



Paediatric Intensive Care Audit Network

National Paediatric Critical Care Audit

State of the Nation Report 2023



Summary Report

Data collection period: January 2020 – December 2022

Published 2023











Contents

Introduction	3
Key Messages	3
National Recommendations	4
Admissions to Paediatric Intensive Care Units	5
Mortality within PICUs	7
Key Metrics	8
Metric 1: Case ascertainment and timeliness of data submission for 2022 admissions	8
Metric 2: Transport team mobilisation times	9
Metric 3: Emergency readmissions within 48 hours	10
Metric 4: Unplanned extubations in PICU	11
Metric 5: Mortality in PICU	12
Organisation Key	13

Online resources

We have a range of resources to accompany this report online.

The <u>Infographic</u> highlights some of the report's key findings in relation to paediatric critical care activity between 2020 and 2022.

The <u>Appendices</u> contain acknowledgements to the paediatric critical care community, as well as background information and methodology about the audit.

A set of tables and figures are available for download from the <u>Report webpage</u>. They document transport and admissions activity within paediatric critical care between 2020 and 2022.

We provide a range of **Quality Improvement Resources** for participating organisations.

New resources to explore are:

- The <u>PICANet Data Dashboard</u>, which is a selection of charts showing data relating to some of PICANet's key metrics. Clinical teams involved with patient care can use these along with other resources that PICANet provide to develop local quality improvement strategies and compare compliance with audit performance metrics. The dashboard will be refreshed on a quarterly basis.
- Information to support the collection of data related to healthcare associated infections and delirium.

Other key resources include:

- <u>Risk-adjusted Resetting Sequential Probability Ratio Test (RSPRT) plot guidance for units</u> to assist PICUs in identifying and responding to potential issues with quality of care in a timesensitive fashion. The guidance includes a case study from a PICU team that responded to a RSPRT reset, which was a cause for concern requiring internal review.
- Signposting to guidance and resources for the collection and recording of ethnicity to improve data completeness and quality.

This State of the Nation Report 2023 is the twentieth PICANet annual clinical audit report describing paediatric critical care activity which occurred within Level 3 paediatric intensive care units and Specialist Paediatric Critical Care Transport Services in the United Kingdom (UK) and Republic of Ireland (ROI) between 2020 and 2022.

The report describes key information on transport and admission events collected by the National Paediatric Critical Care Audit to monitor the delivery and quality of care in relation to agreed standards and evaluate clinical outcomes to inform national policy in paediatric critical care.

We report on five key metrics relevant to Paediatric Intensive Care services: case ascertainment including timeliness of data submission, retrieval mobilisation times, emergency readmissions within 48 hours of discharge, unplanned extubation in PICU and mortality in PICU.

The National Paediatric Critical Care Audit is commissioned by the Healthcare Quality Improvement Partnership (HQIP) as part of the National Clinical Audit and Patient Outcomes Programme (NCAPOP), the Welsh Health Specialised Services, NHS Lothian and NHS Greater Glasgow and Clyde, the Royal Belfast Hospital for Sick Children, The National Office of Clinical Audit (NOCA) for the Republic of Ireland and HCA Healthcare UK.

HQIP is led by a consortium of the Academy of Medical Royal Colleges, the Royal College of Nursing, and National Voices. Its aim is to promote quality improvement in patient outcomes, and in particular, to increase the impact that clinical audit, outcome review programmes and registries have on healthcare quality in England and Wales. HQIP holds the contract to commission, manage, and develop the National Clinical Audit and Patient Outcomes Programme (NCAPOP), comprising around 40 projects covering care provided to people with a wide range of medical, surgical and mental health conditions. The programme is funded by NHS England, the Welsh Government and, with some individual projects, other devolved administrations and crown dependencies <u>www.hqip.org.uk/national-programmes</u>.

Professor Elizabeth S. Draper

Professor Richard G. Feltbower

Principal Investigators

Key Messages

- The number of admissions to paediatric intensive care across the UK and Republic of Ireland (ROI) increased by 3% from 18,307 in 2021 to 18,774 in 2022. This increase was reflected across all countries of the UK and ROI except Northern Ireland, where a small decrease was observed.
- Two in every five admissions to PICUs were accounted for by those aged under 1 year. A further quarter of admissions occurred in those aged 1-4 years and these proportions remained similar between 2020 and 2022.
- Children were more likely to be admitted to PICU if they came from the most deprived areas of England, Wales and Scotland. Similarly, children from the most affluent areas were least likely to be admitted. These patterns remained stable during the three-year reporting period.
- The ethnic distribution of admissions was similar between 2020 and 2022. 63% of admissions were of 'White' ethnic origin, 12% 'Asian', 5% 'Black' and 8% 'Mixed' or 'Other' ethnic minority origin.
- In England, admission rates were much higher among those from 'Asian' and 'Black' ethnic groups (17 per 10,000 population) compared to 'White' and 'Mixed' ethnic groups (10 per 10,000 population).
- Completeness of known data on ethnic group did not improve between 2021 and 2022, remaining around 88-89%.

- Respiratory admissions comprised just over 30% of all PICU activity in 2022, an increase from 27% in 2021 and 22% in 2020.
- The vast majority of children admitted to PICU survived with 96.1% of admissions discharged alive in 2022. There was a slight increase in mortality from 3.3% of admissions in 2021 to 3.9% in 2022.
- Of all child deaths in the population of the UK and ROI, the percentage occurring within PICU increased slightly to 18% in 2022 from 15% in 2021 and 2020 with the UK seeing an increase (14% in 2021 to 18% in 2022) and the ROI a decrease (28% in 2021 to 21% in 2022) in these proportions.
- In 2022, the target for timeliness of data submission to PICANet was changed from three months to two months from the date of discharge. Overall, 80% of all admissions were submitted within the two-month standard across all UK and ROI PICUs¹. Nineteen units submitted over 80% of their admissions within two months (PCCS Quality Standard 2021).
- The number of non-elective transports to a PICU increased slightly from 4,324 in 2021 to 4,505 in 2022. Of those journeys carried out in 2022, 67% were started within 30 minutes vs 65% in 2021 and 64% in 2020, whilst over 83% started within one hour of the clinical decision being made. Overall, 4% of journeys in 2022 started more than three hours after the decision was made, a similar finding to 2020 and 2021.
- The proportion of emergency readmissions within 48 hours of discharge for the UK and ROI decreased slightly from 1.7% in 2021 to 1.5% in 2022. Rates were slightly higher in Scotland (2.0%) in 2022 and lower in Northern Ireland (0.7%).
- Reported rates of unplanned extubations for the UK and ROI remained steady with an overall rate of 4.5 per 1,000 ventilated days in all three report years. There was a consistent increase in reported rates in Northern Ireland from 0.9 in 2020 to 6.4 in 2022. 17 out of 30 PICUs (57%) had an unplanned extubation rate below 5.0 in 2022 (NHS England target 2021/22).
- No units were identified as negative statistical outliers for mortality between 2020 and 2022. One unit was identified as a positive outlier for mortality with much lower numbers of deaths than what was expected.

National Recommendations

- Investigate reasons for higher PICU admission rates among Asian and Black children and those from the most deprived areas of the UK.
 Action: Paediatric Critical Care Society Study Group to identify this as a research priority, National Institute for Health and Care Research to fund the research. Collaborate and share research findings with NHS England's CYP Transformation and Health Inequalities Improvement teams for dissemination to ICBs / networks as well as use in implementation of preventative pathways.
- Develop a strategy to optimise compliance with Paediatric Critical Care Society Quality Standard T-703 Key Performance Indicator, "Departure of team from base or re-tasking within 30 minutes of decision that a critical care transport is required".
 Action: Paediatric Critical Care Society Acute Transport Group to develop a strategy with support from Paediatric Critical Care Operational Delivery Networks to understand local variation.

¹ These figures are calculated based on the period July – December 2022 following the PICANet database outage between March – June 2022.

		202	20	202	1	202	2	2020-2	022
		n	%	n	%	n	%	n	%
Total			30.8	18,307	34.1	18,774	35.0	53,608	
Sex	Male	9,403	56.9	10,303	56.3	10,629	56.6	30,335	56.6
	Female	7,124	43.1	8,004	43.7	8,145	43.4	23,273	43.4
dn (<1	7,028	42.5	7,464	40.8	7,807	41.6	22,299	41.6
Age group (years)	1-4	3,976	24.1	4,625	25.3	4,662	24.8	13,263	24.7
Je (5-10	2,746	16.6	3,012	16.5	3,148	16.8	8,906	16.6
ĂÇ	11-15	2,777	16.8	3,206	17.5	3,157	16.8	9,140	17.0
	White	10,343	62.6	11,573	63.2	11,726	62.5	33,642	62.8
Ę	Mixed/Multiple ethnic groups	562	3.4	671	3.7	694	3.7	1,927	3.6
lici	Asian/Asian British	1,889	11.4	2,174	11.9	2,195	11.7	6,258	11.7
Ethnicity	Black/African/Caribbean/Black British	868	5.3	1,025	5.6	1,010	5.4	2,903	5.4
ш	Other	572	3.5	747	4.1	1,027	5.5	2,346	4.4
	Unknown/not stated	2,293	13.9	2,117	11.6	2,122	11.3	6,532	12.2
_	1 (Most deprived areas)	4,400	26.6	4,743	25.9	4,866	25.9	14,009	26.1
lior	2	3,220	19.5	3,442	18.8	3,641	19.4	10,303	19.2
vat	3	2,641	16.0	2,937	16.0	2,887	15.4	8,465	15.8
Deprivation	4	2,109	12.8	2,336	12.8	2,417	12.9	6,862	12.8
De	5 (Least deprived areas)	1,937	11.7	2,309	12.6	2,215	11.8	6,461	12.1
	Not included	2,220	13.4	2,540	13.9	2,748	14.6	7,508	14.0
	England (NHS)	13,025	78.8	14,260	77.9	14,532	77.4	41,817	78.0
2	England (non-NHS)	231	1.4	240	1.3	278	1.5	749	1.4
Int	Wales	363 1,178	2.2	372	2.0	396	2.1	1,131	2.1
Sol	Scotland		7.1	1,375	7.5	1,509	8.0	4,062	7.6
U	Northern Ireland	353	2.1	443	2.4	425	2.3	1,221	2.3
	Republic of Ireland	1,377	8.3	1,617	8.8	1,634	8.7	4,628	8.6

Percentages are calculated within category by column, except for totals which are calculated across rows. Deprivation scores were calculated for residents of England, Wales and Scotland admitted to a PICU in those nations. Deprivation score was based on the location of residence of the child using the Children in low-income measure (HMRC, 2014). Categories are equivalised to contain equal populations. Where a child's address was unknown, score unavailable, or admission was resident outside England, Wales, or Scotland, these were added to the 'Not included' row. Ethnicity categories were defined using Office for National Statistics definitions (Ethnic group, national identity, and religion). 'Country' refers to country of admission rather than residence of the child.

Table 1a shows the number of admissions recorded in paediatric intensive care units (PICUs) across the UK and Republic of Ireland (ROI) according to socio-demographic factors by year of admission. Total admissions have increased year on year, with a further increase from 18,307 in 2021 to 18,774 in 2022 (an increase of 2.6%). The overall increases in admissions between 2021 and 2022 are generally reflected within the nations that make up the UK and ROI, although there was a small decrease in Northern Ireland. The overall proportion of admissions was higher for males than females (56.6% vs 43.4%), which was constant over the three-year reporting period. Around 40% of all admissions were accounted for by those under 1 year of age; this proportion was constant over time. Children from the most deprived areas of England, Wales and Scotland were over-represented in terms of admissions to PIC, whereas children from the least deprived areas were under-represented. There was a general trend that children from more deprived areas were more likely to be admitted to paediatric intensive care than those from less deprived areas.

The ethnicity distribution of admissions was broadly constant over the three-year period. Despite some progress made on reducing the proportion of admissions where ethnicity was classified as 'Unknown' or 'Not stated' since 2020, it still accounted for 11% of all admission records.

Table 1b shows that 67.0% of PIC admissions in England were of 'White' ethnic origin, compared to 78.1% of all children being white in the general population. The admission rate for white children to PIC was 9.6 per 10,000, similar to children from the 'Mixed' group (9.8 per 10,000), but much lower than the 'Asian' and 'Black' ethnic groups, who had equivalent rates of 17.2 and 16.9 respectively.

Table 1b: Admission rate per 10,000 population by ethnicity (England only)

	Average a admissi		Child population	Admissions/	
	n	%	n	%	10,000 pop
White	7,826	67.0	8,187,293	78.1	9.6
Mixed/multiple ethnic group	557	4.8	566,087	5.4	9.8
Asian/Asian British	1,843	15.8	1,069,275	10.2	17.2
Black/African/Caribbean/Black British	885	7.6	524,155	5.0	16.9
Other	577	4.9	136,280	1.3	42.4
Total	11,688		10,483,090		11.1

Admissions are for an average year in the three-year reporting period, and exclude admissions that had ethnicity recorded as 'unknown' or 'not stated'. Population is based upon 2021 mid-year population estimates (ONS, 2022). Population within each ethnic group is calculated using data from the 2011 census (table LC2109EWIs) and will be updated when the 2021 census data are available.

Table 2: Admissions by primary diagnostic group and year

Primary diagnosis	2020		2021		2022		2020-2022	
	n	%	n	%	n	%		%
Respiratory	3,574	21.6	4,894	26.7	5,723	30.5	14,191	26.5
Cardiovascular	4,860	29.4	4,740	25.9	4,559	24.3	14,159	26.4
Neurological	1,906	11.5	2,102	11.5	2,192	11.7	6,200	11.6
Gastrointestinal	1,190	7.2	1,140	6.2	1,098	5.8	3,428	6.4
Infection	803	4.9	816	4.5	991	5.3	2,610	4.9
Musculoskeletal	715	4.3	778	4.2	823	4.4	2,316	4.3
Oncology	784	4.7	775	4.2	733	3.9	2,292	4.3
Endocrine / metabolic	807	4.9	1,034	5.6	800	4.3	2,641	4.9
Other	1,883	11.4	2,015	11.0	1,825	9.7	5,723	10.7
Unknown	5	<0.1	13	0.1	30	0.2	48	0.1
Total	16,527		18,307		18,774		53,608	

Diagnosis groups represented by 'Other' are: Blood / lymphatic, Body wall and cavities, Trauma, Multisystem, and Other.

Respiratory primary diagnoses increased consistently and markedly over the three-year period of this report, comprising 30% of all admissions in 2022 representing a return to levels from pre-2020. Other primary diagnoses remained the same between 2021 and 2022 except for a decrease in endocrine/metabolic admissions but this still remains higher than pre-2020.

Mortality within PICUs

	2020		2021		2022		2020-2022	
Country of admission	n	%	n	%	n	%	n	%
England	491	3.7	495	3.4	608	4.1	1,594	3.7
Wales	12	3.3	15	4.0	14	3.5	41	3.6
Scotland	27	2.3	23	1.7	32	2.1	82	2.0
Northern Ireland	7	2.0	11	2.5	17	4.0	35	2.9
Republic of Ireland	54	3.9	65	4.0	55	3.4	174	3.8
Total	591	3.6	609	3.3	726	3.9	1,926	3.6

Table 3: Proportion of deaths in PICU of all PICU admissions, by country and year of admission

Table 4: Proportion of deaths in PICUs of all children's deaths in the population: UK and Republic of Ireland

Country	2020	2021	2022	2020-2022
UK	14.7% (n=537)	14.2% (n=544)	17.7% (n=671)	15.5%(n=1,752)
ROI	21.2% (n=54)	27.5% (n=65)	21.1% (n=55)	23.1% (n=174)
UK and ROI	15.1% (n=591)	15.0% (n=609)	17.9% (n=726)	16.0% (n=1,926)

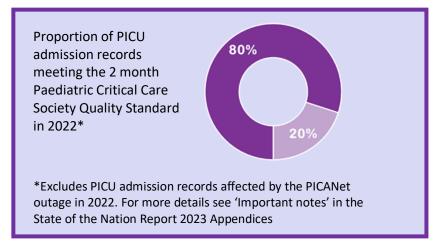
Please note that the 2022 data for children's deaths in the population are not currently available for England, Wales and Northern Ireland. For these nations the 2021 data are used as the population data in 2022.

Numbers of admissions resulting in death when admitted to a PICU remain low. Overall, 96.4% of children admitted to a PICU survived and were discharged alive. The proportion of admissions resulting in death increased from 2021 to 2022, from 3.3% to 3.9%. In Northern Ireland the proportion of deaths increased from 2.5% to 4.0% between 2021 and 2022, although the single PICU in Northern Ireland was not identified as an outlier for mortality when risk adjustment was taken into account (see figure 5). Around 18% of all childhood deaths in the UK in 2022 occurred within a PICU, although this figure was higher in the ROI (21%).

Key Metrics

Metric 1: Case ascertainment and timeliness of data submission for 2022 admissions

Figure 1: Proportion of admission records completed within 2 months of discharge from PICU, 2022: UK and Republic of Ireland



A PICANet database outage took place between March and June 2022. These figures are therefore restricted to the period following the outage from July – December 2022. 80% of admissions were completed within two months of discharge. This is lower than 88% in 2021, although the timeliness threshold in 2021 was completion within three months of discharge. Despite these challenges, nineteen units submitted over 80% of their admissions within two months (PCCS Quality Standard 2021), outside the period affected by the outage.

Metric 2: Transport team mobilisation times

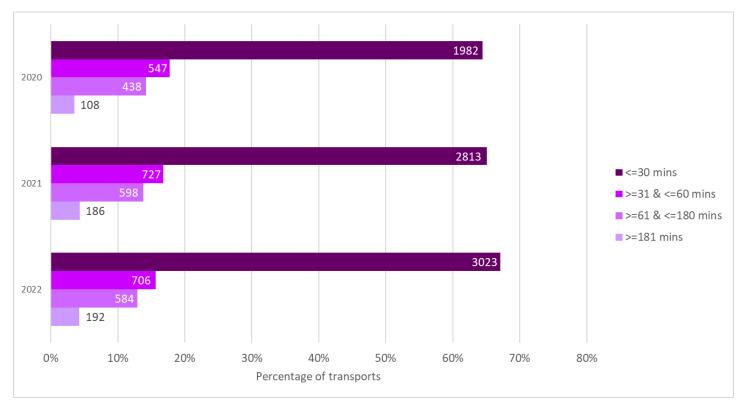


Figure 2: Number of non-elective transports to PICU by time to mobilisation: UK and Republic of Ireland

The number of non-elective transports undertaken by a paediatric critical care transport team to a PICU increased slightly from 4,324 in 2021 to 4,505 in 2022 (Figure 2). Of those journeys carried out in 2022, 67% were started within 30 minutes vs 65% in 2021 and 64% in 2020, whilst over 83% started within one hour of the clinical decision being made. Just over 4% of journeys in 2022 started more than three hours after the decision to transport the child to PICU, similar to 2020 and 2021.

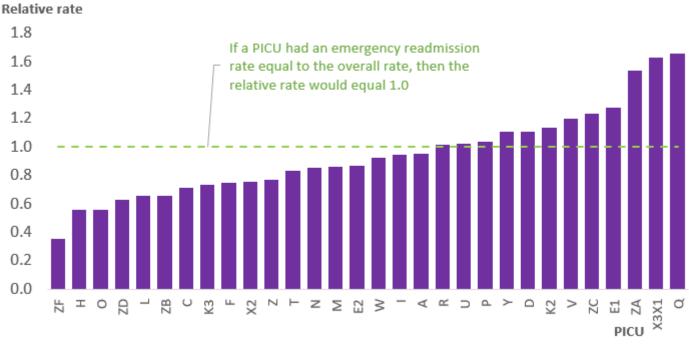
Metric 3: Emergency readmissions within 48 hours

	2020		2021		2022		2020-2022	
Country of admission	n	%	n	%	n	%	n	%
England	216	1.7	229	1.6	219	1.5	664	1.6
Wales	4	1.1	4	1.1	5	1.3	13	1.1
Scotland	25	2.1	33	2.4	30	2.0	88	2.2
Northern Ireland	4	1.1	6	1.4	3	0.7	13	1.1
Republic of Ireland	24	1.7	30	1.9	24	1.5	78	1.7
Total	273	1.7	302	1.7	281	1.5	856	1.6

Table 5: Emergency readmission within 48 hours of discharge by country of admission

The proportion of emergency readmissions within 48 hours of discharge for the UK and ROI decreased slightly from 1.7% in 2021 to 1.5% in 2022. Proportions were slightly higher in Scotland (2.0%) in 2022 and lower in Northern Ireland (0.7%).

Figure 3: Relative rate of emergency readmission within 48 hours of discharge by PICU, 2020-2022



Organisation Key

The overall emergency readmission proportion within 48 hours decreased from 1.7% in 2021 to 1.5% in 2022 (Table 5). This was driven by a decrease in England, Scotland, Northern Ireland and Republic of Ireland. Proportions remained higher in Scotland when compared to all other nations and lower in Northern Ireland.

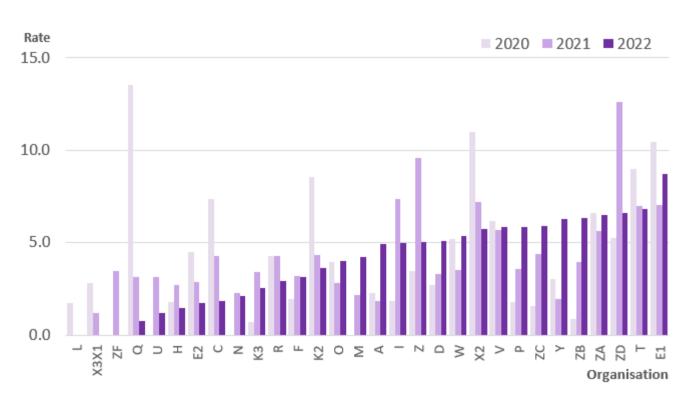
There were also substantive differences in emergency readmission rates by unit, which varied between 0.3% and 1.7% the overall UK and ROI rate (Figure 3).

Metric 4: Unplanned extubations in PICU

Country of admission	2020		2021		2022		2020-2022	
aumission	n	rate	n	rate	n	rate	n	rate
England	191	4.5	209	4.3	229	4.2	629	4.4
Wales	5	7.4	3	4.4	2	1.8	10	4.1
Scotland	18	5.7	16	4.8	23	6.5	57	5.7
Northern Ireland	1	0.9	5	4.0	8	6.4	14	3.8
Republic of Ireland	12	2.4	31	6.2	30	6.1	73	4.9
Total	227	4.4	264	4.5	292	4.5	783	4.5

Table 6: Unplanned extubation rates per 1,000 days of invasive ventilation by country and year

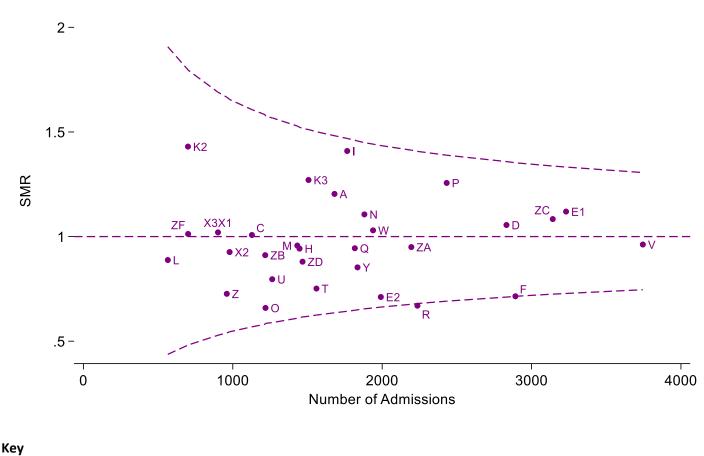
Figure 4: Unplanned extubation rates per 1,000 days of invasive ventilation by health organisation, all admissions, 2020-2022



Organisation Key

The rate of unplanned extubations across the UK and ROI remained constant over the reporting period at 4.5 per 1,000 days of invasive ventilation (Table 6). In 2022, higher rates were evident in Scotland (6.5), Northern Ireland (6.4) and ROI (6.1), although a consistent year-on-year increase was only observed in Northern Ireland. Two units had no unplanned extubation events reported on PICANet for 2022. Seventeen PICUs demonstrated a decrease in their unplanned extubation rate when compared to 2021, with 12 units reporting an increase in their rate (Figure 4). In 2022, seventeen PICUs (57%) met the NHS England target (PIC08a) of an unplanned extubation rate below 5.0 per 1000 ventilated days.

Figure 5: Risk-adjusted Standardised Mortality Ratio (SMR) by health organisation for under 16-year-olds, 2020– 2022



_____ SMR = 1 (expected deaths are equal to observed deaths)

---- 99.9% control limits²

Organisation Key

There were no PICUs with an excess mortality rate compared to what would be expected based on the level of sickness at the time of admission across the three-year reporting period. This is demonstrated in Figure 5, where none of the unit-specific SMR estimates are above the top control chart limit. One unit, Southampton Children's Hospital (organisation code R), had lower mortality rates than would be expected and was therefore classified as a positive outlier.

² For more information please see the <u>PICANet outlier policy</u>

Organisation Key

Α	Addenbrooke's Hospital, Cambridge
С	Noah's Ark Children's Hospital for Wales, Cardiff
D	Royal Manchester Children's Hospital
E1	Great Ormond Street Hospital, London (PICU/NICU)
E2	Great Ormond Street Hospital, London (CICU)
F	Evelina London Children's Hospital
н	King's College Hospital, London
1	Leeds Children's Hospital
K2	Freeman Hospital, Newcastle upon Tyne
K3	Great North Children's Hospital, Newcastle upon Tyne
L	Royal Stoke University Hospital
M	Nottingham Children's Hospital, Queens Medical Centre, Nottingham
N	John Radcliffe Hospital, Oxford
0	Royal Brompton Hospital, London
Р	Alder Hey Children's Hospital, Liverpool
Q	Sheffield Children's Hospital
R	Southampton Children's Hospital
S	James Cook University Hospital, Middlesbrough (not included in key metrics)
т	St George's Hospital, London
U	St Mary's Hospital, London
v	Birmingham Children's Hospital
w	Bristol Royal Hospital for Children
X2	Leicester Royal Infirmary CICU
X3X1	Leicester Royal Infirmary CPICU (previously known as Glenfield Hospital, Leicester)
Y	Royal Hospital for Children and Young People, Edinburgh
z	The Royal London Hospital
ZA	Royal Hospital for Children, Glasgow
ZB	Royal Belfast Hospital for Sick Children
zc	Children's Health, Ireland, Crumlin formerly Our Lady's Children's Hospital, Crumlin, Dublin
ZD	Children's Health, Ireland, Temple Street, formerly Temple Street Children's University Hospital, Dublin
ZE	Harley Street Clinic, London (not included in key metrics)
ZF	The Portland Hospital, London
T001	Children's Acute Transport Service (CATS)
T002	Embrace: Yorkshire & Humber Infant & Children's Transport Service
T003	North West and North Wales Paediatric Transport Service (NWTS)
T004	South Thames Retrieval Service (STRS)
T005	KIDS Intensive Care and Decision Support
T008	Southampton Oxford Retrieval Team (SORT)
T010	Northern Ireland Specialist Transport and Retrieval (NISTAR) Paediatric
T020	Scotland Specialist Transport and Retrieval (ScotSTAR)
T022	Irish Paediatric Acute Transport Service (IPATS)
T024	Wales and West Acute Transport for Children (WATCh)
T026	North East Children's Transport and Retrieval Service (NECTAR)
T027	Children's Medical Emergency Transport Service (CoMET)
T028	Heart Link ECMO Children's Service (included in Tables & Figures only)

T028 Heart Link ECMO Children's Service (included in Tables & Figures only)

T032 Paediatric and Neonatal Decision Support and Retrieval Service (PaNDR)

Published in the UK by the Paediatric Intensive Care Audit Network (PICANet). This work is copyright. Apart from any use as permitted under the Copyright, Designs and Patents Act 1988, no part may be reproduced by any process without permission from PICANet.

Requests and enquiries concerning reproduction rights should be directed to PICANet at: PICANet, Leeds Institute for Data Analytics, School of Medicine, University of Leeds, Clarendon Way, Leeds, LS2 9JT. Telephone 0113 343 8125 · Email <u>picanet@leeds.ac.uk</u>

In all cases, PICANet must be acknowledged as the source when reproducing or quoting any part of this publication. Please use the following format when citing this report: Paediatric Intensive Care Audit Network State of the Nation Report 2023 (published December 2023): Universities of Leeds and Leicester. For this report content is © 2023 Healthcare Quality Improvement Partnership (HQIP)

The ISBN number for this publication is 978-0-85316-366-4

Celebrating 20 years of data