

South West Region Critically Ill Children's Audit



Annual Report
April 2006 – March 2007

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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 delivers 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 represent the spokes. Good quality data is essential to inform our decisions concerning service delivery, and the South West Critically Ill Children's audit is unique within England in providing such data. As a region, we should be proud that our reported mortality rates are impressively low, but as the report outlines there are still many areas for improvement.

General

- As defined by our criteria, there were 2212 children admitted with critical illness to the South West region between April 2006 and March 2007. Across the region, critically ill children accounted for an average of 4.4% of all paediatric inpatient admissions. The burden of critical illness equates to 0.18% of the paediatric population in the South West, or 2 admissions per 1000 children per year.
- Compared with last year, there was a 6% increase in the number of children admitted with critical illnesses (2212 vs 2092). The major reasons for this were approximately 20% increases in the numbers of critically ill children with neurosurgical, metabolic/endocrine and orthopaedic/trauma diagnoses, whilst at the same time there was a 20% reduction in critically ill patients with infectious diagnoses compared to last year (2005/6).
- 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 4.7 years with 51% less than 5 years of age. There continues to be a slight male predominance. Respiratory (30%), neurological (19%), neurosurgery (12%), and metabolic/endocrine (9%) are the main causes of illness.

DGH General Intensive Care Units

- 217 children were admitted to a general ICU during the last 12 months. This accounts for 0.4% of all paediatric admissions (excluding Bristol Royal Hospital for Children), and equates to 2.8 admissions per 10,000 of the paediatric population (under 16 years old) per year.
- The overall median length of stay in ICU is 15 hours. The median duration of ventilation is 4 hours. 18% of children admitted to adult ICUs stay longer than 24 hours (compared with 12% last year) and 17% stay longer than 48 hours (11% last year). When detailed analysis of children staying in a district general hospital ICU for longer than 24 hours is performed, 22% of these admissions (17 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 3.9% and a standardised mortality ratio (SMR) of 0.48. This result may well be kept low by the fact that a significant proportion of mortality is 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 1st October 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 2006/07 the PACU admitted 134 patients, whose median length of stay 23 hours and length of ventilation 20 hours. This is a 91% increase in admissions on the previous year.

Paediatric High Dependency Units

- 1472 children were admitted to 7 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.
- No new designated PHDU beds have opened in the last 12 months. 2 new PHDU beds are planned to be opened in North Devon in December 2007. 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 22 PHDU beds across the region to satisfy demand 95% of the time. There are currently 17 beds (with 2 planned).

Bristol Children's Hospital Paediatric Intensive Care Unit

- In 2006/07, the Bristol PICU treated 652 patients with an average bed occupancy of 83%.
- Outcome continues to be excellent. In 2006/07 the overall survival rate for children was 93% (SMR 0.91).

Paediatric Wards and Retrievals

- 687 children were managed on paediatric wards. This represents 1.4% of inpatient paediatric admissions to those hospitals
- 217 children in the region were retrieved by the BCH south west retrieval team during the last 12 months. An additional 6 were retrieved by PICU teams from outside the South West region. A further 183 critically ill children were transferred around the region by non-specialist teams: 44% of these transfers took place outside normal working hours which undoubtedly stretches district general hospital clinical teams' ability to cover services.

Mortality

- 29 children died and were reported to the Regional Audit, of which 17% died in the PACU at Frenchay, 17% died in PHDU/ward, 31% in Emergency Departments and 35% died in the ICU. 45% had failed CPR, whilst 55% had treatment withdrawn. A post mortem was known to have occurred in 45% of cases. 6 cases went for organ donation. Data is not captured on deaths in neonatal units or children who died out of hospital.
- This is almost certainly an underestimate of hospital deaths within the region. A formal Confidential Enquiry into Children's 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 are being developed across the region to review unexpected child deaths.

Recommendations

1. Numbers of critically ill children admitted to general ICU remain stable across the region, with 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 ICU clinicians are encouraged to inform the regional centre of any child admitted to their unit.

2. The number of children staying beyond 24 hours on the Peri-Anaesthetic Care Unit (PACU) at Frenchay Hospital continues to rise, contrary to the unit's Operational Policy. Some children are remaining ventilated on PACU for significantly longer than 24 hours.

A thorough investigation of the causes for the deviation from Operational Policy is required, 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 paediatric neurosurgery, plastic surgery and burns.

Efforts should continue to ensure that all children's services in Bristol are centralised at the earliest opportunity.

4. At the end of 2007, 2 large district general hospitals in the South West region will still not have a designated paediatric high dependency unit, despite clear Department of Health guidance on this matter.

There is a need for stronger management and effective commissioning of paediatric high dependency beds.

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 retrieval service. Many of these transfers are at night and this significantly impacts upon local hospital teams.

A co-ordinated regional solution to the inter-hospital transfer of sick children should be identified.

6. The number of long-stay patients on PICU commenced on long-term ventilation continues at a steady pace, in part affecting PICU bed availability, despite local initiatives to care for these children on the wards at the Children's Hospital once their ventilatory requirement has stabilised. The number of home-ventilated patients is expected to double over the next 5 years and acute readmissions of this group to hospital will severely stretch current PICU resources.

Consideration should be given to an integrated solution to the problem of long-term ventilated children, including the provision of designated high dependency beds at the Children's Hospital, a potential increase in the provision of high-dependency beds in hospitals across the region, and to expansion of the PICU bed base by 1 bed to provide additional intensive care capacity.

7. 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 10 years ago. These data are now 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 at the South West Children's Commissioning group.

South West Children's 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 Critically Ill Children's Audit 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. This audit has been historically supported and funded by the South West Regional Children's Planning Group, and it is now planned that it should report to the PIC Consortium of the South West Regional Commissioners. 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 need admission to general ICU, HDU and paediatric wards
3. Report on diagnostic case-mix, length of stay and outcome of children admitted to these areas
4. Establish the numbers of referrals and transfers of critically ill children between hospitals
5. Provide individual hospitals with reports 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 2006 until 31st March 2007.

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 1996¹ (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.

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.
- In addition to the above, all ICU returns are internally checked by the Consultant caring for the child. 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

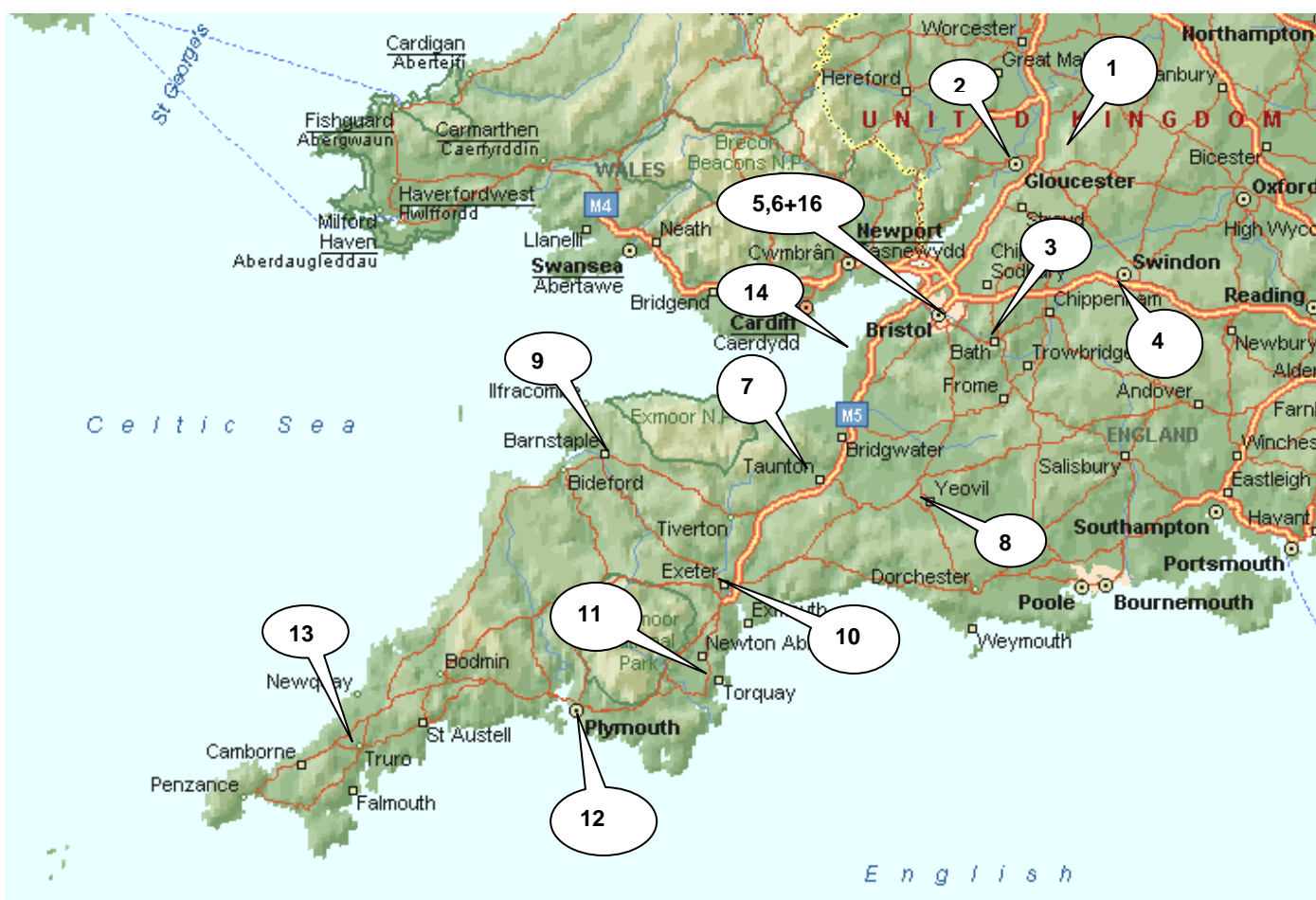
The South West region encompasses 14 district general hospitals, 1 specialist neuro-surgical and burns unit (Frenchay), and 1 tertiary children's hospital with a paediatric intensive care unit (Bristol Royal Hospital for Children).

The under 16 year old population of the South West region as of mid 2005 was approximately 783,700¹. 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, Exeter, Torbay, Plymouth and Royal Cornwall all have designated paediatric high dependency beds. North Devon is due to open 2 PHDU beds in December 2007. Other district general hospitals have put bids together for the development of paediatric high dependency provision.

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 2005 and includes the populations of Avon, Gloucestershire, Wiltshire (excl Salisbury), Somerset and the South West Peninsula.

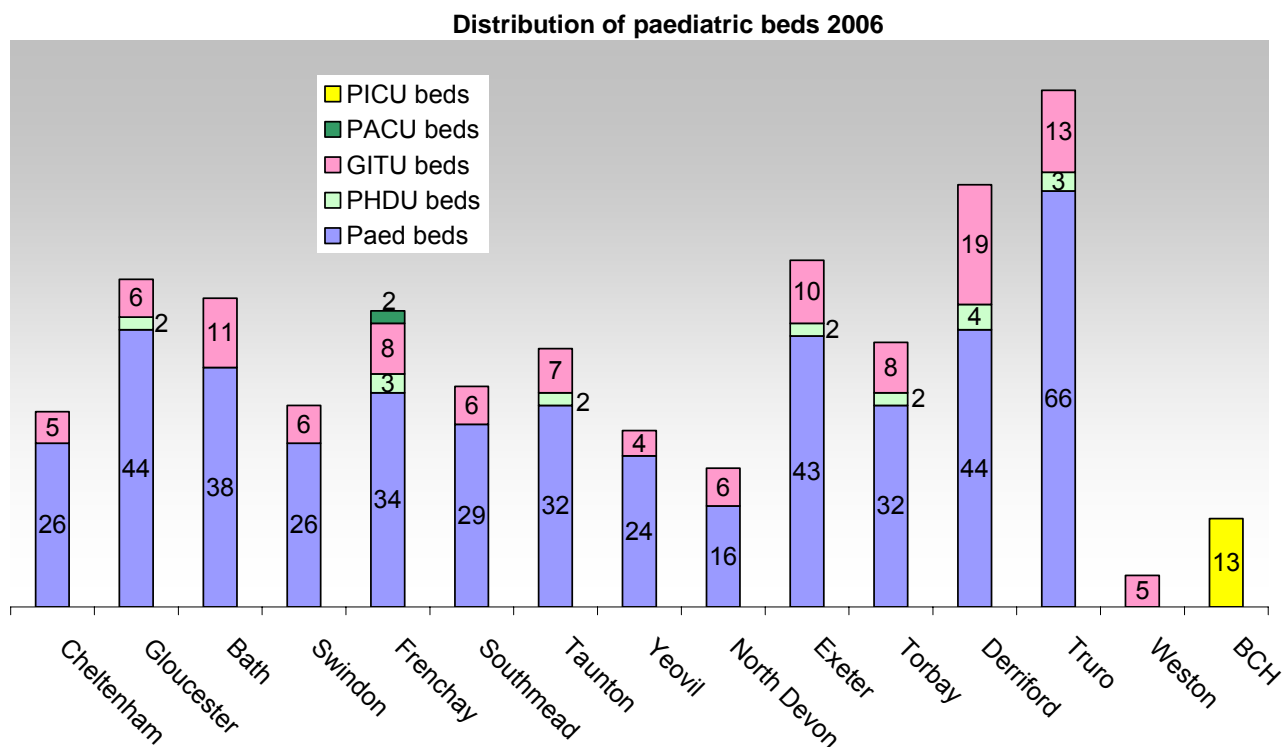
http://www.statistics.gov.uk/downloads/theme_compendia/regional_snapshot_2006/SubregionalPopulation_by_age_and_sex_2005.xls



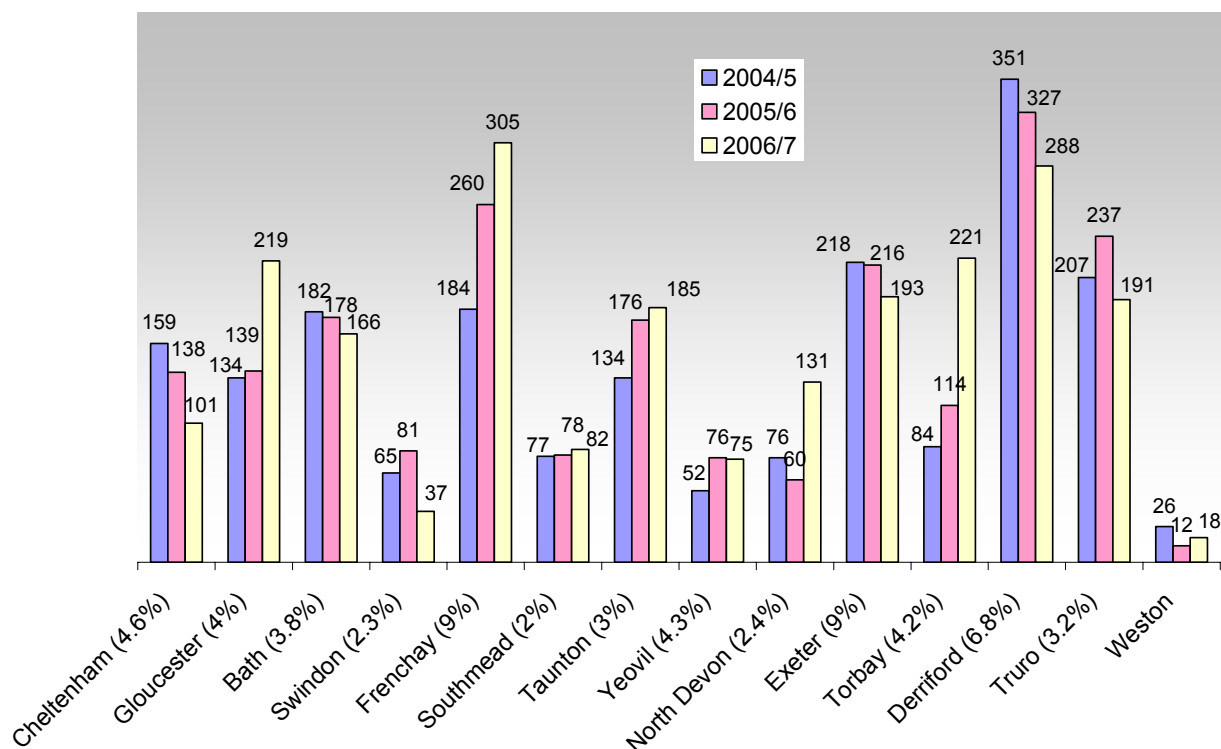
- | | | |
|----------------------------|-----------------------------|--|
| 1 = Cheltenham General | 6 = Southmead | 11 = Torbay |
| 2 = Gloucester Royal | 7 = Taunton and Somerset | 12 = Derriford, Plymouth |
| 3 = Royal United, Bath | 8 = Yeovil | 13 = Royal Cornwall, Truro |
| 4 = Great Western, Swindon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

4. Results for Region

Distribution of paediatric beds – 2006/7



Total number of paediatric critical illness admissions - 2004 to 2007

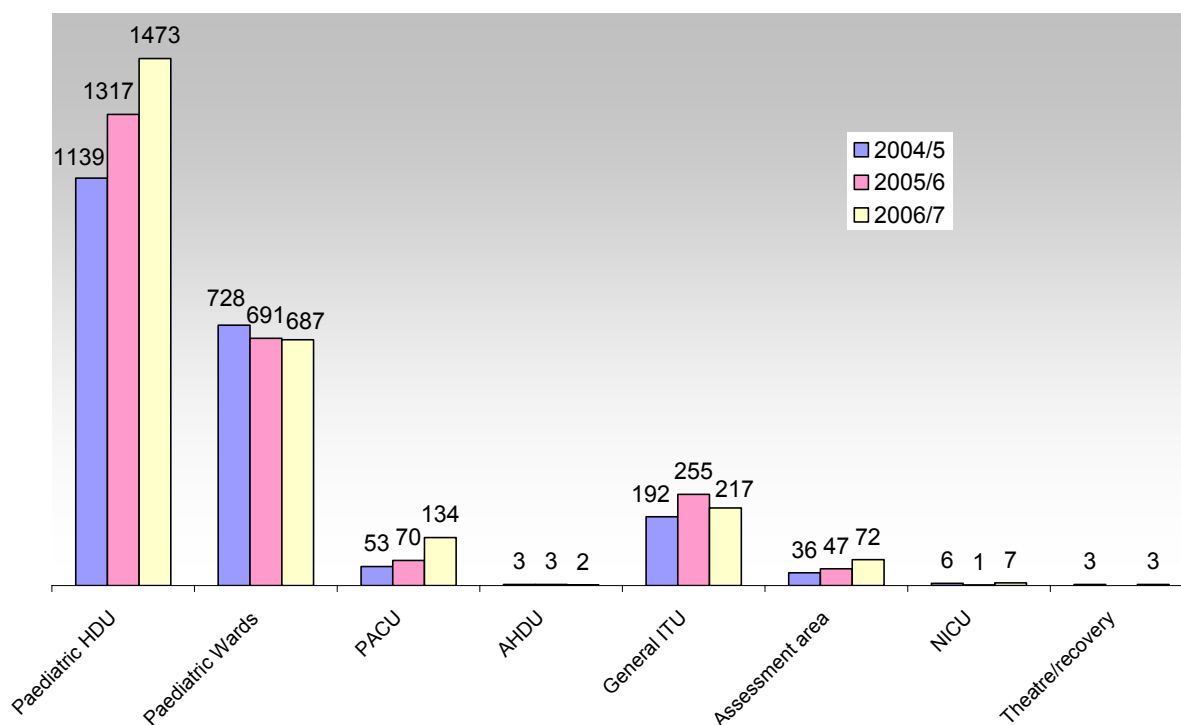


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(% in brackets represent the number of critical illness admissions as a % of all paediatric inpatient admissions)

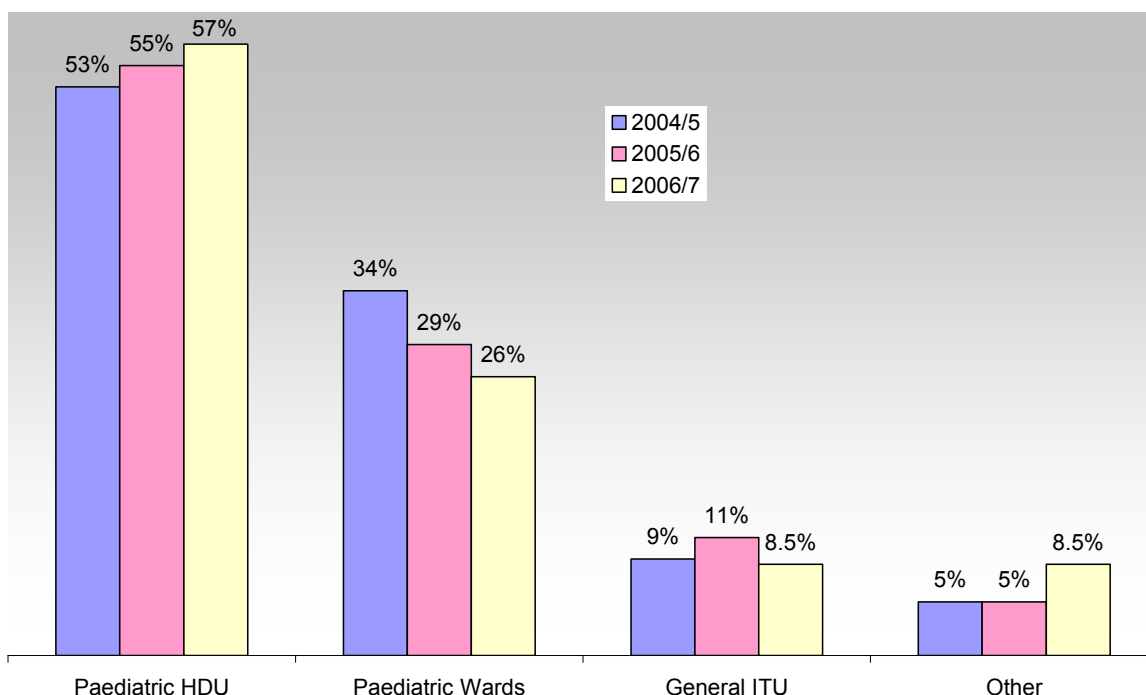
- Total numbers of children meeting critical illness criteria in 2006/7 are similar to previous years.
- The critical illness burden per total paediatric population under the age of 16 years in the South West is 0.3%. This equates to 3 admissions per 1000 children per annum.

Episodes of critical illness within different hospital areas - 2004 to 2007



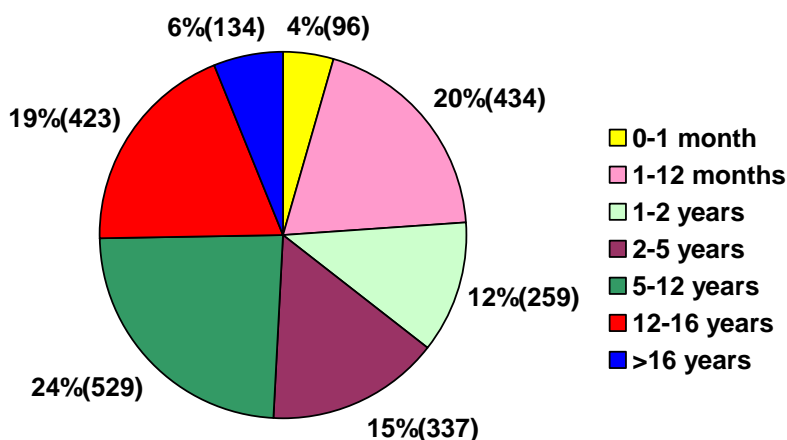
- The discrepancy between numbers of episodes and admissions reflects children who have been admitted to more than one hospital area.
- The occasional critically ill child admitted to other hospital areas is explained by individual hospital practise. For example, some hospitals choose to resuscitate 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 - 2004 to 2007



- This bar chart demonstrates that during the last 3 years the percentage of critically ill children cared for on adult ICUs has plateaued and there has been a decrease in paediatric ward admissions. In parallel, a greater proportion of children are managed on paediatric High Dependency Units. Of the 217 admissions to general ITU, 31% (66) were transferred to a PICU and of those 95% (63) were retrieved by a PICU team.

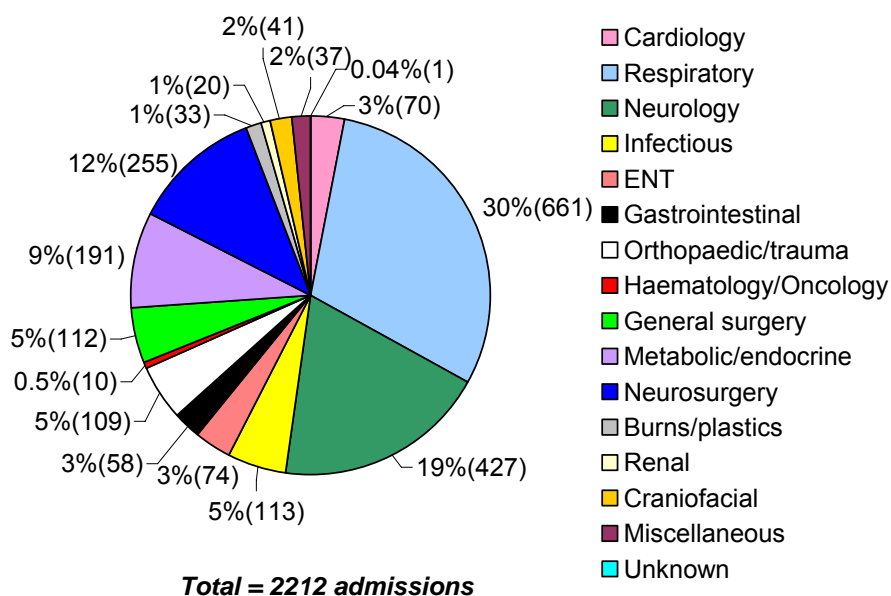
4a) Age and gender of children meeting critical illness criteria



Total = 2212 admissions
Average age = 6.5 years
Median age = 4.7 years

55% (1226) = Male
44.5% (978) = Female
0.5% (8) = Unknown

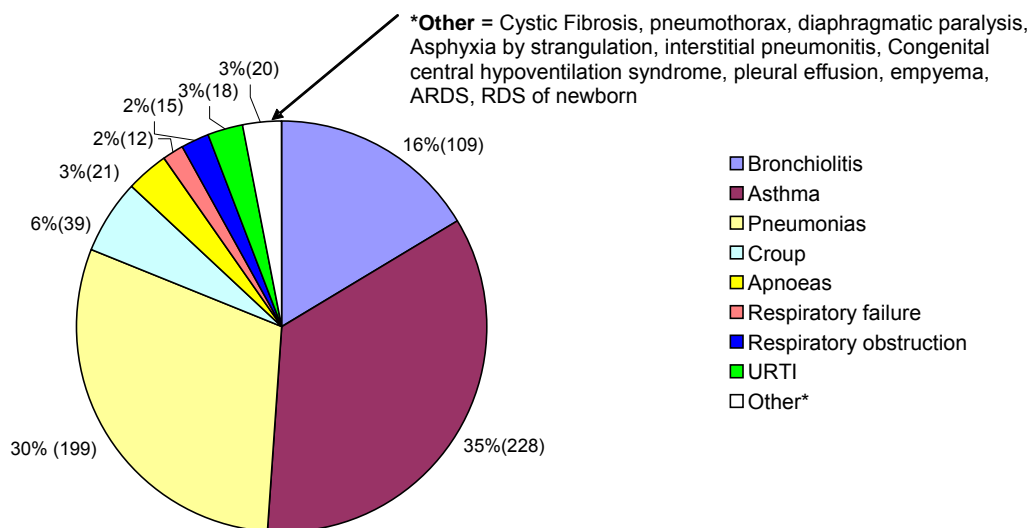
4b) Broad Diagnostic Categories for children meeting critical illness criteria



Total = 2212 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

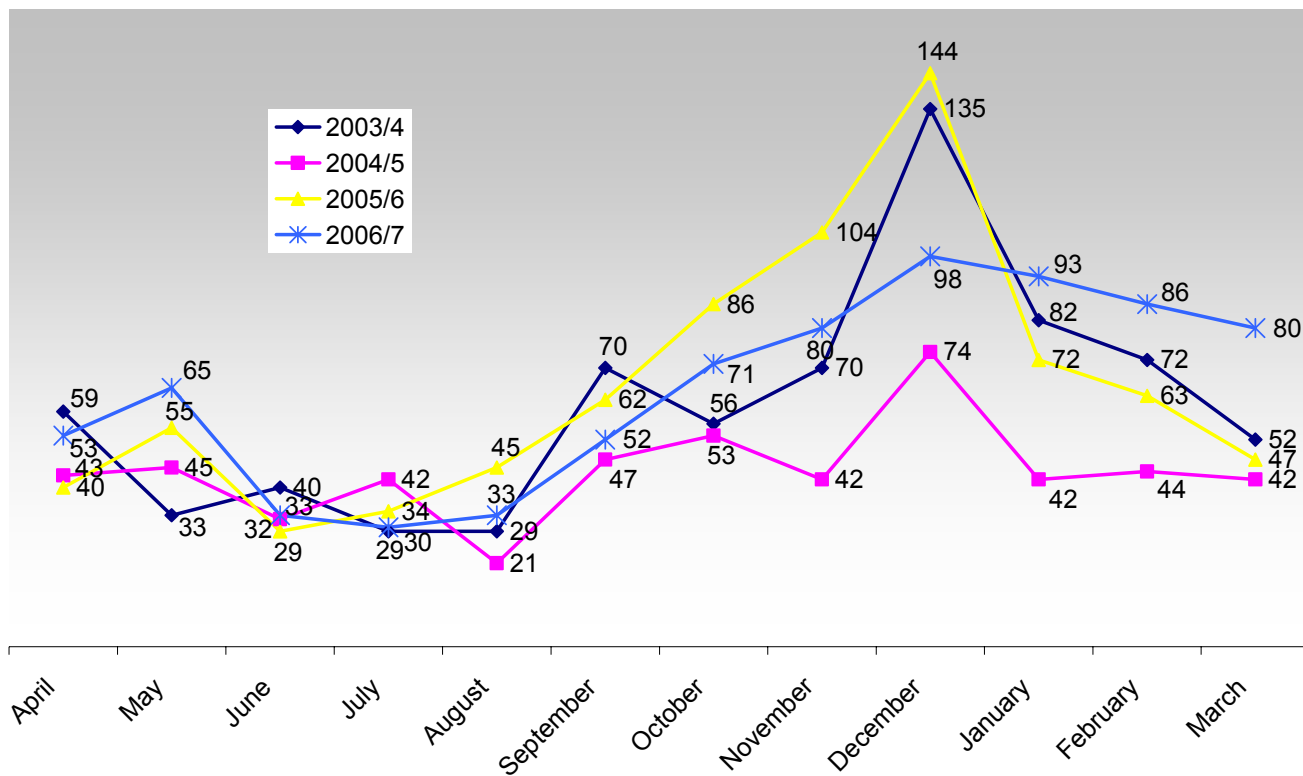


Total = 661 admissions

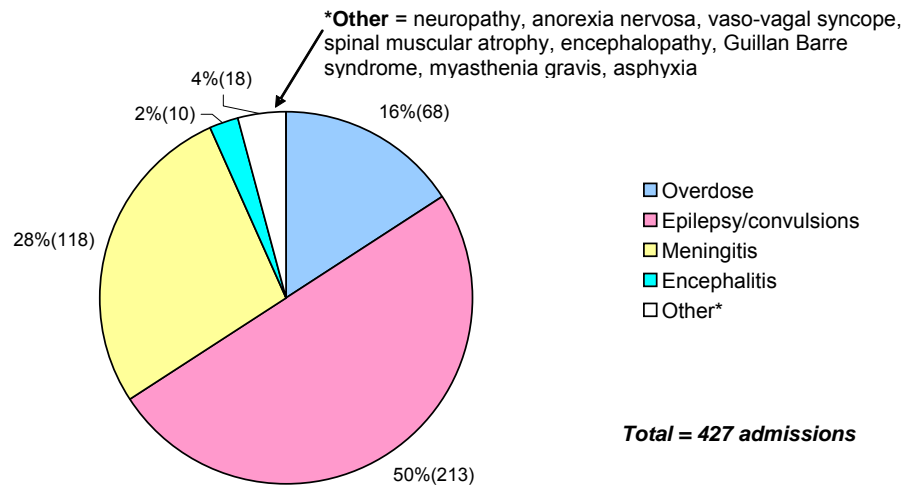
➤ There was a marked reduction in the numbers of children with bronchiolitis (28%) and croup (50%) compared to 2005/6. However there were increased numbers of children with asthma (13%) and pneumonia (20%) compared to 2005/6, with overall numbers of respiratory diagnoses similar between the two years.

➤ Similarly there was a 47% drop in respiratory admissions to PICU in 2006/7 as compared to 2005/6 (77 vs. 145).

Seasonal variation amongst respiratory disease categories 2003-2007



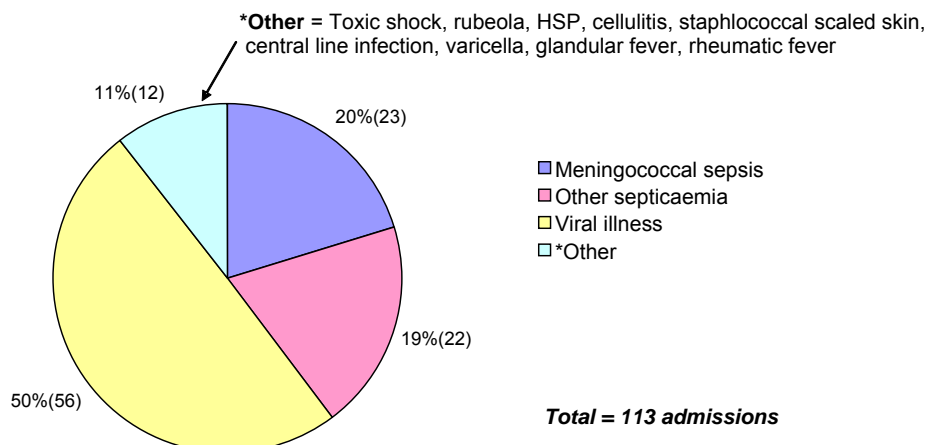
Neurological diagnoses



➤ Children who have taken overdoses are included in this diagnostic category, since they are frequently admitted to high dependency areas for close neurological observation.

➤ There was a 30% increase in the number of children presenting with a diagnosis of meningitis in 2006/7 compared to 2005/6 (118 vs. 91).

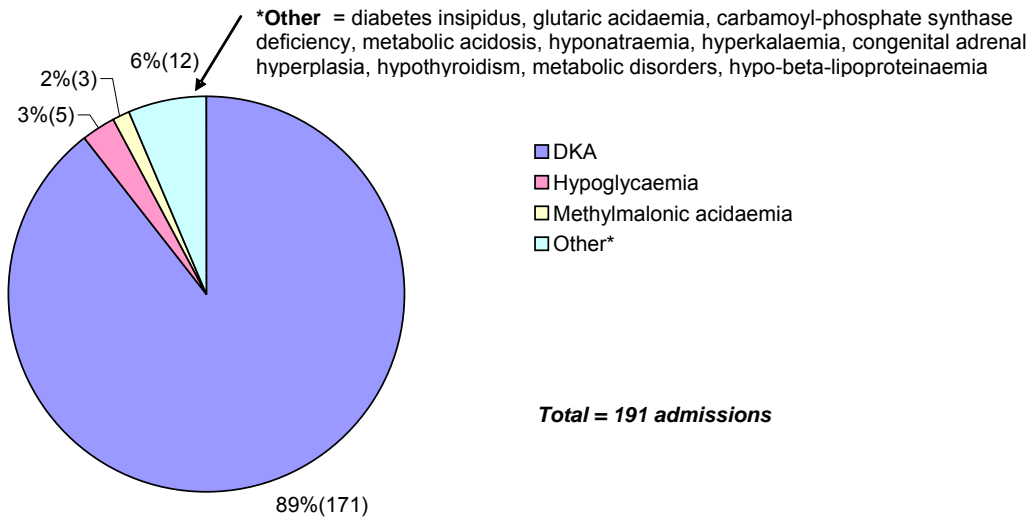
Infectious Diagnoses



➤ Admissions with meningococcal sepsis are markedly reduced from last year 2005/6 (23 vs. 52), representing a 56% fall.

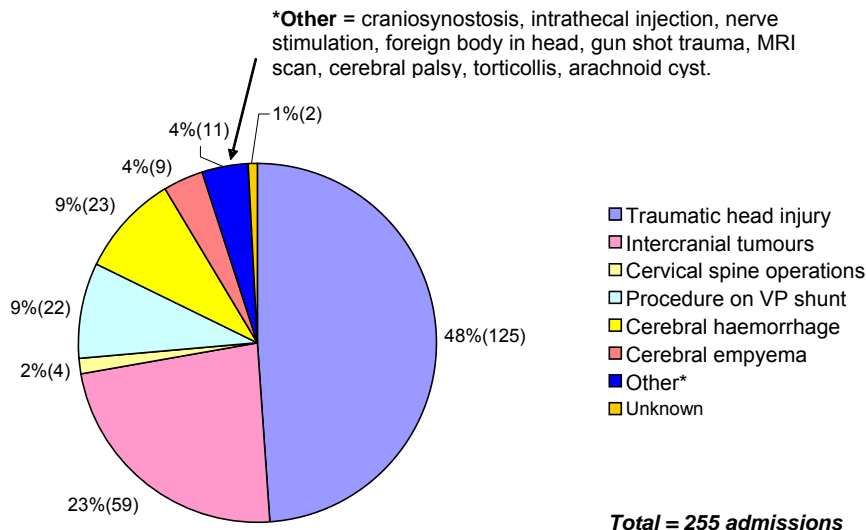
➤ Meningococcal sepsis admissions to PICU fell by a third to just 10 cases in 2006/7.

Metabolic/endocrine Diagnoses



➤ The notable rise in metabolic/endocrine was due to a 24% rise in episodes of DKA compared to 2005/6 (171 vs. 138). This may be due to the application of the regional DKA care flow pathway, with more children being admitted to HDU than previously.

Neurosurgical Diagnoses



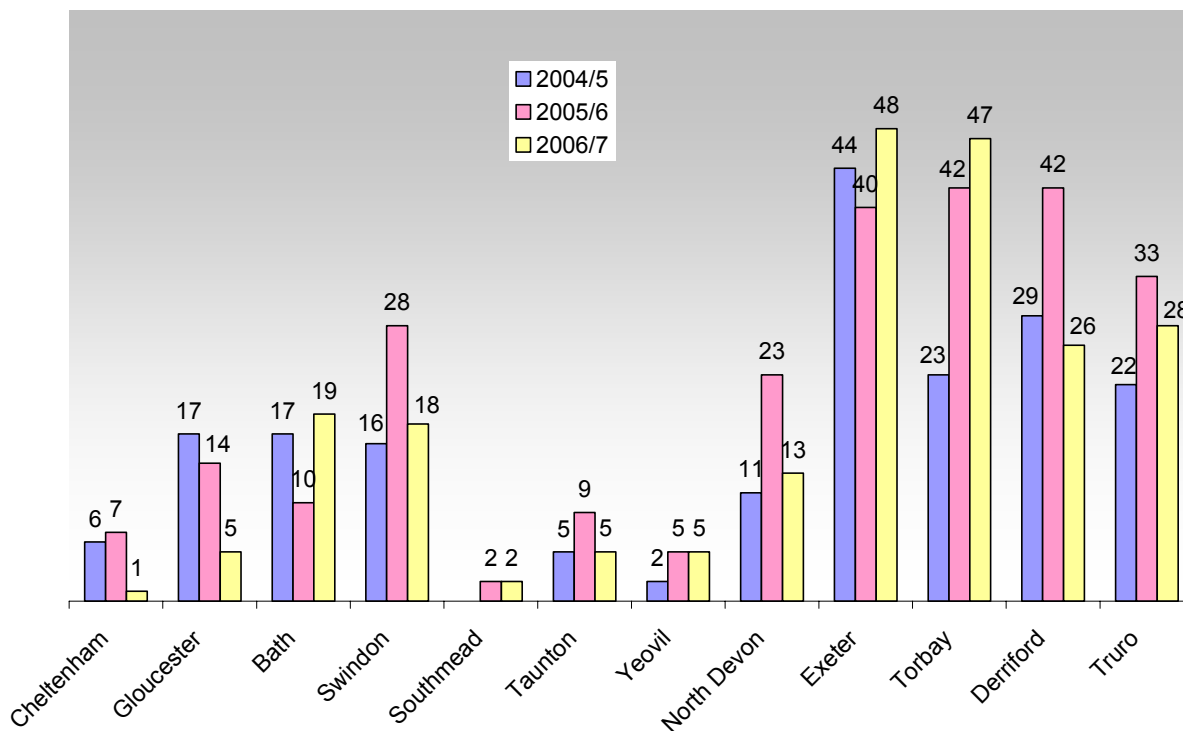
➤ The rise in the number of neurosurgical admissions is in part due to the increasing number of traumatic head injuries and intracranial tumours seen at Frenchay. There was also a dramatic increase in the number of cerebral haemorrhage admissions compared to 2005/6 (23 vs. 2), a small number of children being admitted on more than one occasion.

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

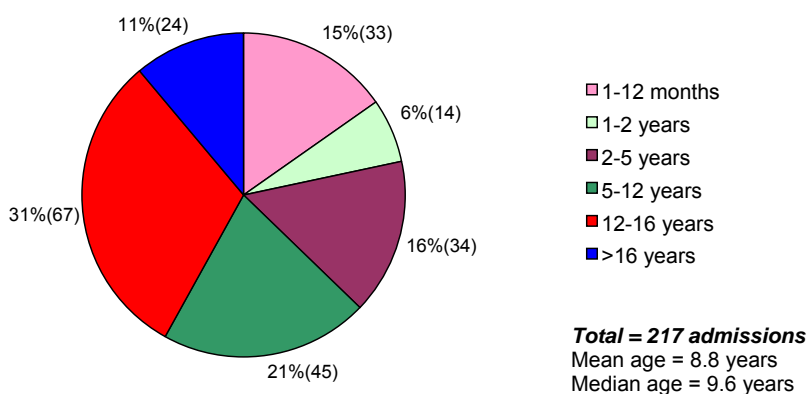
In the South West region, general intensive care units treat level 2 paediatric patients within an agreed protocol with the lead PICU. (Appendix D) This is based on a 24 hour rule, i.e. children should be referred to PICU from all units as soon as possible, if at time of admission, it is envisaged that 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): 2004-2007

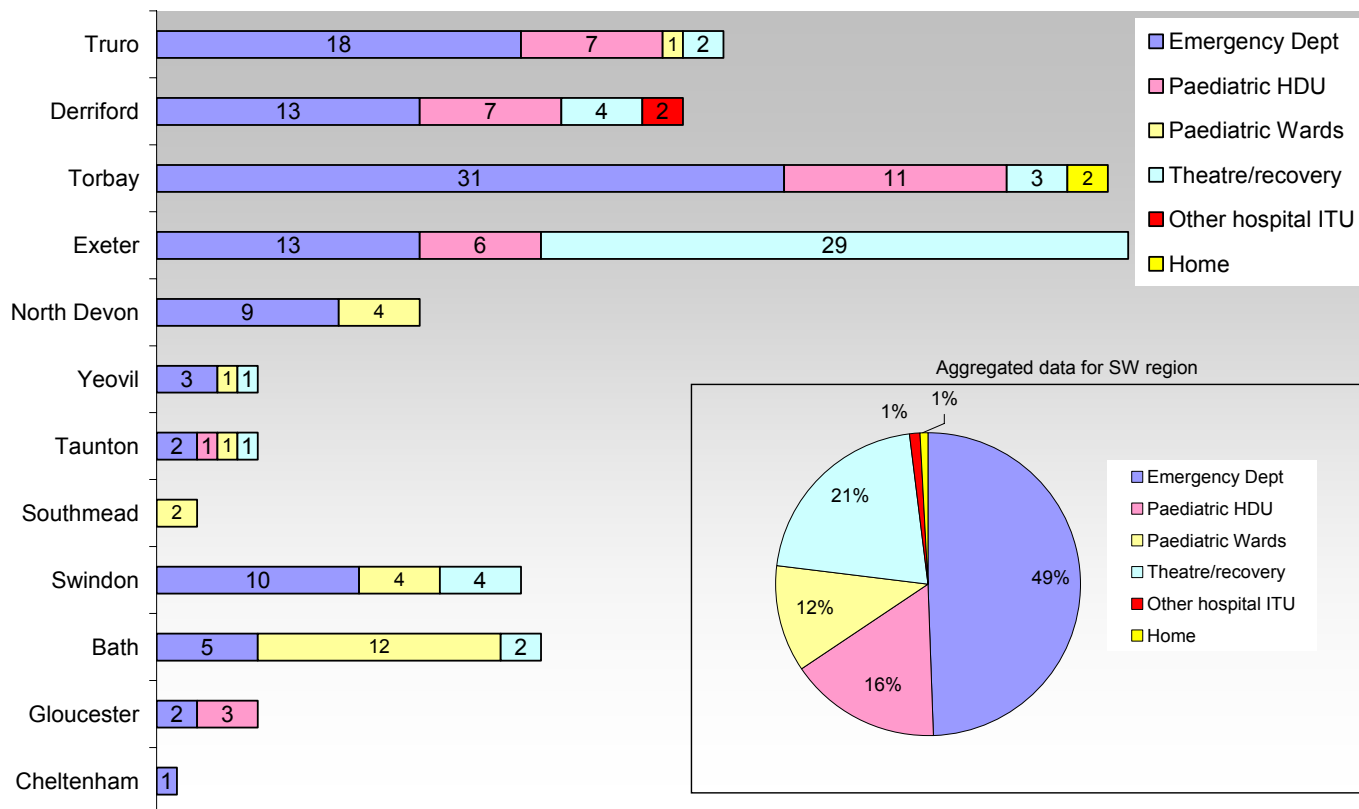


Age of paediatric admissions to general ICUs: 2006-2007

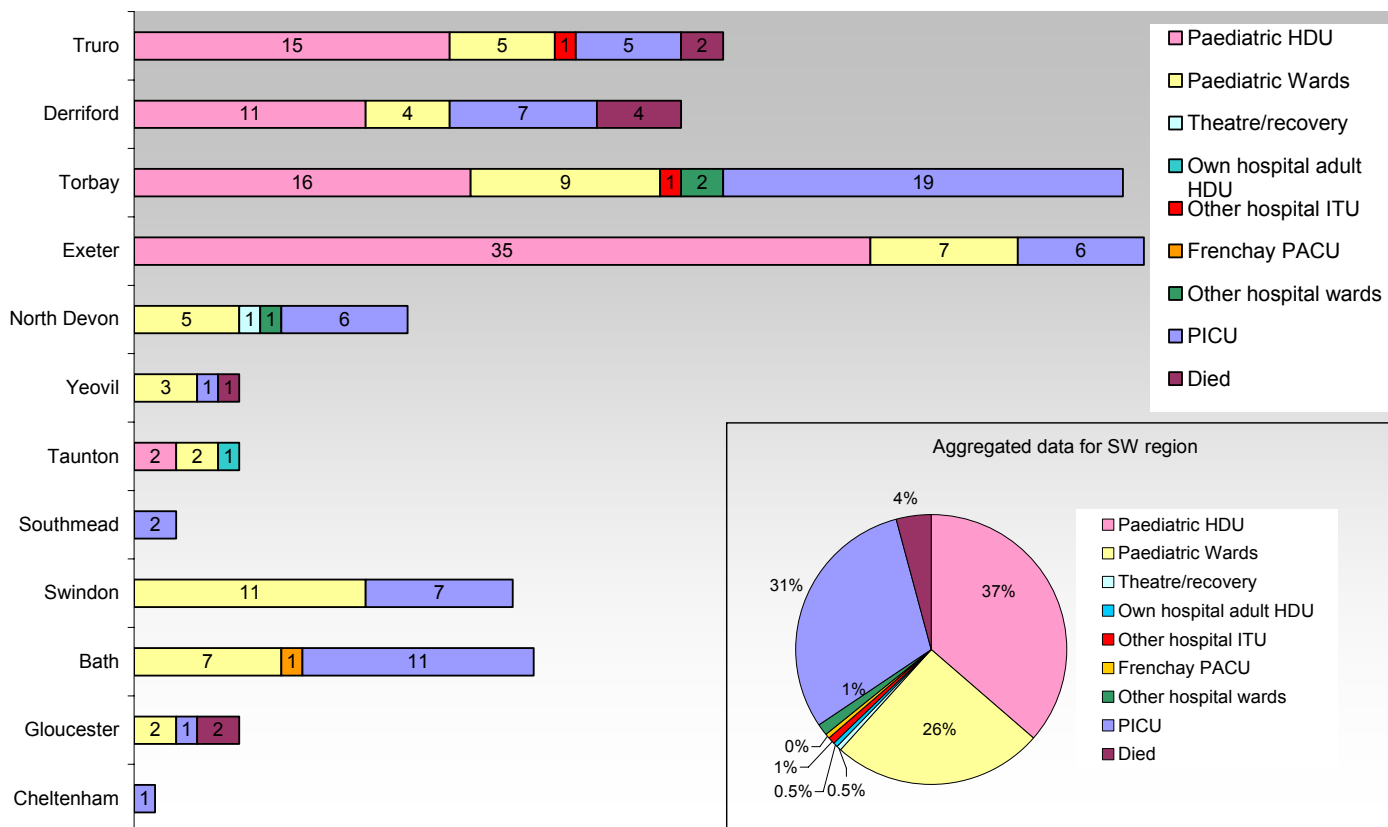


- The median age of children admitted to general ICUs is higher than that of those looked after on the regional PICU (median 12 months).
- There has been a marked reduction of 35% in the number of children under 5 years admitted to general ICUs in 2006/7 compared to 2005/6 (81 vs. 125). It would appear that 2005/6 was an exceptional year, as children under 5 years for once accounted for nearly 50% of admissions to general ICUs unlike previous years, whilst 2006/7 appears to be in line with previous years.
- 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 ITU back to either a paediatric HDU or ward.

Source of paediatric admissions to general ICUs: 2006-2007



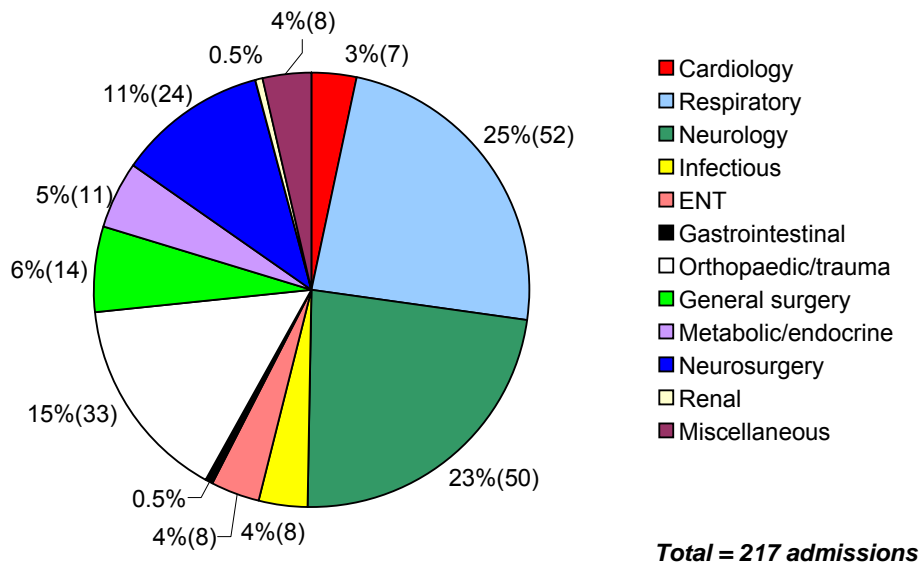
Discharge destination for paediatric admissions to general ICUs: 2006-2007



➤ It can be seen that the majority of children admitted to ICU come from the Emergency Department and are discharged to either PICU, 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



➤ There were significant reductions in the numbers of children admitted with respiratory diagnoses (36% compared to 2005/6; 52 vs. 81) and infectious diagnoses (70% compared to 2005/6; 8 vs. 27). This may correlate with the fall in the number of children under 5 years of age, and may be due to particularly mild winter conditions in 2006/7 as compared to 2005/6.

➤ Of the 24 neurosurgical admissions, 12.5%(3) were transferred to Frenchay, 33% (8) to PICU, 37% (9) to own hospital wards, 8%(2) to Derriford ITU and 8%(2) died.

Descriptive table – paediatric admissions to general ICU: 2006-2007

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
		1	2	3					
Cheltenham	1	0	1	0	5 hrs	5 hrs	100% (1)	0	1
Gloucester	5	2	3	0	10 (7.5-32hrs)	4 (0-13 hrs)	60% (3)	0	1
Bath	19	6	8	5	15(4-31 hrs)	4 (0-30 hrs)	68% (13)	26% (5)	11
Swindon	18	9	9	0	11 (5-30 hrs)	1 (0-126 hrs)	50% (9)	0	7
Southmead	2	0	2	0	3 hrs	4 hrs	100% (2)	0	2
Taunton	5	1	4	0	15 (12-20 hrs)	9 (0-14 hrs)	80% (4)	0	0
Yeovil	5	0	3	2	9 (5.5-12 hrs)	6 (0-13 hrs)	60% (3)	40%(2)	1
North Devon	13	5	5	3	12 (8-24 hrs)	3 (0-24 hrs)	62% (8)	23% (3)	6
Exeter	48	28	16	4	20.5 (11-24 hrs)	0 (0-21 hrs)	44% (21)	8% (4)	6
Torbay	47	15	26	6	10 (5-26 hrs)	4 (0-96 hrs)	70% (33)	13% (6)	19
Derriford	26	3	18	5	18 (7-56 hrs)	12 (0-112 hrs)	88% (23)	19% (5)	7
Truro	28	6	18	4	20 (9-27 hrs)	7.5(0-48 hrs)	75% (21)	18% (5)	5
TOTALS	217	75	113	29	15 (6-27 hrs)	4 (0-126 hrs)	65% (141)	14% (30)	30% (66)
PICU BCH*	652	84	213	329	2.4 days (18 hrs - 12 days)	2 days (0 days – 138 days)	71% (484)	50% (325)	-

- Weston General & Frenchay Hospitals have been excluded from this table as there were no paediatric admissions to their general ICU.
- Of the 142 children [excluding PICU] who reached a Dependency Level of ≥ 2 (i.e. Level 2 and 3), 44%(63) were transferred to PICU or PACU.
- Of the 29 children [excluding PICU] whose dependency reached Level 3, 17(58%) were transferred to a PICU, 1(3.5%) was transferred to Derriford general ICU, 6(21%) died and 5 returned back to own hospital wards.

***PICU BCH** – an additional 13 children reached a dependency of Level 4 and there were 13 children for whom no dependency level was given.

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

Outcome table - paediatric admissions to general ICU: 2002-2007

Mortality prediction for children admitted to general ICU was calculated using the Paediatric Index of Mortality (PIM) scoring system¹. 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. 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 patients²

Hospital	Number of admissions (5 years combined)	Number Level 2 or above staying 24-48 hours					Number Level 2 or above staying >48 hours					PIM predicted deaths	Actual deaths
		2002/3	2003/4	2004/5	2005/6	2006/7	2002/3	2003/4	2004/5	2005/6	2006/7	Years 1-5	Years 1-5
Cheltenham	24						2		1			2.3	1
Gloucester	91				1		3	1	2	1		9	5
Bath	86		3			2			1			8.7	5
Swindon	120	3	3			1	1	1	2	2	1	8.9	2
Frenchay*	329	8	14	13	14	15	15	5	9	8	19	23.8	9
Southmead	6							1				0.75	0
Taunton	48	1	1	1	1		1	1				5	1
Yeovil	18	1						1		1		2.3	1
North Devon	86				1	3	1			1		4.6	1
Exeter	193	9		4	4	8	1	3	3	4	1	7.8	2
Torbay	189	2			2	4	1	1		1	6	13	2
Derriford	163	2	3	8	4	1	9	8	6	6	6	19.8	15
Truro	145	7	6	4	3	5	5	2	4	5	4	13.9	7
TOTALS	1498	33	30	30	30	39	39	24	28	29	37	119.85	51

¹ Paediatric index of mortality (PIM): a mortality prediction model for children in intensive care. F Shann, G Pearson, A Slater, K Wilkinson 1997 (Intensive Care Med 23:201-207)

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

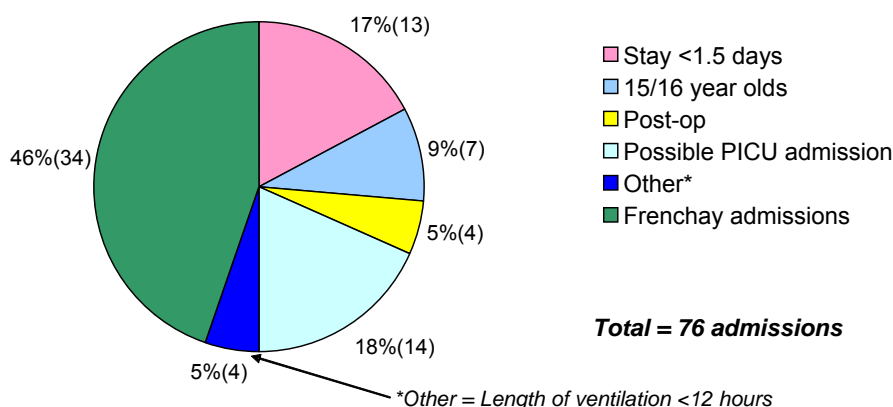
Predicted mortality of children admitted to general ICU across varying bands of death probability (excluding BCH)

Data has been grouped for the last 5 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 [2003-2007]						
PIM	<1%	1-<5%	5-<15%	15-<30%	>30%	TOTALS
Expected deaths	2	15	19	11	47	94
Actual deaths	1	1	6	7	28 (39%)	43
Number to PICU	34 (10%)	172 (33%)	140 (55%)	31 (59%)	33 (46%)	
n =	349	520	254	53	72	1248

- For this period the crude mortality was 3.9% and the SMR was 0.48 (ratio of observed to expected deaths)
- Frenchay Hospital accounts for 46% of all patients who reside on ICU > 24 hours. This situation is in part a reflection of the PACU Operational Policy, but it does require further investigation (see below).
- Over a five-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 33 patients transferred to PICU in the >30% risk of mortality category, 9 died after short PICU admissions.
- On analysis of the region, (excluding Frenchay PACU), some 11% of all general ICU admissions stayed between 24 and 48 hours (compared to 6%: 2005/6, 9%: 2004/5, and 13.5%: 2003/4) whilst a relatively consistent proportion are staying longer than 48 hours, 8% in 2006/7 (compared to 8%: 2005/6 and 10% in 2004/5).

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 2005/6 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, 18% of these admissions (14 patients) might have been predicted 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, 48/76 (63%) were discussed with BCH PICU, 28/76 (37%) were either not discussed or the discussion was unknown to the reporting audit nurse.

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 2006/07

Number of admissions 2006/7	Maximum level of dependency during PACU admission			Median length of stay in hours (IQR)	% ventilated	Median duration of ventilation (range in hours)	% inotropes
	L1*	L2	L3				
134	56	39	39	23 (16-40)	58%(78)	18 hours (0-168)	28% (38)

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

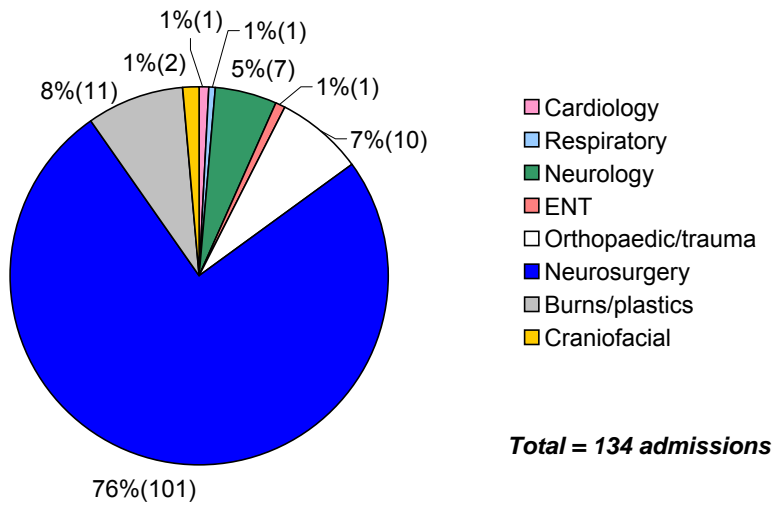
- There has been a 91% increase in the number of admissions to PACU from 2005/6 to 2006/7.
- There has been a 178% increase in the number of children reaching Level 3 during their admission from 2005/6 to 2006/7 (14 vs. 39), with a 192% increase in the number of children receiving inotropes over the same period (13 vs. 38).

Outcome table – data has been grouped for years 1-5 for PIM estimation (Years 1 & 2 for children admitted to the Adult intensive care unit at Frenchay hospital)

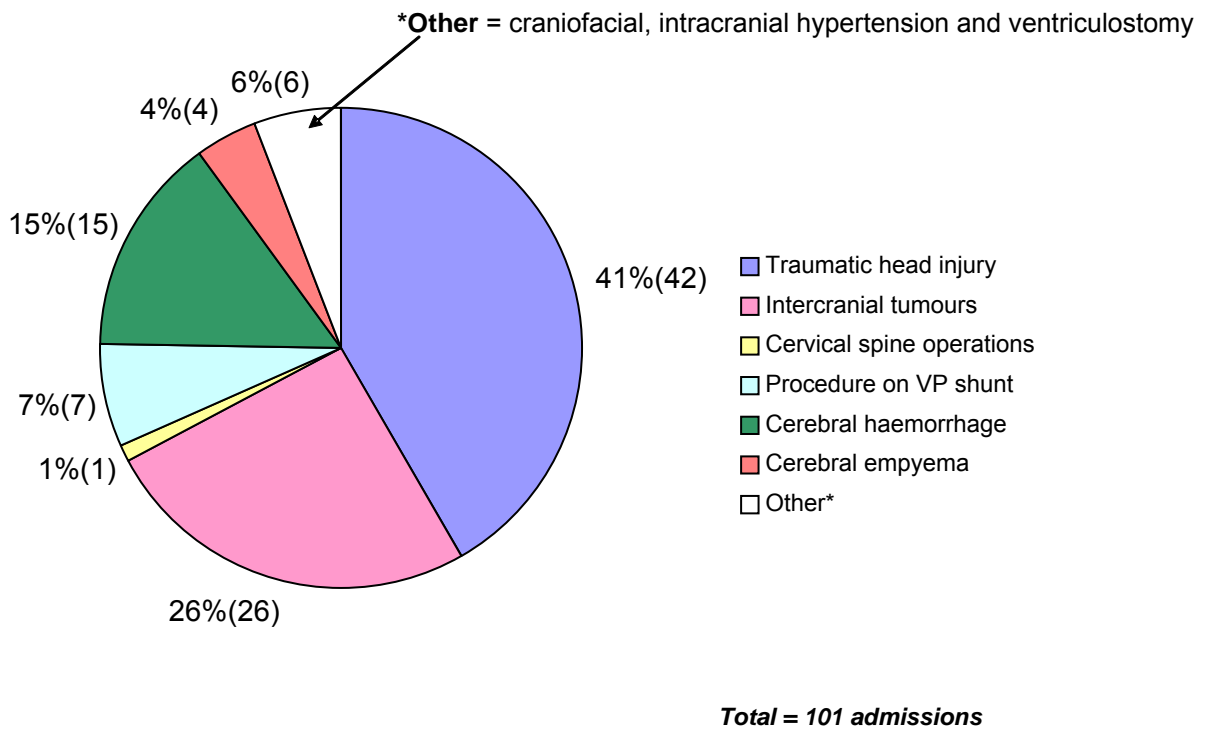
Number of admissions (5 year combined)	Number Level 2 or above staying 24 - 48 hours					Number Level 2 or above staying >48 hours					PIM predicted deaths	Actual deaths
	02/3	03/4	04/5	05/6	06/7	02/3	03/4	04/5	05/6	06/7		
329	8	14	13	14	15	5	5	9	8	19	23.8	9

- It is clear from the tables above that with a median length of stay of 23 hours, increasing numbers of children are 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 require further investigation, including referral back to the Operational Policy to ensure that all parts are being appropriately followed, and that resources are in place for the policy to be fully implemented.

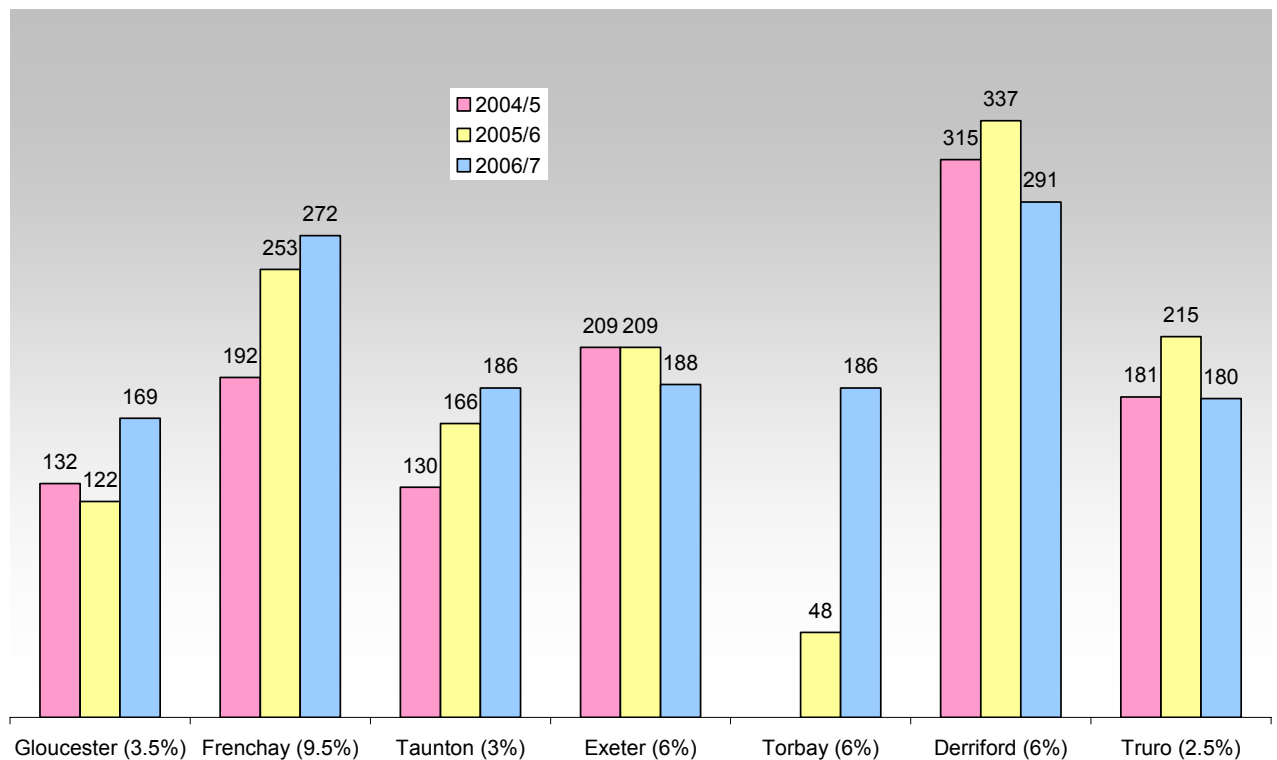
Broad diagnostic categories for children admitted to Frenchay Hospital PACU



Breakdown of neurosurgical admissions admitted to PACU at Frenchay Hospital

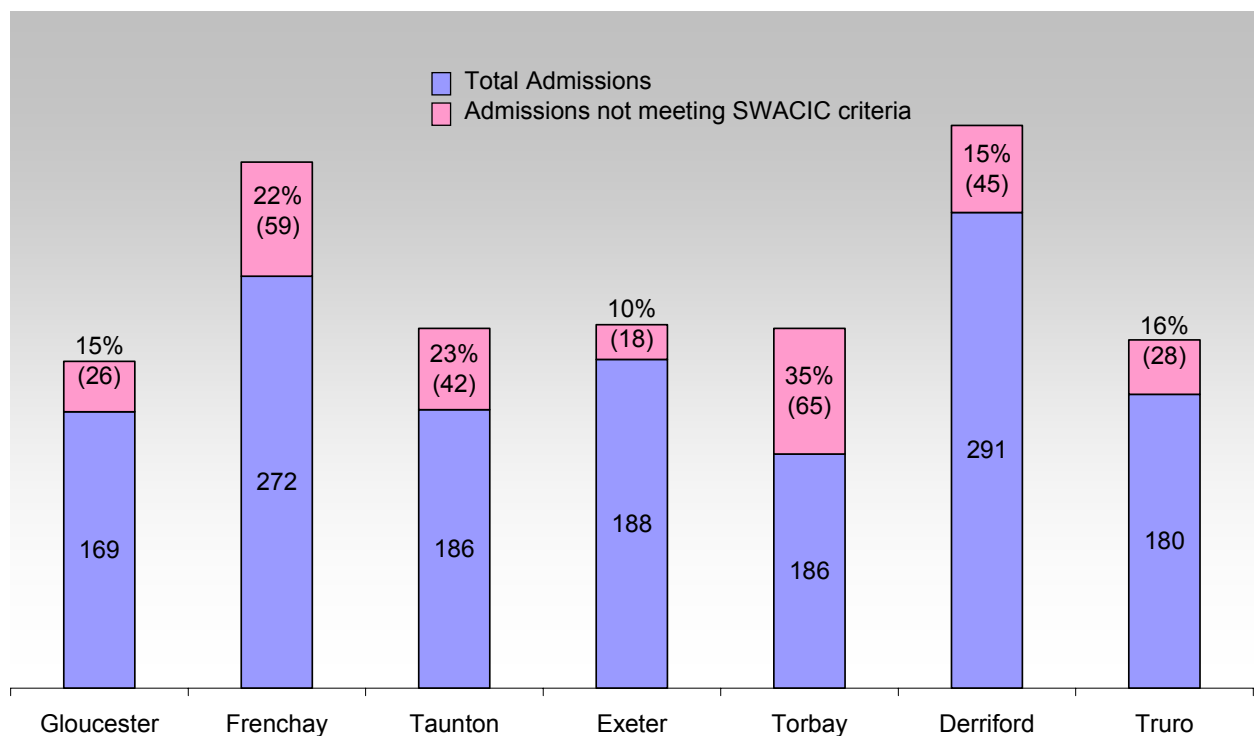


4e) Details on admissions to designated Paediatric High Dependency beds



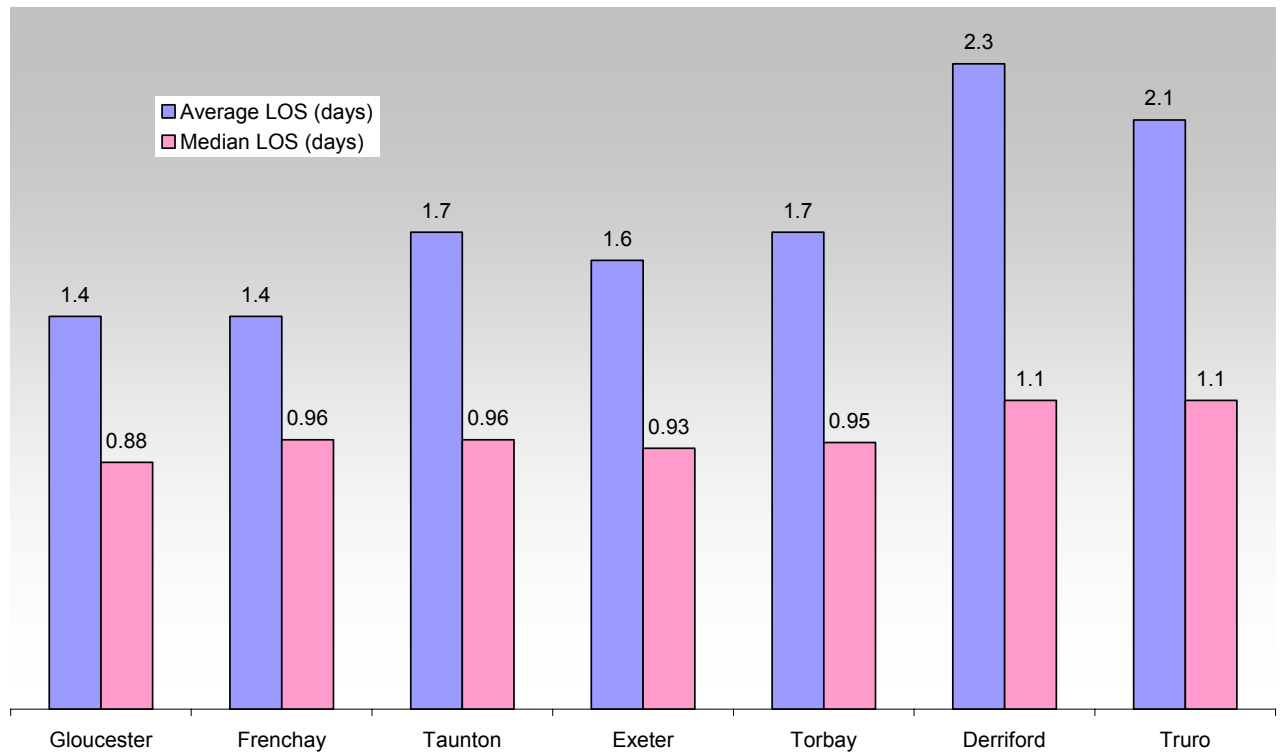
(Figures in brackets are the average % over 1 year PHDU admissions of all paediatric inpatient admissions)

➤ Approximately 2.9% of all paediatric admissions to hospital are admitted to a PHDU.

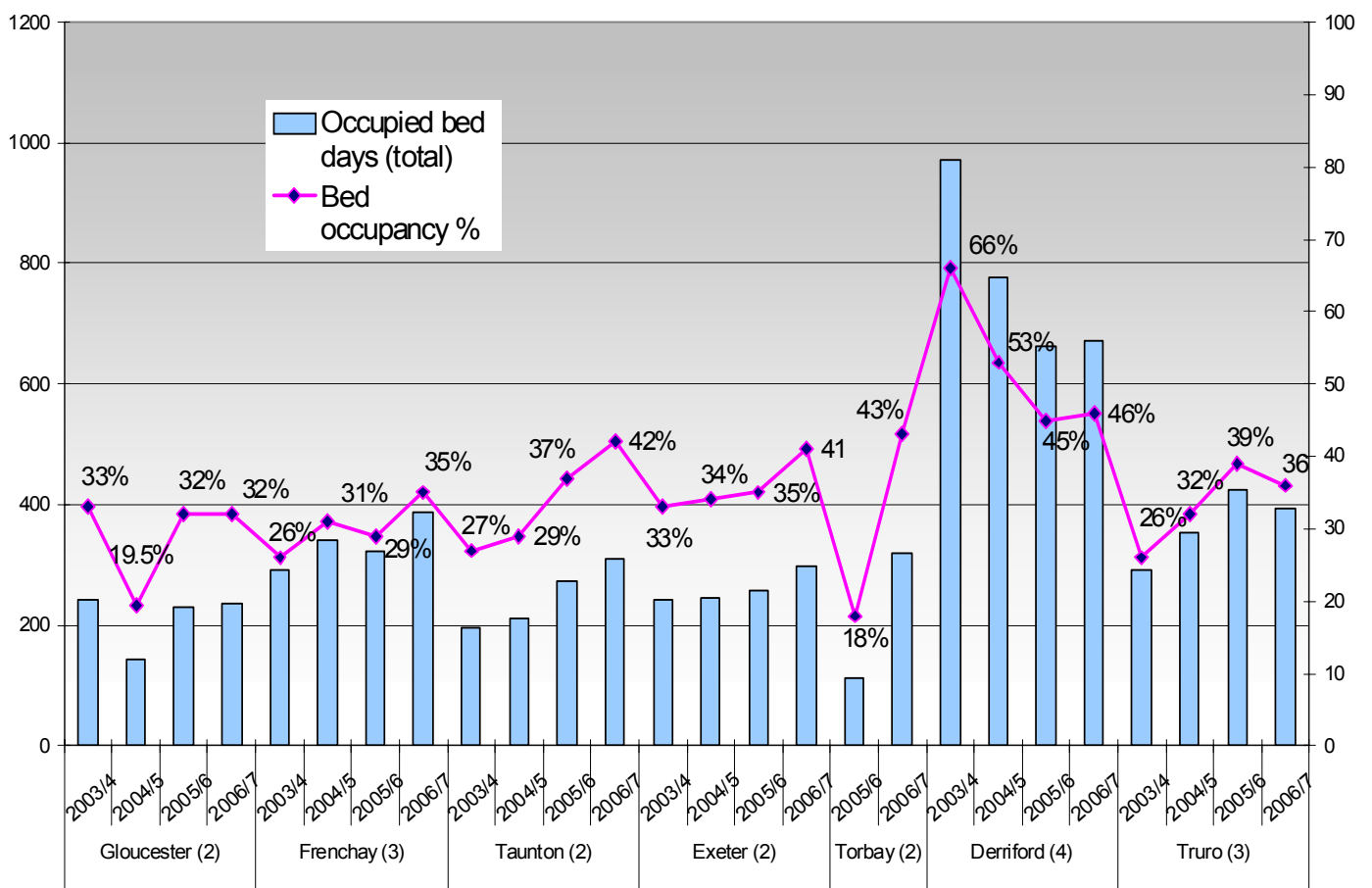


➤ Following analysis of previous years' data, it remains apparent that some children are admitted to PHDU who did not meet our criteria for critical illness. This is primarily because they require higher levels of nursing observation following "step-down" from ICU. When planning the development of a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



Bed occupancy for designated Paediatric High Dependency beds

Hospital	Number of designated PHDU beds	Occupied bed days (SWACIC)	Bed occupancy 2006-2007 (SWACIC)	Occupied bed days (PICANet)	Bed occupancy 2006/7 (PICANet)
Gloucester	2	237	32%	413	57%
Frenchay	2	388	35%	668	61%
Taunton	2	309	42%	491	67%
Exeter	2	298	41%	480	66%
Torbay	2	319	43%	498	68%
Derriford	4	672	46%	967	66%
Truro	3	395	36%	565	52%

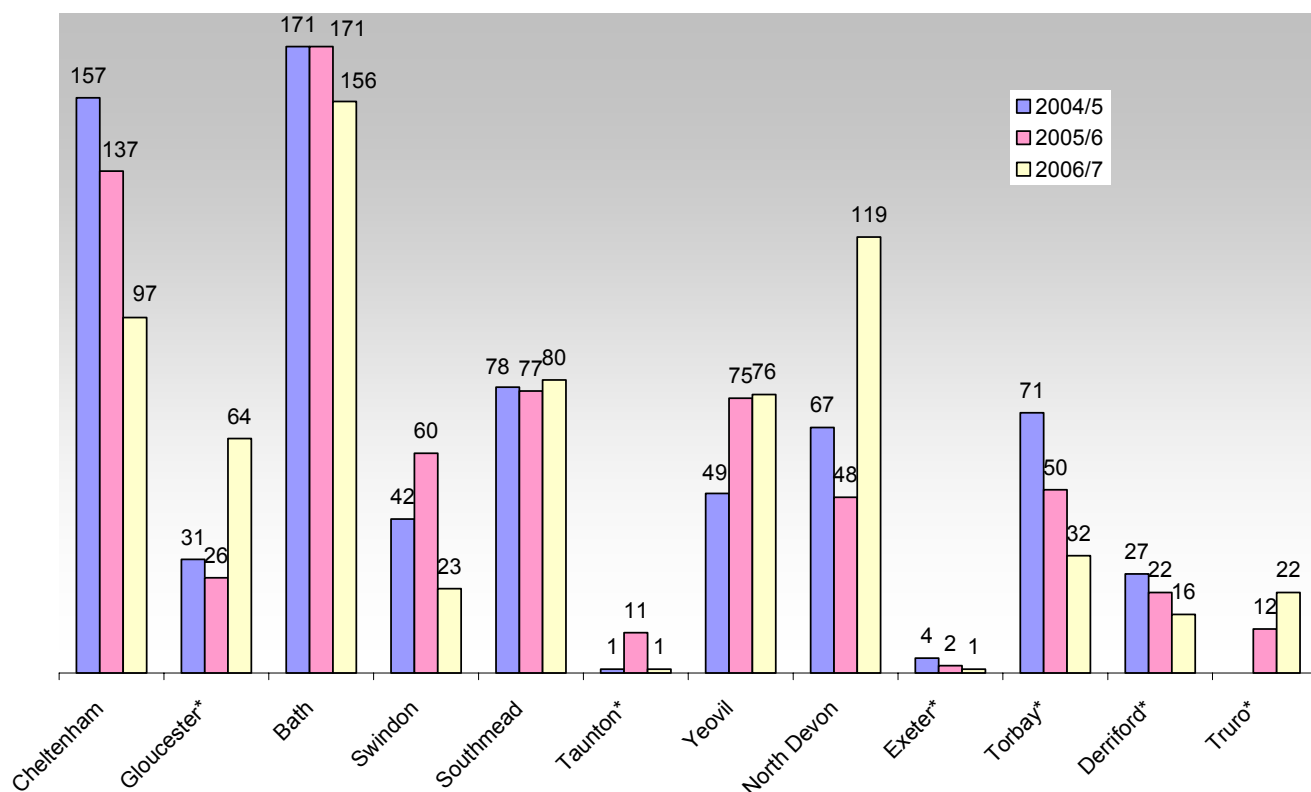
➤ SWACIC data uses hours to calculate the number of bed days occupied, whereas PICANet (the Paediatric Intensive Care Audit Network) counts any fraction of a day occupied as a whole day even if unit stay was only a few hours. This explains the discrepancy seen in the above table. This demonstrates that 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 22 PHDU beds across the region to satisfy demand 95% of the time. There are currently 17 beds (with 2 planned), effectively leaving 2 hospitals to develop 2 beds each. [Bath and Swindon]

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



* = Hospitals with designated PHDU beds

➤ 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.

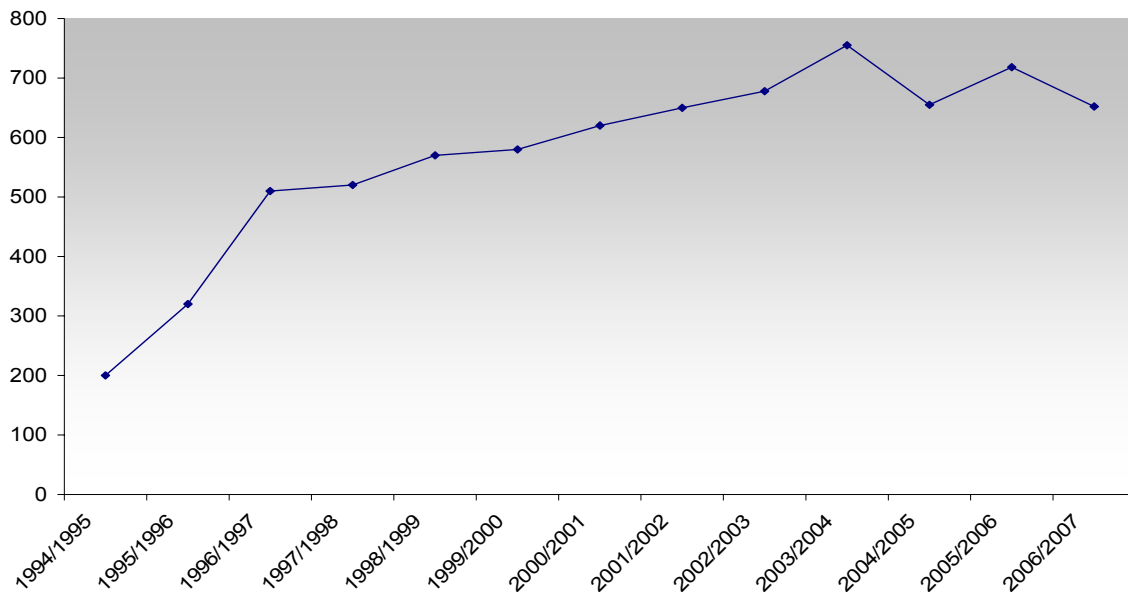
➤ The number of critically-ill children in paediatric ward areas at Cheltenham General Hospital has fallen with changes in the configuration of services locally, such that there are no overnight in-patient facilities. In 2006/7, 60 children meeting criteria were transferred* from Cheltenham to Gloucester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

➤ 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 2006/07, the PICU admitted 652 patients, compared with 719 patients in 2005/06. The overall trends in admission numbers are shown below:



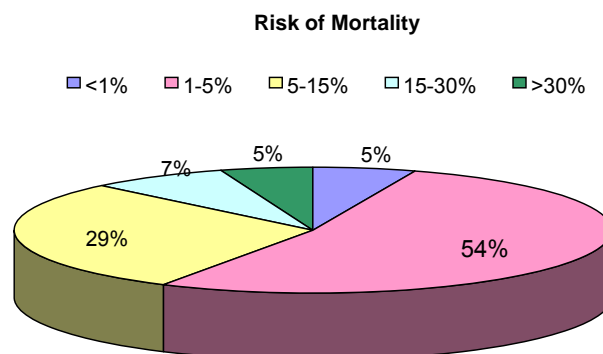
➤ The median length of stay was 2.4 days (2.5 days in 2005/6) with a range of 1 hour to 163 days.

➤ The mean length of stay was 5.8 days (5.5 days in 2005/6). 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	280	170	90	40	30	22	10	9	1

➤ The fall in admissions from the peak of 2003/4 may relate to local policies which have led to a proportion of high dependency children, particularly those supported with long-term ventilation, being admitted to the wards at the Children's Hospital for elective care rather than being admitted to PICU.

Observed vs. Expected Outcome



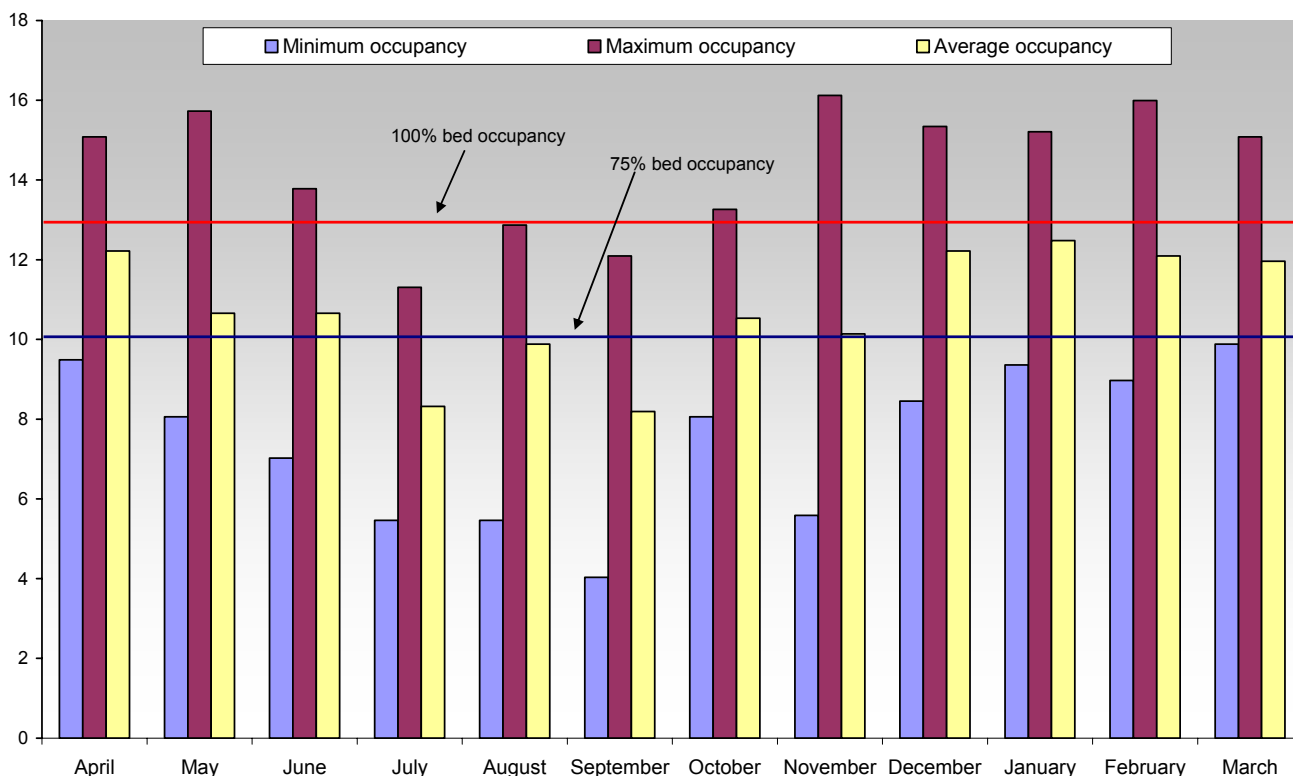
➤ During 2006/7, 46 patients died, giving a crude mortality rate of 0.07 (7%). Predicted mortality using the revised version of the paediatric index of mortality (PIM II) was 7.7% or, 51 deaths. Using this figure, the unit's standardised mortality ratio is 0.91 (0.71 in 2005/6). The apparent increase in mortality is due to the move to the new PIM II calculation, which has been adjusted to reflect improvements in the outcome of paediatric critical care.

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	88	325	161	45	33	652
Predicted Mortality	0.49	8.32	13.3	9.05	20.03	51.19
Actual Mortality	1	14	7	9	15	46

➤ The excess mortality noted in the 1-5% group may relate to incomplete data (e.g. no blood gas performed within 1st hour of contact with PICU) skewing the PIM II calculation downwards.

Bed Occupancy



➤ During 2006/7, although PICU has in the past been funded for 13.4 intensive care beds, only 13 beds were staffed as part of local expenditure savings.

➤ 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 2006/7 the *maximum* funded bed occupancy equalled or exceeded 100% during 10 out of 12 months, i.e. not the summer months, with the *average* funded bed occupancy exceeding 75% in 9 out of 12 months.

➤ Average funded bed occupancy for the year was higher than contract at 82.9% (compared with 87% in the previous year, 2005/6).

➤ On average, there were 54.3 admissions per funded bed during the last year (compared with 53.7 in the previous year, 2005/6).

Refused Retrievals

Compared to the previous year, there was a fall in the number of refused retrieval requests in 2006/7. 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
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

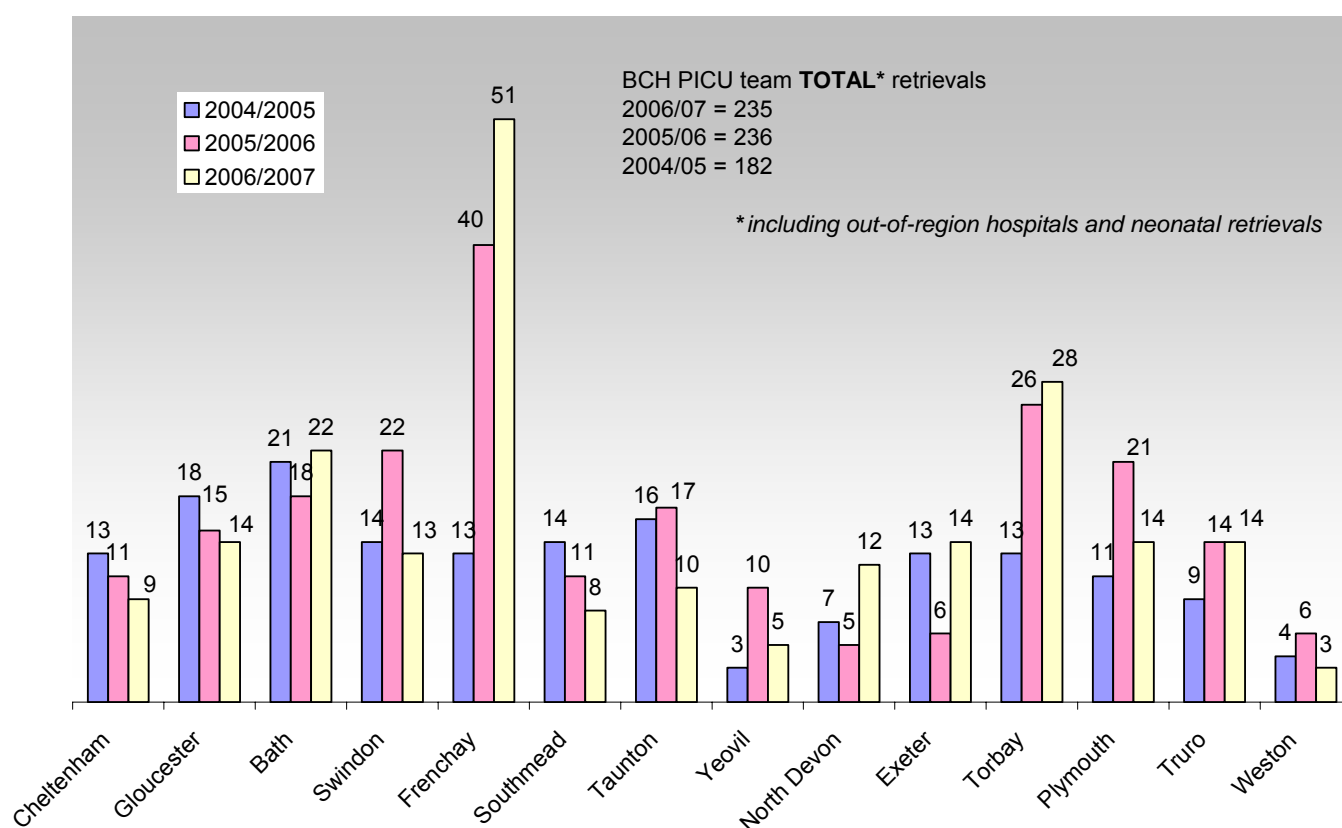
- As usual, the majority of refused retrievals occurred during the winter months when all general PICUs are at their busiest.
- The refused retrievals in June were related to the imposition of the major incident procedure over 1 week preventing admissions to PICU, rather than a lack of available beds or staff.
- 3 refusals were due to the retrieval team already being out on a retrieval. In 2 of these cases the local team brought the child to PICU.

Cancellations of Elective Surgery

Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar
7	1	0	0	1	6	1	5	1	4	0	0

- Cancellations of elective surgery somewhat surprisingly show a marked variation in terms of time of year compared to refused retrievals. This may be due to a reduction in elective surgery during the winter months in anticipation of PICU bed pressures.

6. PICU retrievals performed by Bristol Children's Hospital



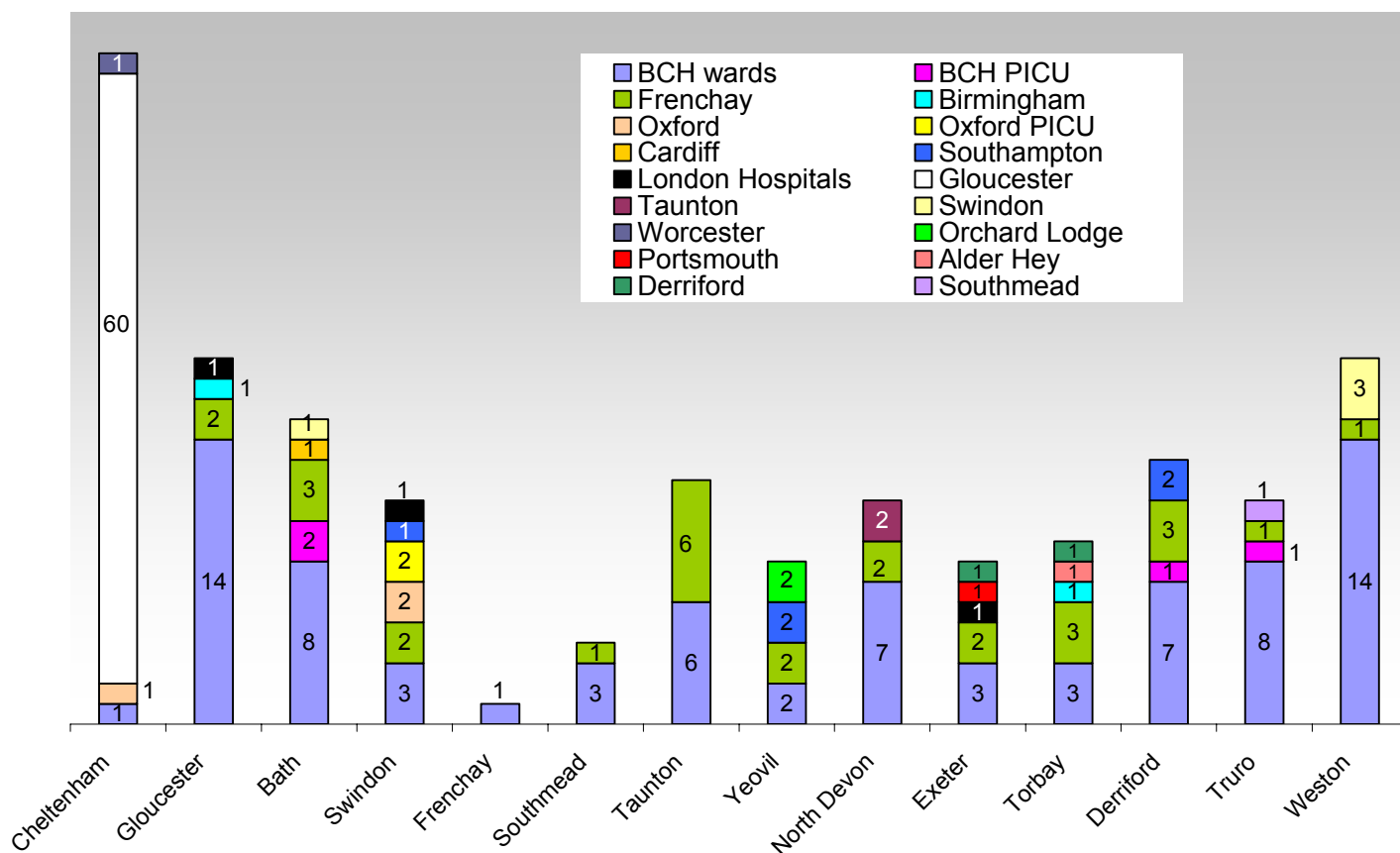
- Retrievals from hospitals out of SW region are not included in this chart.
- The retrieval team undertook 235 retrievals of acutely ill children in 2006-7 of which 217 were from within the South West region. Almost all other retrievals were of cardiac infants and children from South Wales for which 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 47% (110 of 235 retrievals) in 2006-7.
- The marked rise in retrievals from Frenchay corresponds with an increasing neurosurgical workload, with a large number of traumatic head injuries requiring transfer for on-going intensive care management.

PICU retrievals performed by teams outside South West region

- In 2006/7 there were 5 retrievals performed by PICU retrieval teams other than Bristol:

Hospital	2002/3	2003/4	2004/5	2005/6	2006/7
Birmingham	0	2	1	1	0
Cardiff	3	2	3	4	0
Southampton	5	3	3	11	2
Oxford	8	3	0	2	0
GOSH/CATS	0	0	0	3	2
St Mary's/CATS	0	0	0	0	1

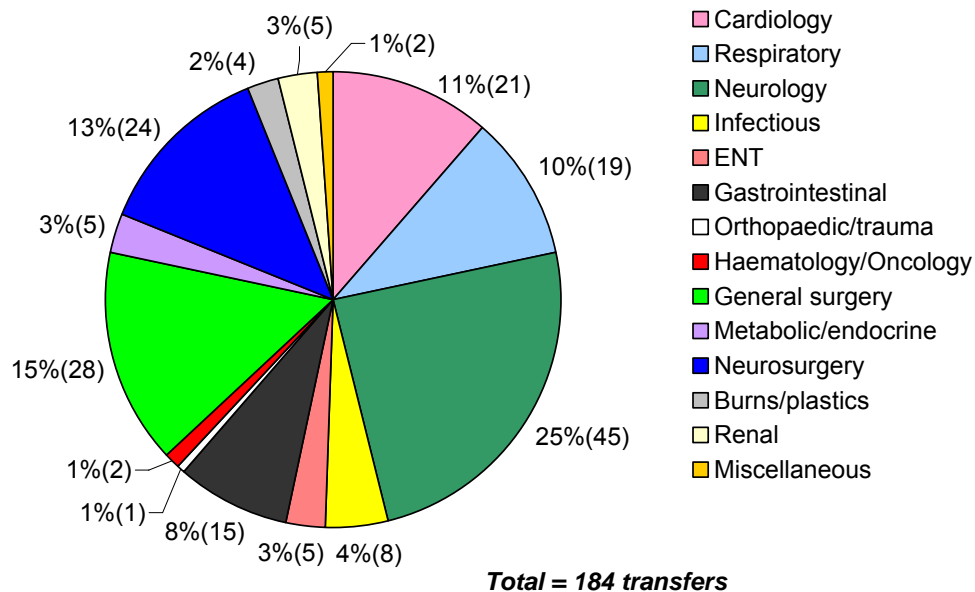
7. Non PICU transfers of children meeting critical illness criteria



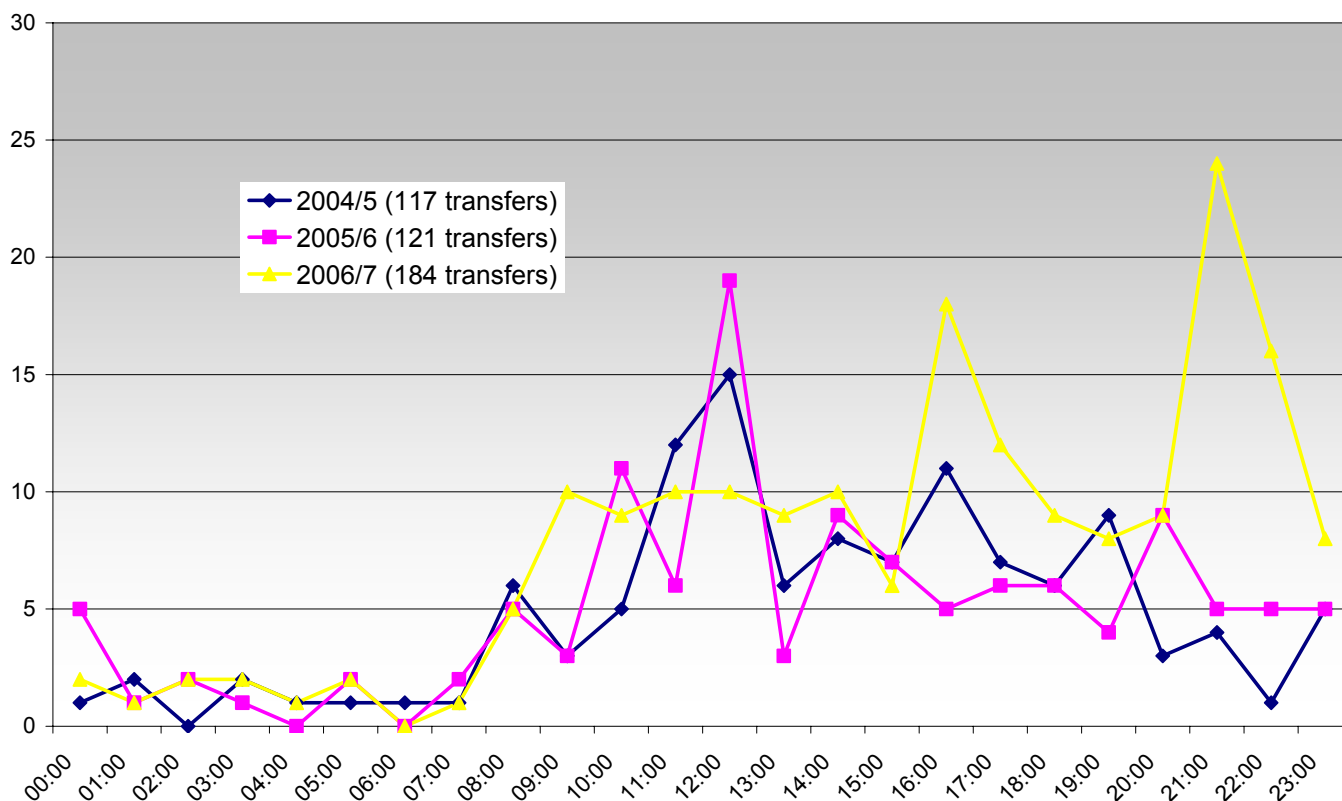
Children taken to PICU by DGH teams

Destination	Age	Referring Hospital	Area	Diagnosis 1	Diagnosis 2
Oxford PICU	4 years	Swindon	ICU	Extradural haematoma	RTA
Oxford PICU	11 years	Swindon	ICU	Cerebral Parenchymal Haemorrhage	ITP
PICU BCH	8 years	Bath	ICU	Tonsillitis	Respiratory Obstruction
PICU BCH	10 months	Bath	ICU	Encephalitis	
PICU BCH	3 months	Derriford	PHDU	Tracheo-oesophageal fistula Tracheostomy	Weaning from mechanically assisted ventilation
PICU BCH	1.3 months	Truro	PHDU	Diaphragmatic paralysis	Domiciliary ventilation

Broad diagnostic categories for non-PICU transfers – 2006-2007

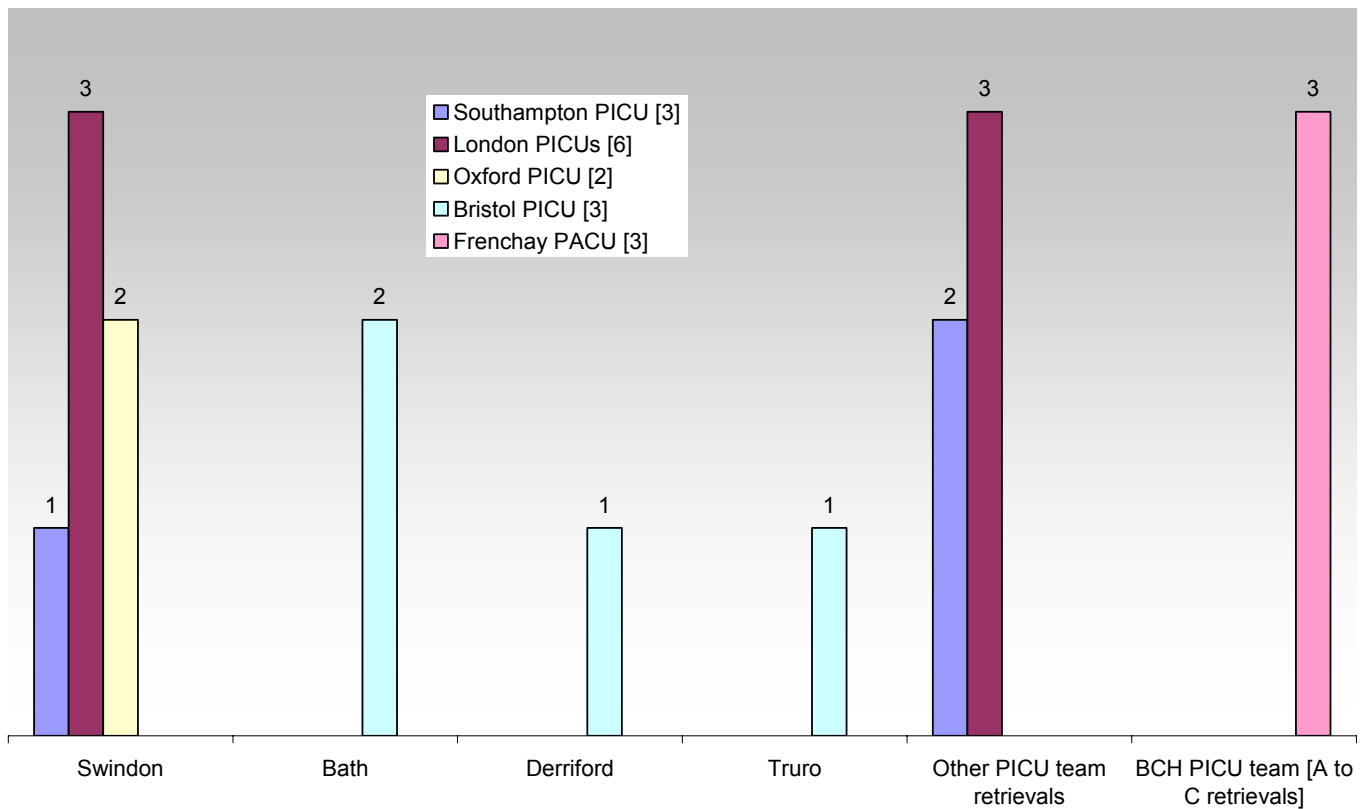


Time of day when non-PICU transfers are carried out - 2006/7



➤ 44% of all transfers occur outside normal working hours. This can be expected to have a significant impact upon available on-call clinical staff.

Transfers to PICU undertaken by referring hospitals teams, by other PICU teams and by Bristol PICU team to PICUs other than Bristol 2006/7



- 71% of these transfers occurred because there was no PICU bed available in Bristol, 17% did not request Bristol PICU and 12% were due to unavailability of PICU team or unknown reasons.

8. Paediatric deaths in South West hospitals - April 2006 to March 2007

Hospital	Admission Area	Age	Reason for admission	Treatment withdrawn?	DNR in place?	Post Mortem?
Cheltenham	Paediatric Ward	22 months	Out-of-hospital arrest, Pulmonary trunk atresia	Failed CPR	No	Yes
Cheltenham	Emergency Dept	16 years	Drowning. Out of hospital arrest	Failed CPR	No	Yes
Cheltenham	Emergency Dept	5months	Out of hospital arrest	Failed CPR	No	Yes
Gloucester	ITU	11 years	Respiratory Failure Cerebral Palsy	Yes	No	Unknown
Gloucester	ITU	10 years	Meningococcal meningitis	Yes	No	Brainstem death
Bath	Paediatric Ward	16 years	Respiratory Failure Quadriplegia	Treatment limited	Yes	Unknown
Bath	Paediatric Ward	17 years	Respiratory Failure Cerebral Palsy	Yes	Yes	Unknown
Bath	Paediatric Ward	11 years	Palliative care	Treatment limited	Yes	Unknown
Bath	Emergency Dept	4 years	VSD. Out of hospital arrest	Failed CPR	No	Yes
Bath	Emergency Dept	1 week	SIDS / Out-of-hospital arrest	Failed CPR	No	Yes
Frenchay	PACU	28 months	Intracranial tumour	Yes	No	Organ donation
Frenchay	PACU	16 years	Hydrocephalus Respiratory Failure	Yes	No	Organ donation
Frenchay	PACU	4 years	Cerebral haemorrhage AVM	Yes	No	Organ donation
Frenchay	PACU	25 months	Cerebral haemorrhage Cardiac arrest	Yes	No	Yes
Frenchay	PACU	18 months	35% burns	Failed CPR	No	Unknown
Yeovil	ITU	14 years	Strangulation Out-of-hospital arrest,	Yes	No	Unknown
Yeovil	Emergency Dept	1 month	SIDS/ Out-of-hospital arrest	Failed CPR	No	Yes
Yeovil	Emergency Dept	16 years	RTA Multi-trauma	Failed CPR	No	Yes
Yeovil	Emergency Dept	1 week	SIDS/ Out-of-hospital arrest	Failed CPR	No	Yes
North Devon	ITU	5 years	Cerebral haemorrhage	Yes	No	Organ donation
Derriford	ITU	15 years	Traumatic brain injury EVD	Yes	No	Organ donation
Derriford	ITU	14 years	Drowning Out-of-hospital arrest,	Yes	No	?Coroner
Derriford	ITU	6 months	Intussusception Sepsis	Failed CPR	No	?Coroner
Derriford	Paediatric HDU	14 years	Cardiomyopathy Heart transplant	Yes	Yes	Yes
Derriford	ITU	10 years	Pneumonia Sepsis Cerebral Palsy	Yes	No	Unknown
Truro	ITU	1 month	SIDS/ Out-of-hospital arrest	Failed CPR	No	Yes
Truro	ITU	30 months	Pneumococcal meningitis	Yes	No	Organ donation
Truro	Emergency Dept	2 months	SIDS/ Out-of-hospital arrest	Failed CPR	No	Yes
Truro	Emergency Dept	1 month	SIDS/ Out-of-hospital arrest	Failed CPR	No	Yes

➤ Data collection comprehensively captures deaths on the wards, HDU and adult ITU. We expect that under reporting occurs in ED, and we have no information on deaths that occur in the community.

➤ Of the 29 children who died and were reported to the Regional Audit, 31% died in the Emergency Dept, 17% died in PHDU/ward, 17% in Frenchay's PACU and 35% died in general ICUs. 45% had failed CPR, whilst 55% had treatment withdrawn or limited. 21% of cases (6) went for organ donation.

➤ Of the 29 deaths, in only 7 cases was PICU contacted. However advice was given regarding 6 of the 10 deaths occurring in general ICUs, and 1 out of 5 deaths on PACU at Frenchay.

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 4 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.

Data analysis and writing of a comprehensive report are currently underway and the report is expected to be published in March 2008.

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 will take 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 www.swretrieval.nhs.uk or by contacting the unit directly on 0117 342 8843.

Appendix A

AUDIT FORM FOR WARD/HDU BASED PAEDIATRIC PATIENTS

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

STUDY No.

<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
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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)

<input type="text"/>	<input type="text"/>
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DO NOT AFFIX PATIENT STICKERS

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

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

SPECIALITY OF CONSULTANT

ADMITTED FROM: HOME GP OPD A&E HDU THEATRE
 ITU/PICU WARD NAME OF WARD

IF TRANSFERRED FROM ANOTHER HOSPITAL, ENTER NAME+WARD AREA OF OTHER HOSPITAL TRANSFERRING TEAM: DGH team SPECIALIST TEAM

Please indicate with a **TICK** if the child fits any of the following **DIAGNOSTIC/CLINICAL CRITERIA**

DIAGNOSTIC/CLINICAL CRITERIA.	YES
Bacterial Meningitis (Proven or suspected)	
Meningococcal Septicaemia (Clinically diagnosed)	
Glasgow Coma Score < 12	
Acute Renal Failure ie Urine output <1ml/kg/hour for >6 hours	
Prolonged (eg: > 20 minutes) or recurrent convulsions	
Cardiac Arrhythmia – excluding sinus bradycardia/tachycardia	
4 x Apnoeic episodes within 12 hours (requiring stimulation)	
Burns of >10%	
Poisoning/substance misuse with the POTENTIAL for significant problems	

Please indicate with a **TICK** if the child required any of the following **INTERVENTION and NURSING CRITERIA** (Indicate **ALL** that apply to THIS admission)

INTERVENTION CRITERIA	YES
FIO2 > 40% for >6 hours	
Nebulised bronchodilators >1 per hour, for >6 hours OR IV Aminophylline/Salbutamol at any time.	
Nebulised Adrenaline at any time.	
Airway Intervention / Support. Please specify below: a) Naso-pharyngeal or Guedal airway b) ETT c) Tracheostomy (please circle)	
Mechanical ventilatory support (including CPAP)	
Invasive Monitoring eg: Arterial line/ CVP line	
Intravenous Fluid Bolus > 10mls/kg at any time	
Intravenous Inotropic Support	
Temporary Cardiac Pacing	
CPR	
Peritoneal Dialysis/Haemodialysis	
Treatment of complicated metabolic alkalosis/acidosis AND/OR severe electrolyte imbalance. eg: DKA	
NURSING CRITERIA	
Pre or post-operative patients following complex surgery (eg: spinal or multi trauma) and/or requiring complex fluid /analgesia management. See explanatory notes.	
The patient with intractable pain eg: acute pancreatitis or oncological conditions	

DIAGNOSTIC DETAILS

Primary diagnosis

Secondary diagnosis

Operative procedure

Co-morbidity

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

Discharge DESTINATION:

Was the patient's condition discussed with BCH PICU at any time? YES

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)

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 PICU 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 (please circle)
--	-------------------------------

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

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

Please enter the **FIRST** value of each variable measured within **one hour** after first contact with ICU doctor.

Response of pupils to bright light >3mm and both fixed = 1, other = 0, 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 <input type="checkbox"/> Face mask with reservoir bag <input type="checkbox"/> Nasal cannulae or face mask <input type="checkbox"/> Head box <input type="checkbox"/> Endotracheal tube <input type="checkbox"/> Tracheostomy <input type="checkbox"/> Unknown <input type="checkbox"/>	
SYSTOLIC blood pressure in mmHg	
CPAP at any time Nasal <input type="checkbox"/> Facial <input type="checkbox"/> Pronged <input type="checkbox"/>	YES / NO (please circle)
Mechanical ventilation at any time in FIRST HOUR	YES / NO (please circle)

PLEASE TURN OVER

DIAGNOSTIC DETAILS

Primary diagnosis

Secondary diagnosis

Operative procedure

Co-morbidity

ADMISSION DETAILS

Was the child ventilated at **any time** during ITU admission? YES NO

IF YES, please enter the total number of hours ventilated

Did the child receive **inotropes** during ITU admission? YES NO

Did the child receive **renal support** during ITU stay? (Eg: CVVH or PD) YES NO

Please enter the Maximum Intensive care Dependency Levels for each day of ITU stay: (See explanatory notes for definitions)

ITU day number	Highest Level of Intensive care 1 - 3	ITU day number	Highest Level of Intensive care 1 - 3	ITU day number	Highest Level of Intensive care 1 - 3
1		5		9	
2		6		10	
3		7		11	
4		8		12	

DISCHARGE INFORMATION

Was there a delay in ITU discharge? YES NO If YES, why?

Date/Time of Discharge/...../..... hrs 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 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.
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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, SpO₂, & 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.

- **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://www.swretrieval.nhs.uk/Guidelines/Regional%20Retrieval%20Guideline.doc>

Appendix E

Children admitted to general intensive care units whose stay exceeded 24 hours and reached a dependency of Level 2 or above who may have been considered for PICU referral 2006-2007

Hospital	Age	Length of stay (days)	Reason for admission	Length of ventilation (hrs)	Contact with PICU BCH?	Destination
Exeter	8 years	3.9	Secondary tonsillectomy haemorrhage	18	No	Ward
Exeter	21 months	1.9	Meningococcal sepsis	16	Yes (retrieval team out)	Ward
Torbay	14.8 years	4.5	Meningitis	63	Yes (unit full)	Ward
Torbay	14 years	2.9	HOCM	68	Yes (advice at 24hrs)	PICU
Torbay	4 years	2.1	Status Epilepticus	28	Yes (unit full)	PHDU
Derriford	12.5 years	3.2	Status Epilepticus	77	Yes (advice at 24hrs)	PICU
Derriford	8.8 years	2.3	Croup	30	Yes (advice within 24hrs)	PHDU
Derriford	9.6 years	2.2	Asthma	29	Yes (advice within 24hrs)	PHDU
Derriford	26 months	3	Status Epilepticus	48	Yes (advice within 24hrs)	PHDU
Derriford	11.8 years	3.6	Epiglottitis	75	Yes (advice at 24hrs)	PHDU
Derriford	3.8 years	3	Epiglottitis	68	Yes (advice at 24hrs)	PHDU
Truro	12.8 years	2	Meningococcal sepsis	20	No	PHDU
Truro	5 years	3	Meningococcal sepsis	48	Yes (unit full)	PHDU
Truro	2.8 years	2	Asthma	26	Yes (advice within 24hrs)	Ward

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