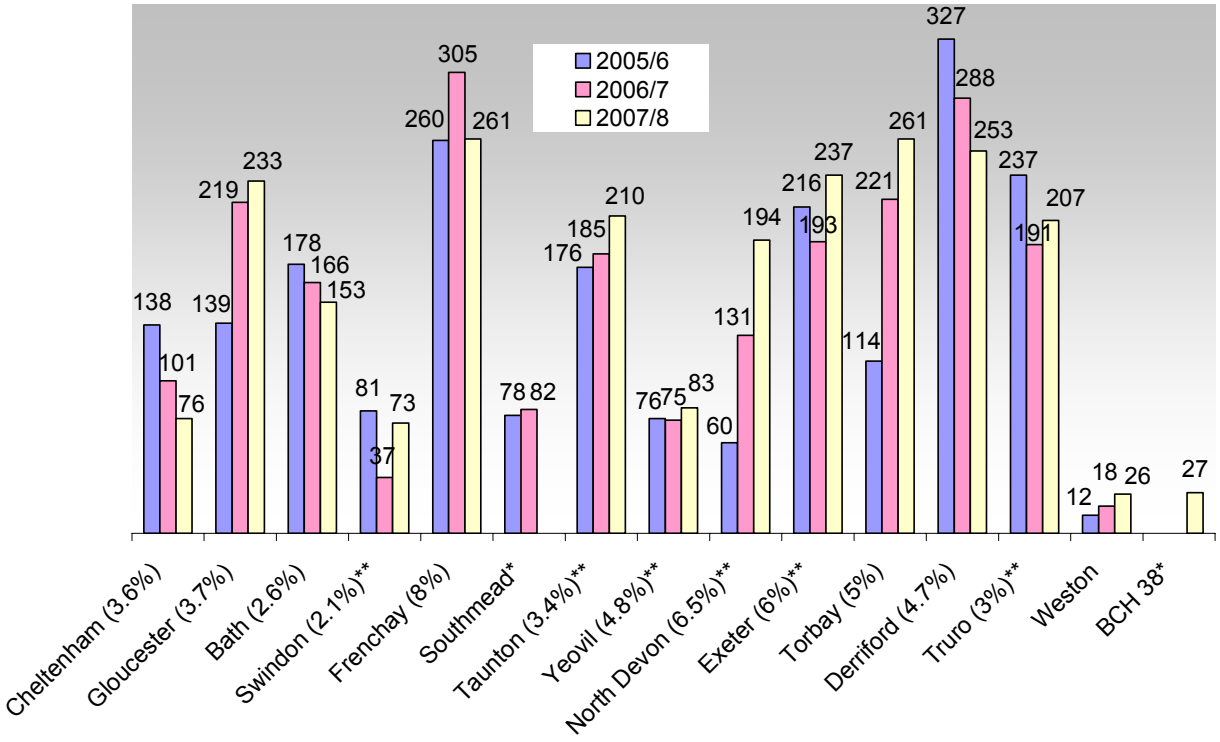
1 = Cheltenham General
2 = Gloucester Royal
3 = Royal United, Bath
4 = Great Western, Swindon
5 = Frenchay
6 = Southmead
7 = Taunton and Somerset
8 = Yeovil
9 = North Devon District
10 = Royal Devon and Exeter
11 = Torbay
12 = Derriford, Plymouth
13 = Royal Cornwall, Truro
14 = Weston General
16 = Bristol Royal Hospital for Children

4. Results for Region

Distribution of paediatric beds - 2007 to 2008



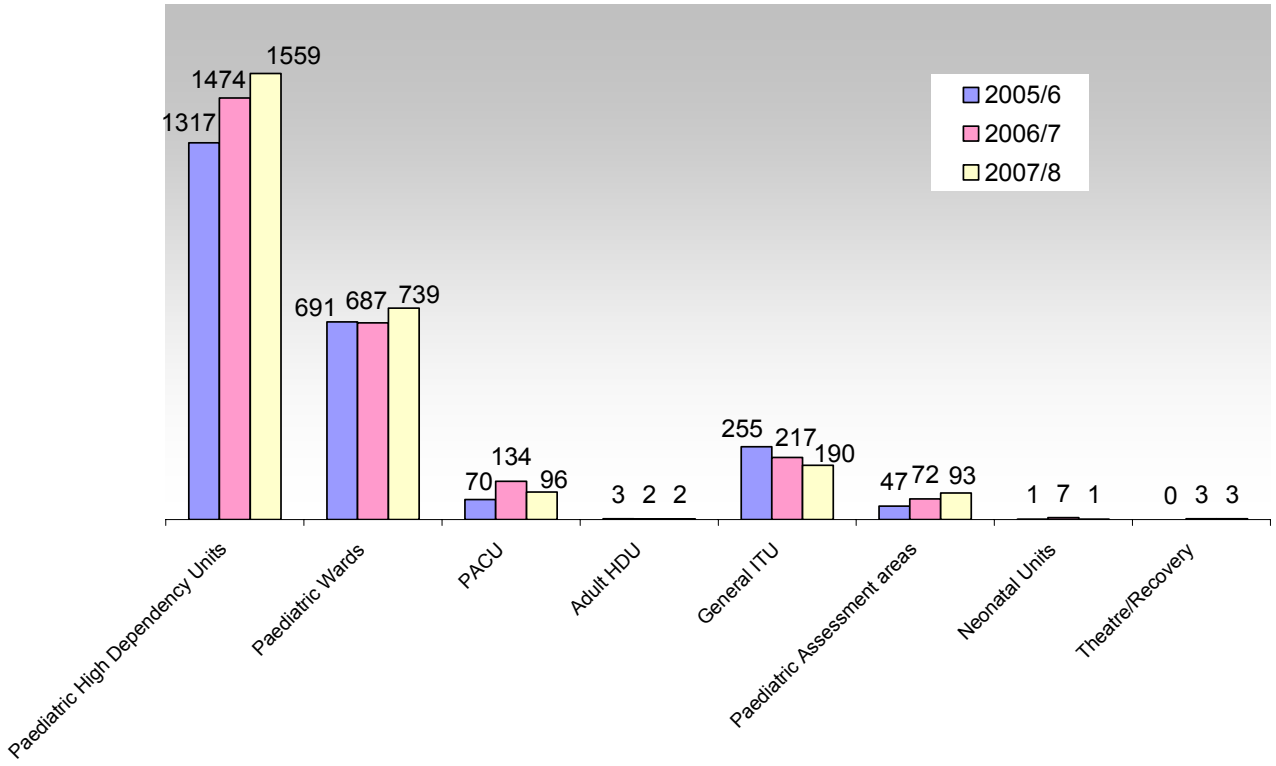
Total number of paediatric critical illness admissions - 2005 to 2008



(% in brackets represent the number of critical illness admissions as a % of all paediatric inpatient admissions)
** Southmead paediatric inpatients moved to Ward 38 at BCH in April 2007- data was collected for 3 months following the move.*
*** 2007/8 inpatient data not supplied by these hospital therefore 2006/7 figures used.*

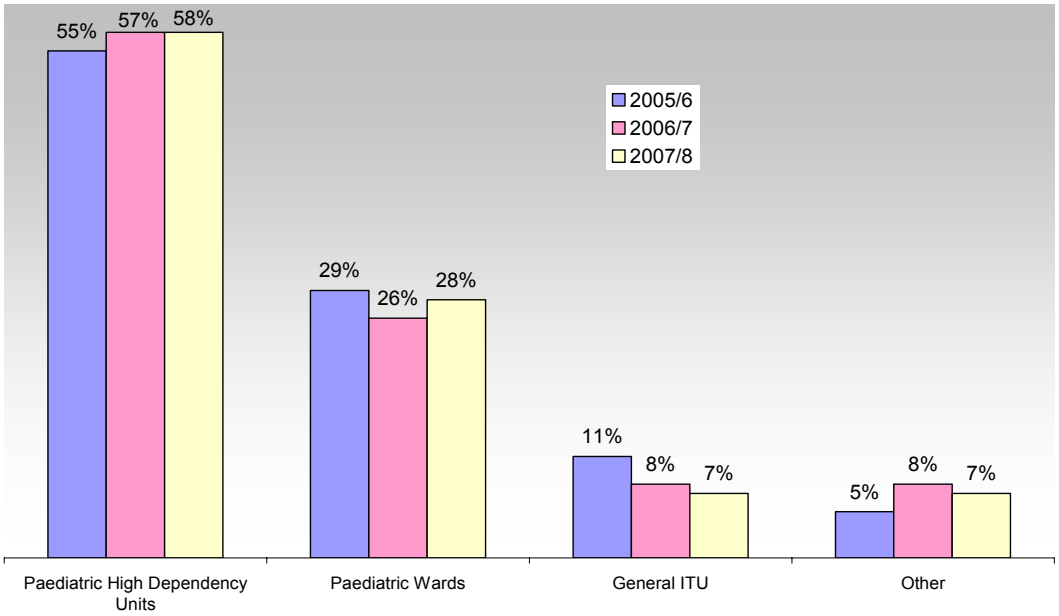
- Total numbers of children meeting critical illness criteria in 2007/8 are similar to previous years.
- The critical illness burden per total paediatric population under the age of 15 years in the South West is 0.22%. This equates to 2 admissions per 1000 children per annum.

Episodes of critical illness within different hospital areas - 2005 to 2008



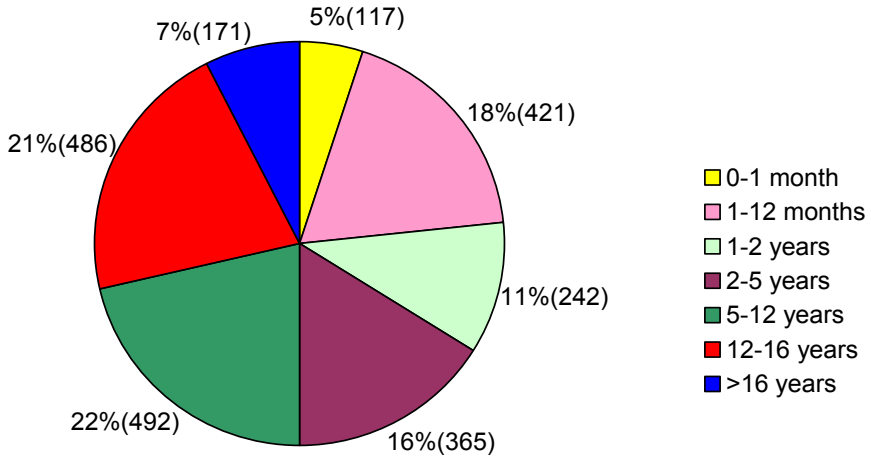
➢ The discrepancy between numbers of episodes and admissions reflects children who have been admitted to more than one hospital area.
➢ The occasional critically ill child admitted to other hospital areas is explained by individual hospital practise. For example, some hospitals choose to resuscitate children in theatre/recovery and others will admit critically ill children to an assessment area prior to transfer to PHDU.

Percentage episodes of critical illness within different hospital areas - 2005 to 2008



➢ This bar chart demonstrates that during the last 3 years the percentage of critically ill children cared for on general ICUs has decreased while the percentage admitted to paediatric ward areas shows little change. In parallel, a slightly higher proportion of children are managed on paediatric High Dependency Units. Of the 190 admissions to general ICU, 39% (74) were transferred to a PICU and of those 96% (71) were retrieved by a PICU team (64 by Bristol, 7 by other PICU teams)

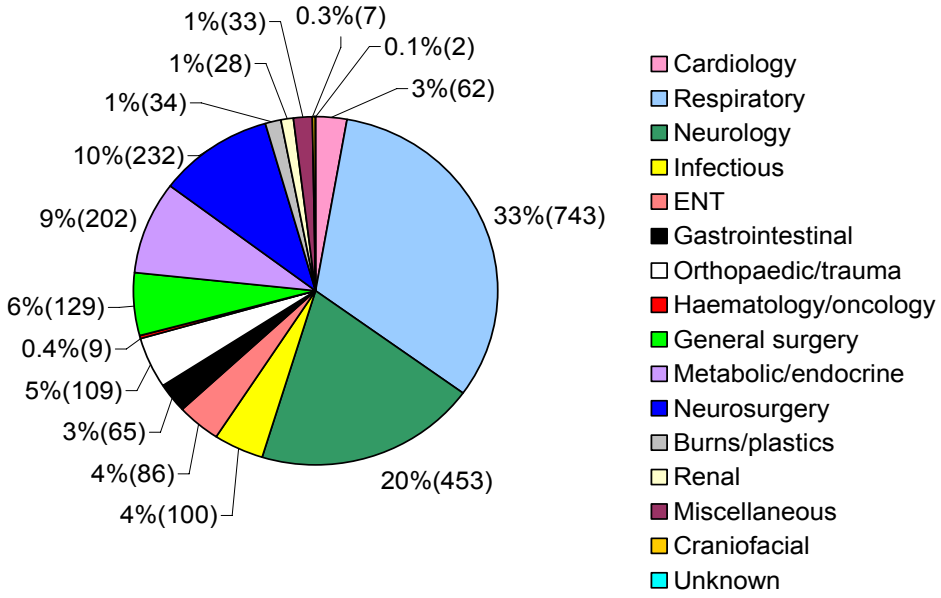
4a) Age and gender of children meeting critical illness criteria



Total = 2294 admissions
Average age = 6.8 years
Median age = 5.1 years

Males = 53.5% (1215)
Females = 45.5% (1039)
Unknown = 1% (16)

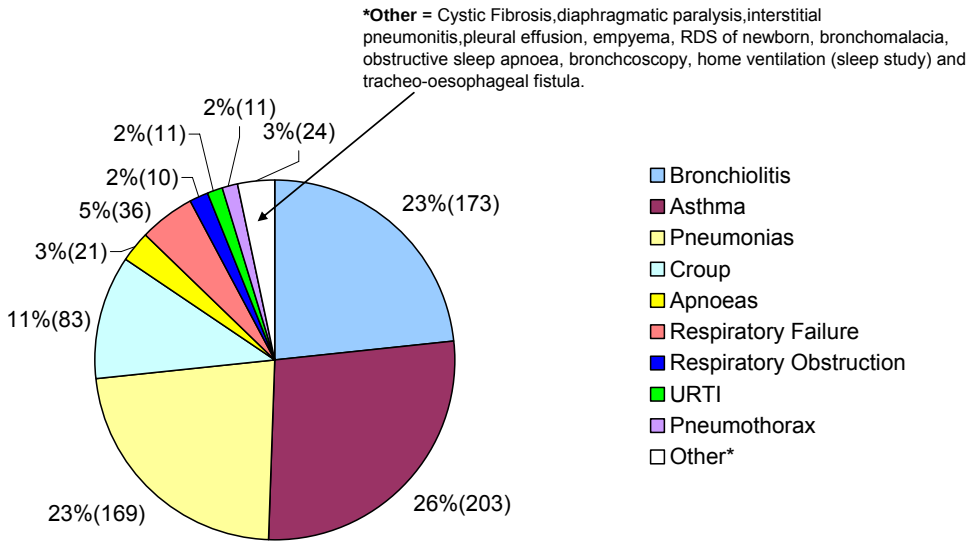
4b) Broad Diagnostic Categories for children meeting critical illness criteria



Total = 2294 admissions

Diagnoses have been categorised as follows. Each patient is assigned a broad diagnostic category which follows the sub-speciality the child would logically fall under if he/she were cared for in a tertiary centre. The patient is also assigned a primary and secondary specific diagnosis according to the DoH Clinical Terminology Read (Version 3) Coding system.

Respiratory diagnoses

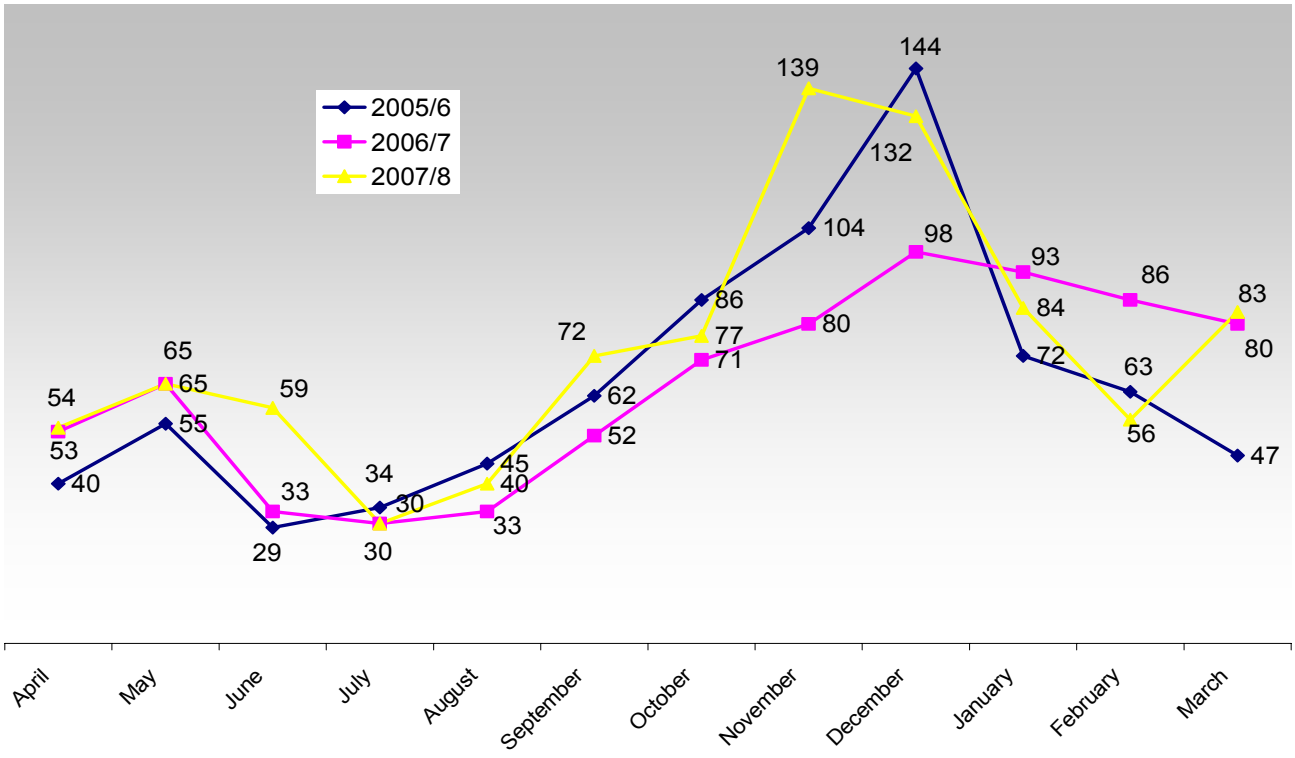


Total = 743 admissions

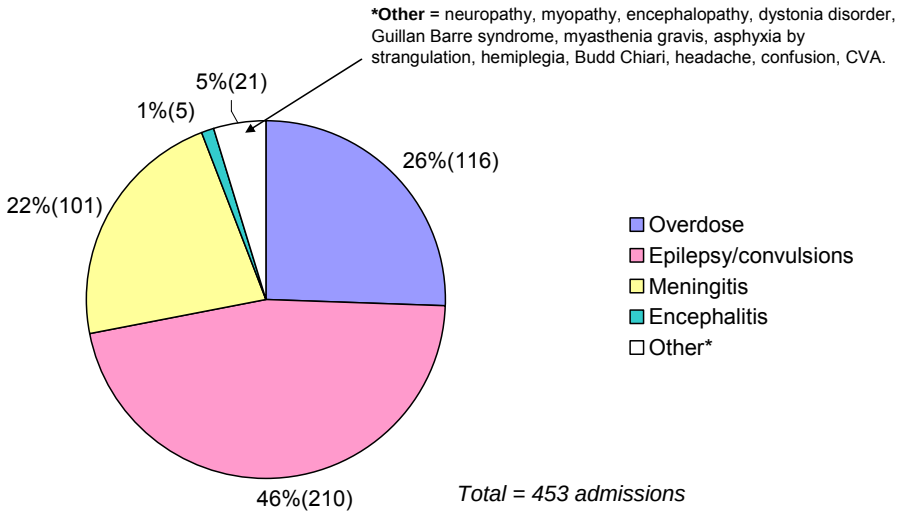
➢ There was a marked increase in the numbers of children with bronchiolitis (59%) and croup (113%) compared to 2006/7, with figures more in line with those of 2005/6. However there were decreased numbers of children with asthma (11%) and pneumonia (15%) compared to 2006/7 back to numbers very similar to those of 2005/6.

➢ Overall numbers of respiratory diagnoses increased by 12% between 2006/7 and 2007/8, whilst the seasonal variation was more noticeable in 2005/6 and 2007/8 compared to 2006/7, presumably due to greater numbers of infants becoming unwell with bronchiolitis.

Seasonal variation amongst respiratory disease categories 2005-2008

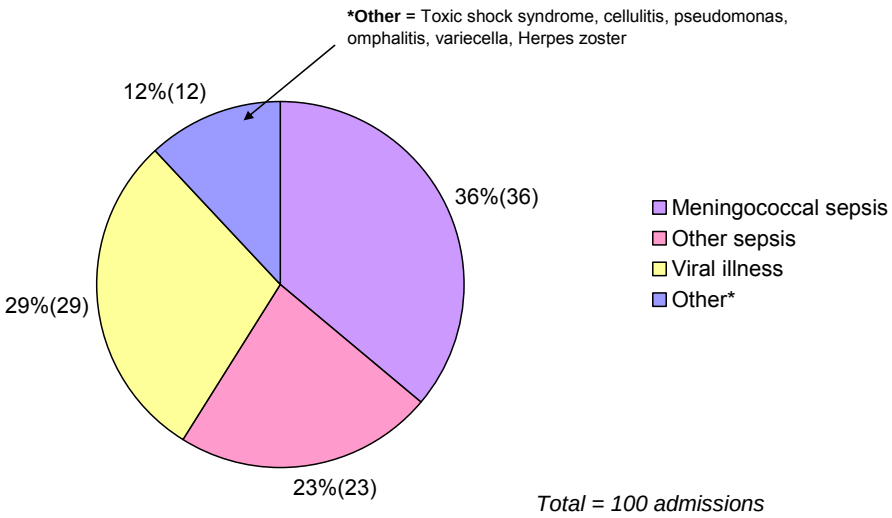


Neurological diagnoses



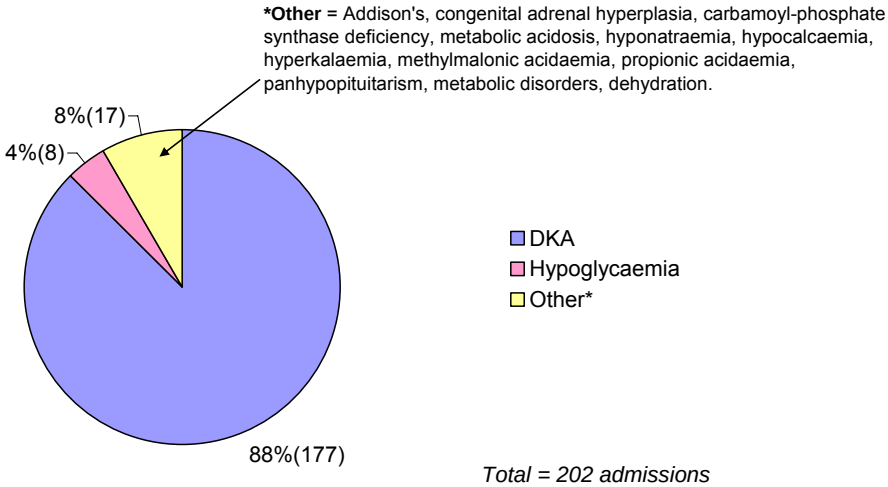
➢ Children who have taken overdoses are included in this diagnostic category, since they are frequently admitted to high dependency areas for close neurological observation.
➢ Overall increase in neurological diagnoses of 6% between 2006/7 and 2007/8 mostly attributable to an increase in overdoses (rise of 71%)

Infectious Diagnoses



➢ Continued fall in number of infectious diagnoses mainly due to reduction in viral illness (51% reduction between 2005/6 and 2007/8).
➢ Despite the use of the Meningococcal C vaccine, numbers of case of meningococcal sepsis showed an increase of 57% compared to 2006/7.

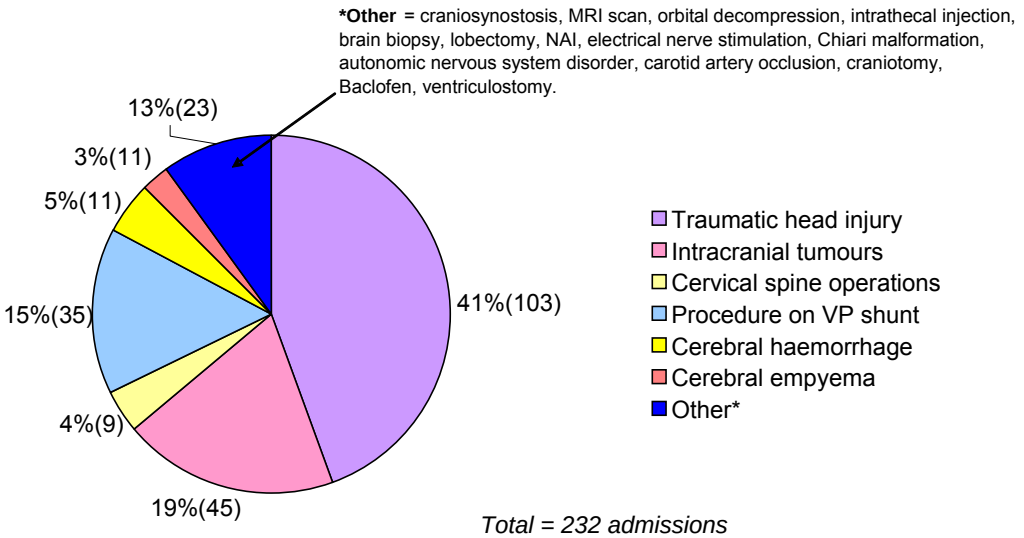
Metabolic/endocrine Diagnoses



Total = 202 admissions

➢ The notable rise in metabolic/endocrine admissions between 2005/6 and 2006/7 has plateaued. This rise was probably attributible to the application of the regional DKA care flow pathway, with more cases admitted to HDUs than previously.

Neurosurgical Diagnoses



Total = 232 admissions

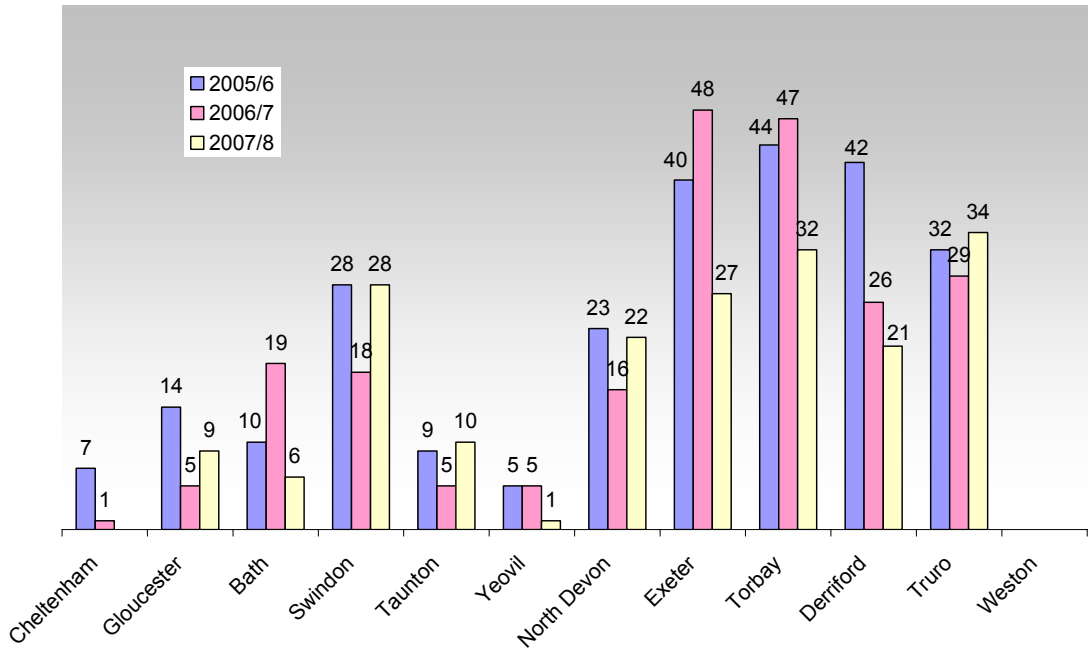
➢ A fall in the number of traumatic head injuries and intracranial tumours has lead to a 9% reduction in the number of neurosurgical diagnoses compared to 2006/7.

4c) Details on paediatric admissions to General Intensive Care Units

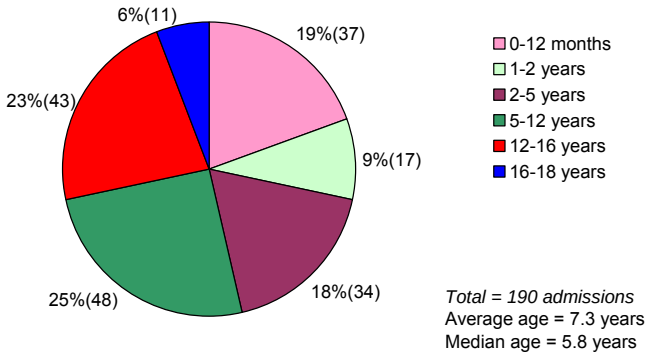
In the South West region, general intensive care units treat level 2 paediatric patients within an agreed protocol with the lead PICU. (Appendix D) This is based on a 24 hour rule, i.e. children should be referred to PICU from all units as soon as possible, if at time of admission, it is envisaged that they will require level 2 care for more than 24 hours or level 3 care for any period.

SWACIC sends data on all children admitted to general ICUs to the national Paediatric Intensive Care Audit Network (PICANet). This is acknowledged in their annual report.

Paediatric admissions to general intensive care units (ICUs): 2005-2008

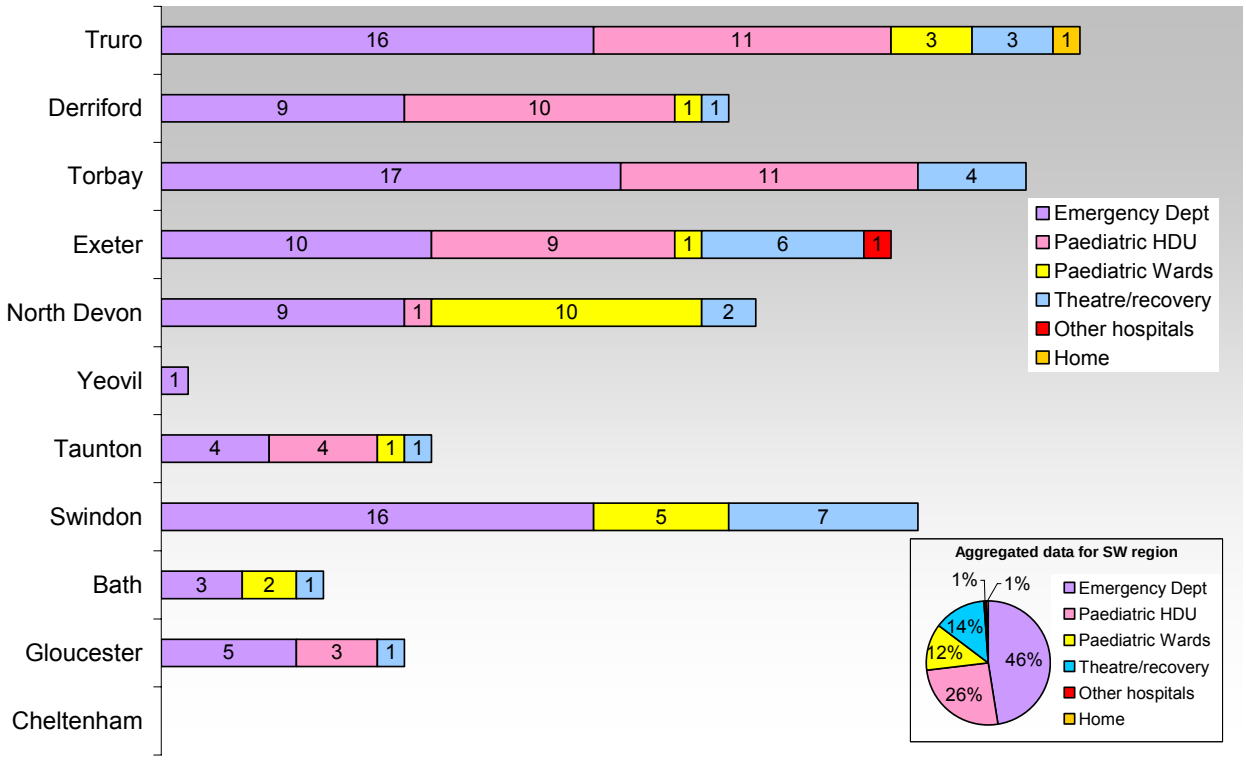


Age of paediatric admissions to general ICUs: 2007 - 2008

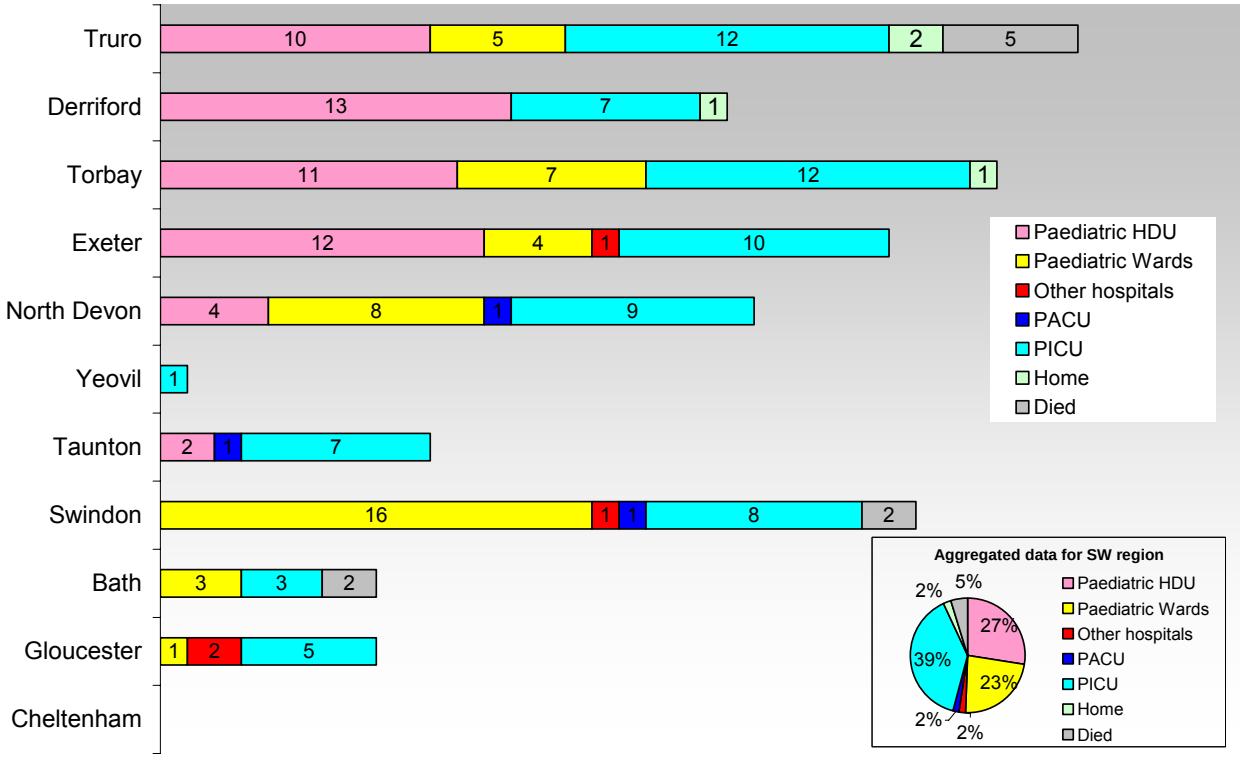


- The median age of children admitted to general ICUs is higher than that of those looked after on the regional PICU (median 12 months).
- There has been a marked decrease (25%) in the number of children admitted to general ICUs between 2005/6 (255 children) and 2007/8 (191 children).
- The marked reduction in the number of children under 5 years of age admitted to general ICUs seen between 2005/6 and 2006/7 has plateau-ed. It would appear that 2005/6 was an exceptional year, whilst 2007/8 appears to be more in line with previous years in terms of absolute numbers of younger children admitted.
- As can be seen, there are a few adolescents over the age of 16 years who are included in our dataset. These are patients who are under general paediatric care and whom are discharged from the general ICU back to either a paediatric HDU or ward.

Source of paediatric admissions to general ICUs: 2007 - 2008



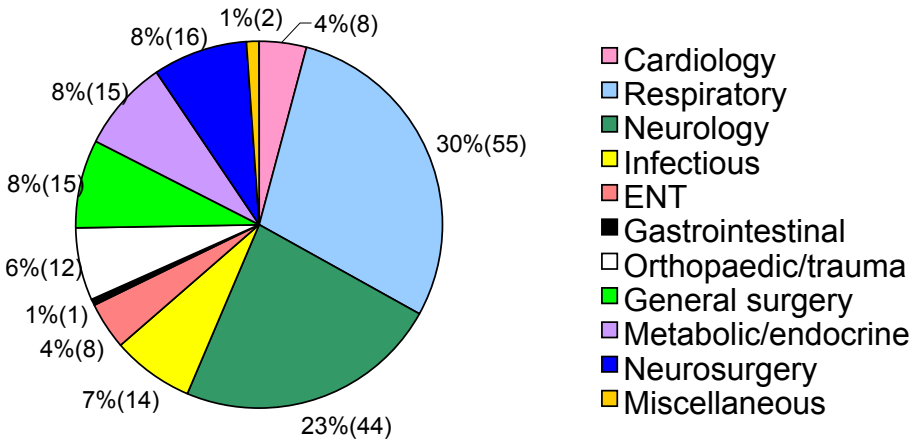
Discharge destination for paediatric admissions to general ICUs: 2007 - 2008



➢ It can be seen that the majority of children admitted to ICU come from the Emergency Department. Nearly 40% are discharged to PICU, with approximately a quarter each to the ward, or to the paediatric high dependency unit should that hospital have the latter facility.

➢ It would appear that for the majority of hospitals with designated PHDUs that they are not admitting children to ICU from their paediatric ward areas but from PHDU, Emergency Departments and theatre.

Diagnostic categories for children admitted to general intensive care units



Total = 190 admissions

- There were similar numbers of children admitted with respiratory diagnoses compared to 2006/7 (55 vs. 52). and children admitted with infectious diagnoses compared to the same period (14 vs. 8).
- Of the 16 neurosurgical admissions, 6 were transferred to Frenchay, 4 to PICU BCH, 1 to own hospital wards, 1 to Oxford PICU and 4 died.

Descriptive table – paediatric admissions to general ICU: 2007-2008

Hospital	Number of admissions	Maximum Level[1] of Dependency during ICU stay			Median LOS in hours (IQR)	Median duration of ventilation (range in hours)	% invasively ventilated	% inotropes	Number admitted to PICU	Number admitted to PACU
		1	2	3						
Gloucester	9	1	4	4	9 (5-11 hrs)	4 (0-13 hrs)	89% (8)	44%(4)0	5	1
Bath	6	1	3	2	14(10-20 hrs)	5(0-17 hrs)	83% (5)	33% (2)	3	0
Swindon	28	12	15	1	7 (3-18 hrs)	2 (0-144 hrs)	61% (17)	4% (1)	8	1
Taunton	10	2	7	1	4 (2.5-6 hrs)	4 (0-14 hrs)	80% (8)	10% (1)	7	1
Yeovil	1	0	0	1	4 hrs	3	100% (1)	100%(1)	1	0
North Devon	22	10	11	1	15 (6-32 hrs)	1 (0-25 hrs)	50% (11)	9% (2)	9	1
Exeter	27	8	11	8	18 (9.5-23 hrs)	7 (0-45 hrs)	74% (20)	30% (8)	10	1
Torbay	32	16	13	3	13 (6-27 hrs)	1 (0-48 hrs)	47% (15)	9% (3)	12	1
Derriford	21	5	10	6	23 (11-40 hrs)	9 (0-350 hrs)	58% (14)	38% (8)	7	0
Truro	34	6	18	10	15 (8-30 hrs)	9 (0-58 hrs)	82% (28)	29% (10)	12	0
TOTALS	**190**	**61**	**92**	**37**	**13 (6-28 hrs)**	**4 (0-350 hrs)**	**67% (127)**	**21% (40)**	**39% (74)**	**3% (6)**
PICU BCH*	**701**	151	189	305	2.8days	2 days (0 days – 80 days)	73% (514)	44% (305)	-	**28**

- Cheltenham General, Frenchay, Southmead & Weston General Hospitals have been excluded from this table as there were no paediatric admissions to their general ICUs.

- Of the 129 children [excluding PICU] who reached a Dependency Level of ≥2 (i.e. Level 2 and 3), 60% were transferred to PICU or PACU.

- Of the 37 children [excluding PICU] whose dependency reached Level 3, 29 were transferred to a PICU, 4 returned back to own hospital PHDU, and 4 died.

[1] Level of dependency stratification uses the Paediatric Intensive Care Society Standards for Paediatric Intensive Care 2001 (see **Appendix C**)

*PICU BCH – 1 child reached a dependency of Level 4 and there were missing dependencies for 55 admissions.

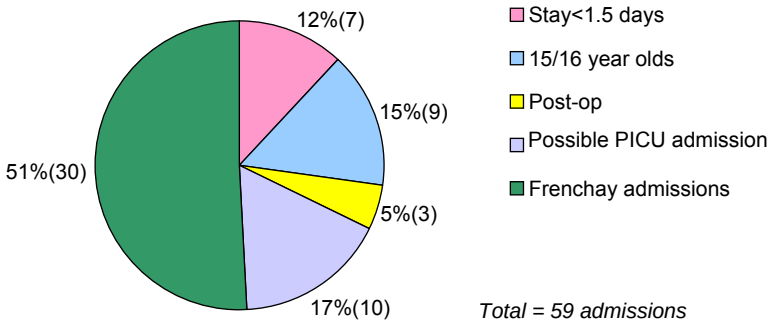
Outcome table - paediatric admissions to general ICU: 2004-2008

Hospital	Number of admissions (4 years combined)	Number Level 2 or above staying 24-48 hours				Number Level 2 or above staying >48 hours				PIM predicted deaths	Actual deaths
		2004/5	2005/6	2006/7	2007/8	2004/5	2005/6	2006/7	2007/8	Years 1-4	Years 1-4
Cheltenham	**14**					1				1.1	0
Gloucester	**45**		1			2	1			6.8	6
Bath	**52**			2		1				4.0	0
Swindon	**90**			1		2	2	1	1	11.0	4
Frenchay	**354**	13	14	15	11	9	8	19	19	22.5	7
Southmead	**4**									0.26	0
Taunton	**29**	1	1						1	3.7	1
Yeovil	**13**						1			2.8	1
North Devon	**72**		1	3	2		1			2.8	1
Exeter	**159**	4	4	8	1	3	4	1	4	7.3	1
Torbay	**146**		2	4	1		1	6	2	9	2
Derriford	**118**	8	4	1	5	6	6	6	2	13.3	9
Truro	**117**	4	3	5	5	4	5	4	5	15.3	9
TOTALS	**1213**	**30**	**30**	**39**	**25**	**28**	**29**	**37**	**34**	**99.85**	**41**

Mortality prediction for children admitted to general ICU was calculated using the Paediatric Index of Mortality (PIM 2) scoring system[1]. This allows predicted and observed mortality for individual general intensive care units to be measured.This system uses eight different variables measured at the time of first patient contact with intensive care staff and adjusts for low risk diagnoses. It is necessary to use risk adjustment scoring systems such as PIM to allow cohorts of patients to be grouped in a similar manner. Thereafter comparisons can be made between both patient groups and different institutions. PIM has been validated in this population of patients[2]

[1] *PIM2: a revised version of the Paediatric Index of Mortality. A prediction model for children in intensive care. A Slater, F Shann, G Pearson, 2002 (Intensive Care Med (2003)29:278-285)*
[2] *Evaluation of the paediatric index of mortality in UK general hospital intensive care units. J Fraser, H Taylor, C. Maskrey 2004 Arch.Dis.Child Oct 2004;89:974-97*

Conditions relating to stay in general ICU >24 hours



- In order to analyse the reasons for admission to ICU for greater than 24 hours, we have used the same criteria as in the 2006/7 report. If children that are admitted to Frenchay hospital, are 15/16 years of age, whose length of stay < 1.5 days (that assumes difficulties in arranging a ward bed), and those post elective surgery are excluded, 17% of these admissions (10 patients) might have been expected to require a PICU referral on admission. The details of these patients are listed in Appendix E.
- Of those children whose length of stay exceeded 24 hours, 47/59 (79%) were discussed with BCH PICU, 12/59 (20%) were either not discussed or the discussion was unknown to the reporting audit nurse.
- Frenchay Hospital accounts for 51% of all patients who reside on ICU > 24 hours. This situation is in part a reflection of the way the PACU Operational Policy has been interpreted (see below).
- On analysis of the region, (excluding Frenchay PACU), some 7% of all general ICU admissions stayed between 24 and 48 hours (compared to 11%: 2006/7; 6%: 2005/6, 9%: 2004/5; and 13.5%: 2003/4) whilst a relatively consistent proportion are staying longer than 48 hours, 8% in 2007/8 (compared to 8% in 2006/7 and 2005/6; 10% in 2004/5).

Predicted mortality of children admitted to general ICU across varying bands of death probability (excluding BCH)

Data has been grouped for the last 4 years for PIM estimation. An accumulative approach to results over several years creates a large enough population to inform proper interpretation of the data. Variation between units in terms of performance can be seen by differences between expected and actual deaths in individual hospitals (see table above).

Predicted Mortality for paediatric General ICU admissions using **PIM 2** [2004-2008]						
PIM	<1%	1-<5%	5-<15%	15-<30%	>30%	TOTALS
Expected deaths	2	14	19	12	51	98
Actual deaths	0	1	6	6	28 (38%)	41
Number to PICU	28(8.1%)	159(33%)	137 (54%)	40 (69%)	37 (50%)	
n =	**342**	**487**	**252**	**58**	**74**	1213

- For this period the crude mortality was 3.3% and the SMR was 0.40 (ratio of observed to expected deaths)
- Over a four-year time period the mortality rate for critically ill children cared for in general ICUs within the region remains below that which is predicted.
- The Standardised Mortality Ratio remains low in general ICU – this may in part, be due to mortality being "exported" to PICU.
- Of the 37 patients transferred to PICU in the >30% risk of mortality category, 13 died after relatively short PICU admissions.

4d) Frenchay Hospital – summary of activity for PACU:

Frenchay hosts the paediatric neurosurgery and burns services for the South West region. Since 1st October 2004, two PACU (Peri-anaesthetic care unit) beds providing short-term ventilation for paediatric neurosurgical, burns and scoliosis cases have been commissioned. Three specialised HDU beds have been operational since 2003 on the Barbara Russell Children's Unit.

Both units are cared for by a group of paediatric critical care nurses, five consultant paediatric anaesthetists and seven middle grade paediatricians. There are strong links between these two units and the regional PICU in Bristol with nursing rotations and joint protocols. Operational policies for neurosurgery and burns dictate the length of time patients should be managed on PACU.

Descriptive table – PACU, Frenchay Hospital 2007/08

Number of admissions 2007/8	Maximum level of dependency during PACU admission			Median length of stay in hours (IQR)	% ventilated	Median duration of ventilation of those ventilated (range in hours)	% inotropes
	L1*	L2	L3				
96	**51**	24	21	24 (13-47)	47%(45)	31 hours (2-300)	22% (21)

*****The numbers of Level 1 children cared for in PACU were placed in the Unit for nursing efficiency reasons

- There has been a 28% reduction in the number of admissions to PACU from 2006/7 to 2007/8.

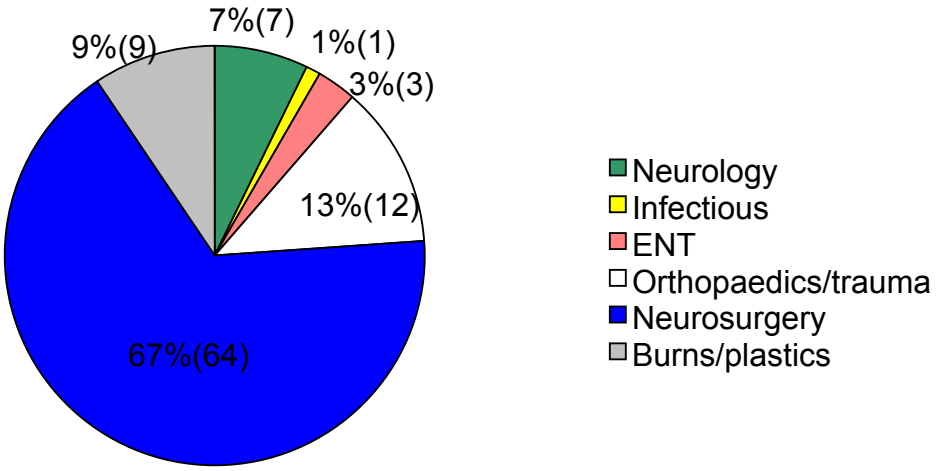
- There has been a 46% reduction in the number of children reaching Level 3 during their admission from 2006/7 to 2007/8 (39 vs. 21), with a 45% reduction in the number of children receiving inotropes over the same period (38 vs. 21). 2006/7 would appear to be an exceptional year, with 2007/8 being more in line with other years.

Outcome table – data has been grouped for years 1-4 for PIM estimation

Number of admissions (4 year combined)	Number Level 2 or above staying 24 - 48 hours				Number Level 2 or above staying >48 hours				PIM predicted deaths	Actual deaths
	04/5	05/6	06/7	07/8	04/5	05/6	06/7	07/8	Years 1-4	Years 1-4
353	13	14	15	11	9	8	19	19	21	7

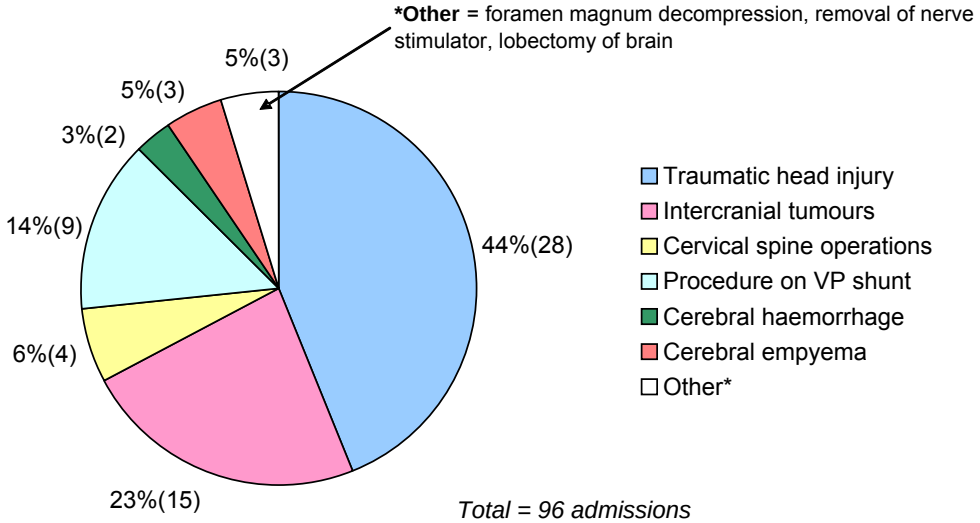
- It is clear from the tables above that with a median length of stay of 24 hours, large numbers of children are still staying on PACU for more than 24 hours, contrary to the original Operational Policy for the unit. It would appear from the range of duration of ventilation that some children are staying on PACU for significantly longer than 24 hours. The reasons for this appear to include continued observation with the potential for a higher level of neurosurgical intervention than currently undertaken at Bristol Royal Hospital for Children, referral to PICU occurring relatively late following admission to PACU, and at times difficulties in bed availability on PICU.

Broad diagnostic categories for children admitted to Frenchay Hospital PACU



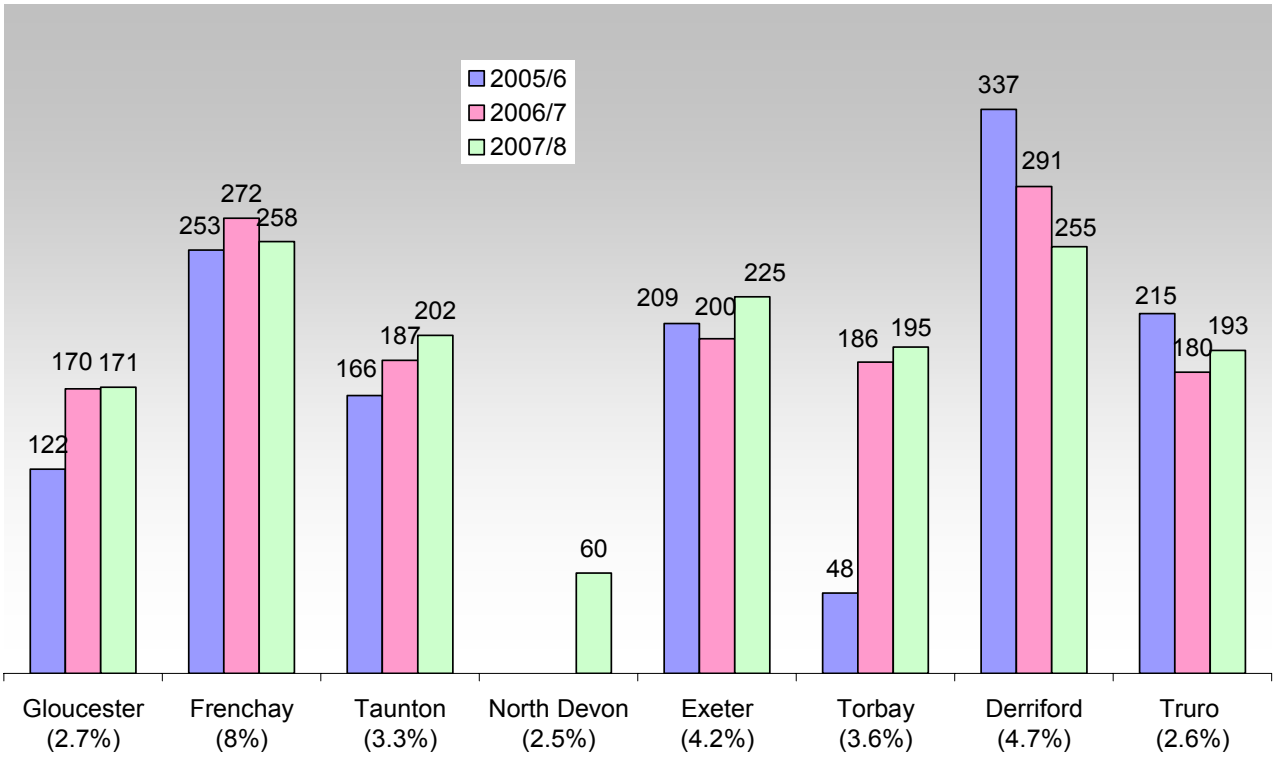
Total = 96 admissions

Breakdown of neurosurgical admissions admitted to PACU at Frenchay Hospital



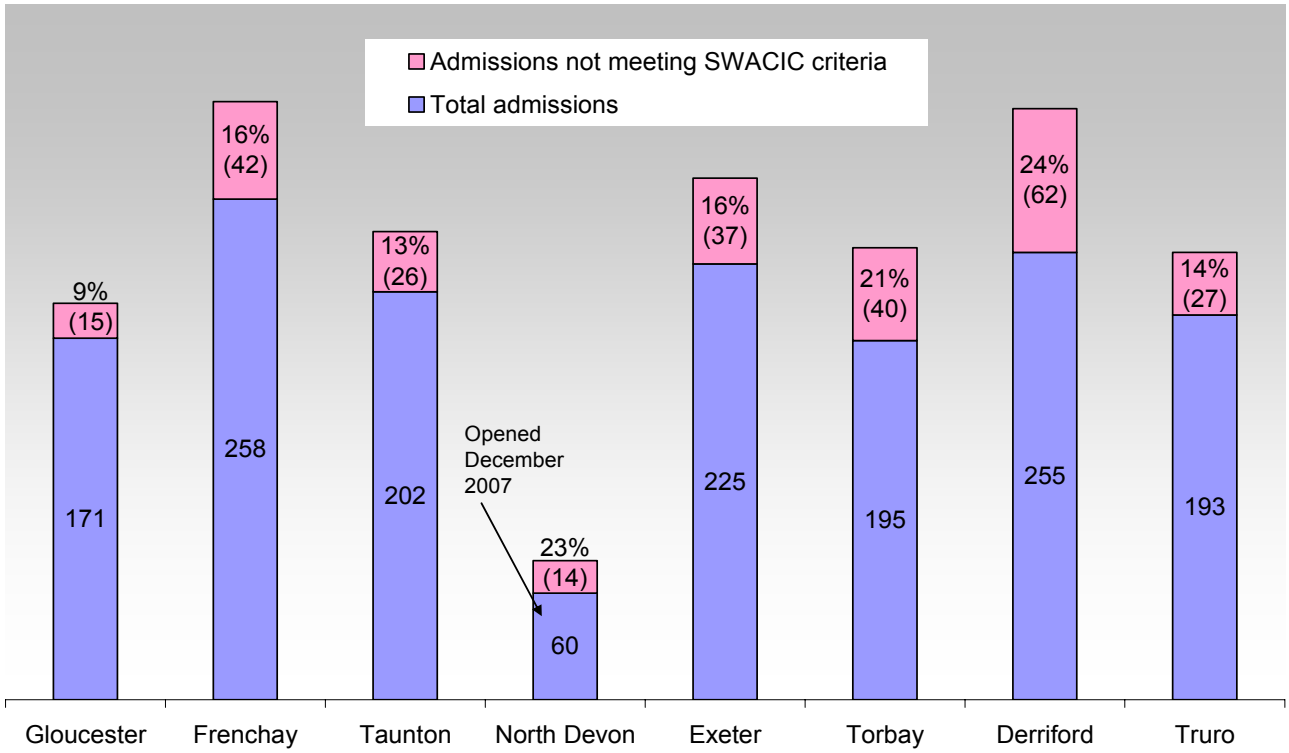
Total = 96 admissions

4e) Details on admissions to designated Paediatric High Dependency beds



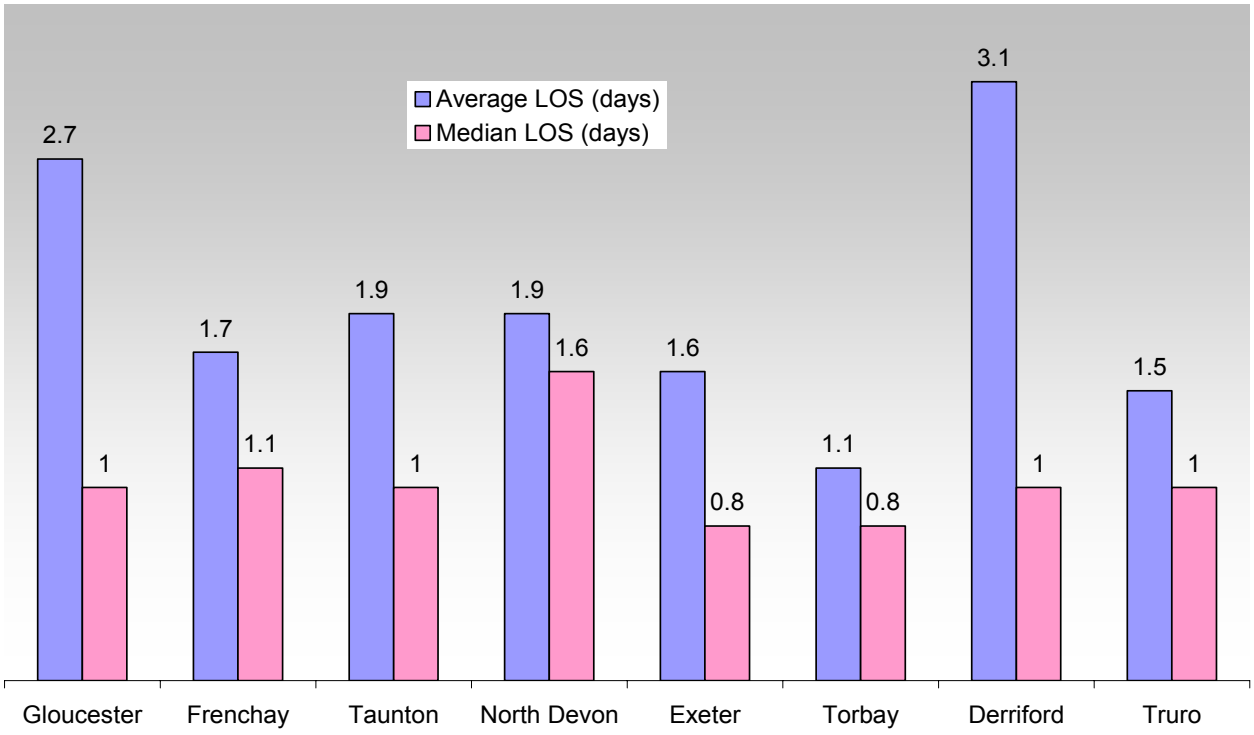
(Figures in brackets are the average % over 1 year PHDU admissions of all paediatric inpatient admissions)

- Approximately 3% of all paediatric admissions to hospital are admitted to a PHDU.

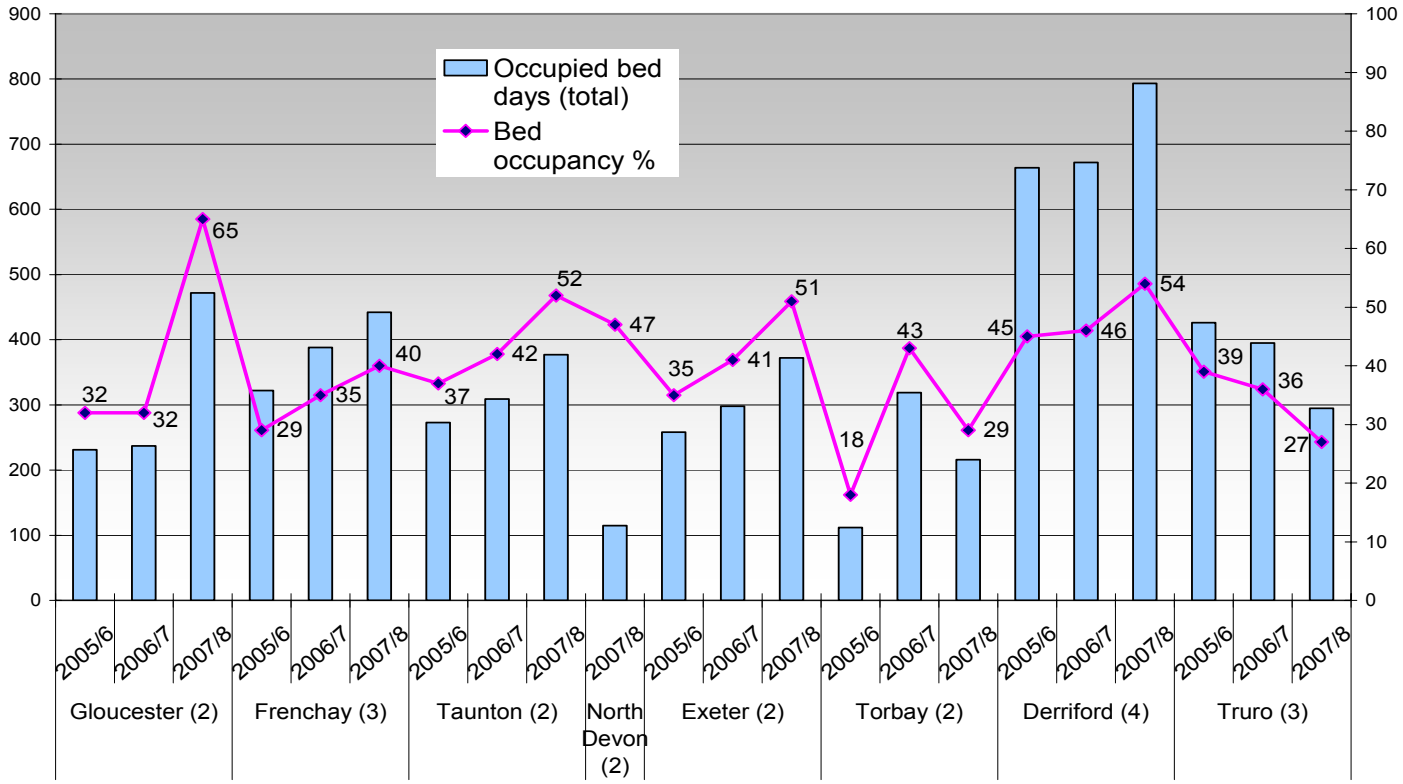


- Following analysis of previous years' data, it remains apparent that some children are admitted to PHDU who did not meet our criteria for critical illness. This is primarily because they require higher levels of nursing observation following "step-down" from ICU. When planning the development of a PHDU this additional percentage of admissions needs to be considered.

Length of stay in designated Paediatric High Dependency beds



Bed occupancy for designated Paediatric High Dependency beds



Admissions to Paediatric HDU with length of stay ≥30 days 2007-8

Hospital	Length of stay - days	Age	Reason for admission	Admission month
Gloucester	31	2 years	Febrile convulsion/pneumonia	April 07
Gloucester	32	11 years	Abdominal injury	Oct 07
Gloucester	185	2 months	Pneumonia/sepsis	June 07
Taunton	32	17 years	Duodenal perforation/multi-trauma	July 07
Taunton	33	16 years	Asthma	Aug 07
Exeter	30	6 years	Extradural abscess	June 07
Exeter	35	17 years	Scoliosis repair/pneumonia	March 08
Derriford	32	4 years	Tonsillectomy	Oct 07
Derriford	32	5 months	Meningitis	Nov 07
Derriford	48	5 months	Respiratory Failure/CPAP	March 08
Derriford	64	10 months	CHD /Tracheomalacia/ LTV	July 07
Derriford	205	7 months	Bronchomalacia/LTV	June 07

Bed occupancy for designated Paediatric High Dependency beds

Hospital	Number of designated PHDU beds	Occupied bed days (SWACIC)	Bed occupancy 2007/8 (SWACIC)	Occupied bed days (PICANet)	Bed occupancy 2007/8 (PICANet)
Gloucester	2	472	65%	651	89%
Frenchay	3	442	40%	701	64%
Taunton	2	377	52%	579	79%
North Devon	2	115	47%	178	73%
Exeter	2	372	51%	595	82%
Torbay	2	216	29%	409	56%
Derriford	4	793	54%	1049	72%
Truro	3	295	27%	489	45%

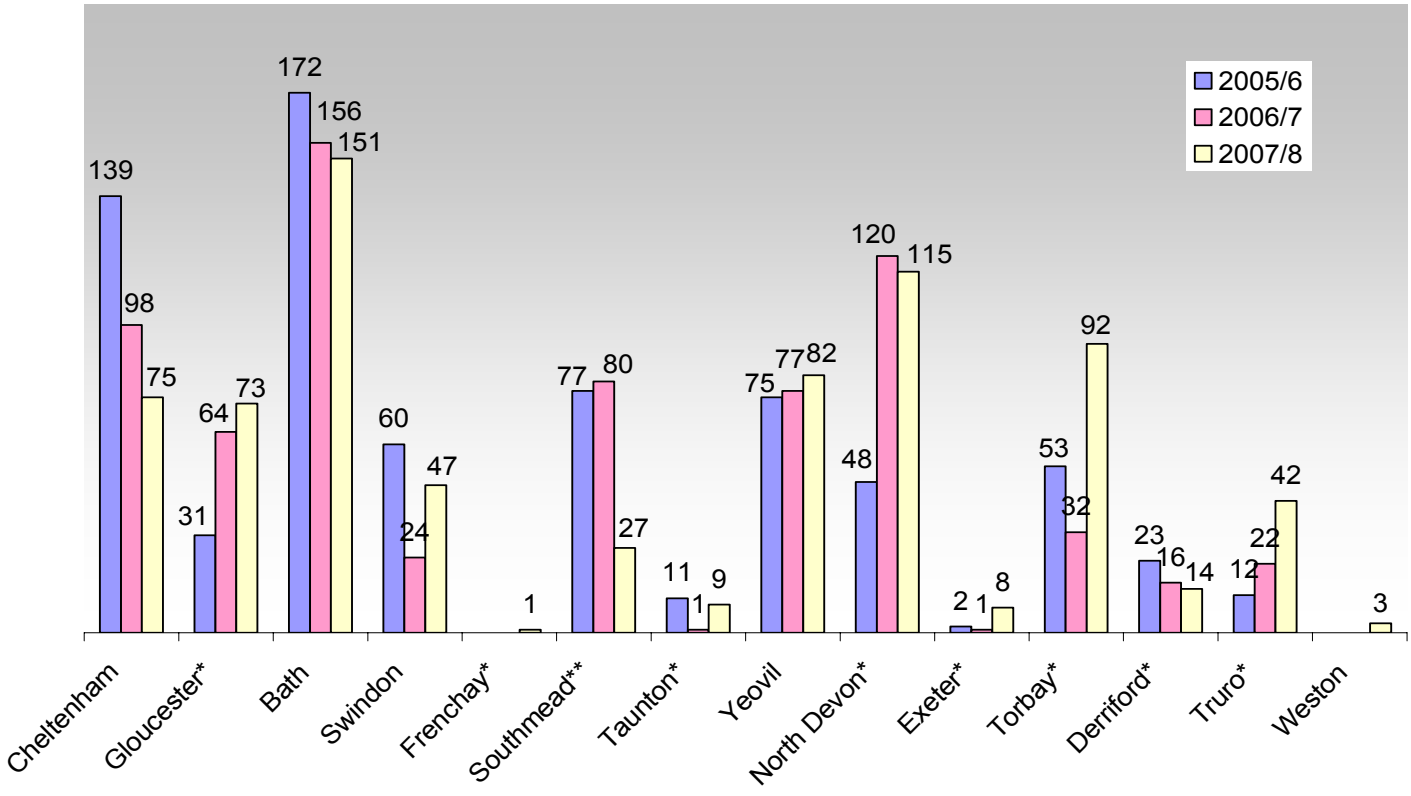
- SWACIC data uses hours to calculate the number of bed days occupied, whereas PICANet (the Paediatric Intensive Care Audit Network) counts any fraction of a day occupied as a whole day even if unit stay was only a few hours. This explains the discrepancy seen in the above table. This demonstrates that the manner in which data is collated nationally can have a significant impact on bed day calculations.

- *The acutely or critically sick or injured child in the district general hospital: A team response* (The Tanner Report) published in October 2006 reiterates the previous recommendations of the 2002 publication, *High dependency care for children – report of an expert advisory group for the Department of Health 2001* that "all hospitals providing inpatient care for children should have arrangements for high dependency care".

- Since paediatric high dependency has been identified as a priority, there remains inequitable provision of paediatric HDU beds across the region, most notably between those hospitals more distant from the tertiary centre and those closer to Bristol. A lack of recognised funding regionally has inhibited implementation, with clinicians having to negotiate with local PCTs.

- A modelling exercise projects that, using an average bed occupancy of 40%, the South West requires 24 PHDU beds across the region to satisfy demand 95% of the time. There are currently 19 beds, effectively leaving 3 hospitals (Bath, Swindon & Yeovil) to develop 5 beds between them.

4f) Details of admissions to Paediatric Ward areas in the South West region



* = Hospitals with designated PHDU beds
**Nb: data were collected on Southmead patients for 3 months following their move to Ward 38 at the Children's Hospital in April 2007.

- It is shown in the above bar chart that hospitals that develop paediatric high dependency facilities significantly reduce the number of critically ill children that are inappropriately cared for on paediatric wards.

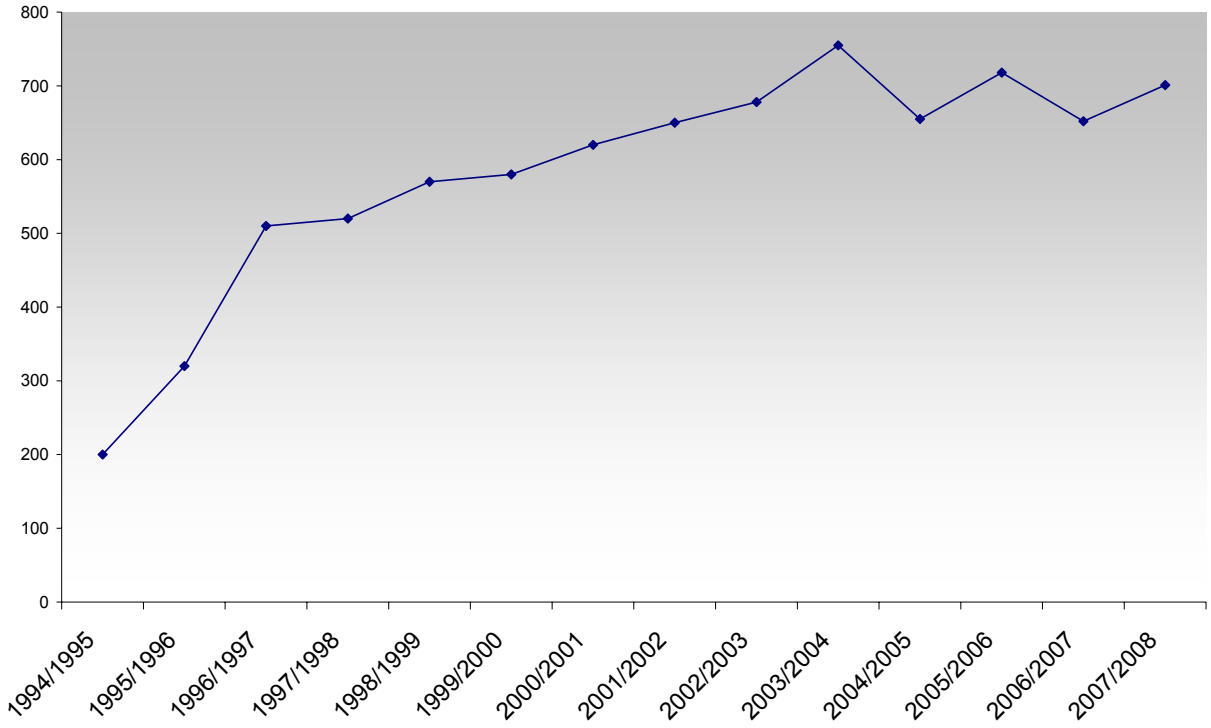
- The number of critically-ill children in paediatric ward areas at Cheltenham General Hospital has fallen with changes in the configuration of services locally, such that there are no overnight in-patient facilities. In 2006/7, 60 children meeting criteria were transferred from Cheltenham to Gloucester.

- The Royal United Hospital in Bath continues to have very high numbers of critically-ill children cared for in its paediatric ward areas, as it still has no designated paediatric high dependency beds.

- In the absence of a paediatric high dependency unit and no change in configuration of services locally, the marked fall in numbers of critically-ill children recorded as having been admitted to the paediatric wards of the Great Western Hospital, Swindon, raises questions regarding the completeness of data collection at that hospital.

5. Bristol Children's Hospital Paediatric Intensive Care Unit summary data

➢ In 2007/08, the PICU admitted 701 patients, compared with 651 patients in 2006/07. The overall trends in admission numbers are shown below:



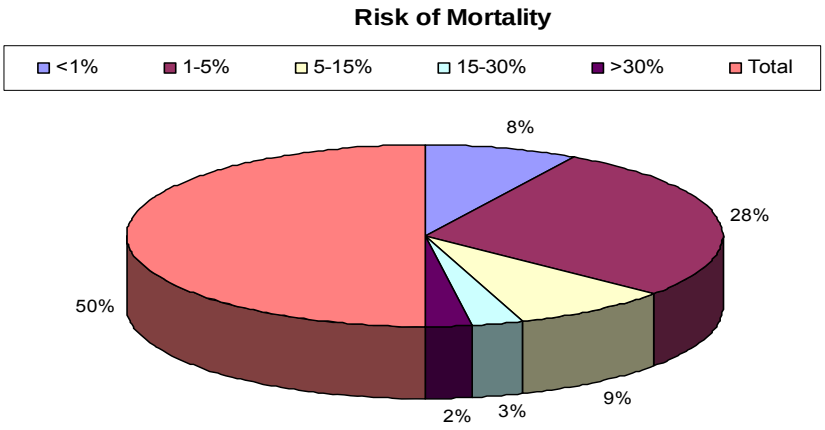
➢ The median length of stay was 2.77 days (2.4 days in 2006/7) with a range of <1 to 103 days.

➢ The mean length of stay was 5.3 days (5.8 days in 2006/7). As in recent years, the average length of stay has been skewed upwards by a small number of long-term patients, as shown in the table below.

Length of stay (Days)	<2	2-4	5-7	8-10	11-14	15-28	29-50	51-100	>100
Number of patients	288	211	68	55	29	35	12	2	1

➢ The fall in admissions from the peak of 2003/4 probably relates to the introduction of local policies, which have led to certain groups of children requiring high dependency care, being admitted to the wards at the Children's Hospital in elective situations rather than being admitted to PICU.

5a) Observed vs. Expected Outcome



➢ During 2007/8 40 patients died, giving a crude mortality rate of 5.7%. Predicted mortality using the latest available revision of the paediatric index of mortality (PIM II) was 6.9% or, 48.45 deaths. Using this figure, the unit's standardised mortality ratio was 0.83 (0.91 in 2006/7), which is in keeping with that reported by PICANet for the calendar year of 2007 using a UK-calibrated PIM II.

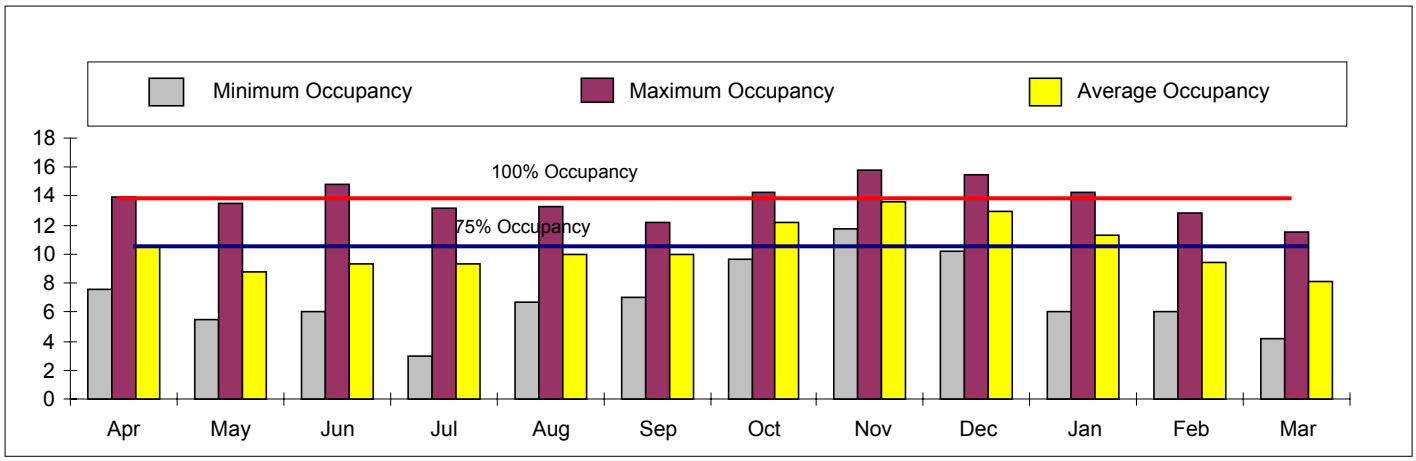
A breakdown of PIM II scores and outcome is show below;

PIM II score	< 1%	1 – 5%	5 – 15%	15 – 30%	> 30%	Total
Number of patients	114	387	121	40	33	695*
Predicted Mortality	0.68	9.35	10.18	8.19	20.05	48.45
Actual Mortality	0	8	11	6	14	40

*** There were 6 patients without a recorded PIM II score (Total = 701 admissions)**

➢ As can be seen from the table above, the greatest reduction in mortality was in those groups with the highest predicated mortality.

5b) Bed Occupancy



- During 2007/8, the number of funded beds increased to 14 and then 15 in the latter part of the financial year giving an average number of beds per month of 14.25
- The unit is expected to achieve a 75% level of bed occupancy each month in order to fulfil its contract to the Regional Commissioning Consortia.
- As the chart above clearly shows, in the year 2007/8 the *maximum* funded bed occupancy equalled or exceeded 100% during 5 out of 12 months, i.e. not the summer months, with the *average* funded bed occupancy exceeding 75% in 4 out of 12 months.
- Average funded bed occupancy for the year was 73% (compared with 82.9% in the previous year, 2006/7).
- On average, there were 49.2 admissions per funded bed during the last year (compared with 54.3 in the previous year, 2006/7).

5c) Refused Retrievals

➢ Compared to previous years, there was a continued fall in the number of refused retrieval requests in 2007/8. Data for this year also includes a review of all contacts with PICU / retrieval team, giving more comprehensive figures than previously available. Refusals only relate to referrals from within the South West region.

➢ The table below shows a breakdown of the retrieval refusals, together with comparative data for the previous five years:

Year	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Total
07/08	**1**	**0**	**0**	**0**	**0**	**2**	**2**	**5**	**3**	**0**	**0**	**0**	**15**
06/07	**3**	**2**	**5**	**1**	**2**	**0**	**0**	**1**	**1**	**6**	**4**	**0**	**25**
05/06	2	0	0	1	0	3	2	8	19	6	0	5	46
04/05	0	0	0	1	0	0	0	2	7	2	0	0	12
03/04	1	1	0	0	0	0	2	2	17	3	2	3	31
02/03	0	0	0	1	1	0	0	2	5	1	1	0	11

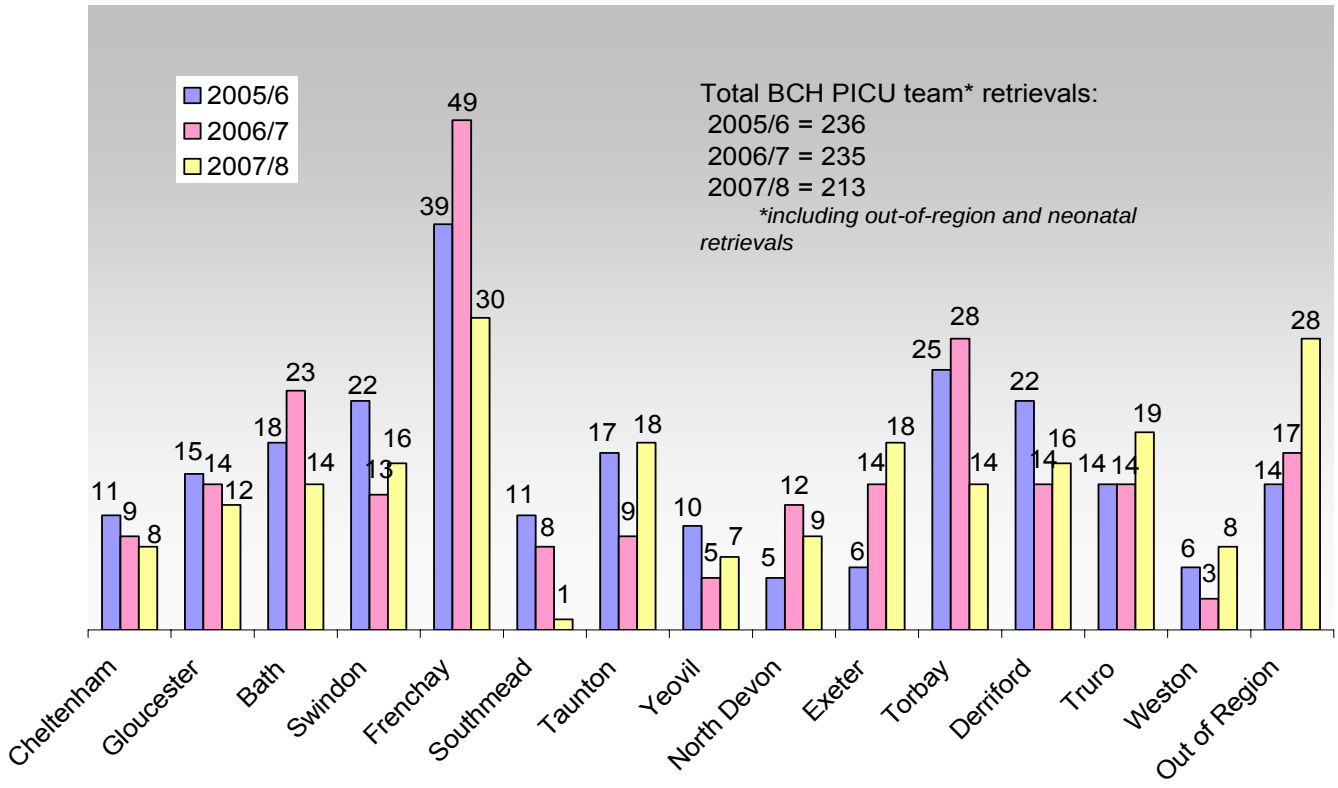
➢ As usual, the majority of refused retrievals occurred during the winter months when all general PICUs are at their busiest. The winter peak was somewhat earlier than previous years occurring during November.

5d) Cancellations of Elective Surgery

Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar
0	0	0	0	1	0	6	3	1	2	0	0

➢ Cancellations of elective surgery show a similar pattern in terms of time of year compared to refused retrievals, with the vast majority occurring during the peak winter months.

6. PICU retrievals performed by Bristol Children's Hospital



➢ The retrieval team undertook 213 retrievals of acutely ill children in 2007-8 of which 192 were from within the South West region. Almost all other retrievals were of cardiac infants and children from South Wales for which the unit has a contract with Health Commission Wales.

➢ The proportion of children for whom a Consultant undertook the retrieval has increased from just 18% in 2001/2 to 52% (112 of 213 retrievals) in 2007/8.

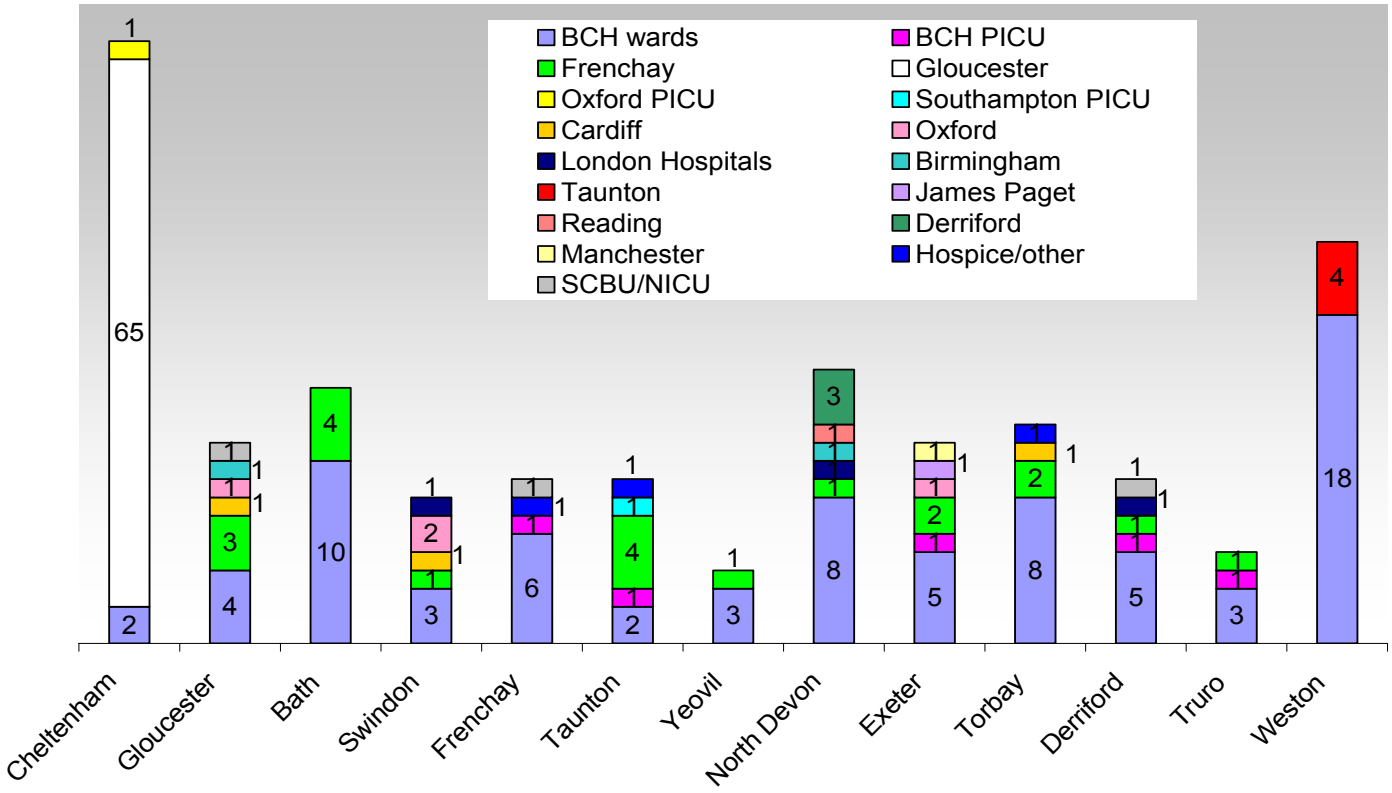
➢ The marked rise in retrievals from out-of-region corresponds with the formal commencement of retrievals of children with cardiac diagnoses from South Wales.

6a) PICU retrievals performed by teams from outside South West region

➢ In 2007/8 there were 9 retrievals performed by PICU retrieval teams other than Bristol:

Hospital	2003/4	2004/5	2005/6	2006/7	2007/8
Birmingham	2	1	1	0	0
Cardiff	2	3	4	0	2
Southampton	3	3	11	2	3
Oxford	3	0	2	0	4
GOSH/CATS	0	0	3	2	0
St Mary's/CATS	0	0	0	1	0

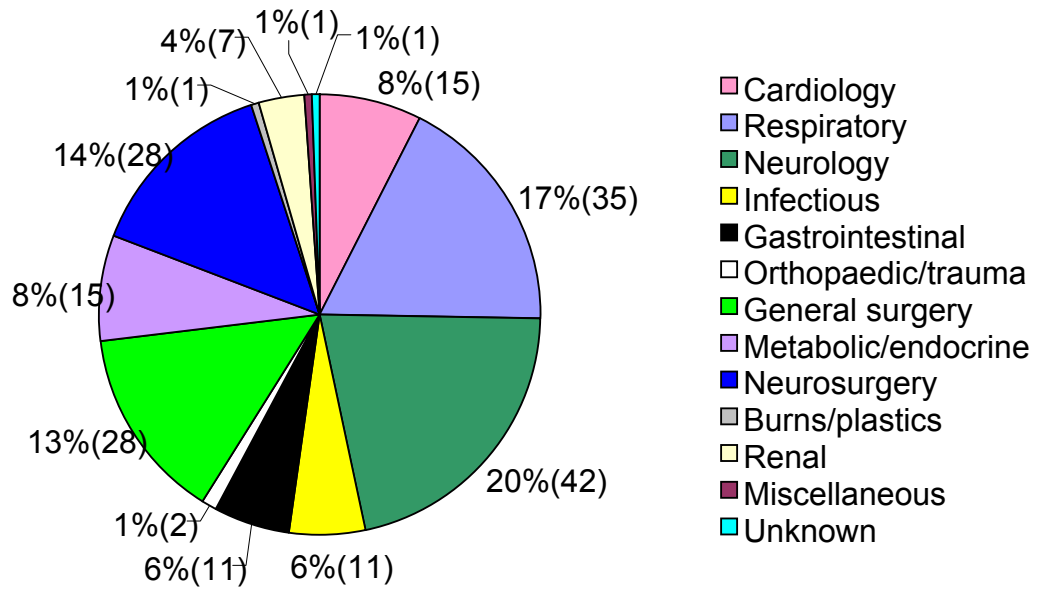
7. Non-PICU transfers of children meeting critical illness criteria



7a) Children taken to PICU by non-PICU teams

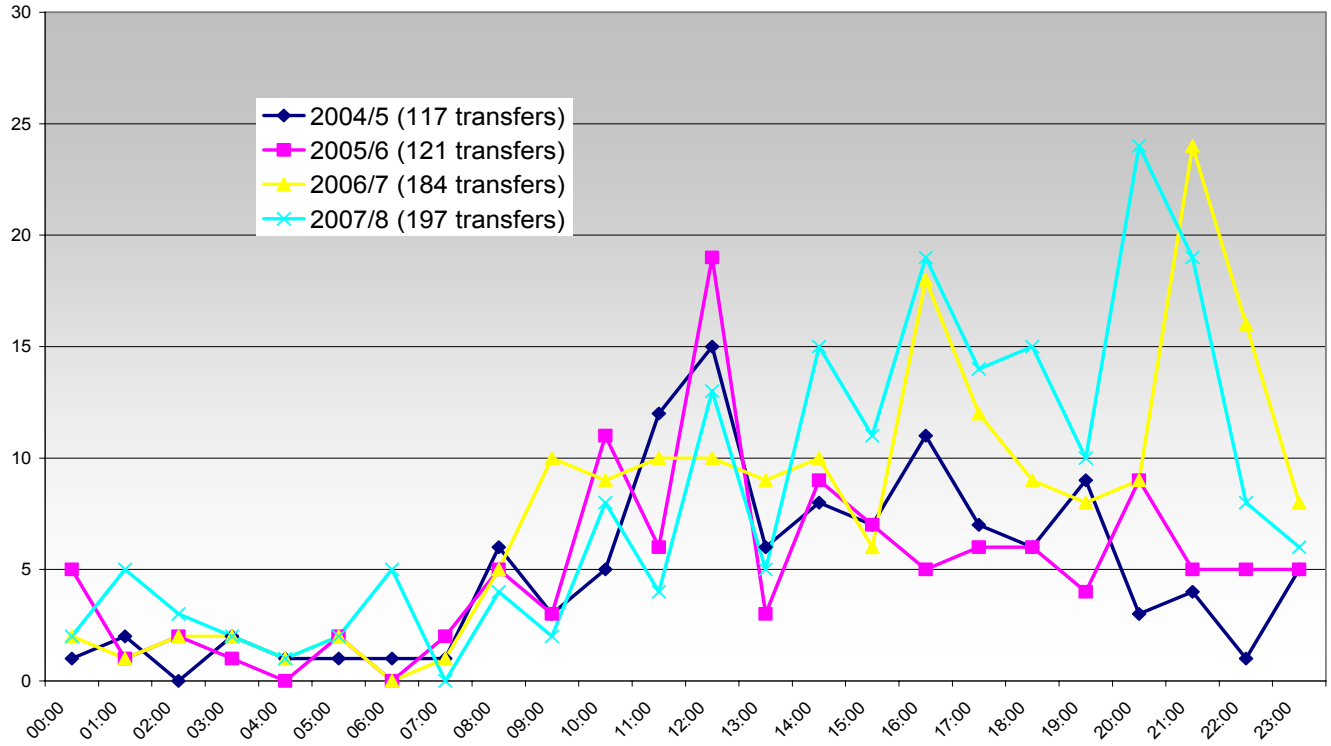
Destination	Age	Referring Hospital	Area	Diagnosis	Intubated and ventilated?
PICU BCH	7 years	**Frenchay**	PHDU	Intracranial tumour	No
PICU BCH	1.5 months	**Taunton**	PHDU	Cardiac	Yes
PICU Southampton	15 years	**Taunton**	ICU	Status Epilepticus/Cerebral palsy	Yes
PICU Oxford	3 years	**Cheltenham**	Paed ward	Status Epilepticus/sepsis/Dandy Walker	Yes
PICU BCH	1 month	**Exeter**	PHDU	Pyelonephritis/sepsis	No
PICU BCH	8.5 months	**Derriford**	PHDU	Tracheomalacia/cardiac/Down's	Yes
PICU BCH	11.5 years	**Truro**	ICU	Hydrocephalus/seizures	Yes

7b) Broad diagnostic categories for non-PICU transfers: 2007-2008



Total = 197 transfers

7c) Time of day when non-PICU transfers are carried out: 2004-8



➢ 47% of all transfers occur outside normal working hours. This can be expected to have a significant impact upon available on-call clinical staff.

8. Paediatric deaths in South West hospitals: April 2007 to March 2008

Hospital	Admission Area	Age	Reason for admission	Treatment withdrawn?	DNR in place?	Post Mortem?
Cheltenham	Emergency Dept	1.7 months	SIDS/Asphyxia	Failed CPR	No	Yes
Gloucester	ICU	16 years	Head Injury	Yes	Yes	Yes
Gloucester	ICU	12 years	Traumatic intracerebral haemorrhage	Yes	Yes	Brainstem death
Gloucester	Paediatric Ward	27 months	Meningococcal meningitis	Failed CPR	No	Yes
Bath	Emergency Dept	4 months	SIDS	Failed CPR	No	Yes
Bath	Emergency Dept	19 years	Cardiac arrest, PPHT	Failed CPR	No	Unknown
Bath	Emergency Dept	1.7 months	SIDS	Failed CPR	No	Yes
Bath	Emergency Dept	2.6 months	SIDS	Unknown	No	Unknown
Bath	Emergency Dept	2 months	SIDS	Failed CPR	No	Yes
Bath	Emergency Dept	1.6 months	SIDS	Failed CPR	No	Yes
Bath	Emergency Dept	1 month	Cardiac arrest	Yes	No	Yes
Bath	Emergency Dept	4 days	SIDS	Failed CPR	No	Yes
Bath	Emergency Dept	4 months	SIDS	Failed CPR	No	Yes
Bath	Emergency Dept	2.6 years	Cardiac arrest	Failed CPR	No	Unknown
Swindon	ICU	2.5 months	SIDS	Yes	No	Unknown
Swindon	ICU	8 years	Head and cervical spine injury	Failed CPR	No	Brainstem death
Swindon	Paediatric Ward	19 years	Respiratory Failure Cerebral Palsy	Yes	Yes	Unknown
Swindon	Emergency Dept	4 months	Cardiac arrest/NAI	Failed CPR	No	Yes
Taunton	Paediatric Ward	12.5 years	Respiratory Failure, Hypothyroidism, Cystic Fibrosis	Yes	Yes	Unknown
Yeovil	Paediatric Ward	11 years	Respiratory Failure Developmental delay	Treatment limited	Yes	Yes
Yeovil	Emergency Dept	2 months	SIDS	Failed CPR	No	Yes
Yeovil	Emergency Dept	11.5 years	Cardiac arrest/cerebral palsy	Failed CPR	No	Yes
Yeovil	Emergency Dept	1 month	SIDS	Unknown	Unknown	Unknown
North Devon	PHDU	3 years	Encephalopathy, Developmental delay, Quadriplegia	Yes	Yes	Unknown
Exeter	PHDU	12 years	Tibial #, aspiration pneumonia, Cerebral Palsy	Yes	Yes	Yes
Exeter	Paediatric Ward	14 years	Palliative care, Intracranial tumour	Yes	Yes	Unknown
Derriford	PHDU	6.5 months	Respiratory Failure, SMA	Yes	Yes	Unknown
Truro	ICU	3.5 years	Bacterial meningitis	Brainstem death	No	Brainstem death
Truro	ICU	8 months	Traumatic intracerebral haemorrhage. Out-of-hospital arrest	Brainstem death	No	Yes
Truro	ICU	10 months	Pneumonia Leigh's disease	No	No	No
Truro	ICU	3.5 months	Sepsis, Cardiac failure	Failed CPR	No	Yes
Truro	ICU	9.5 years	Status epilepticus Trisomy 11	Brainstem death	No	Organ donation

- Data collection comprehensively captures deaths on the wards, PHDU and general ICU. Only limited data from some hospitals on deaths occurring in the Emergency Dept are available.
- Of the 32 children who died and were reported to the Regional Audit, 50% died in the Emergency Dept, 25% died in PHDU/ward, and 28% died in general ICUs. 47% had failed CPR, whilst 34% had treatment withdrawn or limited. 16% of cases met brainstem death criteria. A DNR order was in place for 28% of cases.
- Of the 32 deaths, in only 8 cases was the regional PICU contacted. However advice was given regarding 6 of the 9 deaths occurring in general ICUs

9. Confidential Enquiry into Maternal and Child Health: child death review pilot study

It is the duty of all clinicians involved with the care of children to try to understand why children die but there has been a need to adopt a more systematic approach. The 1-year pilot study reviewing child deaths has been completed. It took place in 5 regions, the South West being chosen for its strong audit infrastructure.

Its objectives were to:
1. Identify all children's deaths over a 12 month time period
2. To collect core data on all identified deaths at a local case review
3. To conduct a detailed review of a subset of deaths with a focus on identifying preventable and avoidable factors.
4. To inform the feasibility of conducting prospective national confidential enquiry into children's deaths.

Why Children Die: A Pilot Study (2006), the final report of the Child Death Review Study was published in May 2008. An abridged Children and Young People's Report is also available for free as a PDF Download at www.cemach.org.uk/Publications/Child-Health/Child-Death-Review.aspx

This work has informed the processes of the Local Safeguarding Children's Boards (LSCBs) in their role relating to unexpected children's deaths. As of April 2008, LSCBs have taken a statutory responsibility in reviewing all unexpected children's deaths. Designated doctors and rapid response teams are currently being set up around the region to undertake these duties.

For further information, please contact Rosie Thompson on 0117 342 0170 or email rosie.thompson@cemach.org.uk.

10. Regional Education

The regional PICU at the Bristol Children's Hospital has a responsibility to provide education and training to nurses and clinicians involved in the care of critically ill children. In response to this the following study days and courses are organised on a 'rolling' basis:

1. Outreach study days - a team comprising at least one PICU consultant, Claire Harper and Carol Maskrey have visited every hospital in the region during the last 18 months. These meetings provide several purposes. They are an opportunity for teams to meet, enable discussion on local issues, often in relation to particular cases, and if requested, provide education.

2. South West Association for Paediatric Intensive Care (SWAPIT). This is held bi-annually and provides an educational forum whereby clinicians from around the region can meet. Invited speakers (sometimes national and always from both the region tertiary centre and the local hospitals) teach on themes relevant to the management of critically ill children from a local hospital perspective. The spring/summer meeting is held in the region, while the winter meeting takes place in Bristol.

3. South West Paediatric Life Support and Transfer Course (SPLAT). This is a one day course held bi-annually in the Bristol Simulator Centre. It provides simulator-centred scenario teaching aimed at clinicians from within the region, particularly to cover that period of stabilisation beyond what is covered in the APLS manual and before the retrieval team arrive.

4. The 'Acutely Ill Study Day' – this annual study day is aimed at nurses and focuses on issues relating to the management of the critically ill child in the local hospital.

5. Paediatric High Dependency Courses – bi-annually for nurses in either Plymouth or Bristol, co-ordinated by Caroline Haines and Bev Cejer.

Details on all these courses can be found on the PICU website **nww.swretrieval.nhs.uk** or by contacting the unit directly on 0117 342 8843.

Appendix A

AUDIT FORM FOR WARD/HDU BASED PAEDIATRIC PATIENTS
[incorporating Paediatric Critical Care Minimum Dataset]

PLEASE ENTER 16 digit unique **PATIENT IDENTIFIER**

Form cannot be processed unless this section is completed
1st 3 letters of **first name**, 1st 3 letters of **surname**, Date of **Birth** in 6 digit format, **1st** part of **post code** eg:
JOHSMI030995GL2- (Enter a dash (-) if box is blank)
DO NOT AFFIX PATIENT STICKERS

GENDER
MALE ☐
FEMALE ☐

Hospital Number

SWACIC STUDY No
(Office use only)

NAME OF **HOSPITAL**:…….. **THIS WARD/DEPARTMENT** AREA…….

DATE&TIME OF ADMISSION TO **THIS** AREA ……/……/……..……:…….HRS

SPECIALITY OF CONSULTANT ……..…… **ADMISSION TYPE**: EMERGENCY ☐ ELECTIVE ☐

ADMITTED FROM: HOME ☐ GP ☐ OPD ☐ A&E ☐ HDU ☐ THEATRE ☐

ITU/PICU ☐ ASSESSMENT AREA OF WARD ☐ WARD ☐ **NAME** OF WARD ……..……..……
IF FROM ANOTHER HOSPITAL, ENTER **OTHER HOSPITAL NAME**+**WARD AREA**……
INCOMING TRANSFER TEAM: DGH team ☐ SPECIALIST TEAM ☐

	Intervention and diagnostic criteria **[Complete adjacent boxes for all applicable criteria]**	**From Date+Time**	**To Date+Time**
09	Supplemental oxygen Therapy (enter % ……..)		
73	Continuous Pulse Oximetry		
59	Severe Asthma requiring intravenous bronchodilator, or continuous nebulisers		
57	Upper airway obstruction requiring nebulised adrenaline		
58	Apnoea requiring intervention in past 24 hrs (>3 stimulation or bag-mask)		
55	Nasopharyngeal* or Guedal* airway		
52	Invasive Ventilation via tracheostomy		
51	Invasive Ventilation via endotracheal tube		
53	Non invasive ventilation / CPAP / BIPAP		
50	Continuous ECG monitoring		
20	Cardiac arrhythmia – excluding sinus bradycardia/tachycardia		
07	>10 ml/kg volume bolus at any time		
63	>80 mls/kg volume boluses in 24 hours		
06	Continuous vasoactive infusion		
62	CVP monitoring		
60	Arterial monitoring		
68	ICP monitoring		
69	Intraventricular catheter or external ventricular drain		
70	DKA requiring continuous insulin infusion		
71	Intravenous thrombolysis (tPA, streptokinase)		
11	Surfactant administration		
61	Temporary pacing		
64	CPR in last 24 hrs		
66	Haemodialysis* 05 Peritoneal dialysis* 22 Haemofiltration* 67 Plasmafiltration*		
04	Exchange transfusion		
22	Burns >10%		
17	Glasgow Coma Score < 12		
18	Acute Renal Failure ie Urine output <1ml/kg/hour for >6 hours		
19	Prolonged (eg: > 20 minutes) or recurrent convulsions		
16	Meningococcal Septicaemia (Clinically diagnosed)		
15	Bacterial Meningitis (Proven or suspected)		
24	Pre or post-operative patients following complex surgery (eg: spinal or multi trauma) and/or requiring complex fluid /analgesia management.		
25	The patient with intractable pain eg: acute pancreatitis or oncological conditions		
23	Poisoning/substance misuse with the POTENTIAL for significant problems		

*** Please circle**

Please turn over……

DIAGNOSTIC DETAILS

Primary diagnosis ……

Secondary diagnosis ……

Co-morbidity ……

Operative procedure (Enter detail and date) ……

Investigations (CT, MRI etc) ……..

DISCHARGE INFORMATION

Was there a **delay** in discharge? **NO** ☐ **YES** ☐ If **YES,** why? ……..…

If requested, was ICU admission **refused**? **YES** ☐ **NO** ☐ **N/A** ☐

If **YES**, why? ……..……...

DATE/TIME of Discharge ……/……..…../…… ……..: ……hrs

DIAGNOSIS ON DISCHARGE ……

DESTINATION: ……..……

Was the patient's condition discussed with **BCH PICU** at any time? **YES** ☐ **NO** ☐

TRANSFER DETAILS – please complete if child is transferred to another hospital

Transferred by your hospital team? **YES** ☐ **NO** ☐ Retrieval by BCH PICU? **YES** ☐ **NO** ☐

Retrieval by other team? **YES** ☐ **NO** ☐ Name of other PICU retrieval team ……..…
If **YES,** was this because**:**

BCH PICU full? ☐ BCH PICU team unavailable? ☐ BCH PICU team not requested? ☐

Other reason ……

OUTCOME: **ALIVE** ☐ **DIED** ☐ Enter date and time of death… …../……../….
…...:…..hrs

Mode of Death: Treatment Withdrawn ☐ Treatment Limited ☐ Failed CPR ☐

Was there a **"Do not Resuscitate"** order in place for this patient? **YES** ☐ **NO** ☐

Please indicate if any of the following were performed:

Brain Stem Death ☐ Tissue/Organ Donation? ☐ Post Mortem? ☐

******* To be signed by a **Clinician** to verify the patient required high dependency care **(form will not be processed unless this section has been signed)**

Signed ..... Date ...../...../.....

Please ensure that *ALL SECTIONS* of the form have been completed before return and complete a new form for each admission episode.

DO NOT SEND WITH PATIENT NOTES

THANK YOU FOR YOUR HELP AND CO-OPERATION.

Please return all COMPLETED forms to: Carol Maskrey – Regional PICU Audit Co-ordinator, PICU Consultants Office, Royal Hospital for Children, C/O No 2 St Michael's Hill, Bristol. BS2 8BJ.
Tel: DDI 0117 342 8843 **Mobile**: 0771 569 1120 **Fax:** 0117 342 8910 **email**: carol.maskrey@ubht.nhs.uk

Appendix B

AUDIT FORM FOR INTENSIVE CARE BASED PAEDIATRIC PATIENTS

PLEASE ENTER 16 digit unique **PATIENT IDENTIFIER**
Form cannot be processed unless this section is completed

1st 3 letters of **first name**, 1st 3 letters of **surname**, Date of **Birth** in 6 digit format, 1st part of **post code** eg: JOHSMI030995GL2- (Enter a dash (-) if box is blank)

Hospital Number ☐

STUDY No ☐

(Office use only)

☐ MALE ☐ FEMALE

DO NOT AFFIX PATIENT STICKERS

NAME OF HOSPITAL:_____DATE/TIME OF **UNIT** ADMISSION: ___/___/___ __:__HRS

SPECIALITY OF CONSULTANT _____

ADMITTED FROM: HOME ☐ GP ☐ OPD ☐ A&E ☐ Adult HDU ☐ Paediatric HDU ☐

THEATRE ☐ ITU/PICU ☐ WARD ☐ WARD NAME _____ __ **OTHER HOSPITAL** ☐

IF TRANSFERRED FROM ANOTHER HOSPITAL, ENTER **NAME+WARD AREA** OF OTHER

HOSPITAL …… WARD AREA ……

TRANSFERRING TEAM: DGH team ☐ SPECIALIST team ☐

PAEDIATRIC INDEX OF MORTALITY (PIM + PIM 2) DATA

Was the child a **BOOKED** admission after elective surgery, or admission for procedure e.g. insertion of a central line.	**YES/NO**

If the child has one of these **UNDERLYING CONDITIONS** please **TICK** the appropriate box

NONE	
Cardiac Arrest **OUT** of hospital.	
Cardiac Arrest **IN** hospital.	
Severe combined immune deficiency.	
Leukaemia/lymphoma after completion of 1st induction	
Spontaneous cerebral haemorrhage from aneurysm or AV malformation.	
Cardiomyopathy or myocarditis	
Hypoplastic left heart syndrome, <1 month requiring Norwood.	
HIV or AIDS infection	
Inborn error in metabolism	
Liver Failure	
Severe developmental delay	
A neurodegenerative disorder	
Ex –premature baby < 32/40	

Please enter the **FIRST** value of each variable measured within **ONE HOUR** of contact with ICU doctor

Pupil response >3mm both fixed = **1** ☐ Other/unknown = **0**	
Base excess in **arterial/capillary/venous** blood (include **+** or **-** sign)	
PaO2 (Arterial sample only)	**Kps or mmHg**
FiO2 or **O2 flow** in litres at time of PaO2 sample above	
METHOD of O2 delivery Nasopharyngeal airway ☐ Face mask with reservoir bag ☐ Nasal cannulae or face mask ☐ Head box ☐ Endotracheal tube ☐ Tracheostomy ☐	
SYSTOLIC blood pressure in mmHg	
CPAP at any time? Nasal ☐ Facial Pronged	**YES/NO**
Mechanical ventilation at any time in **FIRST HOUR**	**YES/NO**

DIAGNOSTIC DETAILS

Primary diagnosis……..……....

Secondary diagnosis ……..…

Operative procedure (enter details and date)..…….…….

Co-morbidity ……..……

Investigations (CT/MRI etc) ……...……

Please turn over ……

PAEDIATRIC CRITICAL CARE MINIMUM DATASET CRITICAL CARE ACTIVITIES

Please indicate below if any of the following interventions were carried out

	Start date and time	Finish date and time
Continuous pulse-oximetry		
Intravenous bronchodilator or continuous nebuliser		
Apnoea requiring intervention in past 24 hrs [>3 stimulation or bag mask]		
Nebulised adrenaline		
Invasive mechanical ventilation		
Continuous CVP monitoring		
Continuous arterial line monitoring		
Vasoactive infusion [inotropes] …….. [enter number}		
>80 ml/kg in 24 hours volume boluses		
CPR in the last 24 hours		
Inhaled Nitric Oxide		
Cardiac pacing		
Intravenous thrombolysis		
DKA requiring continuous infusion of insulin		
Haemofiltration* Haemodialysis* Plasmafiltration* Peritoneal Dialysis*		
Exchange transfusion		
ICP monitoring		
Burns …….. [enter % BSA]		
Isolation in a side room		

*** Please circle all that apply**

DISCHARGE INFORMATION

Was there a delay in ITU discharge? **YES** ☐ **NO** ☐
If **YES,** why? …….

Date/Time of Discharge ……/……/…..… ……:… hrs **DIAGNOSIS ON DISCHARGE** ……..…

Discharge **DESTINATION** ……..…

Was the patient discussed with BCH PICU at any time? **YES** ☐ **NO** ☐

TRANSFER DETAILS – please complete if child is transferred to another hospital

Transferred by your hospital team? **YES** ☐ **NO** ☐ Retrieval by BCH PICU? **YES** ☐ **NO** ☐

Retrieval by other team? **YES** ☐ **NO** ☐ Name of other PICU retrieval team ……
If **YES,** was this because**:**

BCH PICU full? ☐ BCH PICU team unavailable? ☐ BCH PICU team not requested? ☐

Other reason ……. ☐ …….☐ ……

OUTCOME: **ALIVE** ☐ **DIED** ☐ Enter date and time of death… …../……../…. …..:…..hrs

Mode of Death: Treatment Withdrawn ☐ Treatment Limited ☐ Failed CPR ☐

Was there a **"Do not Resuscitate"** order in place for this patient? **YES** ☐ **NO** ☐

Please indicate if any of the following were performed:

Brain Stem Death ☐ Tissue/Organ Donation? ☐ Post Mortem? ☐

******* To be signed by a **Clinician** to verify the patient required high dependency/intensive care
(form will not be processed unless this section has been signed)
Signed ..... Date ...../...../.....

Please ensure that all sections of the form have been completed before return and complete a new form for each admission episode*
DO NOT SEND THIS FORM WITH PATIENT NOTES
THANK YOU FOR YOUR HELP AND CO-OPERATION

Please return all COMPLETED forms to: Carol Maskrey – Regional PICU Audit Co-ordinator, PICU Consultants Office, Royal Hospital for Children, C/O No 2 St Michael's Hill, Bristol. BS2 8BJ.Tel: DDI 0117 342 8843 Mobile: 0771 569 1120 Fax: 0117 342 8910 email: carol.maskrey@UHBristol.nhs.uk

Appendix C

South West Region Critically Ill Children's Audit.
Paediatric Intensive Care Society definitions of Levels of Care*

The definitions in the NCG Report 'Framework for the Future' are summarised below. They follow those quoted in the BPA document, *The Care of Critically Ill Children* (1993) and the documents of the Paediatric Intensive Care Society that preceded this but were published in 1996, *Standards for Paediatric Intensive Care*. Elaboration from the *Paediatric Intensive Care Society Standards Document 2001* has also been included.

Level 1:

Single Organ Support, needing closer observation than on the ordinary ward, characterised as 0.5 nurses to each patient. Monitoring such as ECG, SpO_2, & blood pressure monitoring. Examples include asthma, croup, unstable epilepsy, suspected poisoning or intestinal obstruction.
PICS 2001 standards include short term nasal CPAP and chronic long term ventilation via a tracheostomy.
This is equivalent to high dependency care.

Level 2:

Support for two systems, one of which may be chronically failing. Usually these children require intubation & ventilation and will require continuous nursing supervision with a nurse:patient ratio of 1:1.
PICS 2001 standards also include the child recently extubated, or the unstable non-intubated child such as that with acute upper airway obstruction receiving nebulised adrenaline.

Level 3:

Advanced respiratory support with two or more organ system failure needing complex monitoring and therapeutic procedures, e.g. haemofiltration or dialysis, intracranial pressure monitoring, and/or where the direct input of tertiary medical support from paediatric surgeons, neurosciences, nephrology, cardiology, etc. is necessary.
PICS 2001 standards include the use of inotropic and vasoactive drugs.

NB:

- **There will be some level 2 cases that can be anticipated to require only a short duration of intensive care (e.g. 12-24 hrs.) and, consequently, the need to transfer such children is questionable. The Working Party has attempted to address this in the guidelines. There is a clear understanding that every patient's case must be judged on its merits taking into account all the clinical, social and logistical issues.**

- **There will be some level 2 cases that, because of a presenting diagnosis such as suspected meningococcaemia, fast deterioration to level 3 could be expected and urgent liaison with the PICU is required.**

Appendix D

Responsibilities of the Referring Hospital

This document is extensively based on the National Coordinating Group's ('NCG') report of July 1997 to the Chief Executive of the NHS Executive as well as subsequent advice and recommendations including most recently in 2006, The acutely or critically sick or injured child in the district general hospital – a team response ("The Tanner Report").

- **All hospitals receiving acutely ill children should be able to provide Level 1 and initiate Level 2 intensive care, irrespectively of whether the child is to be transferred to a 'lead centre PICU' subsequently.** The exact details of the resuscitation and the personnel to be involved are best determined by each hospital according to its own circumstances. The PICU in Bristol is available to advise regarding clinical management on a 24 hour-a-day basis.

- Treatment should follow closely the guidelines of the Resuscitation Council (PALS) or the Advanced Life Support Group (APLS). All hospitals should be able to admit such a child to a critical care area that is suitably equipped with facilities for airway, respiratory and circulatory management, and that has equipment, monitoring and disposables for the full paediatric age range.

- Staffing with respect to both experience and training of the medical and nursing personnel involved, together with the appropriate equipment, should be available to maintain Level 2 intensive care until a retrieval team arrives. Delays in retrieval can arise as a result of time needed to mobilise extra staff, adverse weather & traffic conditions or prior engagement on another retrieval.

Referral

All children admitted as emergencies to intensive care should be discussed with the lead PICU. The need for transfer will depend on the likely duration of the child's stay in ICU and the capability of the hospital to deliver Level 1/2 care. In addition, other considerations may apply; for example, it may not be indicated to move a child who has undergone brain-stem death. **For definitions of levels of care, please see the appendix C.**

- **Children with Level 1 illness may be managed at the local hospital, at the discretion of the local clinicians. However, it may become necessary to transfer such children if care becomes protracted or if tertiary involvement is required.**

- **Where appropriate all referring centres may keep children at Level 2 for short term care assuming that the case has been discussed with the lead PICU and there is an agreed plan for management. If, on admission, it is anticipated that the admission will be for more than 24 hours the patient should be referred to the lead PICU.**

- **All Level 3 cases should be referred.**

In all cases, the decision to transfer should be the result of a discussion between the referring and receiving consultants, the basis of which includes an assessment of the risks, benefits and urgency for that individual patient.

Retrieval

i. If the child is suffering from a **neurosurgical emergency or severe burn** and the neurosurgical / burns unit has requested that the child be transferred, there should be no delay in this being achieved. **The Regional Neurosurgery/Burns guidelines should be followed.**

ii. For all other cases, the PICU in Bristol offers a 24hr, 7 day a week retrieval service. If the team is already out, or multiple referrals have been made, it may be necessary to prioritise the retrieval team's activity. In these circumstances:-

- It may be possible to retrieve on a later shift
- It would help the system work better if the less urgent cases are discussed with PICU early so that as far as possible transfers occur during daylight hours.

iii If no staffed bed is available in Bristol, the PICU staff will provide advice and will help to locate a bed in a neighbouring PICU.

http://nww.swretrieval.nhs.uk/Guidelines/Regional%20Retrieval%20Guideline.doc

Appendix E

Children admitted to general intensive care units who reached a dependency of Level 2 or above for more than 24 hours

Hospitals	Age	Length of stay	Reason for admission	Length of ventilation	Contact with PICU BCH?	Destination
Exeter	11 months	4 days	Bronchiolitis, AVSD, Downs	24 hours	Yes	PICU Southampton retrieval (no PICU BCH beds)
Torbay	8 years	3 days	Croup, subglottic stenosis (Bacterial tracheitis)	48 hours	Yes - within 24 hours; managed locally with support; x 2 failed extubations	PICU BCH retrieval
Truro	9.4 years	1.6 days	Status epilepticus, Trisomy 11	45 hours	Yes - within 24 hours; brain stem death; withdrawal locally	Died - organ donation
Truro	5 years	3 days	Dystonia, pontoneocerebellar hypoplasia	43 hours	Yes - within 24 hours	Ward / PHDU then home
Truro	5 years	2 days	Dystonia, pontoneocerebellar hypoplasia	28 hours	Yes - within 24 hours	PICU BCH retrieval
Truro	6 years	2 days	Pneumonia, myopathy, home ventilation	49 hours	No	Home
Truro	6.8 years	2 days	Fits/convulsions	30 hours	Yes - within 24 hours; initially self-ventilating on ward / PHDU	PICU Cardiff retrieval (No PICU BCH beds)

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