NOCA National Office of Clinical Audit

IPCCA Irish Paediatric Critical Care Audit

IRISH PAEDIATRIC CRITICAL CARE AUDIT

NATIONAL REPORT 2024

REPORT WRITING GROUP:

Associate Professor Martina Healy
Irish Paediatric Critical Care Audit (IPCCA) Clinical Lead
Consultant in Paediatric Critical Care
Children's Health Ireland (CHI) at Crumlin

Dr Aisling Walsh
Consultant in Paediatric Critical Care Medicine
CHI at Temple Street

Marie Lawlor
Paediatric Critical Care Unit (PCCU) Clinical Nurse Audit and Research Coordinator
CHI at Temple Street

Mong Hoi Tan
PCCU Clinical Nurse Audit and Research Coordinator
CHI at Crumlin

Joanna Maria Saldanha (Chapter 6)
Bachelor of Medicine Student
RCSI School of Medicine

Dr Sieglinde Müllers (Chapter 7)
Consultant Obstetrician and Gynaecologist, Maternal–Fetal Medicine Specialist and Clinical Lead, Fetal Medicine Services
The Rotunda Hospital

Fiona Fallon
Patient and Public Interest Representative
Irish National Intensive Care Unit Audit Governance Committee
Member of Heart Children Ireland

Karina Hamilton
IPCCA Audit Manager
National Office of Clinical Audit

Lucas Codyre
Data Analyst
National Office of Clinical Audit

NATIONAL OFFICE OF CLINICAL AUDIT (NOCA)

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We would like to especially acknowledge the CHI Arts in Health Programme for curating a collection of artwork for use in this report. These pieces were created by children in hospital schools this year as part of workshops with artist Holly Pereira, who is creating a series of murals for the NCHI car park.

We would also like to thank Associate Professor Sarah Seaton, Co-Principal Investigator; Hannah Lever, Senior Project Manager; and Evrim Anik, Research Statistician, from the Paediatric Intensive Care Audit Network (PICANet). NOCA works with PICANet in the United Kingdom for data validation, data analysis and the generation of reports on activity in paediatric intensive care units.

CHI Arts
Children's Health Ireland
PICA Net

For more information about this report, contact
National Office of Clinical Audit,
118 St Stephen's Green, Dublin 2, D02 X0N1
Tel: +353 (1) 402 8577
Email: icu@noca.ie

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National Report 2024

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NOCA National Office of Clinical Audit

Associate Professor Martina Healy
Clinical Lead
Irish Paediatric Critical Care Audit
National Office of Clinical Audit
4th Floor, 118 St Stephen's Green
Dublin 2
D02 X0N1

19th August 2026

Dear Associate Professor Healy,

On behalf of NOCA, I wish to formally acknowledge receipt of the *Irish Paediatric Critical Care Audit National Report 2024*.

I extend my sincere congratulations to you and the entire team, including Audit Manager Karina Hamilton, Data Analyst Lucas Codyre, the Governance Committee and Patient and Public Interest Representative Fiona Fallon, for their continued commitment to this important audit.

The report provides valuable insight into the delivery of paediatric critical care in Ireland. It is encouraging that survival to paediatric critical care unit discharge remains high at 97%, despite continued high demand and pressures on capacity and staffing. Of particular note is the 45% reduction in respiratory admissions among neonatal infants compared with 2023, likely associated with the introduction of the national RSV immunisation programme. This demonstrates the value of national audit data in identifying changes in patterns of care and informing service planning and policy.

The report also highlights important areas requiring continued attention, including workforce requirements, regional paediatric critical care provision and the further development of specialist transport and services.

This letter serves as the formal endorsement of NOCA for the *Irish Paediatric Critical Care Audit National Report 2024*.

Yours sincerely,

Dr Brian Creedon
Clinical Director
National Office of Clinical Audit

National Office of Clinical Audit
4th Floor,
118 St. Stephen's Green
Dublin, DO2 X0N1
Tel: + (353) 1 402 8577
Email: auditinfo@noca.ie

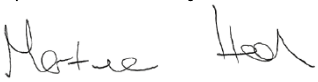
PREFACE

As Clinical Lead for the Irish Paediatric Critical Care Audit (IPCCA), I am pleased to present the fifth National Report on paediatric critical care services in Ireland. Produced under the governance of the National Office of Clinical Audit (NOCA), this report provides an overview of activity, outcomes, quality indicators and service performance during 2024. The Irish Paediatric Critical Care Audit (IPCCA) is central to improving paediatric critical care services in Ireland, providing the data needed to monitor outcomes, support quality improvement, and inform service planning and policy development. The findings demonstrate that critically ill children in Ireland continue to receive care of a very high standard, reflecting the expertise and dedication of multidisciplinary teams across Children's Health Ireland (CHI) at Crumlin and CHI at Temple Street.

This year's report expands our understanding of paediatric critical care activity through detailed breakdown of subspecialties including a section on cardiovascular, cardiothoracic, and neurosurgical admissions, alongside longitudinal reporting on selected congenital conditions. These enhanced data provide valuable insights into patient outcomes, service utilisation, and the growing complexity of care delivered within Ireland's PCCUs. This detailed reporting is made possible by the commitment of audit nurses, data managers and clinicians who collect and validate the data.

The report also highlights positive developments during 2024, including a reduction in severe respiratory illness requiring critical care admission among young infants, likely reflecting the impact of the national RSV immunisation programme.

While these findings are encouraging, significant challenges remain. High bed occupancy and ongoing capacity pressures highlight the need for continued investment in paediatric critical care services. The opening of the National Children's Hospital presents an important opportunity to strengthen service provision, but its success will depend on workforce expansion and retention. Investment in regional paediatric services will also be essential to support care closer to home, reduce pressure on national critical care capacity, and ensure that every child has timely access to the specialist care they need.



Associate Professor Martina Healy
Clinical Lead, Irish Paediatric Critical Care Audit, NOCA

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GLOSSARY

ABBREVIATION	MEANING
ASD	atrial septal defect
AVSD	atrioventricular septal defect
bed days	This is calculated as the sum of children receiving intensive care in a Paediatric Critical Care Unit (PCCU) each day and is counted if a child is in a bed for any part of the day.
bed occupancy	This is expressed as the percentage of bed days used out of total bed days available each year.
CAUTI	catheter-associated urinary tract infection
CDH	congenital diaphragmatic hernia
CHI	Children's Health Ireland
CIS	clinical information system
CLABSI	central line associated bloodstream infection
CMR	crude mortality rate
CNC	Children's Neurosurgical Centre
CPAP	continuous positive airway pressure
CSF	cerebrospinal fluid
CVVH	continuous venovenous haemodialysis
DKA	diabetic ketoacidosis
DORV	double outlet right ventricle
ECLS	extracorporeal life support
ECMO	extracorporeal membrane oxygenation
ECPR	extracorporeal cardiopulmonary resuscitation
ED	Emergency Department
EMR	electronic medical record
ETT	endotracheal tube
FETO	fetoscopic endoluminal tracheal occlusion
GDPR	General Data Protection Regulation
HFNCT	high-flow nasal cannula therapy
HFOV	high-frequency oscillatory ventilation
HIPE	Hospital In-Patient Enquiry
HRG	Healthcare Resource Group
HSE	Health Service Executive
ICCA	IntelliSpace Critical Care and Anaesthesia
ICNARC	Intensive Care National Audit and Research Centre
ICP	intracranial pressure
ICU	Intensive Care Unit
INICUA	Irish National Intensive Care Unit Audit
IPATS	Irish Paediatric Acute Transport Service

ABBREVIATION	MEANING
IPCCA	Irish Paediatric Critical Care Audit
IQR	interquartile range
MDT	multidisciplinary team
LOS	length of stay
NCHD	non-consultant hospital doctor
NG	nasogastric
NHS	National Health Service
NI	Northern Ireland
NICU	Neonatal Intensive Care Unit
NJ	nasojejunal
NOCA	National Office of Clinical Audit
OA	oesophageal atresia
ODTI	Organ Donation Transplant Ireland
PCC	paediatric critical care
PCCU	Paediatric Critical Care Unit
PDA	patent ductus arteriosus
PDSA	Plan–Do–Study–Act
PHDU	Paediatric High Dependency Unit
PICANet	Paediatric Intensive Care Audit Network
PICU	paediatric ICU
PIM	Paediatric Index of Mortality
PIM3	Paediatric Index of Mortality 3
PPHN	persistent pulmonary hypertension of the newborn
PPI	Public and Patient Interest
PR	physical restraint
QI	quality improvement
RCSI	Royal College of Surgeons in Ireland
REO	Regional Executive Officer
ROI	Republic of Ireland
RSV	respiratory syncytial virus
RTA	road traffic accident
SMR	standardised mortality ratio
TOF	tracheo-oesophageal fistula
UK	United Kingdom
VAP	ventilator-associated pneumonia
VSD	ventricular septal defect
WTE	whole-time equivalent

EXECUTIVE SUMMARY

The Irish Paediatric Critical Care Audit (IPCCA) National Report 2024 provides a comprehensive evaluation of paediatric critical care services delivered at Children's Health Ireland (CHI) at Crumlin and CHI at Temple Street. It examines activity, reports on complex sub specialties, quality indicators, patient outcomes, and overall system performance, with benchmarking against comparable UK units. The findings demonstrate that paediatric critical care services in Ireland continue to deliver high-quality care with excellent survival outcomes, while highlighting ongoing challenges related to capacity, workforce, and regional service provision.

Demand for paediatric critical care remains high. In 2024, there was 1,715 admissions of children to Paediatric Critical Care Units (PCCUs), with 45% of patients under 1 year of age, half of which were neonates, reflecting the diversity of the population served. Emergency admissions accounted for 68% of all admissions, demonstrating the unpredictable and urgent nature of demand. PCCUs delivered more than 10,000 bed days during the year. However, the 128 admissions of children to adult intensive care units, predominantly in the HSE West and Northwest region, highlights ongoing capacity constraints and reinforces the need for regional Paediatric High Dependency Units (PHDUs), where planning remains underway.

Capacity pressures remain a challenge in particular during the autumn and winter months. Bed occupancy levels continued to exceed recommended thresholds, reaching 92% in CHI at Crumlin and 88% in CHI at Temple Street, due mainly to winter surges placing considerable pressure on available resources. Workforce challenges also persist. The imminent opening of the National Children's Hospital requires substantial extra funding and planning. While funding has been approved for additional consultant and non-consultant hospital doctor (NCHD) posts to support the future National Children's Hospital critical care service, funding has not been provided for the additional nursing workforce required to staff the 32 single rooms which are a major feature in the NCH. This requirement is outlined in Chapter 8.

The clinical profile of patients reflects a diverse and complex case mix. Chapter 4 reports on neonatal admissions, which continue to represent a high-complexity group within PCCUs, accounting for a substantial proportion of admissions. Respiratory illness remained the largest overall diagnostic category, accounting for 31% of admissions. Cardiovascular conditions predominated in CHI at Crumlin, while neurological conditions were the most common specialist admission group in CHI at Temple Street.

To better reflect the complexity and diversity of age, gestation and subspecialty diagnostics, Chapter 6 includes detailed analyses on cardiovascular and cardiothoracic admissions to CHI at Crumlin and neurosurgical admissions to CHI at Temple Street. This will be expanded to general surgery and orthopaedics in future reports. Chapter 7 provides a longitudinal analysis of congenital diaphragmatic hernia (CDH) and tracheo-oesophageal fistula (TOF), further highlighting the complexity of care delivered within Irish paediatric critical care services. It is important to note that the detailed reporting of subspecialty admissions and outcomes is sourced from hospital databases maintained within individual CHI sites and relies on dedicated data management resources to maintain the quality and integrity of reporting.

A notable finding in 2024 was a 45% reduction in respiratory admissions among neonatal infants compared with 2023, particularly among infants under three months of age. This reduction is likely associated with the introduction of the national respiratory syncytial virus (RSV) immunisation programme and demonstrates the potential impact of preventive public health interventions in reducing demand on paediatric critical care services. Continued monitoring and support of the programme are recommended.

"DEMAND FOR PAEDIATRIC CRITICAL CARE REMAINS HIGH. IN 2024, THERE WAS 1,715 ADMISSIONS OF CHILDREN TO PAEDIATRIC CRITICAL CARE UNITS (PCCUS), WITH 45% OF PATIENTS UNDER 1 YEAR OF AGE, HALF OF WHICH WERE NEONATES, REFLECTING THE DIVERSITY OF THE POPULATION SERVED. EMERGENCY ADMISSIONS ACCOUNTED FOR 68% OF ALL ADMISSIONS, DEMONSTRATING THE UNPREDICTABLE AND URGENT NATURE OF DEMAND."

Several quality indicators improved during 2024:

- Audit data submitted within 3 months
- PCCU bed occupancy
- Irish Paediatric Acute Transport Service (IPATS) mobilisation within 1 hour
- Transport team time to bedside within 3 hours.

Areas requiring improvement include:

- Nurse staffing levels remain below recommended standards
- Out-of-hours discharges remain above target
- Unplanned extubation rates continue to exceed recommended benchmarks
- Progress towards a fully resourced 24-hour, 7-day IPATS remains constrained by ongoing staffing and resource limitations.

The report identifies several ongoing national service gaps:

- Absence of a funded national paediatric respiratory ECMO/ECLS service, resulting in some children being transferred abroad
- Continued reliance on adult ICUs for some paediatric patients
- Lack of fully developed regional PHDUs.

Patient outcomes remain a key strength of the service. Survival to PCCU discharge remained high at 97%, with low and stable mortality rates. Deaths mostly occurred in children under 1 year of age and were commonly associated with planned withdrawal of care or treatment limitation (79%). Advanced therapies, including extracorporeal life support (ECLS), continued to achieve positive outcomes, with an 82% survival rate among patients receiving ECLS.

Several strategic recommendations remain active or open, including expansion of the workforce required to safely operate the National Children's Hospital critical care unit, appointment of dedicated organ donation personnel, establishment of a national paediatric respiratory ECLS service, development of regional PHDUs, and progression of a fully operational 24/7 paediatric transport service. The continuation of the RSV immunisation programme should remain a national priority, given its apparent contribution to reducing respiratory admissions among infants and its potential to deliver lasting benefits for both patient outcomes and paediatric critical care capacity.

Overall, the audit demonstrates that Irish paediatric critical care services are delivering excellent survival and high-quality clinical outcomes, but these achievements are occurring against a backdrop of persistent capacity constraints, workforce shortages and unmet service development needs. Sustained investment in staffing, regional services, transport and specialist programmes will be essential to ensure a resilient paediatric critical care system for the future.

KEY QUALITY INDICATORS

Metric	Standard	2023	2024
AREAS OF IMPROVEMENT – THINGS THAT GOT BETTER			
Audit data submission within 3 months of patient discharge	**100%**	75%	92%
PCCU bed occupancy	**Limit of 85%**	102%	90%
IPATS retrieval mobilisation time	**Within 1 hour**	75%	86%
Transport team time to bedside	**Within 3 hours**	65%	71%
AREAS WITH NO SIGNIFICANT CHANGE – THINGS THAT STAYED THE SAME			
Emergency readmissions within 48 hours of discharge	**Low**	1.8%	1.5%
Mortality in PCCUs	**Low**	2.6%	3.3%
Number of qualified nurses per critical care bed	**5.8 WTE**	5.44	5.45
Unplanned extubation rate per 1,000 intubated days	**Fewer than 5.0**	6.5	6.3
Out-of-hours discharge between 8.00pm and 7.59am	**Less than 10%**	14%	13%

KEY FINDINGS

ACTIVITY AND DEMAND

1,715 admissions were recorded across the two PCCUs in 2024, including 1,098 admissions in CHI at Crumlin and 617 in CHI at Temple Street. Patients ranged in age from 25 weeks' gestation to 16 years, with 45% (n=765) aged under 1 year. Admissions included 103 patients from Northern Ireland and 22 patients aged 16 years or older.

PCCUs delivered 10,274 bed days during 2024, comprising 7,484 bed days in CHI at Crumlin and 2,790 bed days in CHI at Temple Street.

Unplanned admissions accounted for 68% (n=1,168) of all PCCU admissions, reflecting the emergency nature of paediatric critical care activity.

Transfers from other hospitals represented a substantial proportion of admissions, accounting for 65% (n=306) of admissions to CHI at Temple Street and 44% (n=267) of admissions to CHI at Crumlin.

Median length of stay was 2.9 days in CHI at Crumlin and 1.7 days in CHI at Temple Street.

CLINICAL PROFILE

Respiratory illness was the leading overall diagnostic category, accounting for 31% (n=527) of PCCU admissions nationally. Infants aged under 1 year accounted for 41% (n=218) of respiratory admissions.

In CHI at Crumlin, cardiovascular conditions represented the largest admission group, accounting for 40% (n=447) of admissions. Of these, 67% were planned admissions. Cardiothoracic surgical cases accounted for 64% (n=285), cardiology medical cases for 24% (n=109), and cardiac catheterisation procedures for 12% (n=53).

In CHI at Temple Street, neurological conditions were the largest specialist admission group, accounting for 23% (n=139) of admissions. Most (93%) were unplanned admissions, with neurosurgical cases accounting for 54% (n=75) of neurological admissions. Some admissions were associated with e-scooter-related trauma.

NEONATAL ADMISSIONS

Neonates continued to represent a significant proportion of PCCU activity:

- 26% of admissions in CHI at Crumlin; almost one-half (48%; n=135) were due to cardiothoracic or cardiology diagnoses.
- 17% of admissions in CHI at Temple Street; more than one-third (34%; n=36) were due to respiratory conditions.

There was a 45% reduction (n=66) in respiratory admissions among neonatal infants compared with 2023, particularly among RSV-positive infants. This reduction was associated with lower rates of PCCU admission and ventilation and is likely attributable to the impact of the RSV Immunisation Pathfinder Programme.

LONG-STAY PATIENTS

Long-stay patients (greater than 28 days) accounted for 3% (n=34) of admissions in CHI at Crumlin and 1% (n=6) in CHI at Temple Street.

The majority of long-stay patients (65%; n=26) were aged under 1 year.

Most long-stay admissions (80%; n=32) were unplanned.

Respiratory and cardiovascular conditions each accounted for 30% of long-stay admissions.

EXTRACORPOREAL LIFE SUPPORT (ECLS/ECMO)

15 ECLS runs were performed in CHI at Crumlin PCCU during 2024, accounting for 94 ECLS days.

Survival to discharge for children receiving ECLS was 82%.

In 2022–2024, of nine children requiring respiratory ECMO/ECLS support, seven were transferred abroad for treatment due to the absence of a formally funded and resourced national paediatric respiratory ECMO/ECLS service.

ADULT ICU ADMISSIONS

- 128 admissions of children to adult ICUs during 2024.
- The highest number of admissions occurred in the HSE West and Northwest region (n=103).
- Median length of stay was 11.6 hours.
- 31% (n=40) required invasive ventilation.
- Older children aged 6–15 years accounted for 59% (n=75) of admissions.
- 45% (n=54) were transferred for specialist care.

OUTCOMES AND ORGAN DONATION

- Overall survival to PCCU discharge remained high at 97%.
- Among children who died in PCCU, 79% (n=45) died following a treatment limitation or decision to withdraw medical care.
- Two-thirds of deaths (n=39) occurred in children aged under 1 year.
- Four children donated solid organs or tissues in 2024, representing 7% of all PCCU deaths in the Republic of Ireland.

RECOMMENDATIONS

RECOMMENDATION 1

The RSV immunisation programme should be continued and supported nationally as a preventative measure to reduce severe respiratory illness with potential to alleviate demand on paediatric critical care services.

NOCA will continue to monitor reasons for admission to PCCU and assess the impact of changes to the RSV immunisation programme on paediatric critical care services, with findings informing service planning and policy decision-making.

RECOMMENDATION 2

Strengthen data systems and audit infrastructure supported by dedicated local data management resources, to enable comprehensive paediatric critical care reporting, service planning and quality improvement.

OUTSTANDING RECOMMENDATIONS

1. **Children's Health Ireland (CHI) should continue planning for the required increase in the workforce of paediatric critical care medicine consultants, trainees, nurses, and allied health professionals for the safe opening and operation of the National Children's Hospital (NCH) Critical Care Unit with 32–42 beds. This should be part of a comprehensive published CHI workforce document that is in line with medical, nursing, and health and social care professional (HSCP) national standards.**
2. **A national paediatric respiratory extracorporeal life support (ECLS) programme should be progressed in CHI.**
3. **The Health Service Executive (HSE) should support the development of regional Paediatric High Dependency Units (PHDUs) in hospitals providing regional paediatric surgical facilities. It is essential that future planning includes regional investment in the development of regional PHDUs.**
4. **Continue the extension of specialist paediatric transport services to operate 24 hours per day, 7 days per week by resourcing the Irish Paediatric Acute Transport Service (IPATS).**
5. **Organ Donation Transplant Ireland (ODTI) and CHI should progress the appointment of organ donation personnel.**

KEY FINDINGS

Irish Paediatric Critical Care Audit 2024

Many of the children admitted to PCCUs were newborn babies.
In this report, a newborn (or neonate) is a baby less than 29 days old.

CHI AT CRUMLIN

26% of admissions were newborn babies, and almost half were admitted because of heart conditions.

CHI AT TEMPLE STREET

17% of admissions were newborn babies, and around one-third were admitted because of breathing problems.

Heart conditions were the largest group of admissions at CHI at Crumlin, accounting for **40%** of all admissions.

A total of **447** children were admitted with heart conditions, most of which were present from birth. Nearly two-thirds required heart surgery.

40%

CHI AT CRUMLIN

Breathing problems were the most common reason for admission to paediatric critical care, accounting for **31%** of all admissions.

Four in ten of these children were under one year of age.

31%

There was a **45%** reduction in admissions of newborn babies with serious breathing problems in 2024 compared with 2023.

45%

RSV

The biggest reduction was seen in babies with respiratory syncytial virus (RSV). This suggests that the RSV immunisation programme is helping to prevent severe illness in infants and reducing pressure on critical care services.

Conditions affecting the brain, spine, or nervous system accounted for **23%** of admissions to CHI at Temple Street. Most of these admissions were emergencies. During 2024, 75 children required brain or spinal surgery. Most were being treated for brain or spinal tumours, while 17 had suffered a serious head injury.

23%

CHI AT TEMPLE STREET

Fifteen babies and children at CHI at Crumlin received extracorporeal membrane oxygenation (ECMO), a specialised form of life support that temporarily takes over the work of the heart and lungs. Between 2022 and 2024, nine children required ECMO for severe lung failure. Seven of these children had to be transferred abroad because this service is not currently funded in Ireland.

128
2024

Children continue to be admitted to adult intensive care units in some parts of Ireland. In 2024, 128 children under 16 years of age were cared for in adult ICUs. Although most stays were short, this highlights the need for more specialist children's services closer to home.

Despite caring for many very sick and complex patients, outcomes remained excellent. Overall, **97%** of children survived and were discharged from critical care. There were 57 deaths in 2024, and more than two-thirds occurred in babies under one year of age. In most cases, treatment was withdrawn when it was no longer helping the child recover.

97%
SURVIVED & DISCHARGED

CHI AT CRUMLIN	CHI AT TEMPLE STREET
2.9 DAYS	1.7 DAYS

Children stayed in critical care for a relatively short period overall. Half of patients stayed less than **2.9** days in CHI at Crumlin and less than **1.7** days in CHI at Temple Street. A small number of children required a stay of more than 28 days.

Four children and infants donated organs or tissues in 2024, helping to improve or save the lives of others.

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CAPTURING THE PATIENT VOICE
OSCAR'S STORY

BEFORE BIRTH TO LIFE IN PICU

There are moments in life that divide everything into before and after. For our family, that moment came at our 18-week anomaly scan. We were at a concert the night before and I took one picture. When I see that picture, I often think to myself that was the last day before CDH took over my life, the last day of our old life and the start of our new norm.

I had experienced two previous premature births and knew this pregnancy would be considered high-risk; nothing could have prepared us for what followed. Our daughter Violet had been born at 26 weeks following severe pre-eclampsia and lived for four precious weeks. Our son Arthur was born at 32 weeks. Because of my history I was very well looked after by the team in Sligo and linked with University Hospital Galway for additional monitoring for my third pregnancy.

I received a phone call on a Friday to say I had an appointment in Galway the Monday morning. We had already made plans that weekend which meant we would have Arthur with us when we went to that appointment (bringing other children to scans etc. is usually a no-no). We all headed to Galway hospital early that Monday morning from Dublin. We were going to what we believed would be a routine scan/check with a bigger hospital. I sent the boys to the playground while I went in alone.

During the scan the room changed. The conversation stopped. The sonographer became quiet before asking another colleague to review the images. I was asked to go for a walk and return to meet the consultant. Before anyone spoke, I already knew something wasn't right. After further investigations we were told our baby was likely to have CDH, a condition where a hole in the diaphragm allows the abdominal organs to move into the chest, preventing the lungs from developing normally. Two weeks later the diagnosis was confirmed.

BEFORE ANYONE SPOKE, I ALREADY KNEW SOMETHING WASN'T RIGHT. AFTER FURTHER INVESTIGATIONS WE WERE TOLD OUR BABY WAS LIKELY TO HAVE CDH, A CONDITION WHERE A HOLE IN THE DIAPHRAGM ALLOWS THE ABDOMINAL ORGANS TO MOVE INTO THE CHEST, PREVENTING THE LUNGS FROM DEVELOPING NORMALLY. TWO WEEKS LATER THE DIAGNOSIS WAS CONFIRMED.

From that moment onwards, our pregnancy changed completely. Excitement was replaced with scans, appointments, statistics, and conversations no parent ever imagines having. We were told Oscar's chance of survival was around 50%. We discussed quality of life, fetal surgery and even the possibility of termination. I also knew another local family whose baby had sadly died from CDH. Statistics suddenly became very real.

Following discussions between Galway and Leuven, we were offered fetal endoscopic tracheal occlusion (FETO) surgery in Belgium to improve Oscar's chances of survival. We felt we had to give him every possible opportunity. Once we made the decision, everything happened incredibly quickly. Within a week I was in Leuven and, following further assessment, underwent FETO surgery just a few days later. Although the procedure itself was relatively short, the journey was not.

The balloon inserted during FETO must be removed before birth, meaning I needed to remain close to the hospital in case I went into labour early, a very real possibility given my obstetric history. What many people don't realise is that families are not abroad because the treatment lasts for weeks. They are there because they have to be. For almost eight weeks I lived alone in

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a foreign country. Joe couldn't stay with me. We had Arthur at home, someone needed to continue working, and someone needed to continue being his parent. So, while Joe remained in Ireland trying to hold life together, I faced a high-risk pregnancy on my own.

Although the medical care I received in Leuven was exceptional and I always felt safe within the hospital, life outside its walls was very different. Finding accommodation at such short notice was incredibly stressful, and once I was settled there was an overwhelming sense of isolation. I worried constantly about going into labour, about every pain and every twinge, knowing I was alone.

I was fortunate to have an incredibly understanding employer who allowed me to continue working remotely throughout my stay. It gave me some routine during long days on my own, but more importantly it was a financial necessity. While paying for accommodation and living expenses in Belgium, we were also continuing to pay our mortgage and maintain our family home in Ireland. We were, in effect, supporting two households at once. Despite the distance, Joe, our family and friends visited whenever they could, but every journey brought additional financial and emotional strain. Looking back now, I realise that the surgery itself was only one part of the experience. The greatest challenge was the weeks of separation, uncertainty and trying to keep family life going while living in two different countries.

Eventually it was decided I should return to Ireland. I travelled directly from Belgium to the Rotunda Hospital. Arriving late that night, I remember such a warm welcome after weeks of uncertainty. I was monitored closely because of worsening pre-eclampsia, and concerns around Oscar's growth and placental function. At 34 weeks' gestation I had actually carried this pregnancy further than either of my previous pregnancies. On the day of my caesarean section, I met what felt like an endless stream of healthcare professionals. Everyone explained their role and what would happen after Oscar was born. By this stage my overwhelming emotion wasn't fear. It was relief. For 16 weeks we had wondered if Oscar would survive long enough to be born. Hearing that he was alive felt like the greatest victory imaginable.

Oscar arrived fighting and full of spirit. He was transferred to the neonatal unit while I recovered. Before he left for Children's Health Ireland at Crumlin, the Rotunda team brought him to my room for a brief visit. That moment meant everything. Because Oscar arrived early after our return from Belgium, we missed the pre-birth tour of PICU that many CDH families receive. I had no idea what awaited us. Joe travelled to Crumlin before I could. We video-called so I could see Oscar. A day or two later I arrived in a wheelchair. To enter PICU you buzz through two secure doors before stopping at the handwashing station. I understood why those doors existed, but every time I had to leave the unit, they felt like an eternity standing between me and Oscar.

Walking into PICU was daunting. It was bright, spacious, and filled with technology I didn't understand. Doctors and nurses moved confidently while I felt completely out of my depth. Yet despite how busy everyone seemed, there was always someone there. Oscar received one-to-one nursing care and I immediately knew he was in the safest place possible. Walking through the unit was heartbreaking. Every bed held another critically ill child and another family living through unimaginable circumstances. Oscar looked impossibly tiny. Everything hurt. I was still recovering from surgery while trying to absorb this new world. Instead of holding my baby, I learnt how to express breast milk. That became my first job as his mum.

Before long, PICU became our world. We settled into a routine centred around Ronald McDonald House and Oscar's bedside. Our days revolved around pumping schedules, ward rounds, waiting for scans and reading Oscar stories. We rarely ventured far because everything

WALKING INTO PICU WAS DAUNTING. IT WAS BRIGHT, SPACIOUS, AND FILLED WITH TECHNOLOGY I DIDN'T UNDERSTAND. DOCTORS AND NURSES MOVED CONFIDENTLY WHILE I FELT COMPLETELY OUT OF MY DEPTH. YET DESPITE HOW BUSY EVERYONE SEEMED, THERE WAS ALWAYS SOMEONE THERE.

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could change in an instant. For the first month I couldn't hold him. Like every parent, I had imagined those first cuddles after birth. Instead, I learned to celebrate different milestones. Arthur's first visit remains one of my favourite memories. Standing beside Oscar's bed, he sang 'You Are My Sunshine'. In a place filled with machines and monitors, he somehow brought a little piece of normal family life.

Over time we learned to read the room. Parents become experts in noticing the smallest things. We recognised changes in atmosphere, learned which nurses were looking after Oscar when he was particularly unwell, and understood subtle cues long before anyone spoke. We also learned to navigate the many specialist teams involved in Oscar's care. Intensive Care, Respiratory, ENT, Surgery, Airway, and many other specialties all brought different expertise. As registrars rotated every six months, we repeatedly found ourselves rebuilding trust. Just as someone had really come to know Oscar and our family, their time in PICU had finished, they moved on, and then another doctor arrived.

One of the greatest lessons I learned was that parents become experts in their own child. We couldn't interpret blood gases or ventilator settings, but after hundreds of days beside Oscar, we knew him. We noticed tiny changes in his colour, his breathing and his comfort. The moments when healthcare professionals listened to those observations made us feel like genuine members of his team. The nurses became our constants. They knew Oscar. They knew us. They noticed when we hadn't eaten and encouraged us to go get some food or rest. While our own lives were on pause, theirs continued outside the hospital. We celebrated engagements, weddings, grandchildren, and new homes with them. We couldn't help becoming invested in one another because they had become such an important part of our lives.

PICU is filled with hope, but it is also filled with heartbreak. One night another child arrested. Nobody needed to explain what was happening. Every parent knew. We were asked to leave the unit while the team worked. I couldn't bring myself to go back in for some time afterwards. It brought me straight back to losing Violet. Life in PICU became a constant cycle of hope and heartbreak. You celebrated when families finally left intensive care, only to meet them again after another admission. We experienced that ourselves as Oscar moved between PICU and the wards time and again. It often felt like one step forward and two steps back.

Eventually Oscar became well enough to move to the Transitional Care Unit (TCU). Although it was a huge milestone, it came with mixed emotions. For the first time since he was born, we weren't simply watching other people care for Oscar; we were learning how to care for him ourselves. In PICU almost everything had been done for him by the medical team. In TCU we gradually became part of his day-to-day care. Training was organised and we began learning tracheostomy care, suctioning, medications, emergency procedures, and all the practical skills we would eventually need to bring him home. It was exciting, but it was also frightening. After spending so long in PICU there was comfort in knowing that consultants, registrars, and one-to-one nursing support were only ever a few steps away. Leaving that environment meant trusting a different team and, just like before, building new relationships. The nurses and healthcare assistants in TCU were exceptional. They patiently taught us, encouraged us, and gave us the confidence to try. They didn't just teach practical skills; they helped us believe that one day we really could care for Oscar ourselves.

LEARNING CONFIDENCE

Our journey, however, was never straightforward. Oscar continued to move between TCU and PICU whenever he became particularly unwell. Each return to PICU felt like a setback, but every time we started again.

One of our darkest admissions came over Easter 2025. Oscar became critically unwell. He was deeply sedated and placed on the oscillator. Every attempt to reduce his sedation and wake him ended the same way. His airway simply couldn't cope. Those days felt endless. We watched team after team come together, determined to find another solution. I remember seeing the emotion on the faces of the people who had cared for Oscar for so long. They wanted him to get through this just as much as we did. We were told that if he could get through the virus, there was every reason to believe he could recover. The challenge was finding a way to support his airway until then.

Then, one Sunday, we were called to a meeting. Walking into the room with the consultants, surgeon, and one of our favourite PICU nurses, I thought I already knew

what they were going to say. We had sat in a room like that before with Violet. Instead, they told us they wanted to try one more thing: a larger tracheostomy tube. It worked. Slowly, Oscar turned a corner. We could feel the whole PICU team move through that experience with us. Their relief and joy mirrored our own. Then back to TCU.

Eventually something changed. The next time Oscar became unwell, he coped and was able to remain safely in TCU. He no longer needed the level of support provided by intensive care. To anyone else it might have seemed like a small milestone. To us, it meant everything. It was the first time we truly believed he was becoming stronger.

A BIRTHDAY WE WILL NEVER FORGET

By the time Oscar celebrated his first birthday, TCU had become home. It wasn't the first birthday we had imagined when I was pregnant, but after everything he had overcome it felt like a day that deserved to be celebrated. I went completely overboard decorating his room.

The nurses and healthcare assistants joined in. Teams from across the hospital came to wish him a happy birthday. Airway, respiratory, NIV, paediatrics and so many others stopped by. One of Oscar's consultants even baked him a birthday cake. Many of the PICU nurses and consultants who had cared for Oscar during his sickest days came downstairs simply to celebrate with him. Watching so many people gather around this little boy who had fought so hard was incredibly emotional. Oscar wasn't simply a patient. He was Oscar. He was deeply loved throughout the hospital.

HOME

Eventually we left TCU and spent three nights in Sligo before finally coming home. Although Oscar was now over a year old, it was the first time the four of us had ever lived together under one roof. That moment was something we had dreamt about for so long. Home, however, looked very different from how we had once imagined. Along with Oscar came ventilators, suction machines, emergency equipment and an unexpected new member of our team, our nurses. Having nurses in your home five days a week and every night takes time to adjust to, but their support has been invaluable. They have helped us grow in confidence while allowing us to simply be Mum and Dad again. My dad and my sister also completed training so they could support us. Every member of our family found their own way to help. It truly takes a village.

RETURNING TO PICU

Since coming home Oscar has required one further PICU admission. Returning was something we desperately hoped we would never have to do again, but there was also comfort in knowing we were going back to people who already knew him so well. We didn't have to explain his personality, his normal, or his complex medical history. We were returning to a team who cared deeply about him. Thankfully, after only a few days, we were able to come home again.

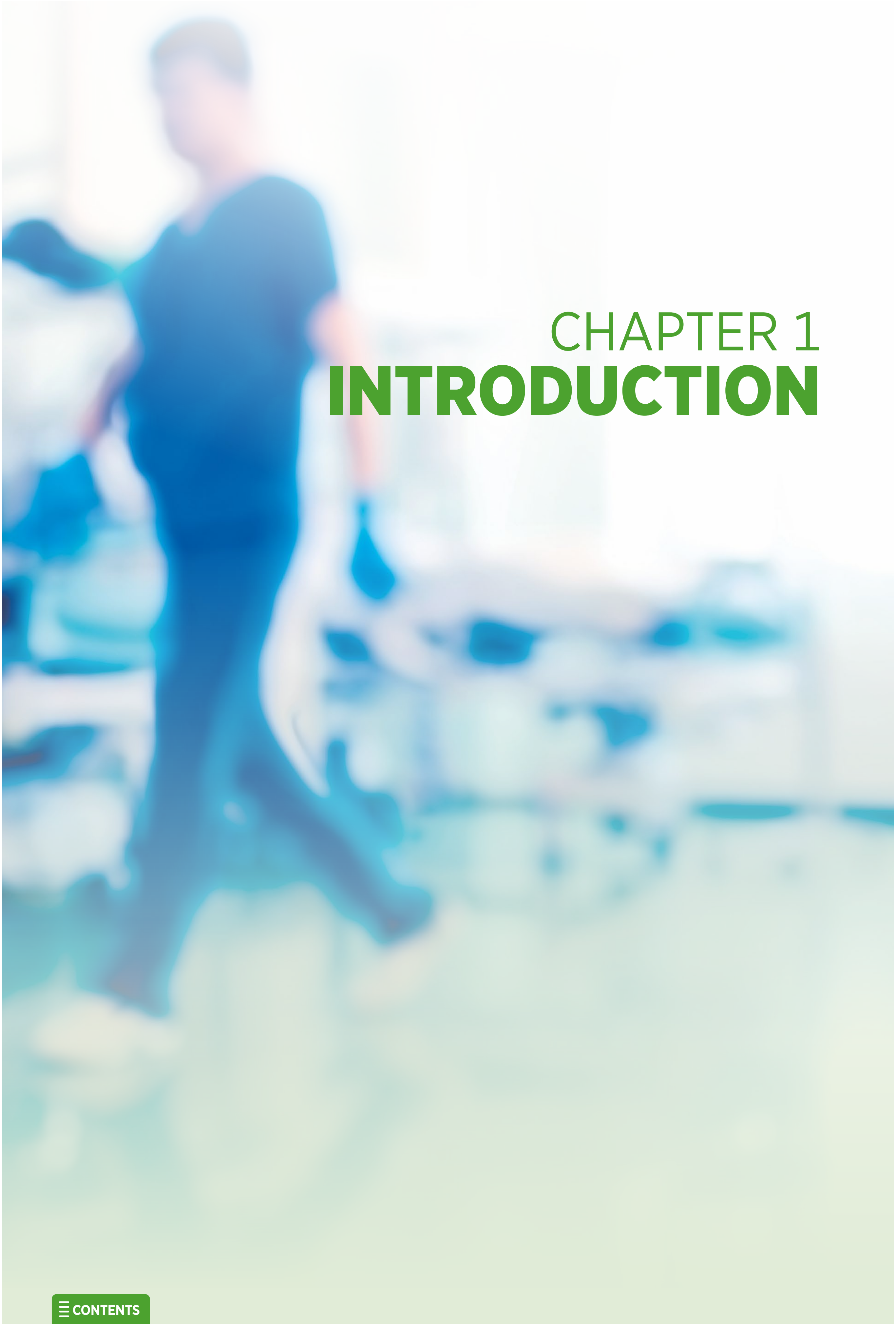
LOOKING BACK

When people hear Oscar's story, they often remember the diagnosis, the surgery in Belgium or the months spent in intensive care. When I think back, I remember people. I remember the nurses who quietly sat with us when there were no words that could make things better. I remember the healthcare assistants who quietly arranged food for my family when Oscar was critically ill and eating was the last thing on our minds. Consultants who refused to stop searching for another option. Ronald McDonald House staff who gave us somewhere to breathe. The TCU team who patiently taught us to care for Oscar. Our home nurses who continue to support us today. Looking back, I realise how much family-centred care shaped our experience.

Of course, the medical care Oscar received was extraordinary, but what has stayed with us most are the moments that went beyond medicine. The conversations about Arthur. The people who asked how we were coping. The professionals who listened to us as parents. Those moments reminded us that while Oscar was their patient, we were all seen as a family. Over time we learnt that caring for a child like Oscar works best as a partnership. The medical team brought their knowledge and expertise, while we brought an understanding of Oscar that only comes from spending every day by his side. Feeling listened to made us feel like genuine members of his team.

Today, when I look at Oscar, I don't immediately think about his diagnosis, his surgeries, or the months we spent in hospital. I see a determined little boy who adores his big brother, keeps us all on our toes, and continues to surprise us every day. Developmentally he is still catching up, but considering everything he has overcome, he continues to exceed our expectations. There are still challenges ahead. But there is also so much joy. Our journey wasn't always straightforward and it certainly wasn't always perfect. There were setbacks, heartbreak, and moments when we wondered how we would find the strength to keep going. But there was never any doubt that Oscar was surrounded by people who genuinely cared about him. No words will ever be enough to thank every member of the multidisciplinary team who cared for Oscar. Their skill, compassion, determination, and expertise saved his life on countless occasions. The medicine saved Oscar's life. The people carried our family.

Clare Lawlor Lynch



CHAPTER 1 INTRODUCTION

CHAPTER 1: **INTRODUCTION**

PAEDIATRIC CRITICAL CARE IN IRELAND

A Paediatric Critical Care Unit (PCCU) is a specialised facility within a children's hospital that is charged with the care of infants and children, staffed by a specialist team, and designated to provide an increased level of detailed clinical observation, invasive monitoring, focused interventions, and technical support to facilitate the care of critically ill paediatric patients over an indefinite period of time. A PCCU will care for patients diagnosed with life-threatening but potentially recoverable conditions, postoperative patients who may benefit from close nursing care, and children with chronic, complex medical comorbidities that exceed the care capabilities of other clinical care areas within the hospital.

In the Republic of Ireland (ROI), there are currently two dedicated PCCUs, located in Dublin at Children's Health Ireland (CHI) at Crumlin (23 beds) and CHI at Temple Street (9 beds), giving a combined capacity of 32 beds. CHI at Crumlin is the national centre for paediatric cardiology and cardiothoracic surgery, the National Paediatric Haematology and Oncology Centre, and the National Paediatric Burns Unit. Major specialties at CHI at Temple Street include the national centre for paediatric neurosurgical cases and renal transplants as well as the National Paediatric Craniofacial Centre and the National Centre for Inherited Metabolic Disorders. The new National Children's Hospital – which will be located on a shared campus with St James's Hospital in Dublin – will house one large state-of-the-art PCCU incorporating a general and cardiac care unit with a planned capacity of 42 beds, and a separate Neonatal Intensive Care Unit (NICU) with a planned capacity of 18 beds, making it one of the largest PCCUs in Europe.

THE IRISH PAEDIATRIC CRITICAL CARE AUDIT

This is the fifth report published by the Irish Paediatric Critical Care Audit (IPCCA), presenting data on patients admitted to a PCCU in the ROI during 2024, with two spotlight chapters included: one focusing on cardiovascular and neurosurgical admissions and one on the specific rare congenital conditions tracheo-oesophageal fistula and congenital diaphragmatic hernia. The overall purpose of the IPCCA is to improve critical care services provided to paediatric patients by measuring the quality of care and outcomes against predetermined standards, using data from across the United Kingdom and ROI as a benchmark.

The National Office of Clinical Audit (NOCA) works with the Paediatric Intensive Care Audit Network (PICANet) in the UK. PICANet was established to develop and maintain a secure and confidential high-quality clinical database of paediatric critical care activity in PCCUs and specialist paediatric critical care transport services across the UK and ROI. There are 31 PCCUs and 14 specialist transport services currently submitting data to PICANet, which is now part of the National Clinical Audit and Patient Outcomes Programme in the UK and is recognised as the definitive source for paediatric critical care data in the UK and the ROI (Healthcare Quality Improvement Partnership, n.d.).

The Irish National ICU Audit Governance Committee (Appendix 1) oversees the audit and developed the aim and objectives of the audit. The Clinical Lead, supported by the NOCA Executive Team, has operational responsibility for implementation of the IPCCA.

CHAPTER 2
METHODOLOGY

CHAPTER 2: METHODOLOGY

This report uses three different datasets to audit the care given to children admitted to a PCCU or adult ICU in the ROI:

1.	The PICANet dataset is used to audit data on children transported and admitted to PCCUs.
2.	The Irish National Intensive Care Unit Audit (INICUA) dataset is used to audit data on all children admitted to an adult ICU in the participating hospitals (see Appendix 2).
3.	PCCU data from the intellispace critical care and anaesthesia (ICCA) patient data management system is used to provide supplemental data not captured in PICANet.

DATASET 1: PICANET

Data collection and data entry in the PCCUs are undertaken by audit nurses and audit coordinators. The data manager is responsible for extracting the data and uploading them to PICANet. The data collected include the following:

- **Admission data:** These consist of each child's demographic details, including their date of birth, ethnicity, and sex. The PICANet database also collects details about where children are admitted from, their date of admission, their clinical diagnoses, and some physiological parameters on admission to PCCU, including arterial blood gas results, blood pressure, medical history, and ventilation status. Data on outcome and discharge details are also included. The medical interventions that each child receives each day are recorded as part of the audit.
- **Referral data:** These include details of the referring hospital, demographic details about the child, the grade of the referring doctor or nurse, the transport team involved, and the destination PCCU.
- **Transport data:** These include details about the transport team, journey times, any interventions carried out, and critical incidents.

PICANet provides documentation on data definitions and standardised data collection forms for the users.

Data entry and submission

The IPCCA uses PICANet's information technology infrastructure to collect audit data. All data submitted are stored in the Leeds Analytic Secure Environment for Research (LASER) system. All data at rest in the LASER system are encrypted using Advanced Encryption Standard (AES) 256-bit encryption. The database enables the recording of admission, transport and referral event data, allowing for real-time data validation and reporting. Hospital access to the database is restricted to each hospital's own data. Permission to access the PICANet Web record for a named hospital or organisation must be granted by the lead clinician. Detailed methodology is available on the PICANet website.

Data quality, validation and case ascertainment

Data validation is performed at multiple stages: initially at the point of local data entry, subsequently within the PICANet web system, and finally through central validation of the database. Validation checks for logical inconsistencies, out-of-range values, and missing and incorrect data are reported back to the individual participating organisations on demand via the web interface. PICANet Web also allows PCCU staff to obtain reports on their own data to aid quality assurance, data validation checks, and case ascertainment checks.

DATASET 2: IRISH NATIONAL ICU AUDIT

Children who present to hospitals outside Dublin and who require specialist ICU care are cared for in adult ICUs. The numbers of children admitted to adult ICUs are small and will be presented separately from children admitted to PCCUs in this report (see Chapter 4). INICUA, in partnership with the UK's Intensive Care National Audit and Research Centre (ICNARC), reports on benchmarked quality indicators of outcomes and activity for INICUA to facilitate quality improvement. The INICUA dataset covers the patient journey throughout the entire acute hospital stay and is outlined in Appendix 2.

DATASET 3: INTELLISPACE CRITICAL CARE AND ANAESTHESIA (ICCA) PATIENT DATA MANAGEMENT SYSTEM

This report incorporates additional locally collected and validated data to support detailed analyses of subspecialty services and outcomes that are not routinely available through national audit datasets. These include cardiothoracic and neurosurgical activity, mortality, healthcare-associated infections, and longitudinal reviews of patients with CDH and TOF.

ICCA provides standardised, structured and comprehensive documentation in PCCUs. It consolidates critical patient data, from admission notes to real-time vital signs and laboratory results, into a single flowsheet. Data are entered daily on the PCCUs ICCA system and Theatre Management System (TMS), which are validated by PCCU clinical personnel. The inclusion of these data enables a more comprehensive assessment of the complexity, quality, and outcomes of paediatric critical care services.

ANALYTICAL TECHNIQUES

Data analysis

NOCA received the finalised data from PICANet as encrypted Excel files. Statistical analysis of these data included simple cross-tabulations and the calculation of crude and risk-adjusted standardised mortality ratios (SMRs) and 95% confidence intervals. The ICNARC dataset was used to describe the children in adult ICUs. Basic descriptive statistics were used to describe the relevant populations.

Data included

Demographic, process and outcome measures are presented in this report for the participating Units in the ROI. PICANet audits and reports on the clinical care of children admitted to PCCUs in both the UK and the ROI. This report presents overall performance on five key quality 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 PCCU, and mortality in PCCU) for the ROI and benchmarks that performance against participating PCCUs in England, Wales, Scotland, and Northern Ireland. Specifically, it includes data from CHI at Crumlin, CHI at Temple Street, and the Irish Paediatric Acute Transport Service (IPATS). The data are presented for 2024. This report should be read in conjunction with the PICANet NPCCA State of the Nations Report 2025 (PICANet, 2025). Figures and tables have been sourced from the PICANet annual report, and NOCA has reproduced some data from that report.

WHO WE WORK WITH

CHI at Crumlin PCCU

Clinical Lead PICANet: Associate Professor Martina Healy
PCCU Data Manager: Jennifer Nugent
PCCU Clinical Nurse Audit and Research Coordinator: Mong Hoi TAN
PCCU Clinical Audit Nurses: Andrea Joan Sequeira, Luiza Dsouza, Ellen McGarr, Teenu Thakyave Naveen
ECLS Coordinator: Sunimol Joseph
ECLS Deputy Coordinator: Mochana Joseph, Orla Boyce, Emiliana I. Prudente
PCCU Clinical Nurse Manager 3: Lorraine O'Reilly

Children's Health Ireland at Crumlin

CHI at Temple Street PCCU

PCCU Clinical Lead: Professor Kevin Carson
PCCU Consultant in Paediatric Critical Care: Dr Aisling Walsh
PCCU Clinical Nurse Audit and Research Coordinator: Marie Lawlor
PCCU Clinical Nurse Manager 3: Susan Kearns

Children's Health Ireland at Temple Street

Relevance

Accuracy and reliability

Timeliness and punctuality

Coherence and comparability

Accessibility and clarity

CHAPTER 3 DATA QUALITY

CONTENTS

CHAPTER 3: **DATA QUALITY**

DATA QUALITY STATEMENT OF *IPCCA NATIONAL REPORT 2024*

Tables 3.1 provides an assessment of the quality of the IPCCA data in this report using internationally agreed dimensions of data quality, as laid out in *Guidance on a Data Quality Framework for Health and Social Care* (Health Information and Quality Authority, 2018).

TABLE 3.1: OVERVIEW OF DATA QUALITY FOR IRISH PAEDIATRIC CRITICAL CARE AUDIT REPORT 2024

DIMENSIONS OF DATA QUALITY	DEFINITION (HIQA, 2018)	ASSESSMENT OF DIMENSION
RELEVANCE	Data meet the current and potential future needs of users.	**PICANet:** This is a definitive data source for paediatric critical care that includes case mix, activity, and outcome data, which are routinely validated and risk adjusted for reporting purposes. **INICUA:** This is a robust dataset that includes case mix, activity, and outcome data, which are routinely validated and risk adjusted for reporting purposes. **ICCA:** Supplemental data were collected locally in PCCU to address specific audit objectives and provide detailed information on subspecialty activity and outcomes, including cardiothoracic and neurosurgical admissions, mortality, healthcare-associated infections, CDH, and TOF. These data provide clinically meaningful information that supports service evaluation, quality improvement, and healthcare planning.
ACCURACY AND RELIABILITY	Data correctly and consistently describe what they were designed to measure.	Data quality is supported through extensive validation processes across all contributing datasets. PICANet applies validation checks at data entry and central database level to identify logical inconsistencies, out-of-range values, and missing or incorrect data. INICUA data undergo more than 600 validation checks before being approved for analysis. These robust quality assurance processes ensure that the data are accurate, reliable, and fit for reporting purposes. Supplemental data are recorded by trained clinical personnel within PCCUs and validated against source records, including patient charts, clinical information systems, operative records, microbiology reports, and mortality reviews. Local clinical review and oversight ensure data accurately reflect patient care and outcomes.
TIMELINESS AND PUNCTUALITY	Data are collected within a reasonable, agreed period and are delivered on the dates promised.	**PICANet:** CHI at Crumlin and CHI at Temple Street did not achieve 100% completeness within three months of discharge during the reporting period (see Figure 8.1). However, 100% completeness was achieved prior to the final data lock for the reporting period, which occurs on 1 March each year. Data completeness reports by data item for each dataset are available here. **INICUA** collects data from 29 Intensive Care Units in the ROI, which represents 100% of all critical care in HSE-funded hospitals (see Appendix 2 for data coverage in each participating hospital for 2024). Supplemental data are entered throughout the patient's admission and reviewed regularly by local clinical teams.

TABLE 3.1: OVERVIEW OF DATA QUALITY FOR IRISH PAEDIATRIC CRITICAL CARE AUDIT REPORT 2024 *CONTINUED*

DIMENSIONS OF DATA QUALITY	DEFINITION (HIQA, 2018)	ASSESSMENT OF DIMENSION
COHERENCE AND COMPARABILITY	**Data are consistent over time and across providers and can be easily combined with other sources.**	Standardised data definitions, coding structures, and validation processes across PICANet and INICUA, support consistency in data collection and reporting. PICANet and INICUA provide routinely validated and risk-adjusted activity and outcome data. The use of established national and international datasets facilitates comparisons over time, between organisations and with other jurisdictions. Consistent methodologies are used for collecting, extracting, and analysing supplemental data from the ICCA system and TMS, enabling reliable comparisons across sites and over time. Data fields are subject to predefined formats, business rules, and clinical validation checks within the ICCA and TMS systems.
ACCESSIBILITY ANDA CLARITY	**Data are easily obtainable and clearly presented in a way that can be understood.**	All participating organisations can access real-time local data downloads for their own unit's data on the PICANet web platform. The PICANet Data Dashboard is publicly available on its website and provides a selection of charts showing data relating to some of PICANet's key metrics. PICANet refreshes the data included in the PICANet Data Dashboard between the publication of the annual reports.

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CHAPTER 4
ADMISSIONS AND PATIENT PROFILE IN PAEDIATRIC AND ADULT CRITICAL CARE UNITS

CHAPTER 4: ADMISSIONS AND PATIENT PROFILE IN PAEDIATRIC AND ADULT CRITICAL CARE UNITS

ADMISSIONS TO PCCU

During 2024 in the ROI, there were 1,715 admissions of patients to PCCU (1,098 to CHI at Crumlin and 617 to CHI at Temple Street); these numbers include 22 admissions of patients aged 16 years or over; and 103 admissions of patients from Northern Ireland. The figures do not include paediatric patients requiring critical care who were treated in adult ICUs; there were 128 admissions of children aged under 16 years to 11 adult ICUs in 2024, and more detailed information on these admissions is available in Table 4.4.

Between 2022 and 2024, there were 55,050 admissions to all PCCUs across the UK and the two Units in the ROI (CHI at Crumlin Paediatric Intensive Care Unit and CHI at Temple Street Paediatric Intensive Care Unit) (Table 4.1). The ROI Units accounted for 9% (n=5018) of all admissions.

TABLE 4.1: NUMBER OF ADMISSIONS TO PCCUS AGED UNDER 16 YEARS BY COUNTRY AND YEAR, 2022–2024

Country	2022	2023	2024	2022–2024
ENGLAND	14 566	14 509	14 119	43 194
SCOTLAND	1509	1500	1434	4443
NORTHERN IRELAND	425	395	349	1169
WALES	397	403	426	1226
REPUBLIC OF IRELAND	1634	1691	1693	5018
TOTAL	**18 531**	**18 498**	**18 021**	**55 050**

The total number of admissions per Unit for 2024 is illustrated in Figure 4.1 (see here for the PICANet organisation key). CHI at Crumlin had the third-highest number of PCCU admissions of all PICANet participating Units, at 1,081 in 2024, after Great Ormond Street Hospital (E1, E2 and E3) and Birmingham Children's Hospital (V). It is worth noting that the amalgamation of the two CHI Units in the National Children's Hospital will result in the admission of nearly 1,700 patients per annum, making it one of the largest Units participating in PICANet.

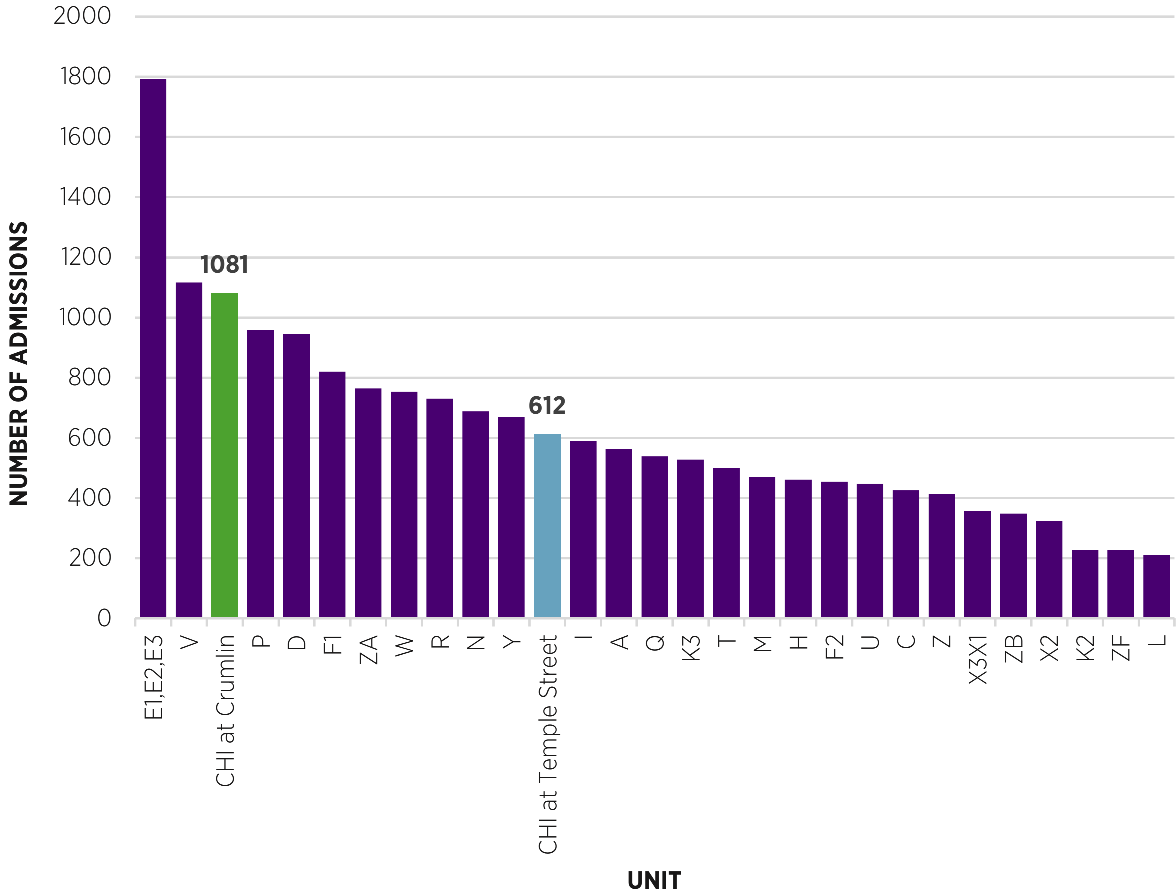

FIGURE 4.1: TOTAL NUMBER OF ADMISSIONS TO UNITS PARTICIPATING IN PICANET, BY UNIT, 2024 (N=18,021)

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AGE PROFILE OF CHILDREN ADMITTED TO PCCUs

The age distribution of children admitted to individual PCCUs in the ROI in 2024 is presented in Figure 4.2. Neonates accounted for 26% (n=280) of all PCCU admissions in CHI at Crumlin and 17% (n=106) in CHI at Temple Street. Infants aged under 1 year (including neonates) accounted for almost half of all PCCU patients (45%), 50% of all admissions to CHI at Crumlin in 2024 (n=545) and 36% of admissions to CHI at Temple Street (n=220). Sixty-four per cent (n=397) of patients admitted to PCCU in CHI at Temple Street were aged over 1 year, compared with 51% (n=553) in CHI at Crumlin.

The age profile of children admitted to CHI at Crumlin and CHI at Temple Street differs from other Units participating in PICANet, as both Units admit neonates requiring surgical intervention who are aged from 24 weeks' gestation. Therefore, it is important that Units monitor morbidity and outcomes and compare these with international norms in neonatal audit.

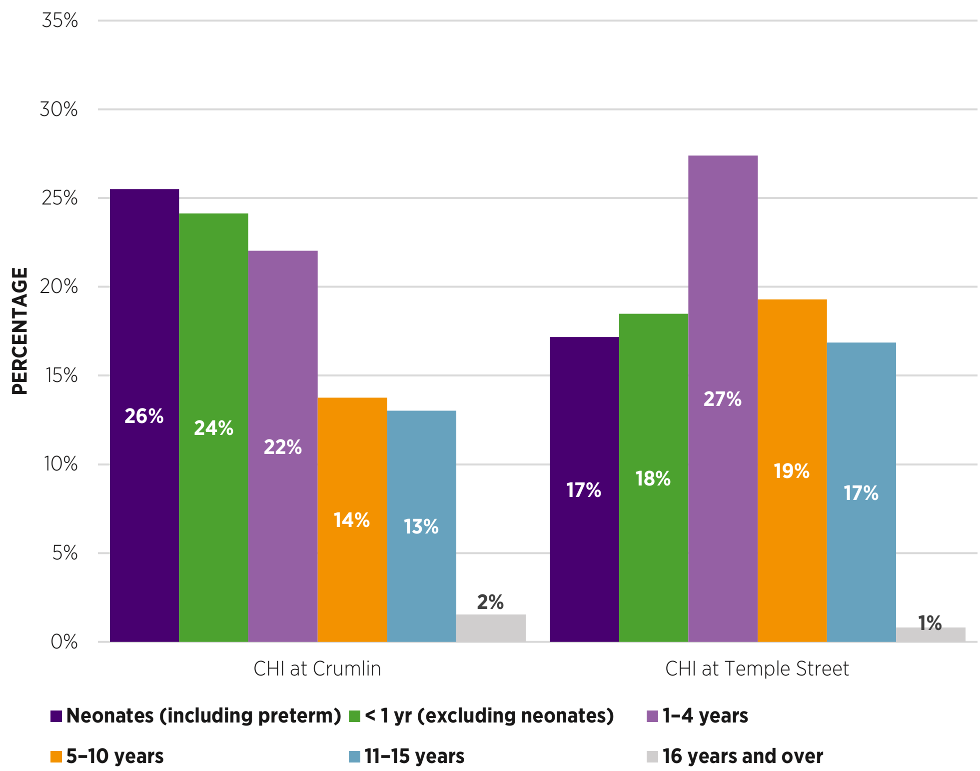

FIGURE 4.2: AGE PROFILE OF CHILDREN IN PCCUS IN CHI AT CRUMLIN (N=1098) AND CHI AT TEMPLE STREET (n=617), 2024

ETHNICITY OF CHILDREN ADMITTED TO PCCUs

Table 4.2 shows that the majority (83%) of admissions to PCCUs in the ROI were for children of White ethnic origin, who make up 91% of the general child population in the ROI. The rate of admissions for the White ethnic group was 14.5 per 10,000 population. This is lower than the admission rates for children of Asian and 'Other (including mixed)' ethnic groups, which were 26.3 and 24.8 per 10,000 population, respectively. The Black ethnic group had the highest rate of admission, at 27.9 per 10,000 population.

TABLE 4.2: ADMISSION RATE PER 10,000 POPULATION AGED UNDER 16 YEARS IN THE ROI, BY ETHNICITY, 2024[1]

Ethnicity	Child population 2022		PCCU admissions 2024		Admissions per 10 000 population
	N	%	N	%	
Asian	42 895	4%	113	7%	26.3
Black	22 872	2%	64	4%	27.9
Other (including mixed)	34 635	3%	86	5%	24.8
White	969 287	91%	1408	83%	14.5
Total	**1 069 689**		**1693**		**15.8**

[1] Excludes admissions that had ethnicity recorded as 'unknown' or 'not stated'.
'Other' includes children of Arab and Roma ethnicity.
The population within each ethnic group is calculated using data from the Central Statistics Office's 2022 Census.

TYPE AND SOURCE OF ADMISSION

Figure 4.3 shows that the greatest proportion of admissions to both PCCUs were unplanned (i.e. emergencies), with differences between the two Units. There was a 6% increase in planned admissions to CHI at Crumlin in 2024 (n=440) when compared with 2023 (n=414). In CHI at Temple Street there was a 25% increase in unplanned admissions in 2024 (n=510) when compared with 2023 (n=408).

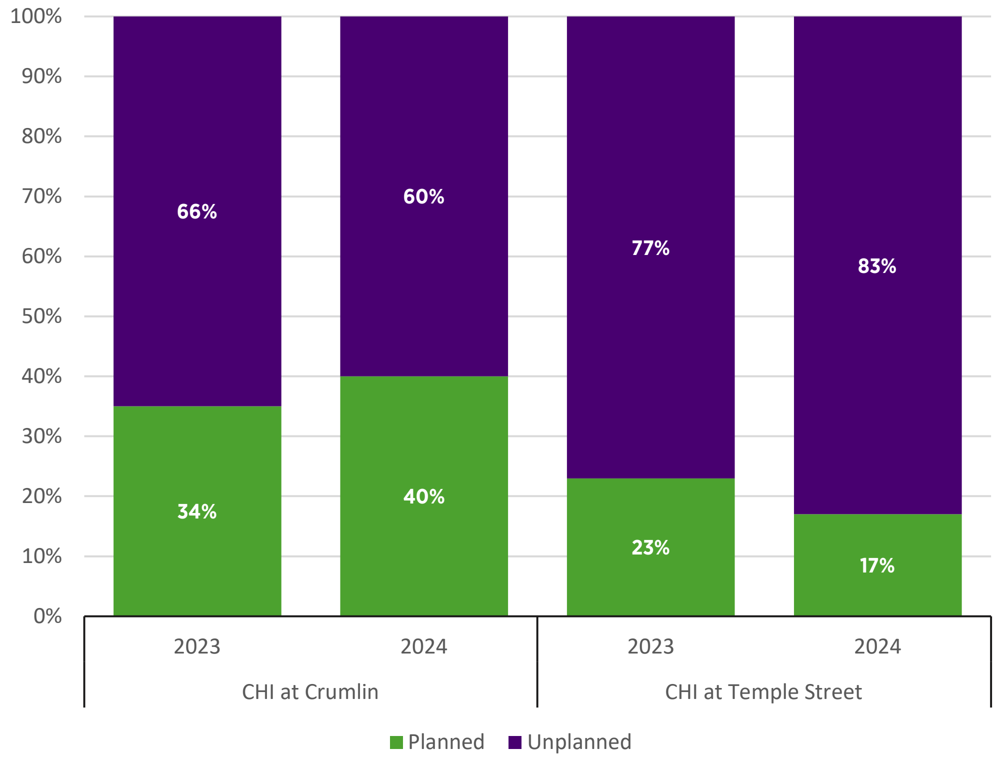

FIGURE 4.3: ADMISSIONS TO CHI AT CRUMLIN (n=2294) AND CHI AT TEMPLE STREET (n=1144), BY TYPE, 2023–2024

The source of unplanned admissions varied between CHI at Crumlin and CHI at Temple Street. A larger proportion of unplanned admissions to PCCU in CHI at Crumlin were inpatients of the same hospital (56%; n=339), whereas in CHI at Temple Street, a larger proportion of unplanned admissions to PCCU were transfers from another hospital (65%; n=306) (Figure 4.4).

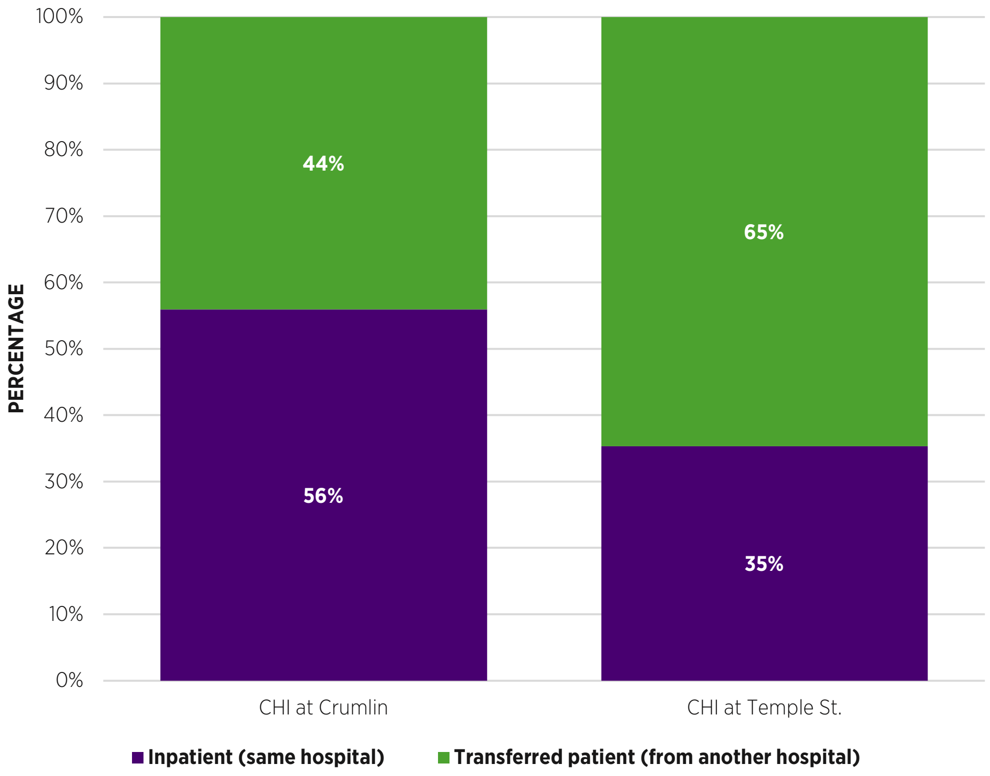

FIGURE 4.4: SOURCE OF 'UNPLANNED – OTHER' PCCU ADMISSIONS TO CHI AT CRUMLIN (n=606) AND CHI AT TEMPLE STREET (n=473), 2024

ADMISSIONS BY PRIMARY DIAGNOSIS GROUP

The number of admissions to PCCU in 2024 grouped by primary diagnosis is outlined in Figure 4.5. In CHI at Crumlin, the largest proportion of patients admitted to PCCU (40%; n=429) were those with cardiovascular diagnoses. CHI at Crumlin is the site of the All-Island Congenital Heart Disease Network, and admissions reflect both cardiology and cardiothoracic admissions in 2024. A more detailed breakdown of these admissions is provided in Chapter 6. In CHI at Temple Street, the largest proportion of patients were admitted for respiratory diagnoses, accounting for 38% (n=230) of admissions to this Unit. CHI at Temple Street is the national centre for excellence for neurosurgical treatment: 23% (n=139) of PCCU admissions were neurological patients. Please note that the introduction of the SNOMED clinical coding system to PICANet has created an increase in the number of admissions with a primary diagnosis as 'Other' in 2024. This impact will be addressed in future updates of the data.

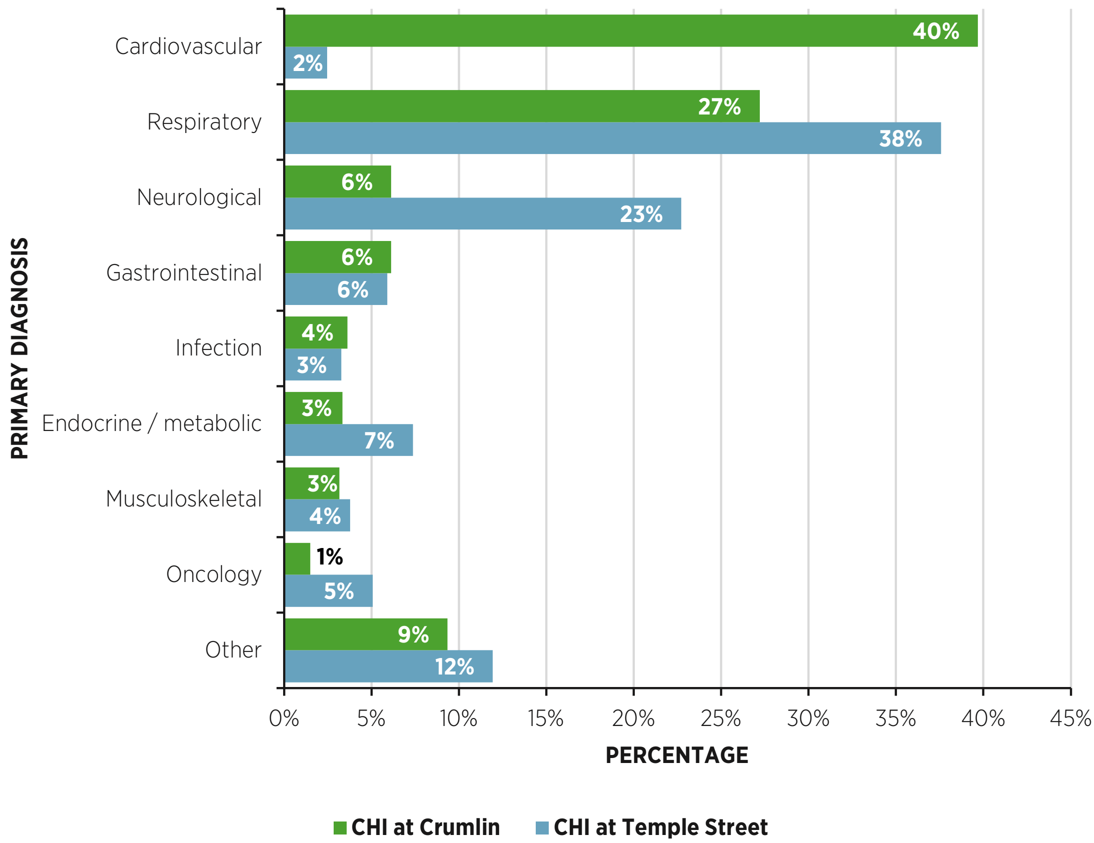

FIGURE 4.5: ADMISSIONS TO PCCUs IN THE ROI, BY PRIMARY DIAGNOSIS, 2024 (N=1693)

Figure 4.6 outlines the admissions to PCCU by primary diagnosis and elective status. Overall, 68% (n=1157) of admissions to PCCU in 2024 were unplanned. The most common reason for admission to PCCU was a respiratory diagnosis (31%, n=524), and the majority of these admissions (92%) were unplanned. In contrast, the majority of admissions (67%) for the second most common primary diagnosis group, cardiovascular (26%, n=444), were planned. This reflects the children admitted to CHI at Crumlin's All-Island Congenital Heart Disease Network, which includes both cardiothoracic surgery and cardiology. Of the remaining primary diagnosis groups, the majority were unplanned, with only musculoskeletal and oncology admissions being mainly planned.

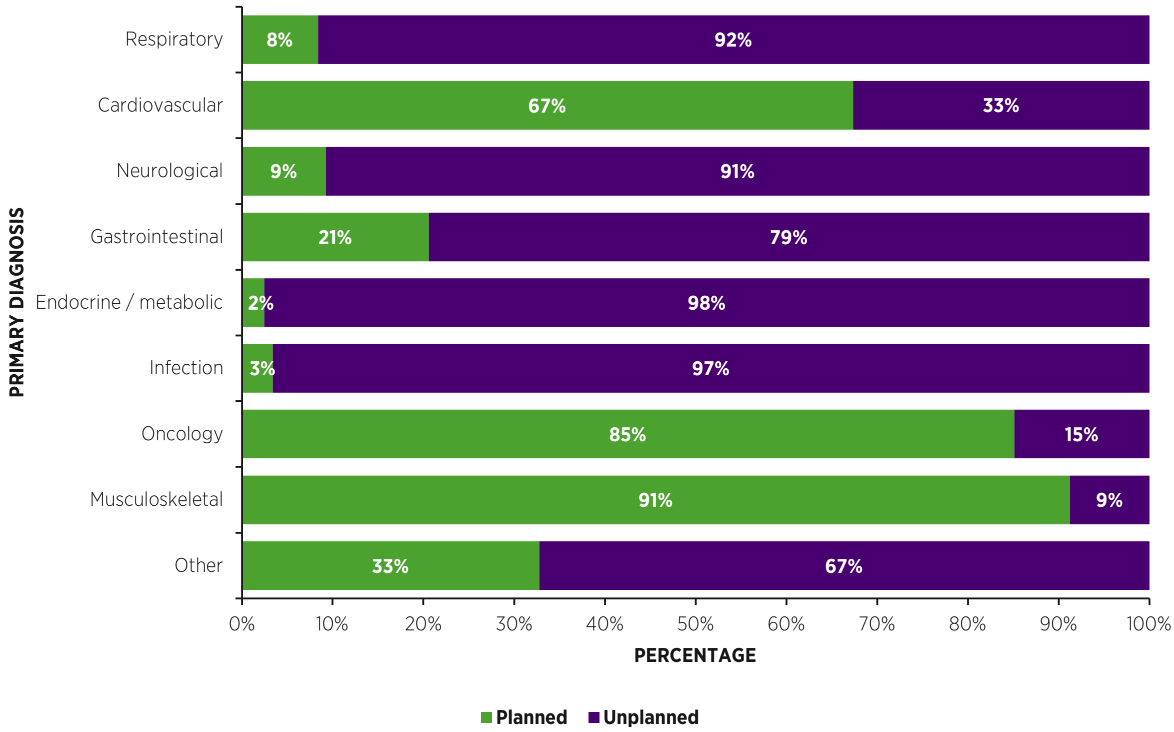

FIGURE 4.6: ADMISSIONS TO PCCUs IN THE ROI, BY PRIMARY DIAGNOSIS AND ELECTIVE STATUS, 2024 (N=1693)

NEONATAL ADMISSIONS

The ROI Units are among the few PCCUs participating in PICANet to have nearly 30% of all admissions in the neonatal age category, with more than one-half of these being aged under 38 weeks. Neonates are among the most complicated and highest-risk cases admitted to PCCU. Neonate admissions are defined as those with a corrected age at admission to PCCU of under 29 days, where corrected age is calculated to the nearest full week.

Table 4.3 presents the proportion of overall admissions that are neonates by their gestational age at delivery (in weeks) to CHI at Crumlin and CHI at Temple Street PCCUs in 2024. Twenty-six per cent (n=280) of overall admissions to CHI at Crumlin were neonates; 13% (n=145) were preterm, and 5% (n=54) were born under 32 weeks' gestation. Seventeen per cent (n=106) of admissions to CHI at Temple Street were neonates; 12% (n=72) were preterm, and 6% (n=36) were born under 32 weeks' gestation.

TABLE 4.3: NEONATAL PCCU ADMISSIONS AS A PERCENTAGE OF TOTAL ADMISSIONS IN CHI AT CRUMLIN (n=280) AND CHI AT TEMPLE STREET (n=106), BY GESTATIONAL AGE, 2024

Gestational Age	CHI at Crumlin		CHI at Temple Street	
	N	Percentage of total admissions	N	Percentage of total admissions
Extremely preterm (<28 weeks)	27	2.5%	14	2.3%
Very preterm (28–32 weeks)	27	2.5%	22	3.5%
Moderate to late preterm (33–37 weeks)	91	8.3%	36	5.8%
Term (38–42 weeks)	135	12.3%	34	5.6%
Total	**280**	**25.5%**	**106**	**17.2%**

Figure 4.7 presents the breakdown of neonatal admissions to each individual PCCU during 2024. In CHI at Crumlin, the largest proportion (48%; n=135) of neonates were admitted due to cardiovascular problems (this includes postoperative cardiothoracic and post-catheterisation laboratory cardiology patients), with the next largest group (16%; n=46) admitted due to respiratory diagnoses. By contrast, in CHI at Temple Street, respiratory (34%; n=36), gastrointestinal (25%; n=27), and neurological (13%; n=14) diagnoses were the main reasons for admission. Please note that the introduction of the SNOMED clinical coding system in PICANet has created an increase in the number of admissions with a primary diagnosis as 'other' in 2024. This impact will be addressed in future updates of the data.

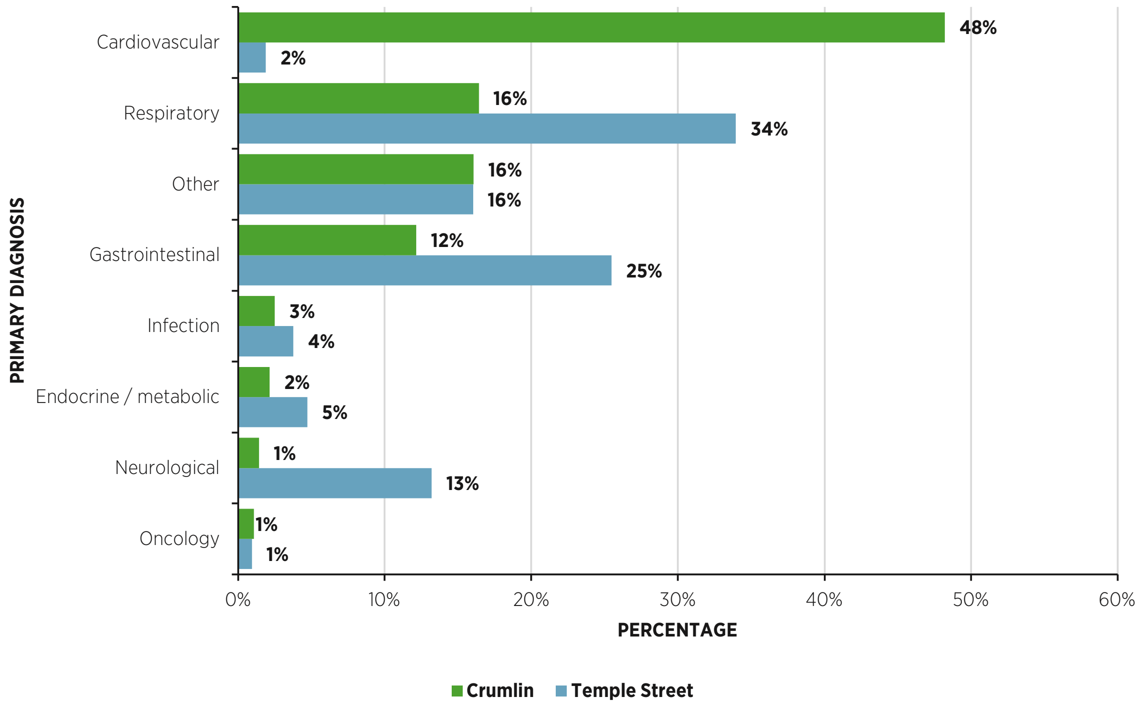

FIGURE 4.7: NEONATAL PCCU ADMISSIONS IN CHI AT CRUMLIN (n=280) AND CHI AT TEMPLE STREET (n=106), BY PRIMARY DIAGNOSIS, 2024[2]

[2] 'Other' includes 'unknown', 'blood/lymphatic', and 'multisystem'.

RESPIRATORY DIAGNOSES

Respiratory diagnoses were the main reason for admission to a PCCU in CHI in 2024, comprising 31% (n=527) of all admissions. Respiratory diagnoses include bronchiolitis and pneumonia – infections of the upper or lower respiratory tract that may be caused by bacteria or viruses, including respiratory syncytial virus (RSV). The peak monthly admissions for respiratory illness were January to February and October to December, with November and December being the busiest months.

Figure 4.8 shows there was a 45% (n=66) decrease in respiratory admissions in neonatal infants when compared with 2023. This is most likely due to the effect of the RSV Immunisation Pathfinder programme, which was implemented by the HSE in August 2024 as a temporary measure for the 2024/2025 RSV season. All newborns born between 1 September 2024 and 28 February 2025 were offered this immunisation and it had an overall uptake of 83%. In August 2025, an expanded RSV immunisation programme was introduced for the 2025–2026 season.

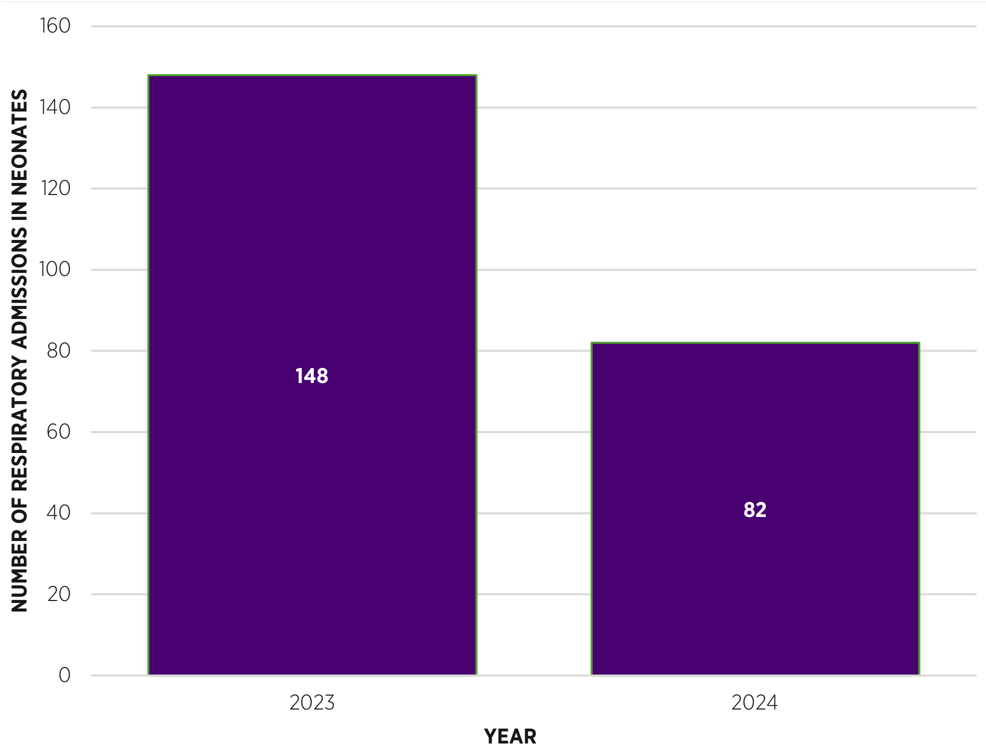

FIGURE 4.8: NEONATAL RESPIRATORY ADMISSIONS TO PCCUs IN THE ROI, BY AGE, 2023 (n=148) AND 2024 (n=82)

ADMISSIONS OF CHILDREN TO ADULT ICUs

There were 128 admissions of children aged under 16 years to 11 adult ICUs across the ROI in 2024 (Figure 4.9). The HSE West and North West health region had the highest number of such admissions (80%, n=103).

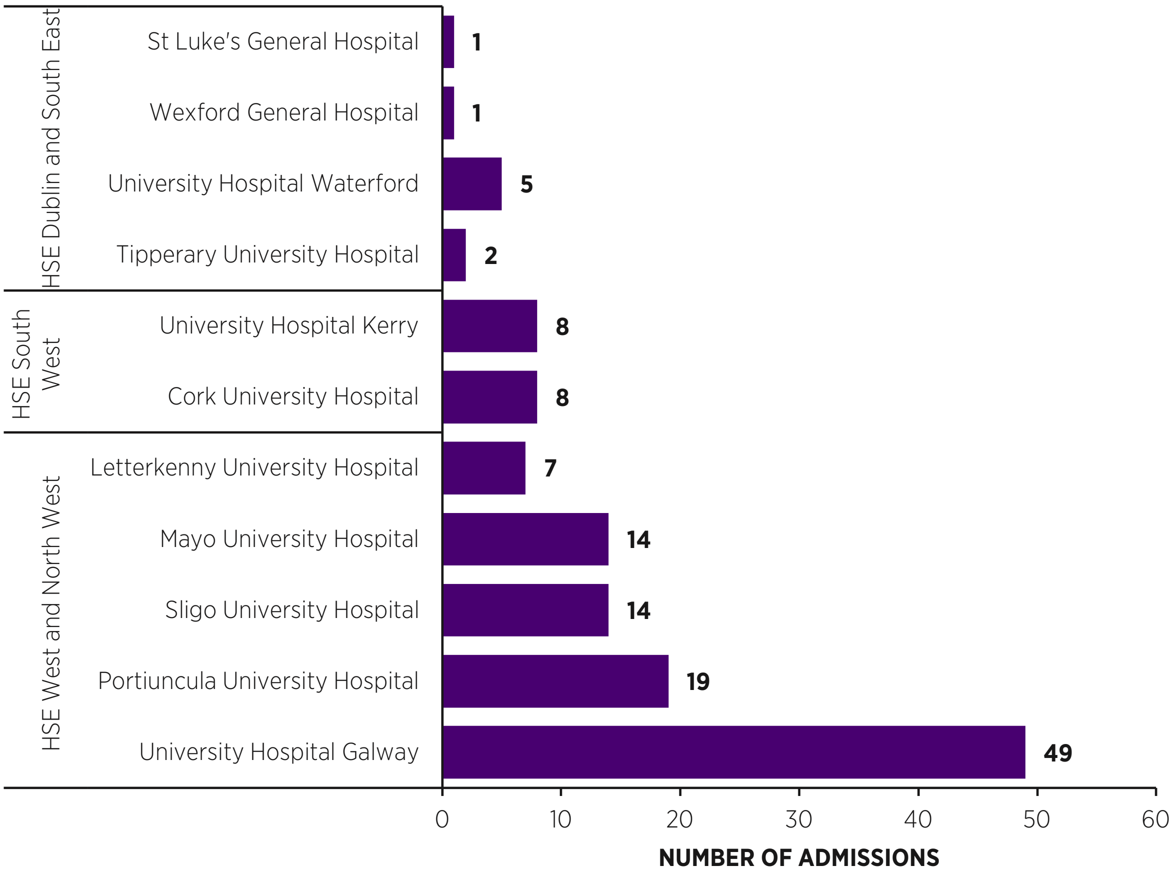

FIGURE 4.9: PAEDIATRIC ADMISSIONS TO ADULT ICUs IN THE ROI, BY HSE HEALTH REGION, 2024 (n=128)

In 2024, the median length of stay (LOS) in adult ICUs was less than 24 hours (11.6 hours) (Table 4.4) with a small number requiring a longer stay. Almost one-third (31%; n=40) of the children admitted to adult ICUs in 2024 required invasive ventilation. Admissions occurred across three age groups:

- **Under 1 year**: (14%, n=18) bronchiolitis, pneumonia, croup, pertussis and other respiratory illnesses.
- **1–5 years**: (27%, n=35) respiratory conditions, asthma, pneumonia and seizure disorders.
- **6–15 years**: the largest group (59%, n=75), with a broader range of presentations including:
  - Diabetic ketoacidosis
  - Asthma
  - Seizures
  - Pneumonia
  - Trauma
  - Poisoning/self-harm
  - Neurological and surgical conditions.

Almost half of the patients (45%, n=54) were transferred onward to specialist paediatric/neonatal critical care services, and overall survival was high (97%).The data provided by the INICUA for this group of children who were admitted to adult ICUs show a short LOS and mainly Level 2 care, highlighting the need for regional Paediatric High Dependency Units (PHDUs) in designated areas, as outlined in the *Model of Care for Paediatric Critical Care* (National Clinical Programme for Critical Care and National Clinical Programme for Paediatrics, 2019). Admitting children to adult ICUs is not ideal and should be avoided where possible. The National Clinical Programme for Critical Care reiterates that adult ICUs admitting children should have designated nursing medical staff, as per the Joint Faculty of Intensive Care Medicine of Ireland's Paediatric Intensive Care Medicine standards, and should work towards setting up regional PHDUs.

TABLE 4.4: CHILDREN AGED UNDER 16 YEARS ADMITTED TO ADULT ICUs IN THE ROI, BY AGE, CASE MIX, VENTILATION, LENGTH OF STAY, AND SURVIVAL TO HOSPITAL DISCHARGE, 2023 (N=148) AND 2024 (N=128)

Parameter	2023	2024
Total number of patients aged <16 years	148	128
Mean age, in years (median; interquartile range (IQR))	6 (5; 1–12)	8 (9;2–13)
Number of patients aged <1 year (%)	31 (21%)	18 (14%)
Number of patients aged 1–5 years (%)	45 (30%)	35 (27%)
Number of patients aged 6–15 years (%)	72 (49%)	75 (59%)
Number of admissions after surgery (%)	14 (9%)	16 (12%)
Number of admissions with sepsis (%)	43 (29%)	41 (32%)
Number of patients who received invasive ventilation (%)	46 (31%)	40 (31%)
Mean Unit LOS, in hours (median; IQR)	18 (11.6; 4.9–19.0)	16 (11.6; 5.0-17.8)
Mean predicted mortality rate (median; IQR)	11.9 (5.0; 0.9–15.1)	7.2 (1.6;0.6-6.6)
Number of Unit survivors (%)	143 (97%)	117 (98%) *
Number of hospital survivors (%)	138 (93%)	116 (97%) *

*Excludes nine readmissions within same hospital stay.

CHAPTER 5
BED ACTIVITY INTERVENTIONS AND OUTCOMES IN PCCUS

CHAPTER 5: **BED ACTIVITY INTERVENTIONS AND OUTCOMES IN PCCUs**

NUMBER OF BED DAYS DELIVERED

The total number of bed days delivered is calculated as the sum of children receiving critical care in a PCCU each day. A bed day is counted if a child is in a PCCU bed for part of any day during the reporting period. National figures of bed days delivered for individual countries are presented in Table 5.1. The ROI Units accounted for 7% (n=10,274) of all bed days delivered in 2024. Bed days delivered by the PCCUs in the ROI decreased by 8% in 2024 compared with 2023.

TABLE 5.1: NUMBER OF BED DAYS DELIVERED, BY COUNTRY OF ADMISSION AND YEAR, 2022–2024

Country	2022	2023	2024	Total
ENGLAND	121 180	114 033	117 426	352 639
SCOTLAND	10 999	10 157	11 107	32 263
NORTHERN IRELAND	3079	2816	2670	8565
WALES	2428	3510	3109	9047
REPUBLIC OF IRELAND	10 795	11 164	10 274	32 233
TOTAL	**148 481**	**141 680**	**144 586**	**434 747**

The total number of bed days delivered in each Unit during 2024 is illustrated in Figure 5.1. In 2024, CHI at Crumlin delivered the third-highest number of bed days (n=7484) out of all PCCUs in the UK and the ROI, after Birmingham Children's Hospital (V) and Royal Manchester Children's Hospital (D). CHI at Temple Street delivered 2790 bed days in 2024.

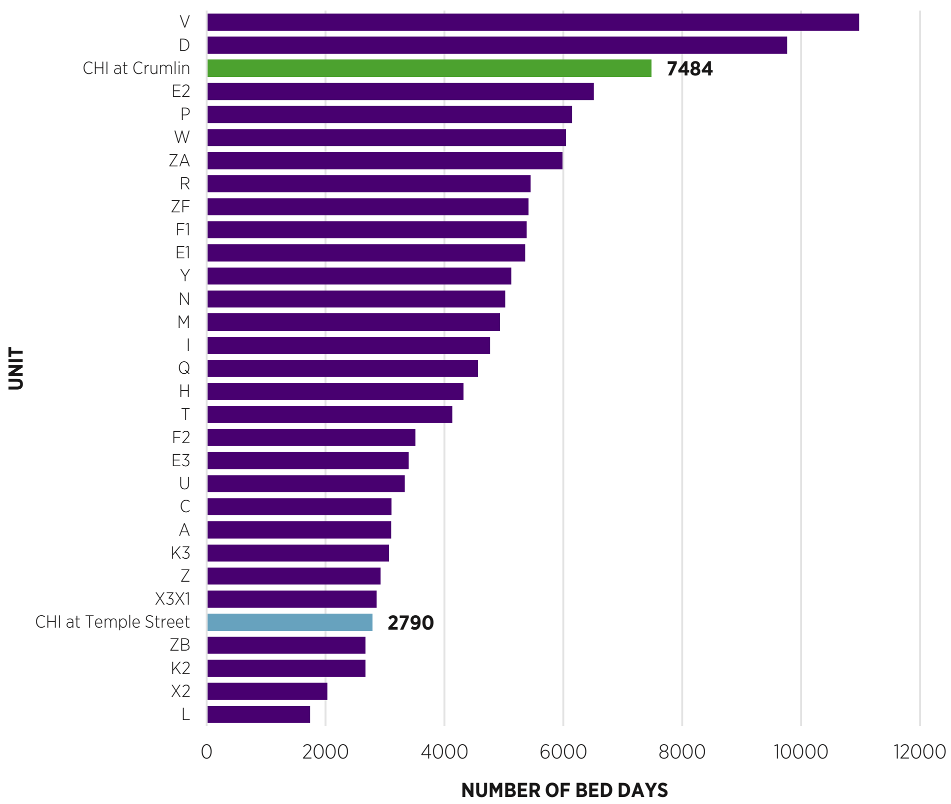

FIGURE 5.1: NUMBER OF BED DAYS DELIVERED IN EACH UNIT PARTICIPATING IN PICANet, BY UNIT, 2024 (N=144586)

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Figure 5.2 shows that children aged less than 1 year account for the largest proportion of bed days in CHI at Crumlin (63%, n=4686), with infants aged under 1 month accounting for one-third of bed days; whereas in CHI at Temple Street, children aged over 1 year account for the largest proportion of bed days (62%, n=1724).

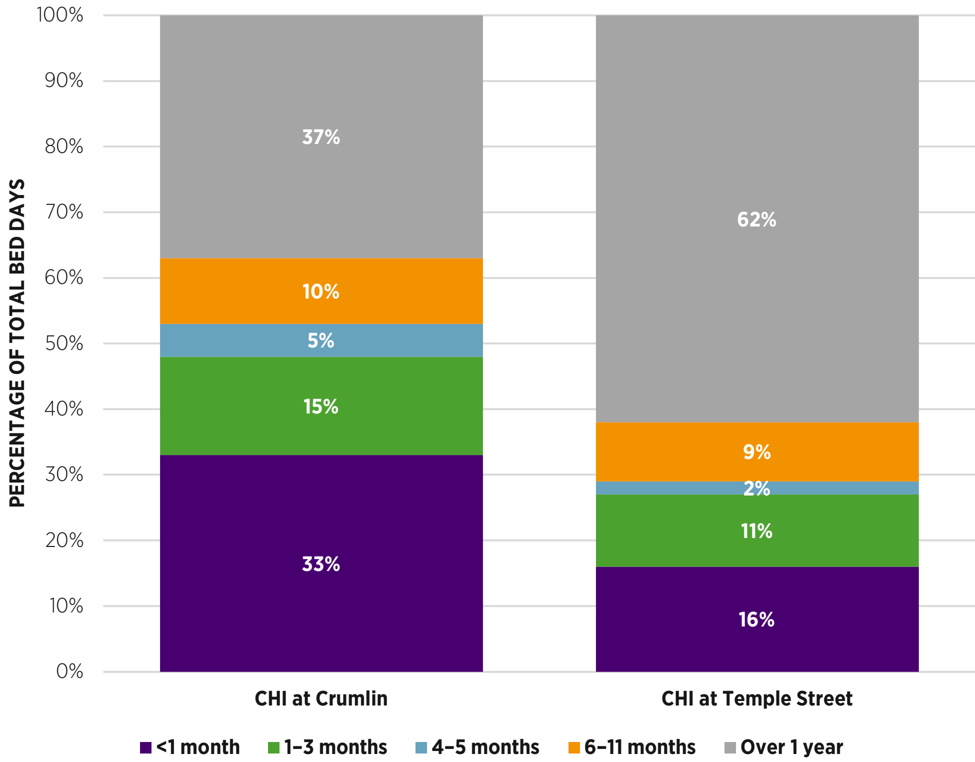


FIGURE 5.2: PERCENTAGE OF TOTAL BED DAYS DELIVERED IN CHI AT CRUMLIN (n=7484) AND CHI AT TEMPLE STREET (n=2790), BY AGE GROUP, 2024

BED ACTIVITY

Table 5.2 shows the bed activity in both ROI Units for each year from 2022 to 2024. CHI at Crumlin had 23 bed spaces available in 2024, and CHI at Temple Street had 9 bed spaces available. CHI at Crumlin had a median of 23 beds open during 2024, while CHI at Temple Street had a median of 8 beds open.

TABLE 5.2: BED ACTIVITY, ALL ADMISSIONS TO PCCUs IN THE ROI, BY YEAR, 2022–2024

Unit	2022		2023		2024	
	Median	IQR	Median	IQR	Median	IQR
CHI at Crumlin	22	20–24	23	21–23	23	21–23
CHI at Temple Street	8	6-9	7	6-8	8	8-9

BED OCCUPANCY IN PCCU

The *National Standards for Paediatric Critical Care Services* (Joint Faculty of Intensive Care Medicine of Ireland, 2025) recommends an average annual bed occupancy limit of 85%. This should allow for seasonal surges when required.

The physical number of beds in a Unit does not reflect operational bed availability, occupancy, or staffing issues. An actual PCCU bed should reflect national PCCU standards for medical and nursing staff cover. These data do not reflect acuity, where one bed could require a nurse–patient ratio of 3:1; for example, if the patient is on extracorporeal life support (ECLS) and continuous venovenous haemofiltration (CVVH).

Figure 5.3 shows the bed occupancy rate for each Unit by month during 2024. Both Units exceeded the recommended occupancy limit of 85% for most months during the year, apart from the summer season. The average annual bed occupancy for CHI at Crumlin was 92% and for CHI at Temple Street 88%. In November 2024, CHI at Crumlin reached a peak of 106% bed occupancy, and in January 2024 CHI at Temple Street reached a peak of 113%.

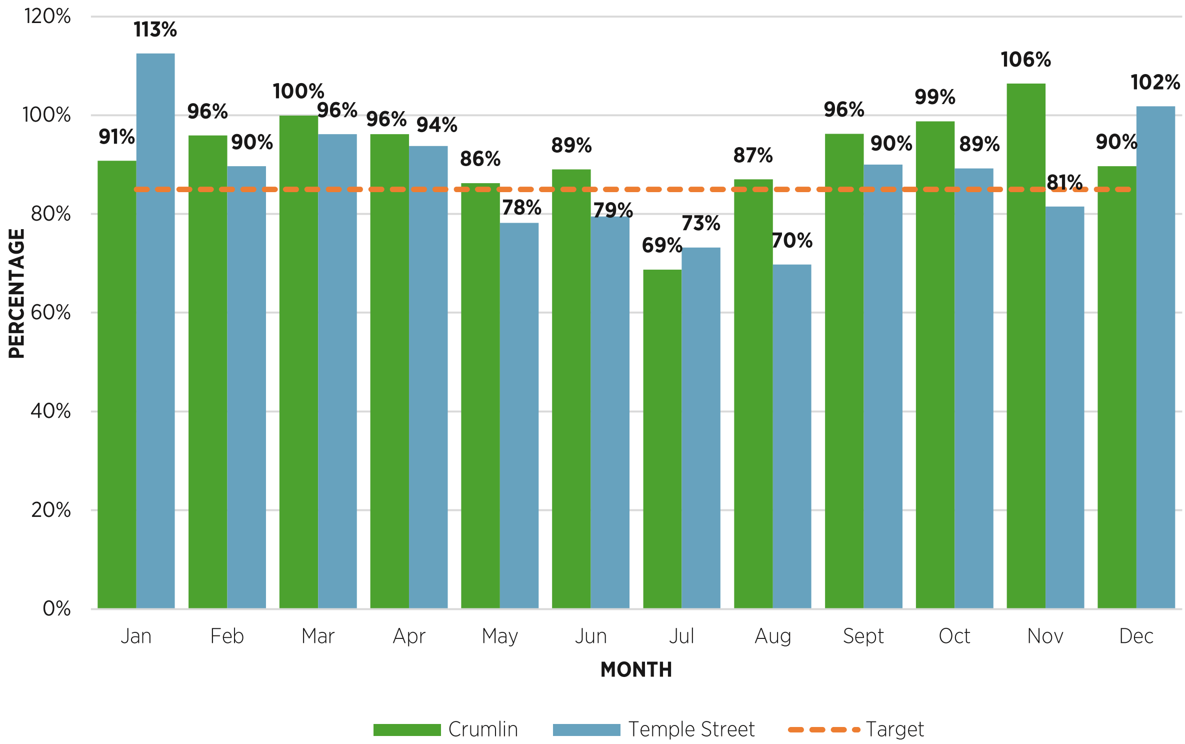


FIGURE 5.3: BED OCCUPANCY IN CHI AT CRUMLIN AND CHI AT TEMPLE STREET, BY MONTH, 2024

LENGTH OF STAY

Table 5.3 presents the median LOS for 2024 as the median number of days, along with the IQR, by country. The median LOS in the ROI was 2 days, which is lower than all other countries except for Scotland, which also had a median LOS of 2 days. The proportion of patients with a long stay (more than 28 days) ranged from 2% in the ROI (n=40) and Northern Ireland (n=8) to 4% in England (n=605) and Scotland (n=62).

TABLE 5.3: LENGTH OF STAY, BY COUNTRY, 2024

Country	Number of admissions	Median LOS, in days	IQR	Long stay	Long stay
				N	%
ENGLAND	14 134	3	1.1–6.4	605	4%
SCOTLAND	1435	2	0.9–5.7	62	4%
NORTHERN IRELAND	344	3	1.2–6.8	8	2%
WALES	421	3	1.0–7.1	12	3%
REPUBLIC OF IRELAND	1693	2	1.1–5.3	40	2%

Figure 5.4 shows the median LOS for each Unit. The median LOS in 2024 was longer for patients in CHI at Crumlin (2.9 days) than for those in CHI at Temple Street (1.7 days). The proportion of patients with a long stay (longer than 28 days) in 2024 was 3% (n=34) for CHI at Crumlin and 1% (n=6) for CHI at Temple Street. Table 5.4 provides more details on the long-stay patients. Most long-stay patients were aged under 1 year (65%; n=26). Most were unplanned admissions (80%; n=32), and respiratory diagnoses accounted for 33% (n=13) of these patients.

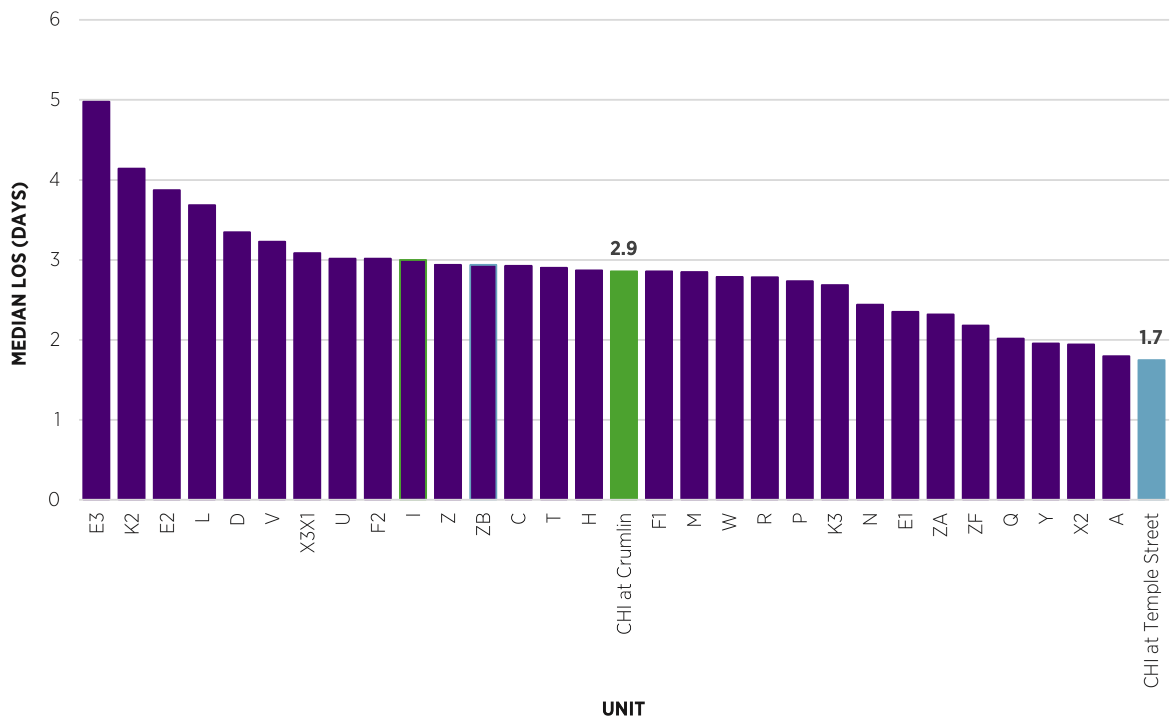


FIGURE 5.4: MEDIAN LOS IN EACH UNIT PARTICIPATING IN PICANet, BY UNIT, 2024

TABLE 5.4: CASE MIX OF LONG-STAY PATIENTS (MORE THAN 28 DAYS) IN PCCUs IN THE ROI, 2024 (n=40)

Variable		n	%
Age	Neonates	21	53%
	<1 year (excluding neonates)	~	*
	1–10 years	8	20%
	11–15 years	6	15%
Primary Diagnosis	Respiratory	13	33%
	Cardiovascular	12	30%
	Body wall and cavities (CDH)	6	15%
	Neurological	~	*
	Other	~	*
PCCU	CHI at Crumlin	34	85%
	CHI at Temple Street	6	15%
Admission Type	Planned	8	20%
	Unplanned	32	80%
Source of Admission	Other hospital	18	45%
	Same hospital	22	55%
Previous ICU Admission	ICU (Adult)	~	*
	NICU	12	30%
	PICU	9	23%
	None	16	40%
Duration of Intensive Ventilation	0–30 days	20	50%
	31–60 days	18	45%
	≥61 days	~	*
Outcome	Alive	33	83%
	Dead	7	18%

~ Denotes five cases or fewer.
* Further suppression required in order to prevent disclosure of five cases or fewer.

DAILY ACTIVITY DATA: PAEDIATRIC CRITICAL CARE MINIMUM DATA SET

The purpose of the Paediatric Critical Care Minimum Data Set (PCCMDS) is to provide the basis for payment based on results through the establishment of UK Healthcare Resource Groups (HRGs). HRGs were specified to take account of differing levels of activity in PCCUs (National Casemix Office, 2022). HRG definitions highlight differences in the intensity and complexity of support provided in PCCUs. HRG definitions and descriptions of the levels of paediatric critical care in the ROI are detailed in Appendix 3. Figure 5.5 illustrates the proportion of patients who received care at each of the specified levels of care in 2024. These data are important in terms of bed days used, staffing, and bed availability.

Sixty-four per cent of patients (n=694) who were admitted to CHI at Crumlin received advanced critical care at Level 1 and above. The most frequent level of care delivered to patients in CHI at Crumlin was Level 2 (35%), with 10% of patients receiving more complex care at Levels 3, 4, and 5. Forty-eight per cent of patients admitted to CHI at Temple Street received advanced critical care at Level 1 or above, with 18% receiving Level 2 care and 5% receiving more complex care (Levels 3 and 4).

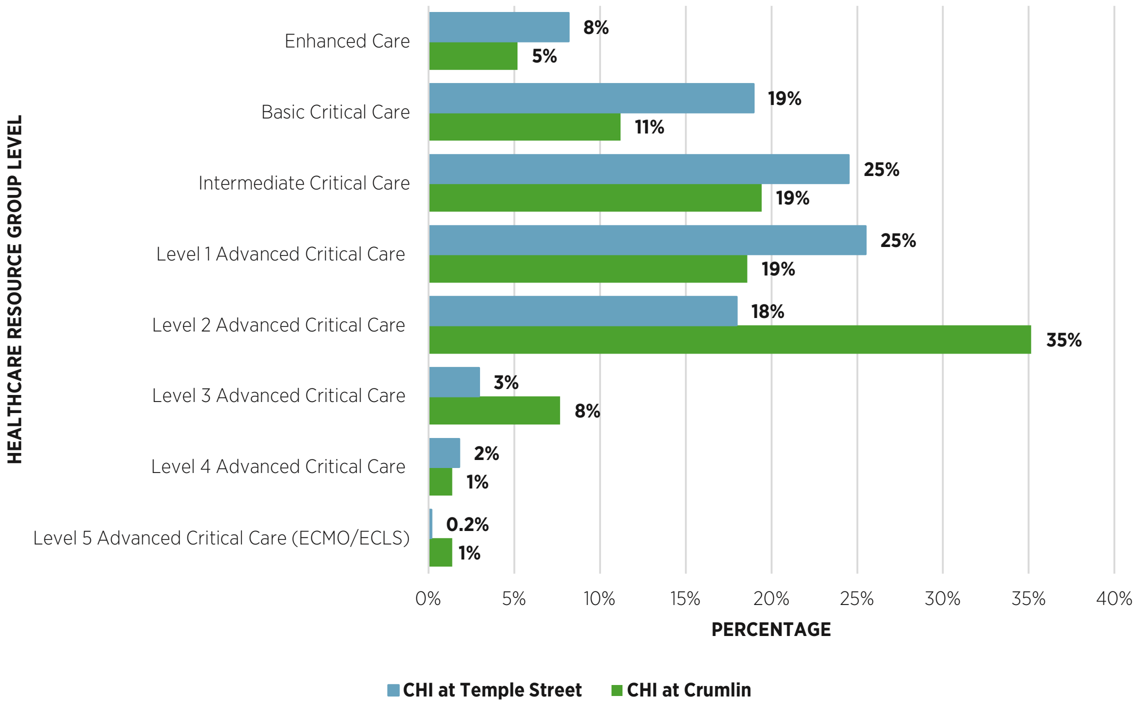


FIGURE 5.5: PROPORTION OF ADMISSIONS RECEIVING CARE AT EACH HRG LEVEL IN CHI AT CRUMLIN (n=1081) AND CHI AT TEMPLE STREET (n=612), 2024

INTERVENTIONS IN PCCUs IN IRELAND

Figure 5.6 shows the patient interventions carried out in the PCCUs in CHI at Crumlin and CHI at Temple Street in 2024. The most frequently used intervention for patients in both PCCUs during the reporting period was invasive ventilation to deliver oxygen and air into the lungs (e.g. via an endotracheal tube). There was a much greater use of vasoactive medication to support the patient's cardiovascular system in CHI at Crumlin (44%; n=478) compared with CHI at Temple Street (13%; n=81). During the reporting period, 6% (n=40) of patients in CHI at Temple Street had an intracranial pressure (ICP) device placed, which reflects the proportion of neurosurgery patients in that PCCU. The percentage of patients requiring renal support was the same in both Units (2%), and 1% of patients (n=15) received extracorporeal membrane oxygenation (ECMO) in CHI at Crumlin.

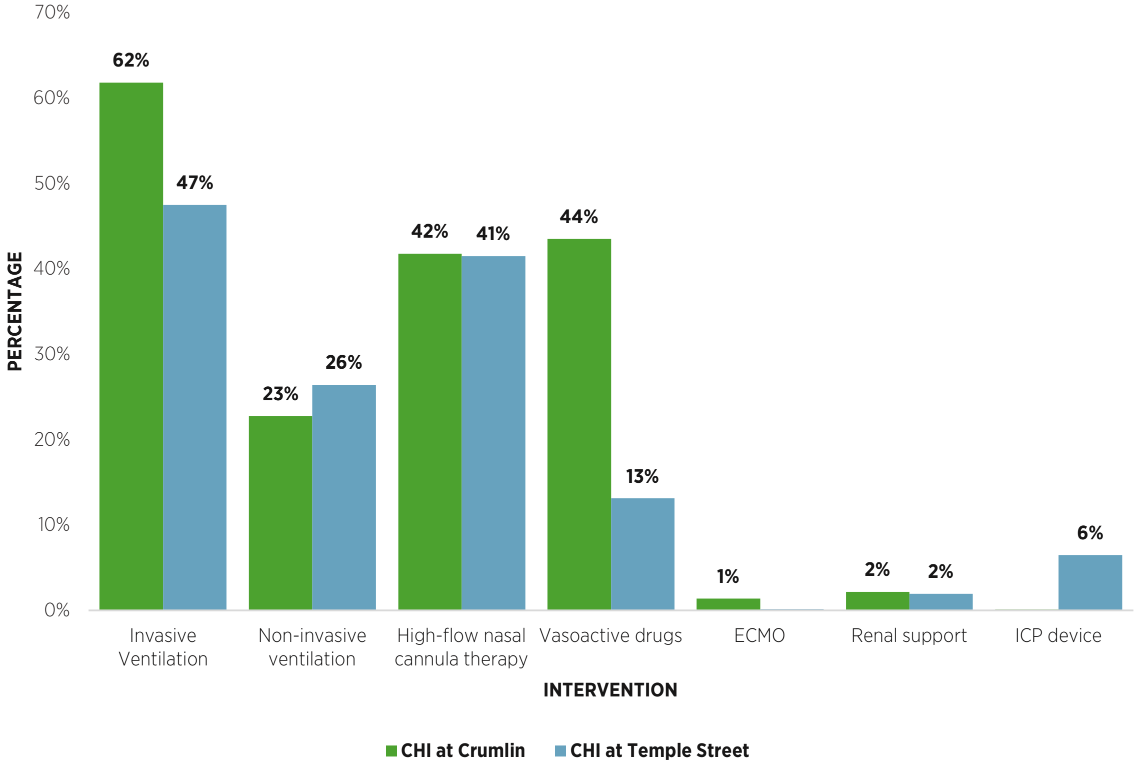


FIGURE 5.6: INTERVENTIONS DELIVERED TO PATIENTS IN CHI AT CRUMLIN AND CHI AT TEMPLE STREET, 2024

EXTRACORPOREAL LIFE SUPPORT

There were 48 ECMO/ECLS runs required by CHI patients from 2022 to 2024 (Table 5.5) with 82% survival-to-discharge. CHI Crumlin PICU carried out 41 of these ECMO/ECLS runs, most of which (n=39) were for cardiac surgical patients. However, seven of the runs for respiratory ECMO/ECLS necessitated patients being transferred abroad for treatment, as there is no formally funded and resourced paediatric respiratory ECMO/ECLS service in the ROI. Respiratory ECMO/ECLS provides life-saving treatment for infants and children with very severe lung failure.

TABLE 5.5: TOTAL ECMO RUNS IN CHI, 2022–2024

ECMO provided	2022	2023	2024	2022-2024
Number of patients who received cardiac ECMO	8	16	15	**39**
Number of patients who received respiratory ECMO, by diagnosis	4 Airway repair, RSV, Streptococcus A	3 Acute respiratory distress syndrome, septic shock	2 Streptococcus A	**9**
Total number of cardiac and respiratory ECMO runs in CHI	10	16	15	**41**
Total number of ECMO days in CHI at Crumlin	79	83	94	**256**
Number of patients who received respiratory ECMO abroad	2	3	2	**7**
Total number of ECMO days abroad	15	48	11	**74**
Total LOS abroad (days)	22	61	23	**106**
Patients who survived to decannulation (%)	83%	100%	94%	**92%**
Patients who survived to discharge (%)	83%	94%	82%	**86%**

PAEDIATRIC INDEX OF MORTALITY

The Paediatric Index of Mortality (PIM) is a severity scoring system used in paediatric intensive care for estimating how sick a child is and predicting their risk of mortality based on data collected within the first hour following admission (Straney *et al.*, 2013). The Paediatric Index of Mortality 3 (PIM3) risk grouping of children admitted to PCCU in both CHI at Crumlin and CHI at Temple Street in 2024 and all units participating in PICANet is presented in Figure 5.7. The largest proportion of admissions to CHI at Crumlin (44%; n=474) and to CHI at Temple Street (50%; n=304) were in the 1–5% low-risk group. In both Units, less than 5% of admissions were in the higher risk groups of 15–30% and over 30%.

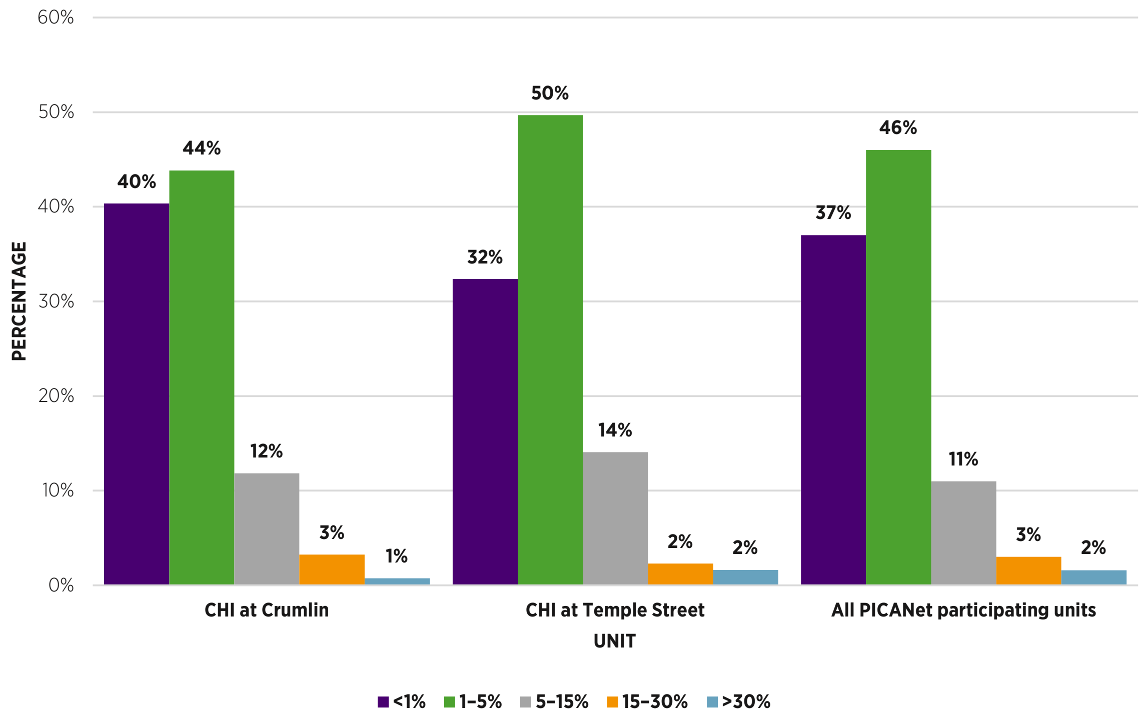


FIGURE 5.7: ADMISSIONS TO PICUs IN THE ROI (N=1693) AND ALL PICANET PARTICIPATING UNITS, BY PIM3 RISK GROUPS, 2024 (N=18,021)

DEATHS IN PCCU

The proportion of deaths that occur after PCCU admission but prior to discharge is illustrated in Figure 5.8. In 2024, both CHI at Crumlin and CHI at Temple Street had a crude mortality rate of 3%. This shows that the risk of death in PCCU is extremely low, with 97% of patients discharged alive.

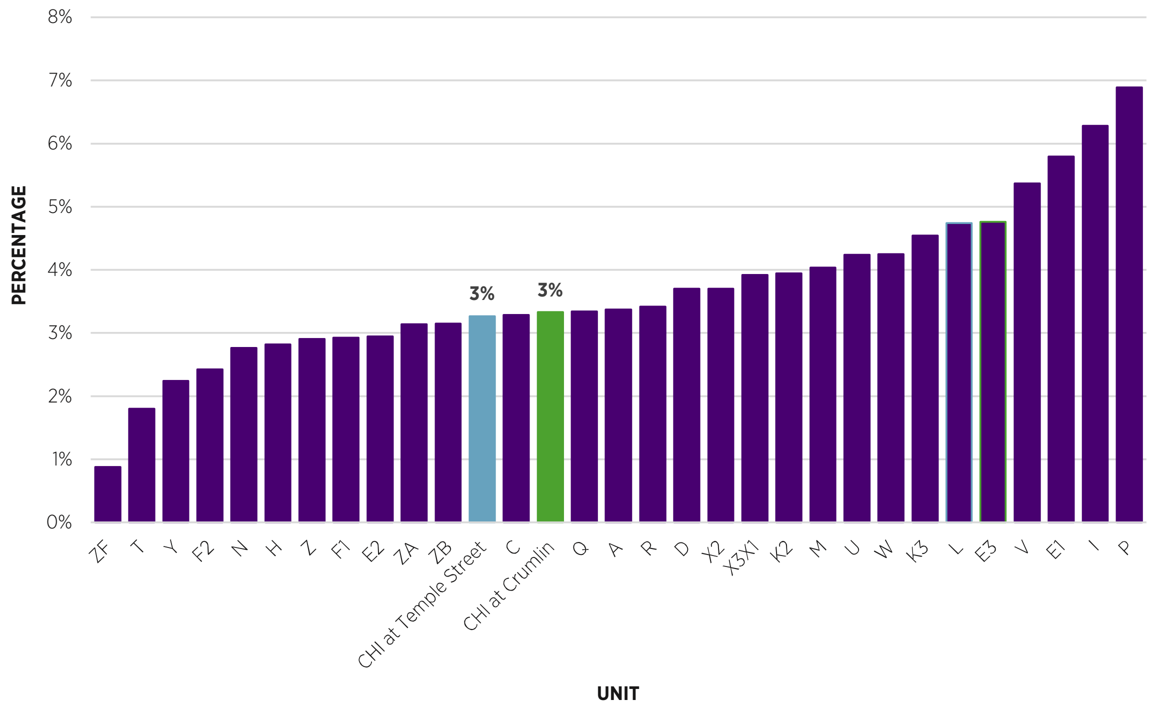


FIGURE 5.8: CRUDE MORTALITY RATE IN EACH UNIT PARTICIPATING IN PICANET, BY UNIT, 2024

PCCU deaths in the ROI accounted for 3.3% of admissions to PCCU in 2024 (Table 5.6). The proportion of deaths in PCCU in England was the highest of all countries (4.1%).

TABLE 5.6: DEATHS IN PCCUs, BY COUNTRY OF ADMISSION, 2022–2024

Country of admission	2022		2023		2024	
	N	%	N	%	N	%
ENGLAND	609	4.2%	582	4.0%	569	4.1%
SCOTLAND	14	3.5%	12	3.0%	14	3.3%
NORTHERN IRELAND	32	2.1%	41	2.7%	39	2.5%
WALES	17	4.0%	8	2.0%	11	3.1%
REPUBLIC OF IRELAND	55	3.4%	44	2.6%	57	3.3%
TOTAL	**727**	**3.9%**	**687**	**3.7%**	**690**	**3.8%**

The statistical process control (SPC) chart (Figure 5.9) for all PCCU admissions in the ROI from 2014 to 2024 indicates that the crude mortality rate (CMR) was relatively stable throughout this time period and experienced common cause fluctuation (typical/expected fluctuation). The CMR for 2014–2024 reached its lowest point in Q4 2023; however, this was not sustained, with a return to mean levels in Q1 2024, and below mean levels in Q2–Q4 2024.

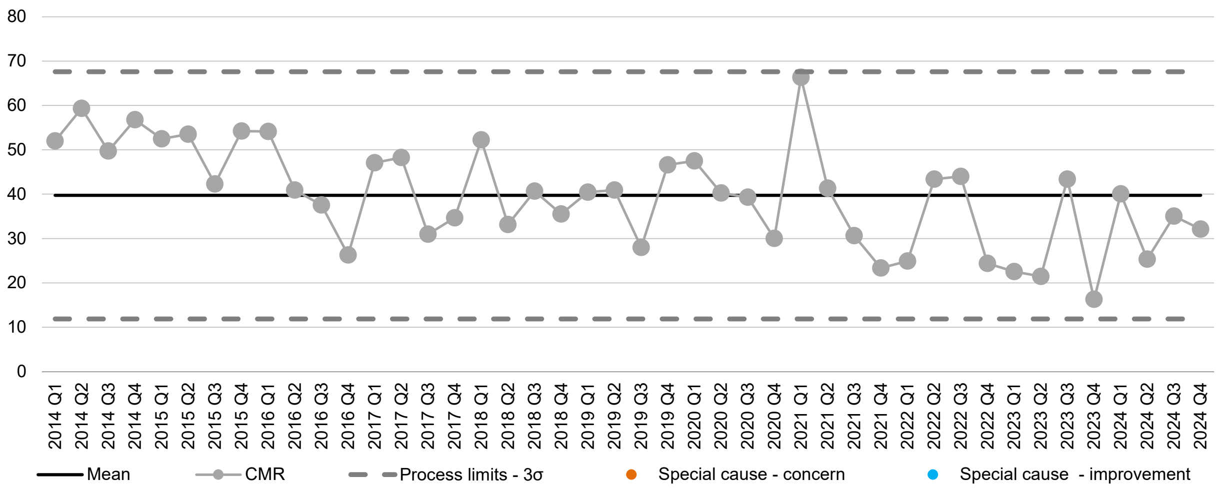


FIGURE 5.9: CMR FOR ALL ADMISSIONS TO PCCUs IN THE ROI, BY QUARTER, 2014–2024

AGE AT DEATH

There were 57 deaths in PCCUs in the ROI during 2024: 36 in CHI at Crumlin and 21 in CHI at Temple Street. Figure 5.10 provides a breakdown of the age at which patients died in PCCU. The majority (68%; n=39) of the deaths occurred in infants aged under 1 year, with the largest proportion of all deaths (46%; n=26) occurring in the neonatal age group; 14% (n=8) of the deaths occurred in children aged 1–10 years, and 18% (n=10) occurred in older children aged 11–15 years.

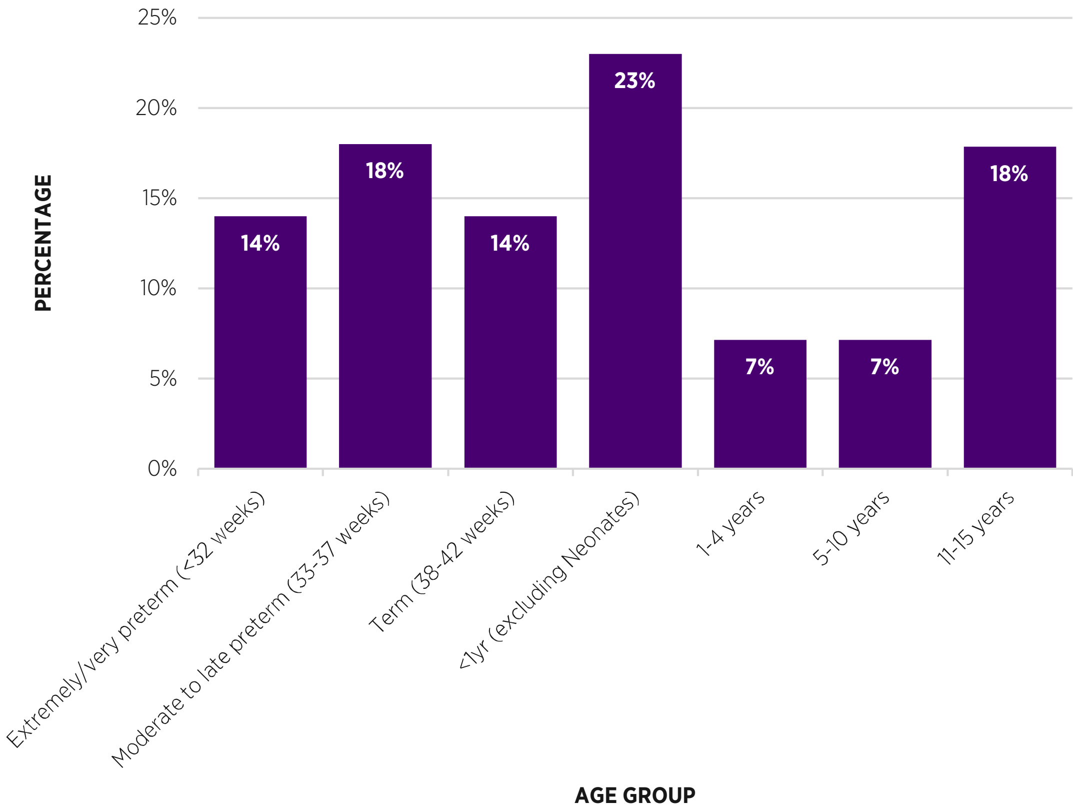


FIGURE 5.10: AGE DISTRIBUTION OF DEATHS IN PCCUs IN THE ROI, 2024 (n=57)

CAUSE OF DEATH

The largest proportion (23%; n=13) of deaths in ROI Units in 2024 were due to cardiovascular problems (Figure 5.11). Gastrointestinal diagnoses accounted for 18% (n=10) of deaths, six of which were due to necrotising enterocolitis. Body wall and cavities deaths (11%, n=6) were due to CDH. Other diagnoses (21%, n=12) include trauma, endocrine/metabolic, infection, blood/lymphatic, musculoskeletal, and oncology.

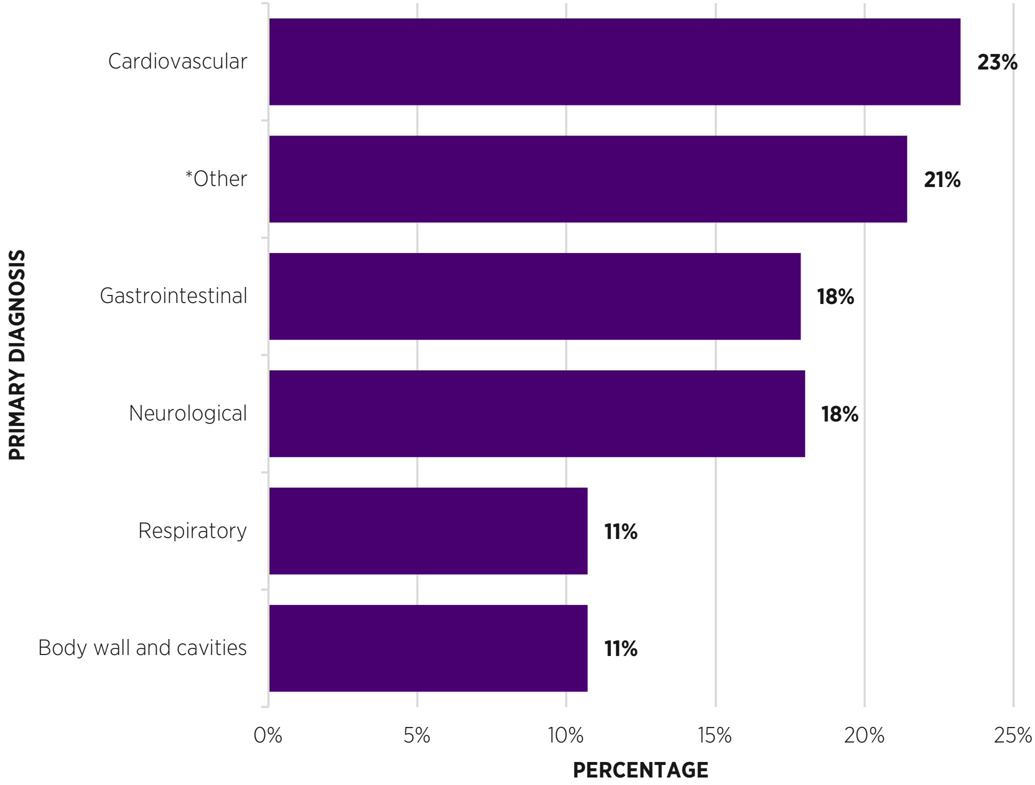


FIGURE 5.11: DEATHS IN PCCUs IN THE ROI BY PRIMARY DIAGNOSIS, 2024 (n=57)

MODE OF DEATH AND ORGAN DONATION

There were 57 deaths in PICU in 2024. In the ROI, the majority of deceased PCCU patients in 2024 (79%, n=45) died following treatment limitation and the withdrawal of ongoing organ support. Mode of death and transplant donor details are reported in Figure 5.12 and Table 5.7, respectively. In 2024, four children donated solid organs or tissues in the ROI, representing 7% of all PCCU deaths. Organ donation may be considered in children who die in PCCUs if certain criteria are met and if their families wish to donate their organs. Both CHI PCCUs have full-time intensive care consultants and nurses who are trained in the management of potential organ donors and their families.

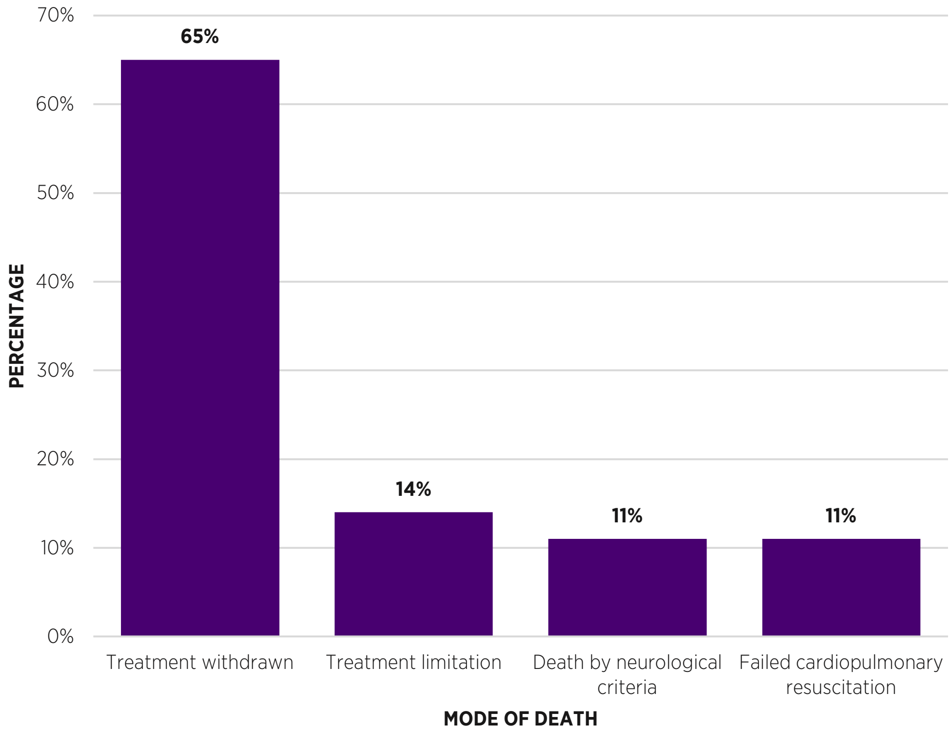


FIGURE 5.12: MODE OF DEATH IN PCCUs IN THE ROI, 2024 (n=57)

TABLE 5.7: TRANSPLANT DONORS IN PCCUs IN THE ROI, 2022–2024 (n=13)

Transplant Donor	2022	2023	2024	2022-2024
Yes – solid organs only	3	4	3	10
Yes – tissues only	0	0	1	1
Yes – both solid organs and tissues	2	0	0	2
Total	5	4	4	13
% of PCCU Deaths	11%	9%	7%	9%

DEATH POST DISCHARGE FROM PCCU

Data collected on patient status 30 days post discharge from PCCU show there were 14 deaths during 2024. This represents 0.8% of total patients discharged. Eight of these patients were discharged from PCCU for palliative care. Table 5.8 provides a breakdown.

TABLE 5.8: CASE MIX OF DEATHS AT 30 DAYS POST DISCHARGE FROM PCCU, 2024 (n=14)

Variable		n
Discharge Destination	Same hospital (CHI)	7
	Other hospital (NICU)	7
Age Group	Neonates and under 1 year	9
	1–15 years	5
Primary Diagnosis	Cardiovascular or neurological	8
	Other	6

CHAPTER 6

SPOTLIGHT ON CARDIOVASCULAR AND NEUROSURGICAL ADMISSIONS

CHAPTER 6: **SPOTLIGHT ON CARDIOVASVULAR AND NEUROSURGICAL ADMISSIONS**

CARDIOVASCULAR ADMISSIONS

The heart is the organ most commonly affected by congenital abnormalities, because its development is complex. Congenital heart disease (CHD) remains one of the most common birth defects worldwide, affecting approximately 1% (n=500) of all babies born in Ireland annually. While some defects are minor and require only monitoring, many need specialist intervention in the form of cardiac surgery or cardiac catheterisation to optimise outcomes and improve quality of life.

The national congenital cardiac service for both the ROI and Northern Ireland is delivered through Children's Health Ireland (CHI) at Crumlin, which serves as the sole tertiary referral centre for paediatric cardiac care on the island. The service provides highly specialised assessment, intervention, and postoperative care for children with both congenital and acquired cardiac conditions. Within the PICU, eight designated beds are specifically allocated for cardiac patients, with additional capacity available within the general PICU when required.

Paediatric cardiac surgery encompasses a broad spectrum of procedures aimed at correcting structural heart defects and restoring normal cardiovascular function. Surgical interventions range from the repair of relatively common lesions, such as atrial septal defects, ventricular septal defects, and coarctation of the aorta, to highly complex neonatal and congenital procedures. These include arterial switch operations, repair of truncus arteriosus, management of hypoplastic left heart syndrome, interrupted aortic arch repair, and palliative procedures for single ventricle physiology. Advances in surgical techniques, perioperative care and long-term follow-up have significantly improved survival for these patients over recent decades.

In addition to congenital heart disease, children may develop acquired cardiac conditions after birth. Unlike congenital defects, these disorders arise secondary to infections, inflammatory processes, genetic predisposition, or other underlying health conditions. Common acquired cardiac diseases in childhood include Kawasaki disease, cardiomyopathy, and myocarditis. Clinical presentation can vary considerably: some may not present any symptoms, while others can be severe enough to require immediate treatment. Diagnostic assessment often involves echocardiography, advanced imaging and cardiac catheterisation, while treatment strategies may include medication to manage symptoms, interventional procedures, or surgery depending on the underlying pathology.

Cardiac catheterisation plays a pivotal role in modern paediatric cardiology, serving both diagnostic and therapeutic purposes. The procedure involves the insertion of a fine catheter through a vein or artery, typically in the groin or neck, which is then guided to the heart. Cardiac catheterisation allows detailed assessment of cardiac anatomy and structural abnormalities, while also providing opportunities for minimally invasive intervention. Procedures performed in the catheterisation laboratory include but are not limited to:

- Open valves or vessels by inflating balloons in obstructed areas
- Place devices that close small holes inside the heart (such as with atrial septal defect or ventricular septal defect) or intentionally block blood flow in a blood vessel
- Place wire devices, called stents, in narrowed blood vessels to keep them open
- To conduct an electrophysiological study (EPS) or a radiofrequency catheter ablation (RFCA): a procedure that can help identify any irregular rhythm (arrhythmia) in the heart. In some cases, this procedure may be used to attempt to get rid of the arrhythmia.

Table 6.1 provides a description of the case mix of the 447 cardiovascular admissions in 2024. There were more males (58%, n=260) than females (42%, n=187). The majority of admissions were due to congenital cardiac conditions (78%, n=349). Overall, outcomes were favourable, with 97% (n=434) of patients discharged alive. Most patients (91%, n=409) were discharged to the ward for continued care.

TABLE 6.1: CASE MIX OF CARDIOVASCULAR ADMISSIONS TO PCCUS IN CHI (n=447), 2024

Variable		n	%
Sex	Male	260	58%
	Female	187	42%
Country of Residence	Ireland	355	79%
	Northern Ireland	92	21%
Ethnicity	White	379	85%
	Asian	20	4%
	Black	20	4%
	Mixed	10	2%
	Other	16	4%
Cardiac Condition	Congenital	349	78%
	Acquired	98	22%
Outcome	Alive	434	97%
	Dead	13	3%
Unit Discharge Destination	Other hospital	25	6%
	Same hospital	409	91%

Figure 6.1 provides a breakdown of cardiac admissions in 2024, by category, based on why the child needed PCCU care. Cardiothoracic (surgical) cases accounted for the majority, 64% (n=285); cardiology medical (non-surgical), 24% (n=109); and cardiac catheterisation 12% (n=53).

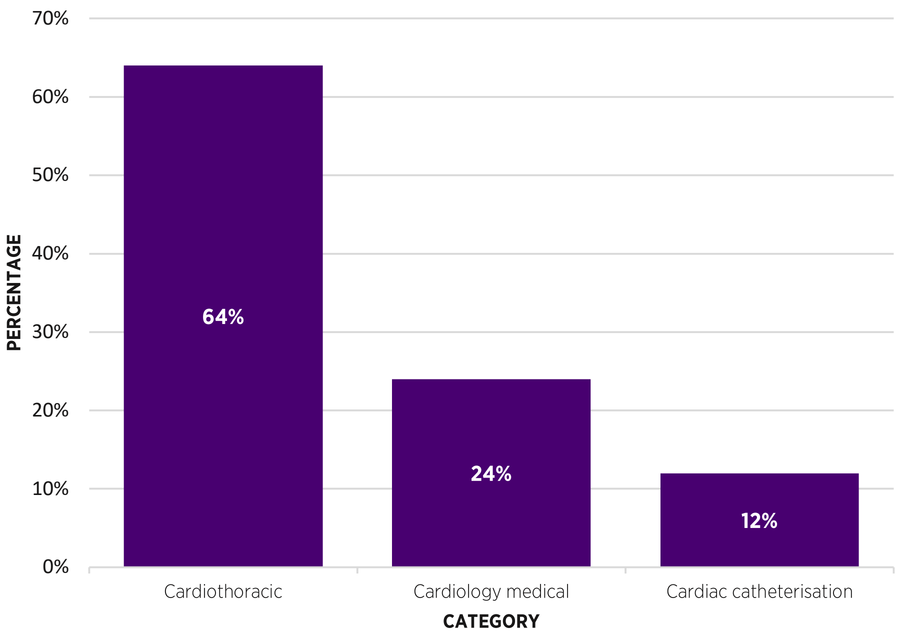


FIGURE 6.1: CARDIOLOGY CATEGORY OF CARDIOVASCULAR ADMISSIONS TO PCCUs IN CHI (n=447), 2024

Figure 6.2 shows the age distribution for each cardiology category. Neonates and infants aged under 1 year accounted for 65% (n=185) of cardiothoracic cases, 60% (n=65) of cardiology medical cases and 89% (n=47) of cardiac catheterization cases. A breakdown of neonatal age group by gestation is detailed in Table 6.2.

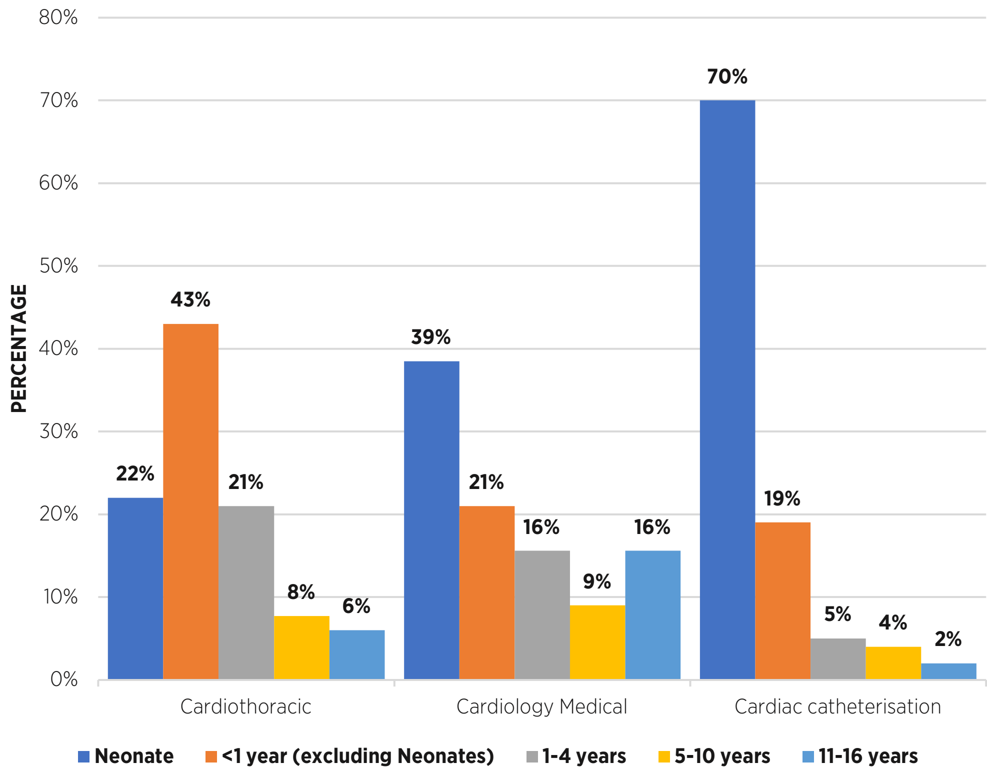


FIGURE 6.2: AGE PROFILE OF CARDIOVASCULAR ADMISSIONS TO PCCUs IN CHI (n=447), BY CATEGORY, 2024

TABLE 6.2: GESTATIONAL AGE AT BIRTH FOR CARDIAC NEONATAL ADMISSIONS TO PCCUs IN CHI (n=141), 2024

Gestational age at birth	Cardiothoracic n	Cardiology Medical n	Cardiac catheterization n
Very preterm (28–32 weeks)	~	~	8
Moderate to late preterm (33–37 weeks)	~	16	7
Term (38–42 weeks)	58	23	21
Total	**63**	**42**	**36**

~ Denotes five cases or fewer.

A breakdown of admission type is provided in Figure 6.3. The majority of cardiothoracic admissions were planned (following surgery) (90%, n=255), whereas most cardiology medical admissions were unplanned (87%, n=95). Cardiac catheterisation admissions were mostly planned (62%, n=33).

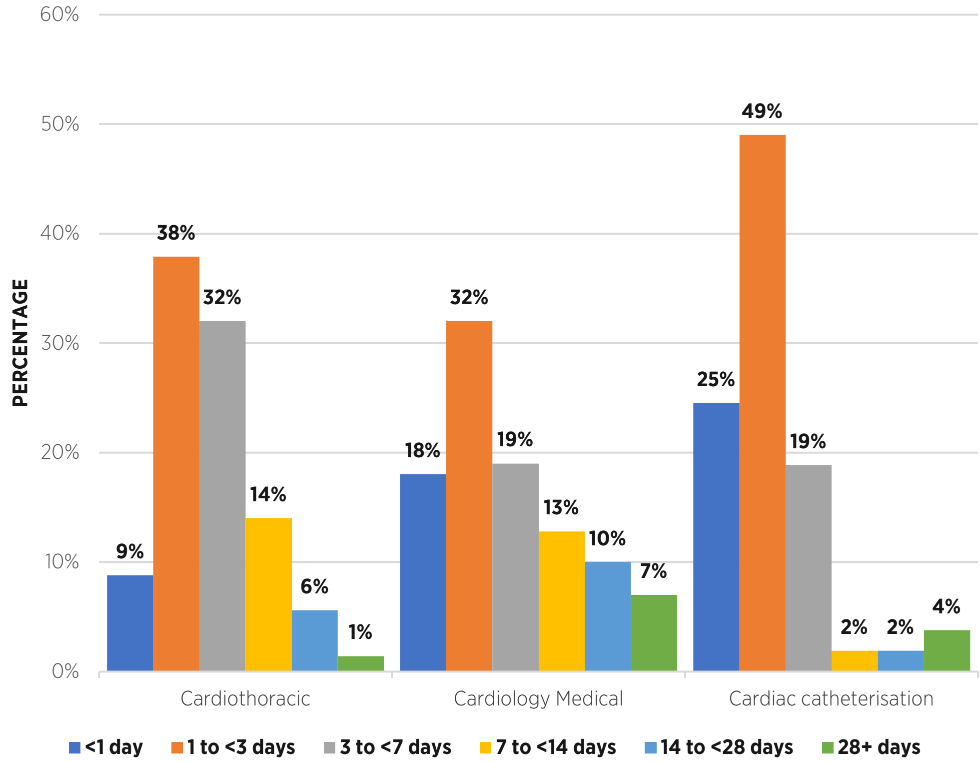


FIGURE 6.3: ADMISSION TYPE FOR CARDIOVASCULAR ADMISSIONS TO PCCUS IN CHI (n=447), BY CATEGORY, 2024

A breakdown of diagnostic groups is provided in Table 6.3. The main reason for admission to PCCU was congenital heart disease (70%, n=312), with septal defects accounting for 21% of these admissions (n=92).

TABLE 6.3: DIAGNOSTIC GROUP FOR CARDIAC ADMISSIONS TO PCCUs IN CHI (n=447), 2024[3]

Diagnostic group	Description / Included diagnoses	n	%
Congenital Heart Disease (structural):			
a. Septal Defects	Ventricular septal defect (VSD) (all types), atrial septal defect (ASD), atrioventricular septal defect (AVSD) (all variants), cor triatriatum	92	21%
b. Conotruncal & Outflow Tract Defects	TOF, double outlet right ventricle (DORV), truncus arteriosus, discordant VA connection	76	17%
c. SingleVentricle & Hypoplastic Syndromes	Hypoplastic left heart syndrome, right hypoplastic heart, double inlet left ventricle, common ventricle, Uhl's disease	35	8%
d. Valve Abnormalities	Aortic, mitral, tricuspid, pulmonary valve disease, Ebstein's anomaly	43	10%
e. Aortic Arch & Great Vessel Abnormalities	Coarctation, interrupted/hypoplastic arch, double aortic arch	66	15%
Cardiomyopathy & Myocardial Disease	Cardiomyopathy, hypertrophic cardiomyopathy, myocarditis	12	3%
Heart Failure Syndromes	Heart failure, biventricular failure, pulmonary oedema	15	3%
Arrhythmias & Conduction Disorders	Supraventricular tachycardia, atrial flutter, ventricular arrhythmias, heart block	35	8%
Pulmonary Vascular Disease	Pulmonary hypertension and pulmonary vascular disorders	7	2%
Thrombotic & Vascular Complications	Atrial/peripheral thrombosis, vascular injury	9	2%
Pericardial & Pleural Disease	Pericardial effusion, constrictive pericarditis, pleural effusion	7	2%
Cardiac Arrest, Shock & Critical Events	Cardiac arrest, cardiopulmonary arrest, shock, hypoxia	15	3%
Infective & Inflammatory Cardiac Conditions	Endocarditis, Kawasaki disease, rheumatic valve disease	8	2%
Postoperative / Postprocedural & DeviceRelated	Surgical/catheter complications, pacemaker issues	8	2%
Associated NonCardiac Thoracic Conditions	CDH, pneumothorax, pulmonary haemorrhage, airway anomalies	12	3%

3 Excludes cases which had an unknown diagnosis.

PRE-PCCU CARDIAC ARREST

Seven patients experienced a cardiac arrest preceding their PCCU admission; six of these patients experienced a prehospital cardiac arrest, 86% (n=6) survived to discharge.

CARDIOMYOPATHY AND MYOCARDITIS

In 2024, 12 children were admitted with a diagnosis of myocarditis or cardiomyopathy, 4 patients required ECLS and renal support for circulatory failure, 83% (n=10) survived to discharge. Median age was 1.5 years, median LOS 13 days and median days of invasive ventilation 17. Table 6.4 demonstrates the important role of ECMO as a rescue therapy for children with severe cardiac failure, and highlights favourable outcomes despite the complexity of the patient cohort.

TABLE 6.4: ECLS FOR MYOCARDITIS/CARDIOMYOPATHY PATIENTS, 2021–2024

Year	No. of patients	Median LOS (days)	Median ECMO days	Complications (%)	Survival to recovery/ transplant (%)
2021	2	2.5	2.4	100%	0%
2022	1	13	7.5	0%	100%
2023	2	8	5.9	50%	100%
2024	4	18.5	10.4	50%	75%
Total	**9**	**12**	**7.4**	**45%**	**66%**

PATENT DUCTUS ARTERIOSUS

Patent ductus arteriosus (PDA) is a congenital heart defect and occurs when a blood vessel that normally closes within the first 48 hours after birth fails to close. It is more common in premature infants. Seventeen children were admitted with a diagnosis of PDA; 14 of these were neonates with a median age of 32 weeks and 1.6kg median weight on admission to PCCU. Median invasive ventilation was 2 days and median LOS was 1.7 days, Overall survival was 100%.

ECLS

Fifteen children required ECLS, 14 of whom were cardiology or cardiothoracic patients; 9 were post-op cardiothoracic patients. One patient was referred to Sweden for continuation of ECLS. Median ECMO days was 4.5, median invasive ventilation days 15 and median LOS 17 days. Overall survival was 93% (n=14).

ECMO Patient Primary Diagnosis

Cardiothoracic post-op
Hypoplastic left heart syndrome
Discordant ventriculoarterial connection
Transposition of great arteries with concordant atrioventricular connections and ventricular septal defect
Shone complex
Congenital atresia of tricuspid valve
Left ventricular outflow tract obstruction
Cardiology medical
Myocarditis
CDH
Cardiac arrest
Aortic valve stenosis

Table 6.5 provides a breakdown of surgical categories performed. The case mix shows the wide range of congenital cardiac surgeries, from common routine repairs to more complex, less frequent procedures. Septal defect surgery represents the largest proportion of cases (33%, n=91).

TABLE 6.5: SURGICAL CATEGORY FOR CARDIAC ADMISSIONS TO PCCUs IN CHI (n=273), 2024

Surgical category	n	%
Septal defect surgery (VSD, ASD, AVSD)	91	33%
Conotruncal / ventricular outflow tract lesions (TOF, PA/VSD, DORV, truncus, Rastelli, Ross–Konno)	62	23%
Singleventricle palliation pathway (Norwood, Glenn, Fontan/TCPC, hybrid strategies)	43	16%
Aortic arch & aortic pathology (coarctation, interrupted arch, arch/root repair)	33	12%
Pulmonary artery / pulmonary bloodflow procedures (PA bands, arterioplasty, shunts)	10	4%
Pulmonary venous abnormalities (e.g., cor triatriatum)	10	4%
Primary valvar surgery (mitral, tricuspid, pulmonary valve procedures)	4	2%
Noncardiac / adjunct procedures (pacemaker, vascular ring, lung surgery, pericardectomy)	20	7%
Total	273	100%

LENGTH OF STAY

Figure 6.4a compares the median LOS and median invasive ventilation days across five congenital cardiac conditions: single ventricle defect, VSD, ASD, AVSD, and DORV. Median LOS varies considerably between conditions, with the single ventricle defect group having the longest stay (4.8 days) and ASD (1.8 days) the shortest. Invasive ventilation days were broadly similar across all diagnostic groups.

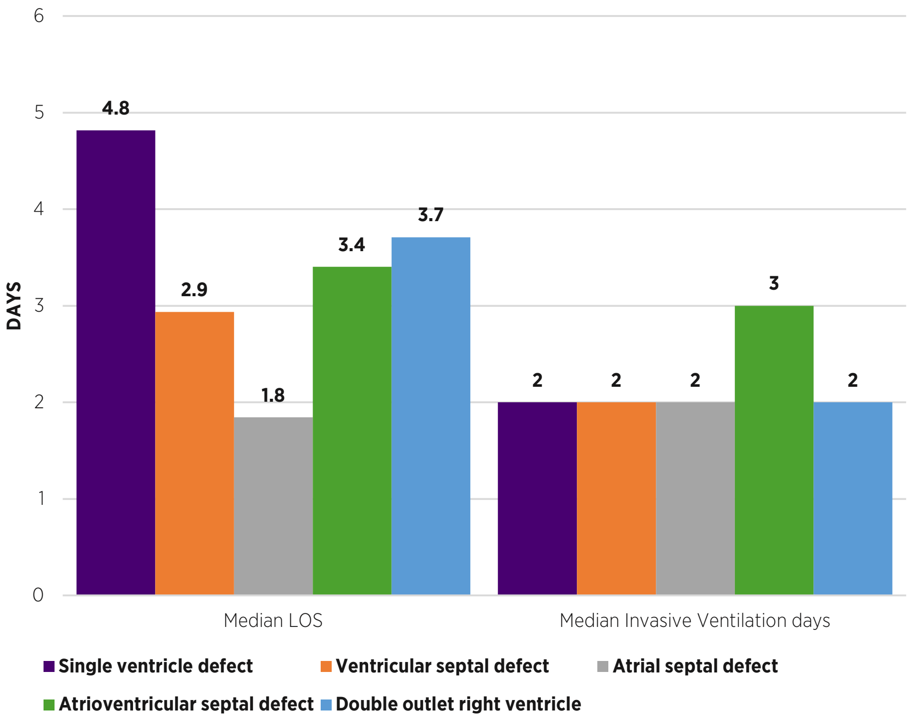


FIGURE 6.4A: LOS AND DAYS VENTILATED FOR SPECIFIC CARDIAC DIAGNOSIS ADMISSIONS TO PCCUs IN CHI (n=123), 2024

LOS varies for each cardiology category: cardiothoracic patients show a broader distribution and longer stays, reflecting greater clinical complexity; half of cardiology medical patients were discharged within 1–3 days (50%, n=55) and 7% (n=8) of patients were long-stay, while for cardiac catheterisation admissions most patients (74%, n= 39) were discharged from PCCU within 1–3 days.

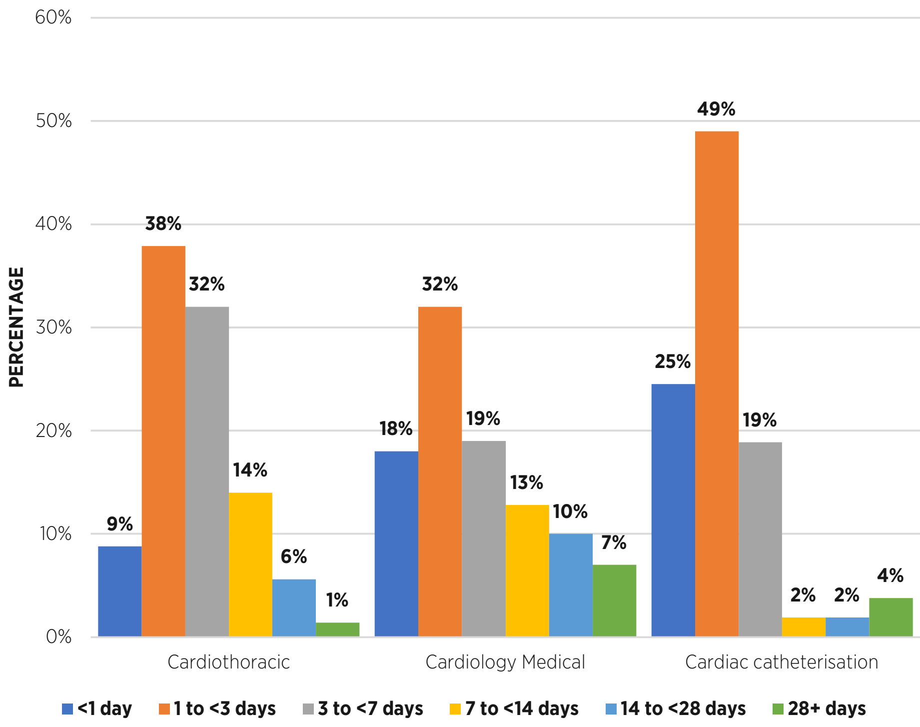


FIGURE 6.4B: LOS FOR CARDIOVASCULAR ADMISSIONS TO PCCUs IN CHI (n=447) BY CATEGORY, 2024

PIM SCORE GROUP AND SURVIVAL

Across all cardiac categories, most patients fall within the low predicted risk categories <1% and 1–5% groups. Cardiology Medical includes a higher proportion of moderate- to high-risk patients (16%, n=17).

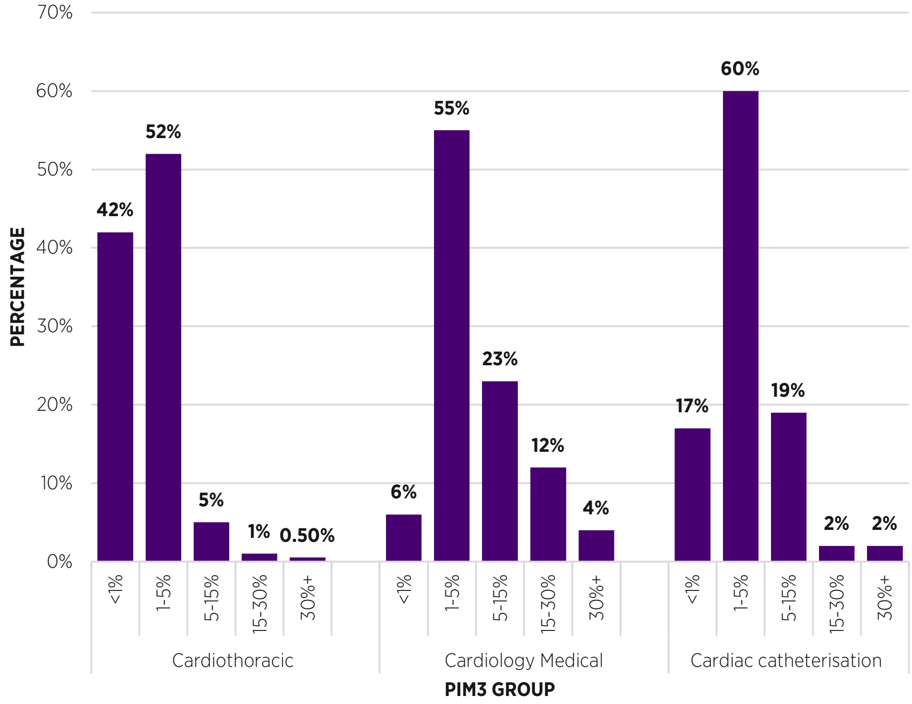


FIGURE 6.5: CARDIAC GROUP ADMISSIONS TO PCCUs IN THE ROI, BY PIM3 RISK GROUPS, 2024 (N=447)

Overall, there was a 97% survival in the cardiac group of patients admitted to PCCU

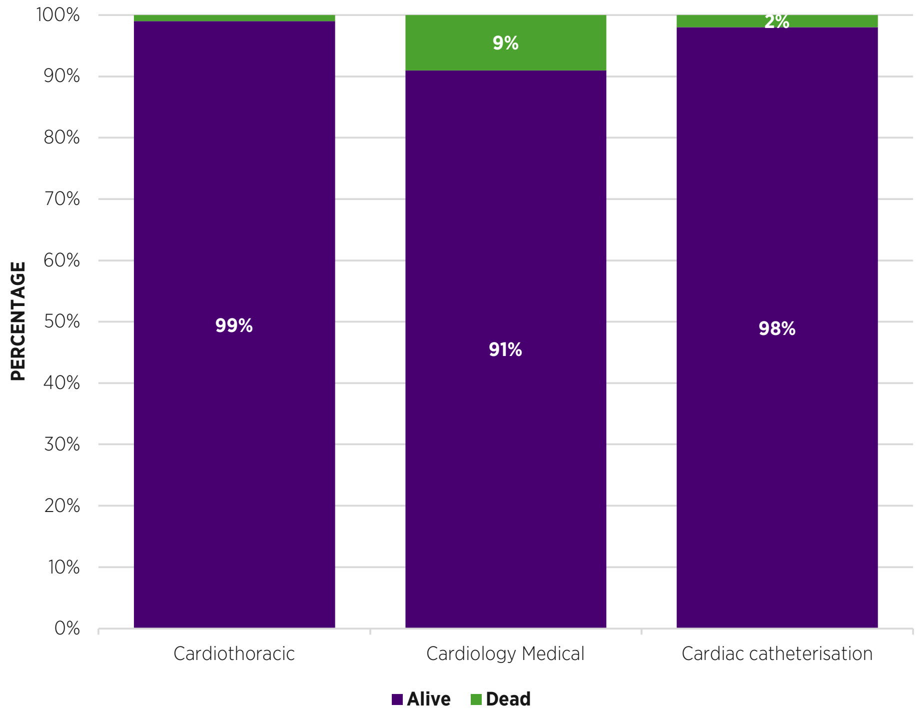


FIGURE 6.6: MORTALITY OF CARDIAC ADMISSIONS TO PCCUs IN THE ROI BY CATEGORY, 2024 (N=447)

NEUROSURGICAL ADMISSIONS

The Children's Neurosurgical Centre (CNC) is based in CHI at Temple Street and is a national centre for excellence providing care to any child in Ireland from 0 to 16 years who requires neurosurgical care. It is one of the busiest paediatric neurosurgical centres in Ireland and the UK. The CNC provides care for patients in collaboration with the other clinical specialities in CHI at Temple Street, and with Beaumont Hospital, St Luke's Hospital Radiotherapy Services, the Central Remedial Clinic, and the National Maternity Hospital.

Neurosurgery is the medical specialty concerned with the diagnosis, treatment, and rehabilitation of disorders or trauma that affect the brain, spinal cord, peripheral nerves, and extracranial cerebrovascular system. Every year in Ireland, an average of 45 children and teenagers are diagnosed with a tumour of the brain or spinal cord. Brain tumours are the most common tumours seen in children, and account for 2 in 10 new cases of childhood cancer every year.

In 2024, 12% (n=75) of children admitted to CHI at Temple Street PCCU had neurosurgical diagnoses. Figure 6.7 illustrates the most common reasons for neurosurgical admission, which were: neuro-oncology (47%, n=35), trauma (23%, n=17), cerebrospinal fluid (CSF) diversion (20%, n=15), and other (non-traumatic haemorrhage/neurovascular/ epilepsy surgery) (11%, n=8).

Neuro-oncology includes all children whose primary reason for admission was related to a brain or spinal cord tumour. Trauma includes all children with a traumatic brain injury. CSF diversion includes all children whose primary reason for admission was related to diversion of CSF. This includes children with external ventricular drains, ventriculoperitoneal shunts, and ventricular access devices. The other category includes children with non-traumatic intracranial haemorrhages, children with neurovascular conditions, and children who had epilepsy surgery. These have been grouped together to maintain patient confidentiality.

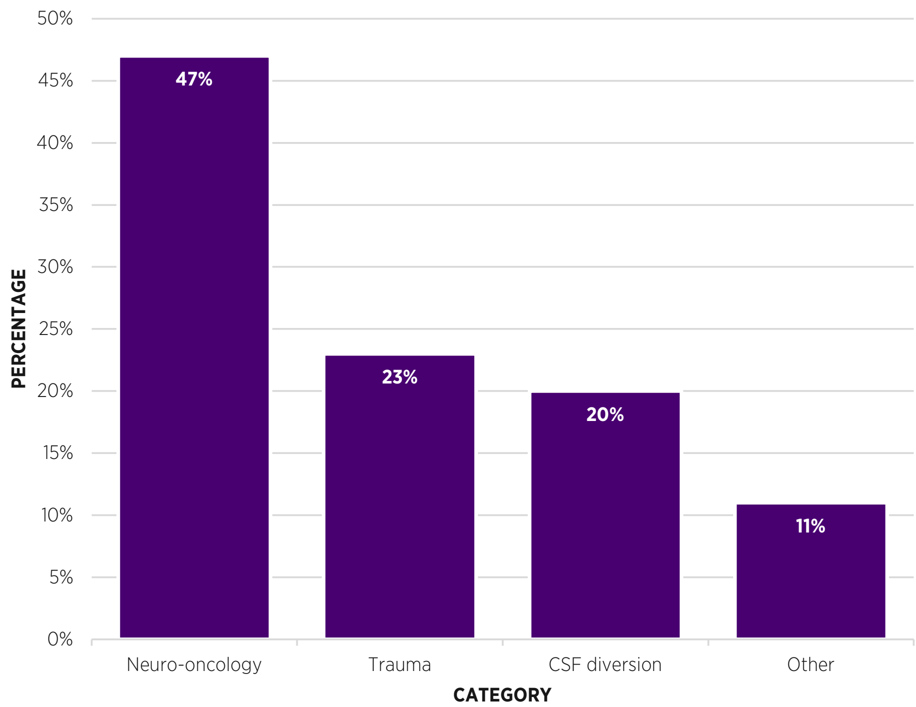


FIGURE 6.7: NEUROSURGICAL ADMISSIONS TO PCCUs IN THE ROI BY CATEGORY, 2024 (N=75)

CONTENTS PRINT

Table 6.6 shows that falls and road traffic accidents (RTAs) were the leading causes of traumatic brain injury admissions, each accounting for 47% (n=8) of cases. Half of the RTAs were associated with trauma related to e-scooter use.

TABLE 6.6: CAUSE OF TRAUMATIC BRAIN INJURY ADMISSIONS TO PCCUs IN CHILDREN'S HEALTH IRELAND (n=17), 2024

Cause of Trauma	n	%
Fall	8	47%
RTA	8	47%
Other	1	6%
Total	17	100%

Figure 6.8 shows the age distribution of neurosurgical patients. The majority of patients admitted were older children, with all of the neonatal patients being admitted for CSF diversion. CSF diversion procedures are surgical interventions used to drain excess fluid from the brain and spinal cord, primarily to treat conditions like hydrocephalus.

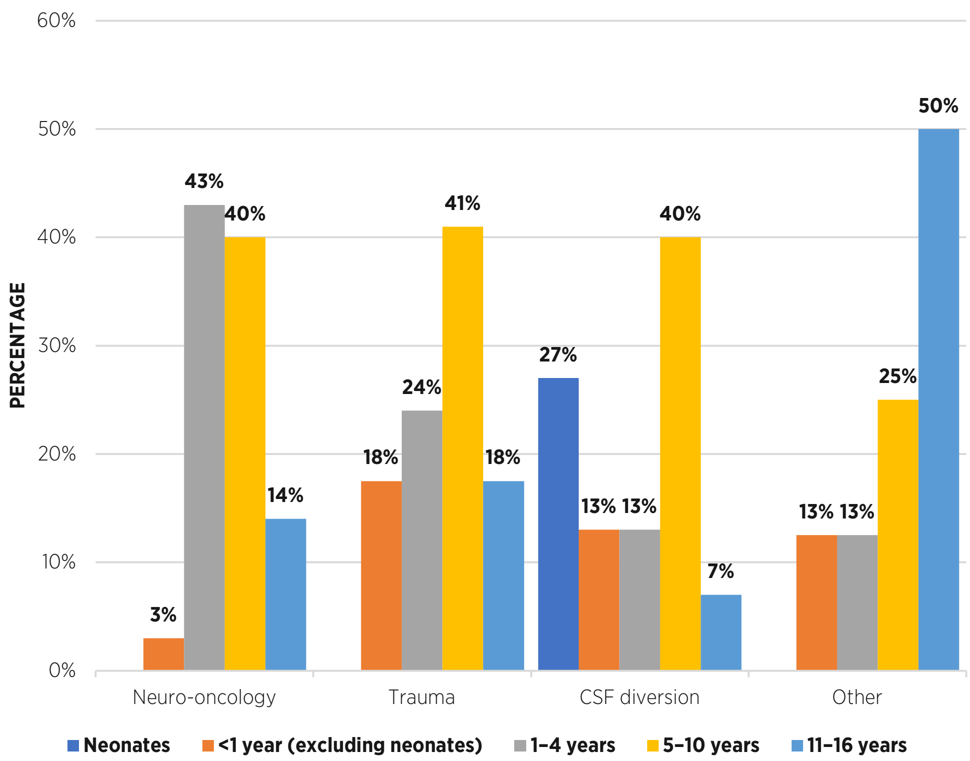


FIGURE 6.8: AGE PROFILE OF NEUROSURGICAL ADMISSIONS TO PCCUs IN CHI (n=75) BY CATEGORY, 2024

Figure 6.9 shows the median LOS and invasive ventilation days by diagnostic category. Trauma patients had both a longer LOS and a longer length of invasive ventilation than the other categories.

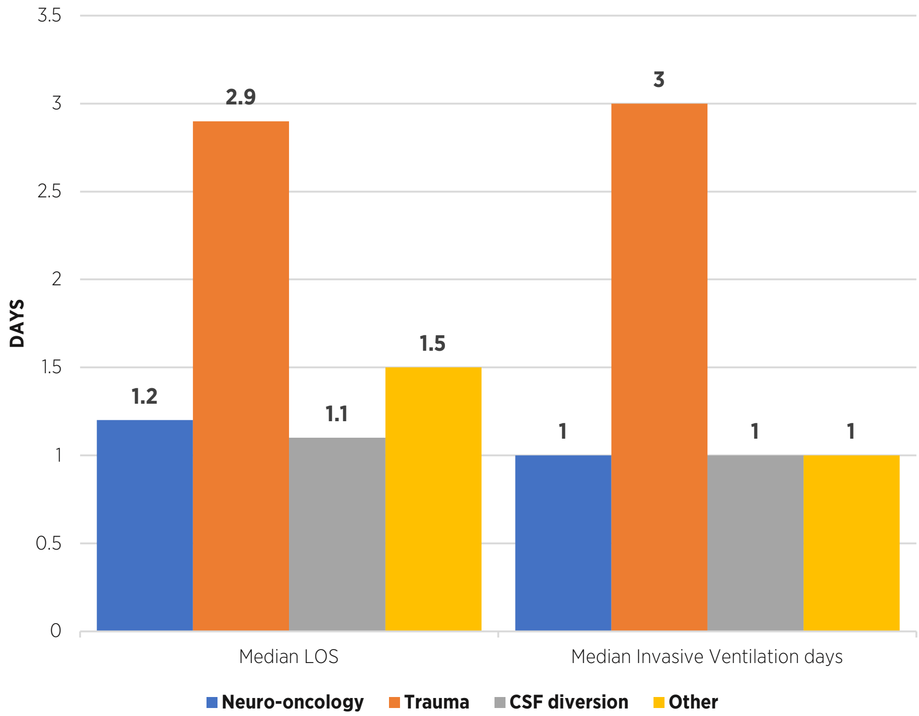


FIGURE 6.9: MEDIAN LOS AND INVASIVE VENTILATION DAYS FOR NEUROSURGICAL ADMISSIONS TO PCCUs IN CHI (n=75) BY CATEGORY, 2024

Figure 6.10 shows the PIM3 score by category. Most patients were in the 1-5% group. Trauma patients were the only group represented in the high risk >30% PIM3 score.

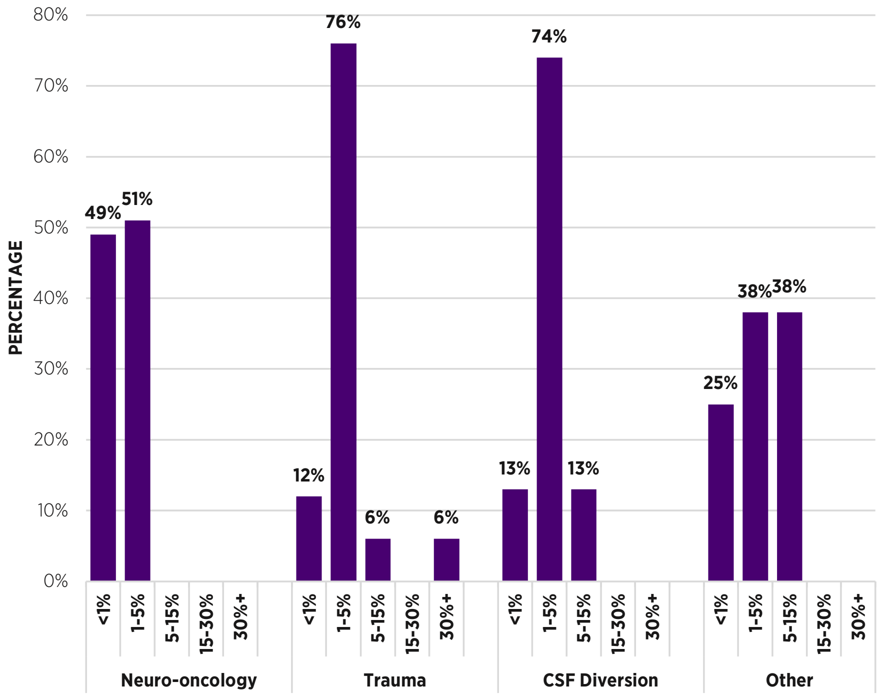


FIGURE 6.10: NEUROSURGICAL ADMISSIONS TO PCCUs IN THE ROI BY PIM3 RISK GROUP, 2024 (N=75)

OUTCOMES

Overall, there was a 97% survival rate in the neurosurgical group of patients admitted to PCCU.

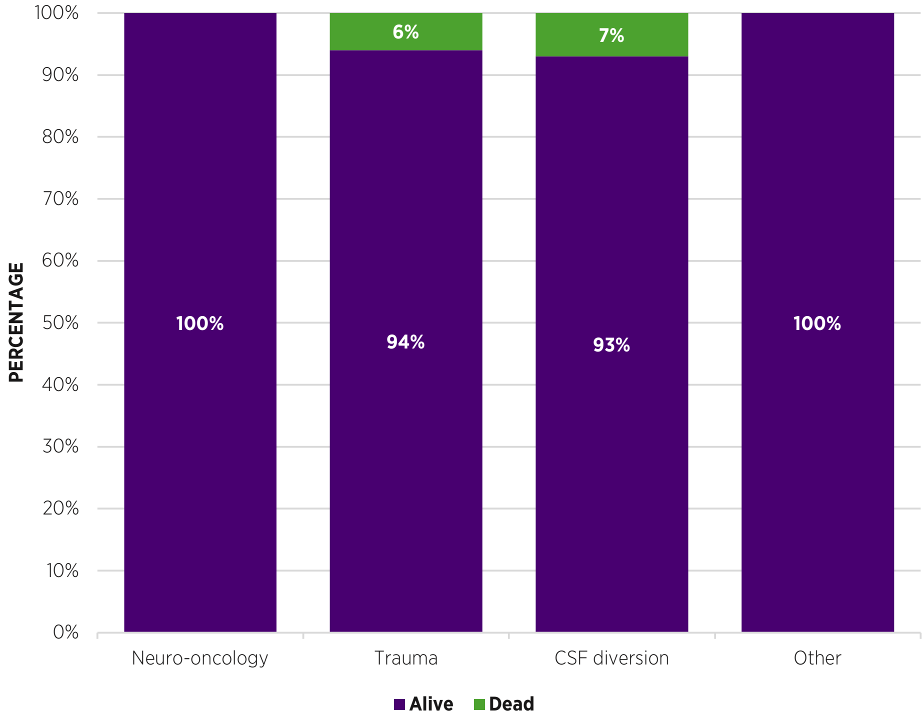


FIGURE 6.11: MORTALITY OF NEUROSURGICAL ADMISSIONS TO PCCUs IN THE ROI BY CATEGORY, 2024 (N=75)

This chapter highlights the complexity and diversity of paediatric cardiovascular and neurosurgical care, the high proportion of surgical activity, and consistently strong survival outcomes despite the acuity and complexity of cases.

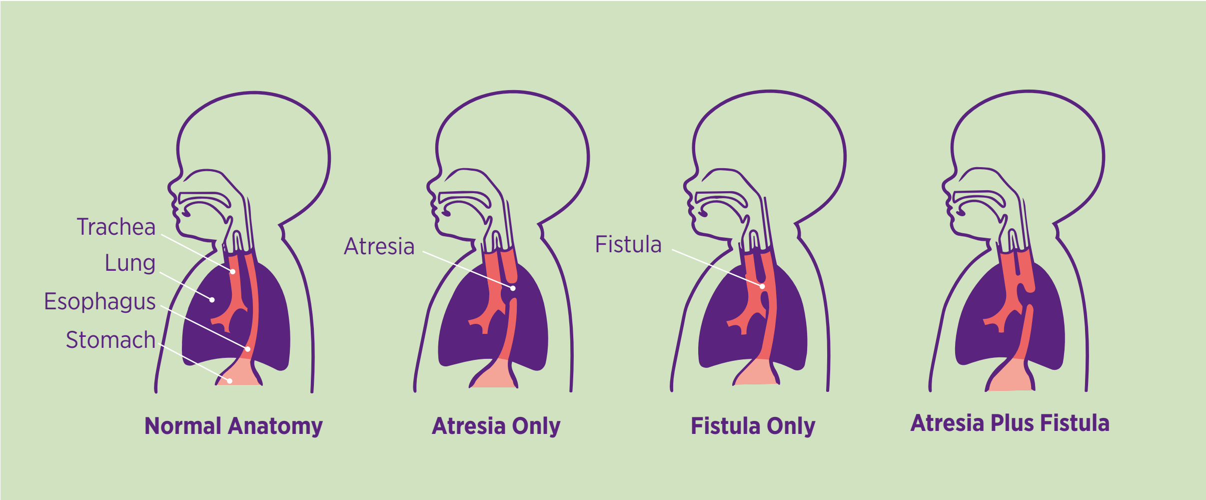
CHAPTER 7
SPOTLIGHT ON TRACHEO-OESOPHAGEAL FISTULA AND CONGENITAL DIAPHRAGMATIC HERNIA

CHAPTER 7: SPOTLIGHT ON TRACHEO-OESOPHAGEAL FISTULA AND CONGENITAL DIAPHRAGMATIC HERNIA

The aim of this spotlight chapter is to provide a detailed breakdown of the admissions of patients with specific congenital conditions requiring surgical intervention, usually soon after birth.

OESOPHAGEAL ATRESIA AND TRACHEO-OESOPHAGEAL FISTULA

Oesophageal atresia (OA) is a rare condition where a short section at the top of the oesophagus (gullet or food pipe) has not formed properly, so it is not connected to the stomach. This means food cannot pass from the throat to the stomach. Tracheo-oesophageal fistula (TOF) is another rare condition, which tends to occur alongside OA. This is where part of the oesophagus is joined to the trachea (windpipe). Both OA and TOF tend to be diagnosed soon after birth, typically recognised during feeding. It is very rare, occurring in between 1 in 3,500 and 1 in 5,000 births. The condition may be diagnosed prenatally primarily through ultrasound imaging; features can include a small or absent stomach along with polyhydramnios (excess fluid in the womb), but diagnosis is not definitive. Most infants undergo corrective surgery within the first days of life.



This chapter will present a 10-year review of the 181 admissions to PCCU from 2015 to 2024, 43% (n=77) of which had both OA and TOF present. Figure 7.1 shows the percentage of total PICU admissions due to OA or TOF each year and the rate per 1,000 live births. Admissions varied between a low of 0.6% (n=10) in 2019 and a high of 2.0% (n=34) in 2021. Rates per 1,000 live births varied from 0.16 in 2016 to 0.56 in 2021. Figure 7.2 shows the number of admissions to each PCCU per year.

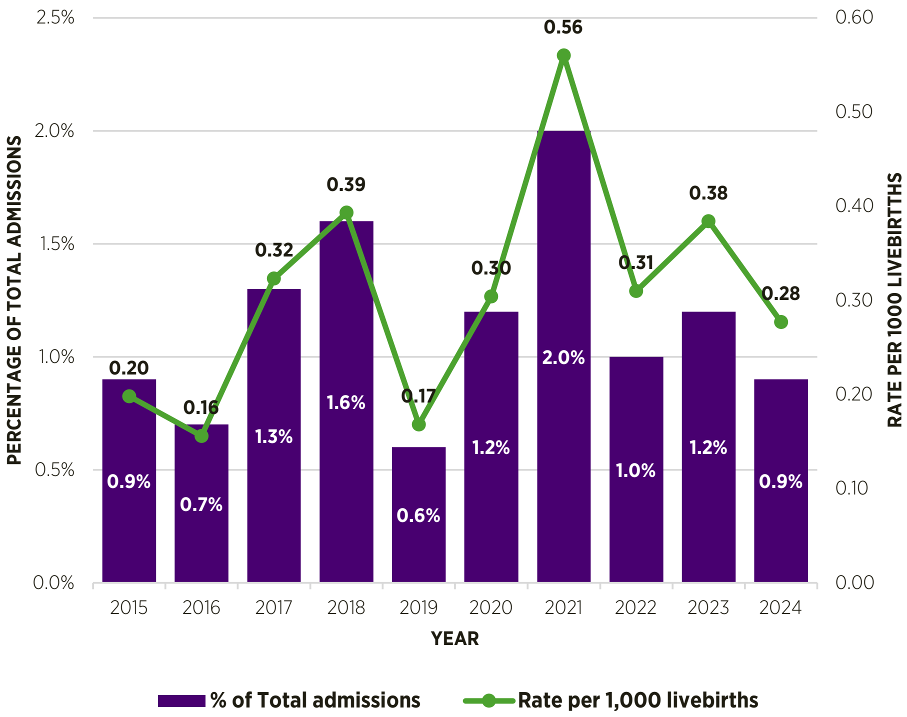


FIGURE 7.1: TOF ADMISSIONS (n=181) TO PCCUs IN THE ROI AS A PERCENTAGE OF TOTAL ADMISSIONS AND RATE PER 1,000 LIVE BIRTHS, 2015–2024

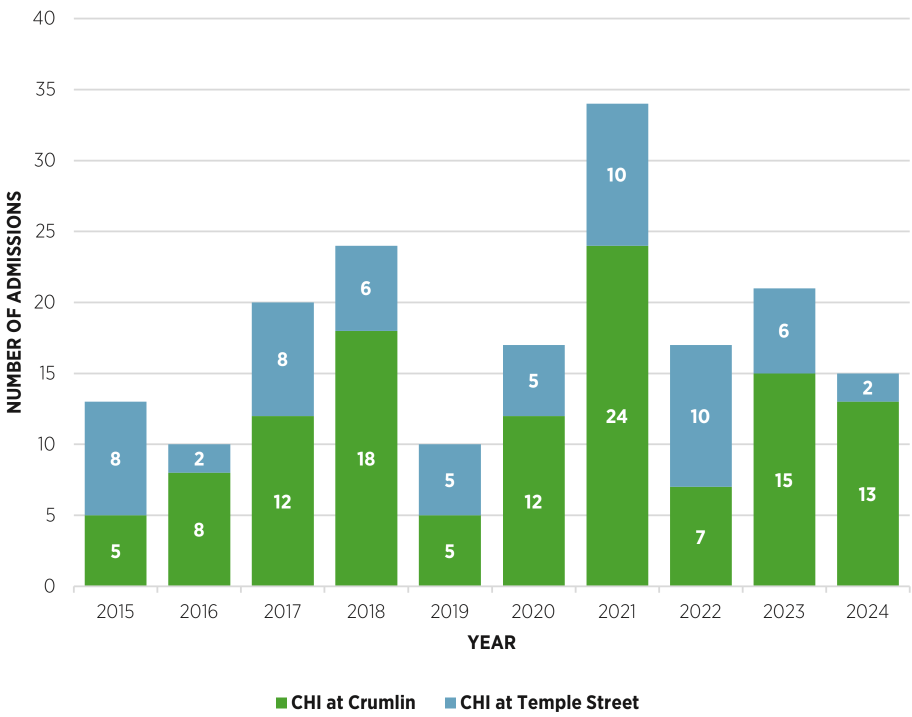


FIGURE 7.2: TOF ADMISSIONS (n=181) TO PCCUs IN THE ROI, 2015–2024

Figure 7.3 shows the age distribution for patients admitted with a primary diagnosis of OA/TOF, the majority (86%, n=156) being in the neonatal age group. Table 7.1 provides a breakdown of the gestational age at birth, weight, and outcome. Twelve per cent (n=23) were born very preterm (less than 32 weeks) and 43% (n=77) were moderate to late preterm (33–37 weeks). Sex distribution showed higher males (59%) than females (41%).

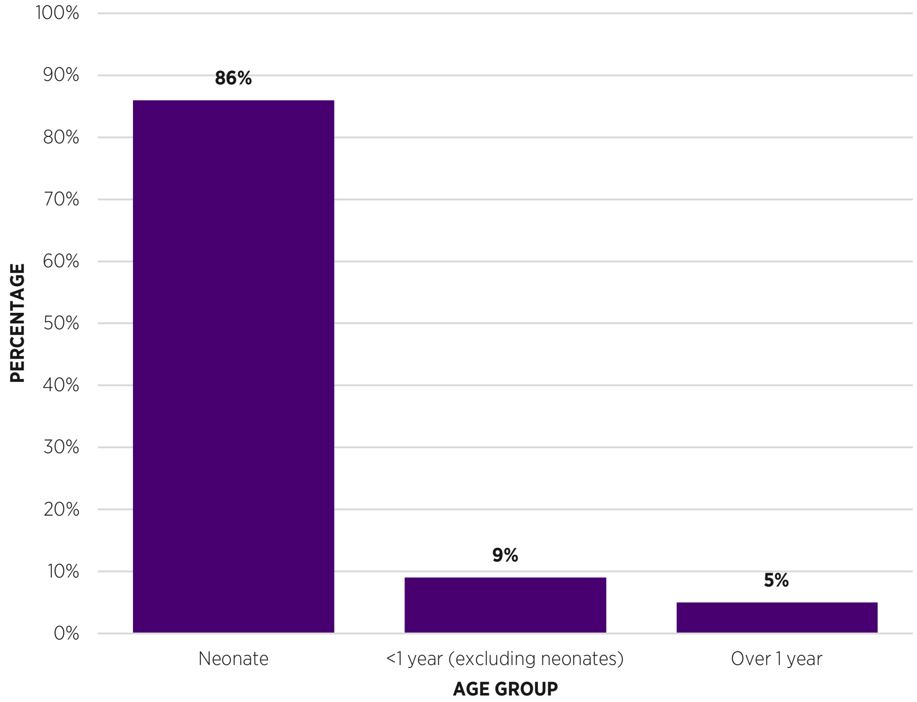


FIGURE 7.3: AGE DISTRIBUTION OF TOF (n=181) ADMISSIONS TO PCCUs IN THE ROI, 2015–2024

TABLE 7.1: GESTATIONAL AGE AT BIRTH, WEIGHT AND OUTCOME FOR TOF ADMISSIONS TO PCCUs IN CHI, 2015–2024

	Alive			Dead		
Gestational age at birth	**n**	**%**	**Median weight**	**n**	**%**	**Median weight**
Very preterm (<28–32 weeks)	18	11%	1.5 kg (0.8–2.5)	~	50%	1.3 kg (0.7–2.0)
Moderate to late preterm (33–37 weeks)	74	43%	2.4 kg (1.8—4.0)	~	*	1.8 kg (1.2–2.7)
Term (38–42 weeks)	79	46%	3.1 kg (2.1–4.6)	~	*	3.4 kg
Total	171	100%		10	100%	

~ Denotes five cases or fewer.
* Further suppression required in order to prevent disclosure of five cases or fewer.

COMORBIDITIES

TOF/OA are frequently associated with other congenital abnormalities. VACTERL is an acronym made up of vertebral defects, anorectal anomalies, cardiac defects, TOF/OA, renal abnormalities, and limb abnormalities. This is a rare group of birth defects affecting multiple body systems and is typically diagnosed when at least three of the anomalies are present. VACTERL association was present in 70% (n=7) of the patients that died. Cardiac defects were present in 26% (n=47) of patients with TOF/OA.

FEEDING

A gastrostomy is a surgical opening through the skin of the abdomen to the stomach. A feeding device is put into this opening so that feed can be delivered directly into the stomach, bypassing the mouth and throat. A gastrostomy in TOF patients is commonly used before or after TOF repair, especially in infants with oesophageal atresia, respiratory instability, or associated anomalies, and supports adequate nutrition and growth during recovery. Thirteen per cent (n=24) of patients had a gastrostomy.

Figure 7.4 shows the duration of invasive ventilation for TOF patients; the majority (64%) were ventilated less than 7 days.

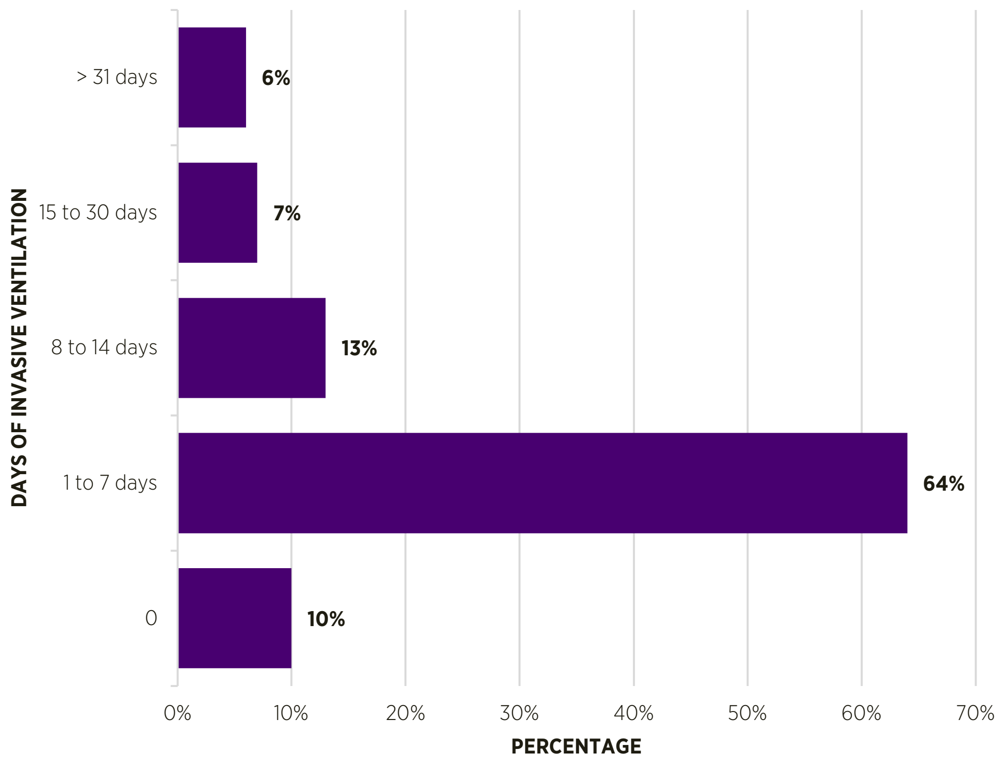


FIGURE 7.4: DAYS OF INVASIVE VENTILATION FOR TOF (n=181) ADMISSIONS TO PCCUs IN THE ROI, 2015–2024

Most patients admitted to PCCU (77%, n=142) were unplanned transfers from other hospitals and 87% (n=124) were transported by a specialist team from a NICU/ICU. Figure 7.5 shows the LOS in PCCU for OA/TOF patients. Over half (57%, n=104) of patients had an LOS less than 7 days.

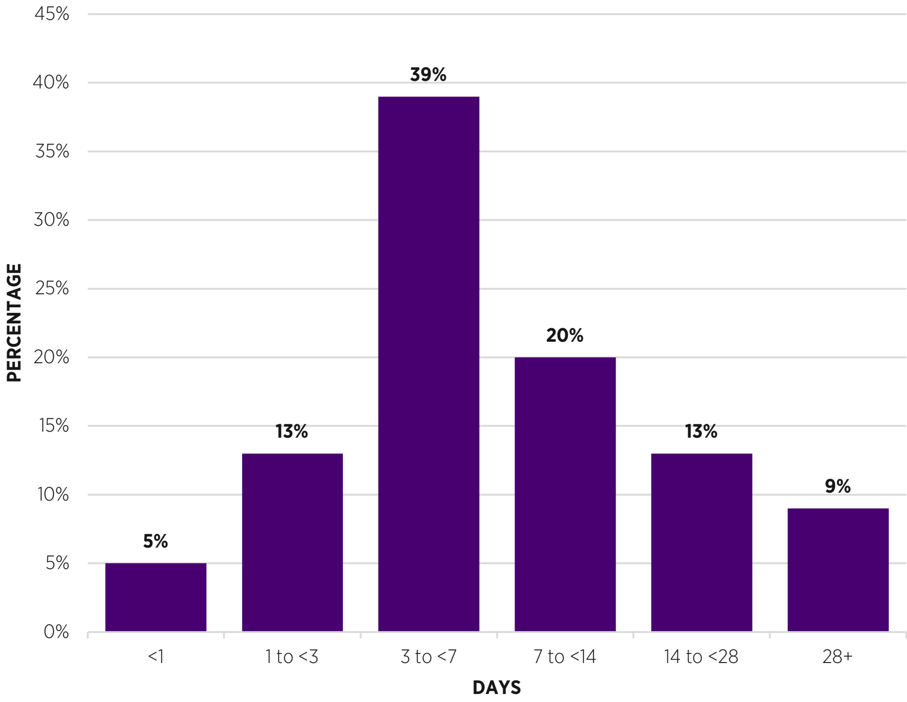


FIGURE 7.5: LOS FOR TOF (n=181) ADMISSIONS TO PCCUs IN THE ROI, 2015–2024

Figure 7.6 shows the PIM3 score on admission to PCCU: 68% of patients were in the 1–5% low-risk group. Overall survival rates for OA/TOF were 94%.

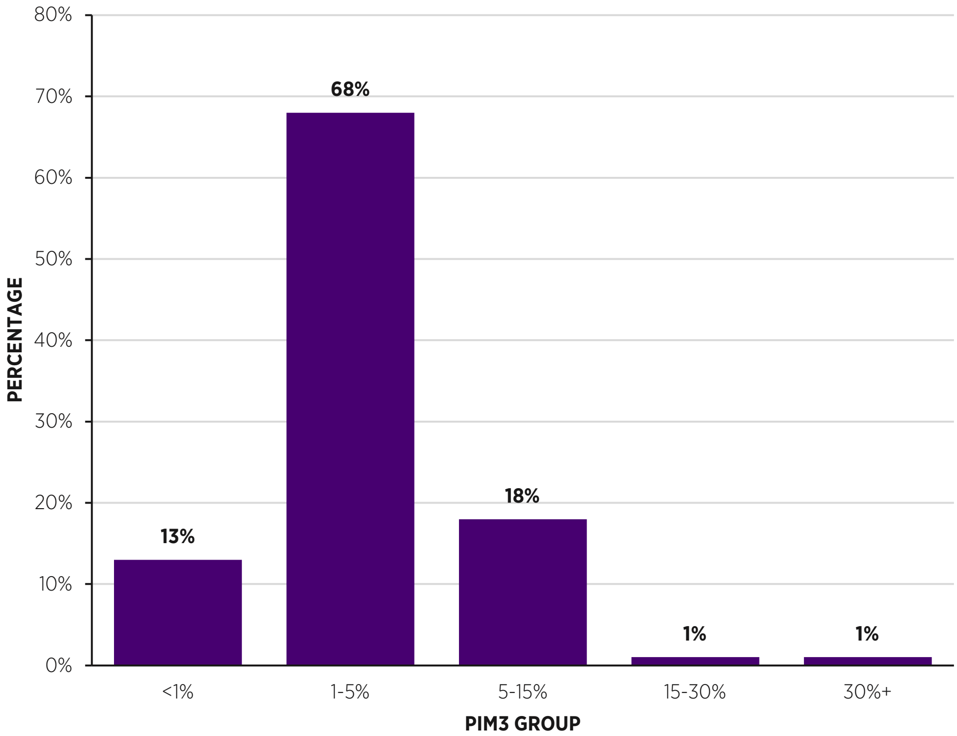


FIGURE 7.6: PIM3 RISK GROUPS FOR TOF (n=181) ADMISSIONS TO PCCUs IN THE ROI, 2015–2024

CONGENITAL DIAPHRAGMATIC HERNIA

CDH is a serious condition that develops during pregnancy while babies are growing. It arises from a defect in the diaphragm that allows abdominal organs to herniate into the chest before birth, restricting normal lung growth; in Ireland the condition has been reported to affect roughly 1 in 3,000 live births. Infants with CDH are often diagnosed prenatally through routine ultrasound, and those affected typically require highly coordinated care immediately after birth. Otherwise, it is diagnosed soon after birth when a baby shows signs of breathing difficulties. After stabilisation with specialised respiratory support and careful management, surgical repair of the diaphragmatic defect is undertaken once the baby is physiologically ready.

This chapter will present a 16-year review of the 249 cases admitted to the PCCU in CHI at Crumlin from 2010 to 2025. Figure 7.7 shows the percentage of total PICU admissions due to CDH each year and the rate per 1,000 live births. Admissions varied between a low of 0.5% (n=7) in 2010 and a high of 1.9% (n=29) in 2014. Rates per 1000 live births varied from 0.09 per 1,000 in 2010 to 0.43 per 1,000 in 2014.

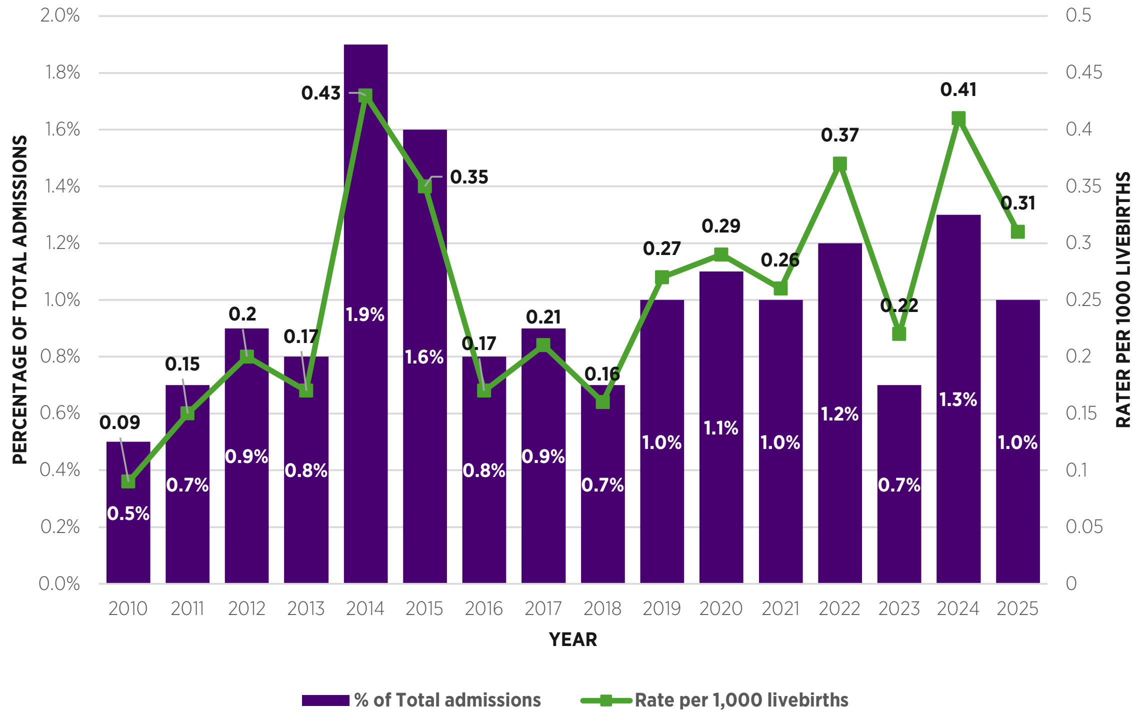


FIGURE 7.7: CDH ADMISSIONS (n=249) TO PCCUs IN THE ROI AS A PERCENTAGE OF TOTAL ADMISSIONS AND RATE PER 1,000 LIVE BIRTHS, 2010–2025

Figure 7.8 shows the place of birth for CDH admissions to PCCU; 72% (n=179) were delivered in one of the three Dublin maternity hospitals. Figure 7.9 shows the mode of delivery for these infants: half (n=123) were delivered by caesarian section, either emergency or planned.

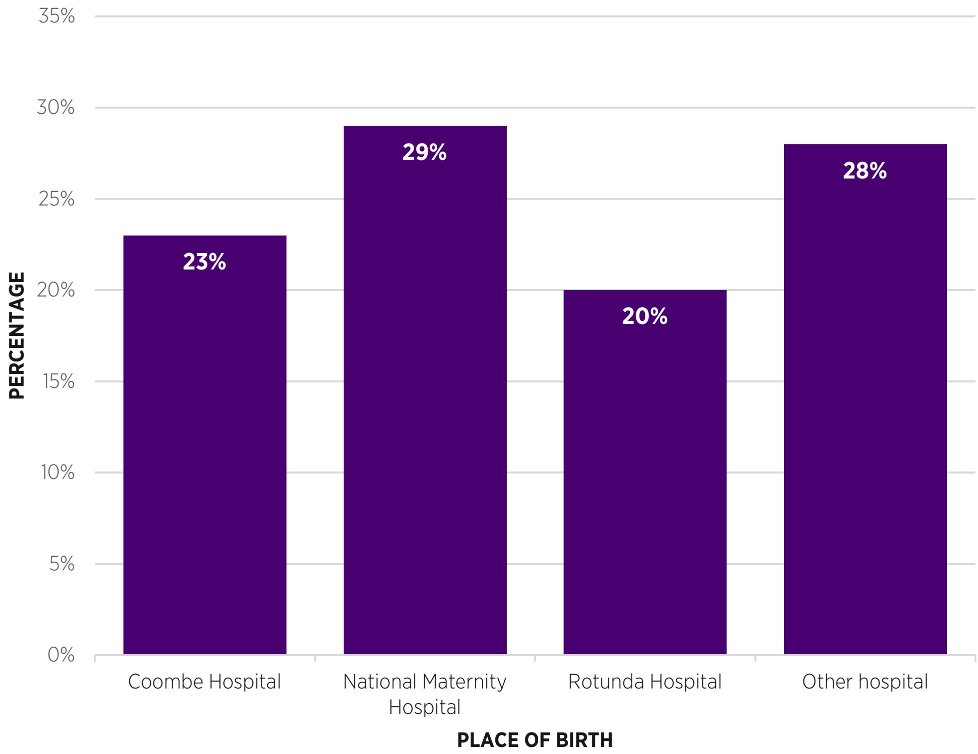


FIGURE 7.8: PLACE OF BIRTH FOR CDH ADMISSIONS (n=249) TO PCCUs IN THE ROI, 2010–2025[4]

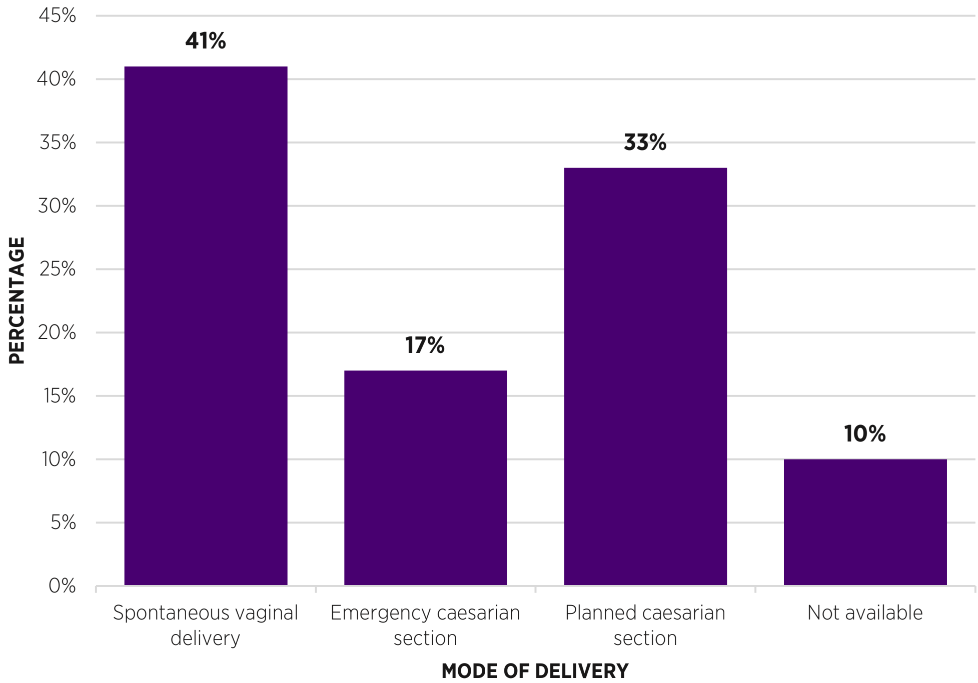


FIGURE 7.9: MODE OF DELIVERY FOR CDH ADMISSIONS (n=249) TO PCCUs IN THE ROI, 2010–2025

[4] Excludes one case where place of birth was missing

Table 7.2 shows that 63% of infants were born greater than 38 weeks. Males comprised 51% (n=126) versus females 49% (n=123). Antenatal diagnosis was made in 70% of patients (n=174). Figure 7.10 shows that most of the defects were located on the left-hand side of the diaphragm (84%, n=210). Forty-five per cent (n=112) of infants were also born with a cardiac anomaly and 5% (n=12) with a chromosomal abnormality.

TABLE 7.2: GESTATIONAL AGE, BIRTHWEIGHT, AND MEDIAN APGAR SCORES FOR CDH ADMISSIONS, 2010–2025

Gestational age	Birthweight	n	Total	%	Median Apgar score at 1 min	Median Apgar score at 5 mins
<34 weeks	<1kg	1	17	7%	4	7
	1-2 kg	13				
	>2 kg	3				
34–37 weeks	1-2 kg	8	75	30%	7	8
	2-3 kg	35				
	3-4 kg	28				
	N/A	4				
>=38 weeks	2-3 kg	36	157	63%	7	8
	3-4 kg	92				
	4-5 kg	14				
	N/A	15				

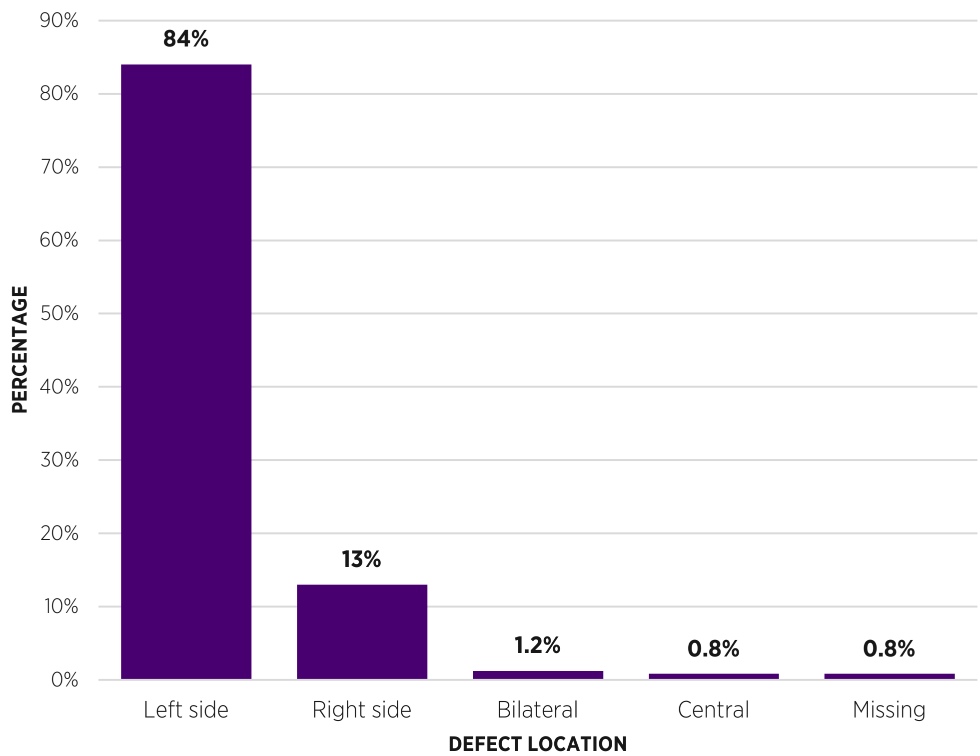


FIGURE 7.10: DEFECT LOCATION FOR CDH ADMISSIONS (n=249) TO PCCUs IN THE ROI, 2010–2025[5]

[5] Excludes missing cases which account for 0.8%.

INTERVENTIONS

Fetoscopic Endoluminal Tracheal Occlusion (FETO)

FETO is a surgical procedure before birth that can improve outcomes for infants with severe cases of CDH. This was offered antenatally in 6% (n=15) of cases, and upon review for suitability was carried out for 3% (n=8) of the CDH patients from Ireland in University Hospital Leuven, Belgium.

Table 7.3 shows that two-thirds (n=166) of CDH patients required respiratory support with high-frequency oscillatory ventilation (HFOV) and 74% (n=184) required nitric oxide for pulmonary hypertension. Nutritional support via NG feeding was used in two-thirds of patients (n=165), and 20% (n=51) had more complex feeding needs.

TABLE 7.3: INTERVENTIONS FOR CDH ADMISSIONS, 2010–2025

Intervention	n	%
Tracheostomy	9	4%
Gastrostomy	6	2%
HFOV	166	66%
Nitric oxide	184	74%
Nasogastric (NG) tube feeding	165	66%
Nasojejunal (NJ) tube feeding	63	25%
NG and NJ tube feeding	51	20%

Figure 7.11 shows variability in the duration of invasive ventilation, reflecting CDH severity. While one-third of patients (n=85) required short-term or no ventilation, the majority required prolonged respiratory support, with over one-quarter (n=62) being ventilated for more than 3 weeks.

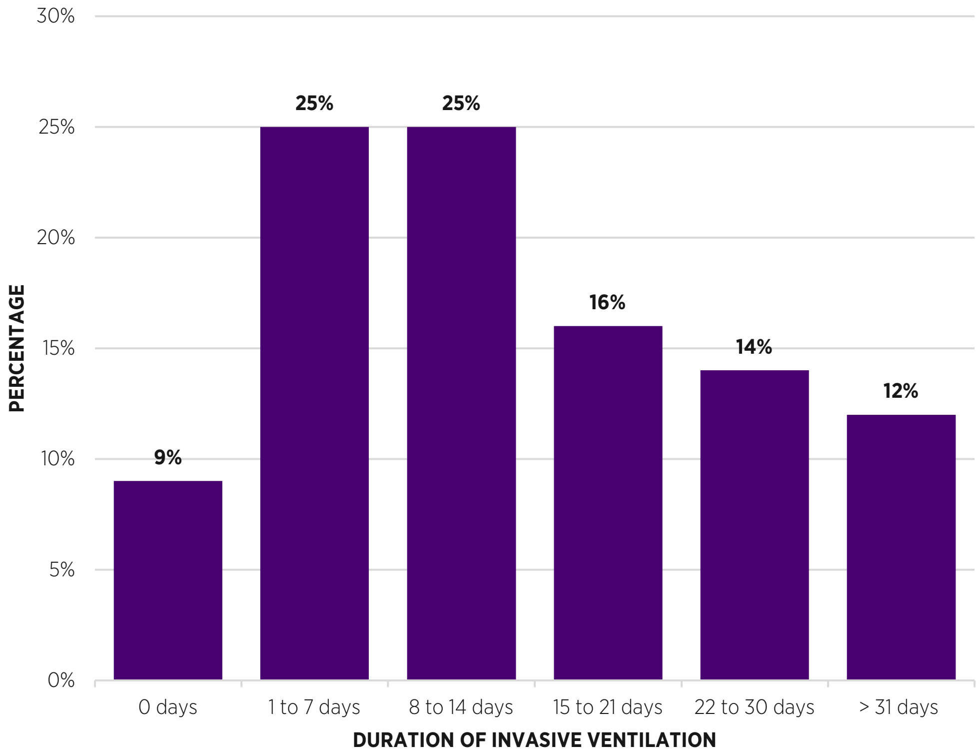


FIGURE 7.11: DURATION OF INVASIVE VENTILATION FOR CDH ADMISSIONS (n=249) TO PCCUs IN THE ROI, 2010–2025

ECLS

Fourteen infants (5%) with CDH required treatment with ECLS, with 50% (n=7) survival.

TABLE 7.4: DESCRIPTION OF ECLS CDH ADMISSIONS, 2010–2025 (n=14)

Median	n
Gestational age at delivery (weeks)	39
Birthweight (kg)	3.5
Apgar's at 1 minute	5
Apgar's at 5 minutes	6
PICU LOS (days)	3.5
Hospital LOS (days)	49
PO2 maternity hospital (kPa)	6.4
PO2 CHI (kPa)	7.58

LENGTH OF STAY

Figures 7.12 and 7.13 show the variation in LOS for CDH patients by gestational age and side of defect. The high proportion of infants requiring more than 30 days of hospitalisation (n=135) underscores the significant chronic care burden associated with CDH.

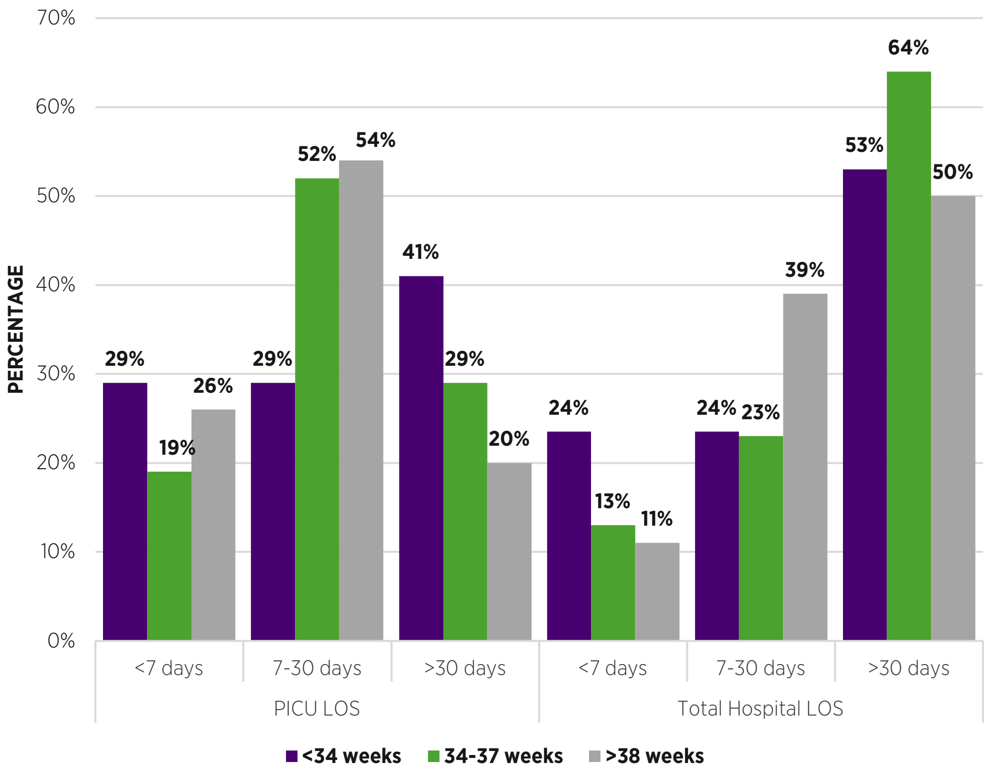


FIGURE 7.12: LOS BY GESTATION FOR CDH ADMISSIONS (n=249) TO PCCUs IN THE ROI, 2010–2025

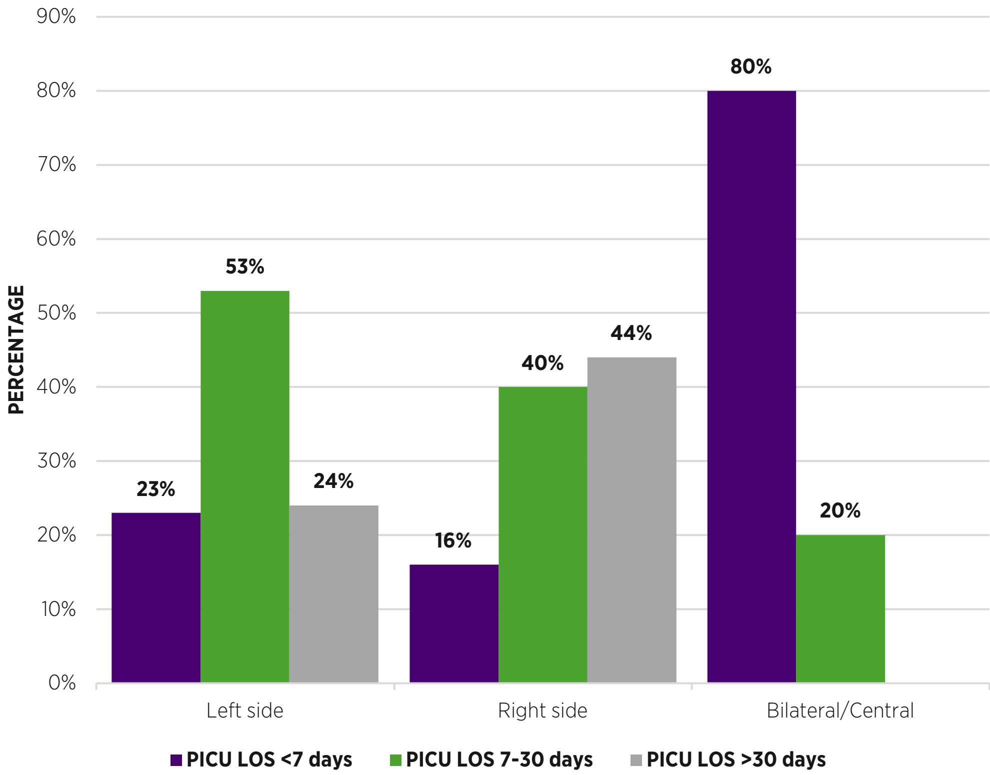


FIGURE 7.13: LOS BY SIDE OF DEFECT FOR CDH ADMISSIONS (n=249) TO PCCUs IN THE ROI, 2010–2025

OUTCOMES

Figure 7.14 shows consistently high survival rates across the 16-year period 2010–2025; however, there is variability between years, likely reflecting differences in disease severity. Table 7.5 provides a description of non-survivors, with most deaths (78%, n=25) occurring prior to surgical repair: this reflects the severity of CDH at presentation to PCCU.

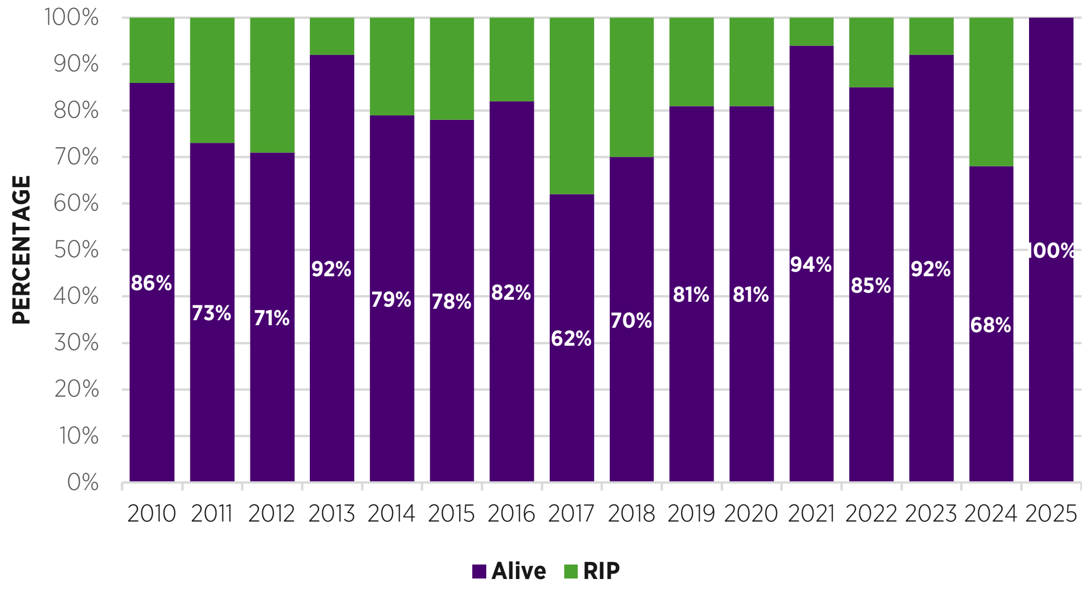


FIGURE 7.14: SURVIVAL FOR CDH ADMISSIONS (n=249) TO PCCUs IN THE ROI, 2010–2025

TABLE 7.5: DESCRIPTION OF NON-SURVIVORS (LESS THAN 30 DAYS) FOR CDH ADMISSIONS, 2010–2025 (n=32)

Variable	Median	Variable	n	%
Gestational age at delivery (weeks)	38	Died pre-surgery	25	78
Birthweight (kg)	2.8	Died postoperatively	7	22
Apgar's at 1min	4	Left-sided defect	25	78
Apgar's at 5 min	6	Right/Bilateral/Central-sided defect	7	22
Best PaO2 in first 36 hours (kPa)	12.15			
Best PaCO2 in first 36 hours (kPa)	5			
Days of life	2			
Total LOS (days)	2.5			

Long-term outcomes

The overall survival of CDH continues to improve; however, with that comes the increased burden of morbidity for those survivors. Chronic lung disease, gastroesophageal and oral dysfunction, and neurodevelopmental delays are areas of interest in this population. Identification of these morbidities starts at the time of discharge. Survival rate of CDH in CHI is 87% (n=217). According to the data, the best predictors of survival of CDH patients are:

- Birth weight
- Apgar score at 5 minutes
- Best PaO2 in the first 36 hours of life.

I am honoured to provide commentary on this important chapter. Although these conditions are rare, neonatal outcomes are heavily influenced by prenatal diagnosis and delivery planning.

Dr Sieglinde Müllers, Consultant Obstetrician and Gynaecologist, Maternal-Fetal Medicine Specialist and Clinical Lead, Fetal Medicine Services, The Rotunda Hospital, Dublin

PRENATAL DIAGNOSIS OF TOF/OA

Historically, prenatal diagnosis of TOF/OA by ultrasound has been challenging, with detection rates below 50%. Key indicators of TOF/OA, such as an absent or under-filled stomach, along with polyhydramnios, are not consistently observed. In many cases, a small or relatively under-filled stomach may be the only finding, which might not raise immediate concern, as polyhydramnios can appear late or as an isolated feature. However, the vast differential diagnosis for polyhydramnios complicates prenatal counselling, as many cases of polyhydramnios are deemed idiopathic and benign. It is crucial to strike a balance between raising awareness of potential gastrointestinal issues and providing reassurance for cases likely to be normal, all while ensuring perinatal delivery plans are established accordingly.

In the Rotunda, fetuses identified with a consistently small or under-filled stomach bubble in conjunction with polyhydramnios are flagged as potential TOF cases. These cases are referred to our fetal medicine service for detailed assessments, including fetal echocardiograms to identify associated anomalies. Recommendations for invasive prenatal diagnosis with amniocentesis are routinely made, and cases with gross polyhydramnios occasionally require serial amnio-reduction and are flagged as high risk for TOF. A fetal MRI is typically undertaken to glean information regarding the degree of atresia and, if visualised, information regarding the fistula location and tract, which can provide valuable prognostic information with respect to surgical planning.

All suspected TOF/OA cases are now referred to our monthly Fetal Surgical Clinic at The Rotunda Hospital, established in 2025. This multidisciplinary clinic integrates expertise from paediatric surgery, neonatology, fetal medicine, and midwifery to facilitate real-time fetal assessments, comprehensive counselling, and effective delivery planning. Each case is thoroughly discussed at our weekly Fetal Medicine MDT, ensuring that delivery plans are communicated in advance to the paediatric intensive care team at CHI @ Crumlin. The findings of this PICU audit, indicating that over 50% of neonates have a length of stay of less than 7 days, paired with a 94% survival rate, provide reassurance and will enhance antenatal counselling for suspected cases of OA and TOF.

"HISTORICALLY, PRENATAL DIAGNOSIS OF TOF/OA BY ULTRASOUND HAS BEEN CHALLENGING, WITH DETECTION RATES BELOW 50%. KEY INDICATORS OF TOF/OA, SUCH AS AN ABSENT OR UNDER-FILLED STOMACH, ALONG WITH POLYHYDRAMNIOS, ARE NOT CONSISTENTLY OBSERVED."

TRANSFORMATIONS IN CDH MANAGEMENT

CDH is particularly close to my heart. Since the TOTAL trial findings in 2021, led by Professor Jan Deprest, UZ Leuven, Belgium, which demonstrated clear survival benefits through fetoscopic endoluminal tracheal occlusion (FETO), prenatal management of CDH has transformed dramatically. With Level I evidence now supporting improved survival rates and emerging data suggesting reduced morbidity for moderate and severe cases, FETO offers expectant parents a proactive option for in-utero treatment. Among the nine Irish cases treated with FETO in Belgium, survival rates have exceeded 60%, surpassing the original survival rate of 40% from the TOTAL trial.

Currently, a significant barrier for Irish patients is the necessity of performing the procedure in Belgium, which requires a six-week stay during balloon occlusion. Post-deflation, patients may return to Ireland for delivery around 37–38 weeks. However, the high rate of preterm pre-labour rupture of membranes, approximately 40%, renders these cases high-risk, occasionally necessitating repatriation via the Mobile Intensive Care Ambulance Service (MICAS) and the National Neonatal Transport Programme (NNTP), supported by midwifery teams and the Irish Air Corps. Efforts are underway to bring FETO to Ireland, which will enhance clinical resources and significantly improve the patient experience. This initiative will enable the Irish Fetal Surgical Team to further develop advanced fetal surgical skills under the mentorship of Professor Jan Deprest.

"TO ENSURE TIMELY NEONATAL STABILISATION BEFORE TRANSFERRING TO CHI @ CRUMLIN PICU, IT IS NOW ACCEPTED THAT BIRTHS FOR CDH CASES PLANNED FOR TRANSFER FOR PAEDIATRIC CARE SHOULD OCCUR IN DUBLIN."

The prenatal detection rate for CDH in Ireland is comparable to international standards, reaching 70%, as highlighted in this chapter. Most cases are left-sided and display the typical hallmarks. However, prenatal diagnosis can be challenging in some cases, particularly right-sided lesions. All patients diagnosed with CDH in the prenatal period, typically during mid-trimester anomaly ultrasounds, are advised to undergo invasive prenatal diagnostic testing, primarily through amniocentesis given that CDH is associated with chromosomal disorders and genetic conditions in over one-third of cases. In cases with lethal conditions such as Trisomy 13 and 18, termination of pregnancy may be considered under the Health Act, 2018. Fetal MRIs are now undertaken in all cases of suspected CDH, particularly if being considered for FETO; all patients considering FETO have a remote consultation arranged with the fetal therapy team in Belgium and all diagnostic imaging to date is reviewed prior to consideration for FETO. Given this treatment is not currently available in Ireland, following central approval, the HSE Treatment Abroad Scheme will cover the cost of the procedure.

Though not a substitute for thorough neonatal counselling, insights from this dedicated chapter – such as the average duration of invasive ventilation for CDH being up to two weeks – will enhance prenatal counselling efforts. Of note, the observation of the relatively high proportion (80%) of cases of bilateral/central CDH requiring the shortest length of PICU stay possibly reflects higher mortality in these complex and rare cases.

To ensure timely neonatal stabilisation before transferring to CHI @ Crumlin PICU, it is now accepted that births for CDH cases planned for transfer for paediatric care should occur in Dublin. This current PICU audit indicating that 28% of CDH transfers to Crumlin PICU are regionally delivered highlights gaps in care that warrant further investigation. Despite the high-risk nature of CDH, the rate of caesarean deliveries overall is surprisingly low, highlighted here at only 50%. Although vaginal delivery is not contraindicated, many patients who undergo FETO prefer caesarean delivery due to the complexities of their pregnancies and the understandable optimal preference of all stakeholders for a planned elective delivery.

Following a CDH diagnosis, all patients at The Rotunda are referred to a paediatric surgeon at CHI @ Crumlin for review in the third trimester. They receive comprehensive counselling on paediatric surgical and neonatal outcomes, including gastrointestinal complications, and are given the opportunity to tour the Crumlin PICU, meeting with clinical nurse specialists and the speech and language teams. As delivery approaches, a neonatal review is conducted with fetal medicine midwives who provide ongoing support, and families can engage in *The Journey Initiative*, a parent-driven strategy aimed at assisting perinatal planning.

This chapter underscores the importance of collaboration across maternity, neonatal, and paediatric intensive care teams in enhancing care for children and their families affected by CDH. I had the pleasure of visiting the Crumlin PICU two years ago: it was a humbling experience, and a reminder of the importance of continuity of care from prenatal diagnosis to infancy, childhood, and beyond, and a stark reminder of the importance of acknowledging the full extent a prenatal diagnosis of CDH and TOF/OA carries.

The longer-term effects of CDH including the high rate of oral aversion and reflux are increasingly recognised as having significant impact on quality of life. Sharing the experience of these longer-term issues with extended fetal medicine teams can only enhance holistic counselling for parents, and at an early stage after diagnosis. Looking ahead, discussions have taken place around creating a National Prenatal Registry for CDH, including collaborations with Northern Ireland. The experience of our collective former patient Clare Lawlor Lynch, whose son Oscar received FETO treatment for CDH in 2024 and battled a long journey to recovery, highlights both the emotional and logistical challenges faced by families. Her story provides a powerful reminder of the substantial personal, financial, and practical burdens associated with accessing treatment abroad, and further strengthens the argument for developing advanced fetal therapies, including FETO, within Ireland.

CHAPTER 8
QUALITY ASSURANCE

CHAPTER 8: QUALITY ASSURANCE

The Paediatric Intensive Care Audit Network (PICANet) makes comparisons between PCCUs in the UK and the ROI, assessing each Unit against established clinical standards and guidelines. PICANet reports on five key performance metrics related to paediatric critical care services. This chapter presents these metrics, as well as key quality standards in the ROI.

PICANet METRIC 1: CASE ASCERTAINMENT AND TIMELINESS OF DATA SUBMISSION

Case ascertainment was 100% in 2024. The completeness of patients' admission data within 3 months of their discharge from the Unit was 92% for the ROI in 2024.

Case ascertainment: In 2024, case ascertainment for all units was 100%. Checks were conducted at all PICUs on four occasions during 2024. Each check covered a period of 2 out of 3 months within a quarter, thus the case ascertainment metric covers 8 out of the 12 months in 2024. Units were given the opportunity to resolve initial discrepancies identified on the PICANet database.

Timeliness of data submission is measured using the number of admission events that are completed on the PICANet database within 3 months of discharge – a requirement of the Paediatric Critical Care Society's (PCCS) *Quality Standards for the Care of Critically Ill or Injured Children*, 6th edition (PCCS, 2021). From 1 January 2022, PICANet moved to a 2-month submission guideline as per L3-702 of the PCCS quality standards (PCCS, 2021) and PIC10a of National Health Service (NHS) England's *Paediatric Intensive Care (PICU) Quality Dashboard 2021/22* (NHS England, 2021). An admission record is defined as complete when all validation checks have been fulfilled.

Figure 8.1 provides a breakdown by ROI Unit of the completeness of patients' admission data within 3 months of their discharge for the years 2022–2024. CHI at Temple Street achieved 78% completeness within 3 months in 2024; resource and IT issues hindered timely data completion. CHI at Crumlin achieved 100% completeness within 3 months in 2024.

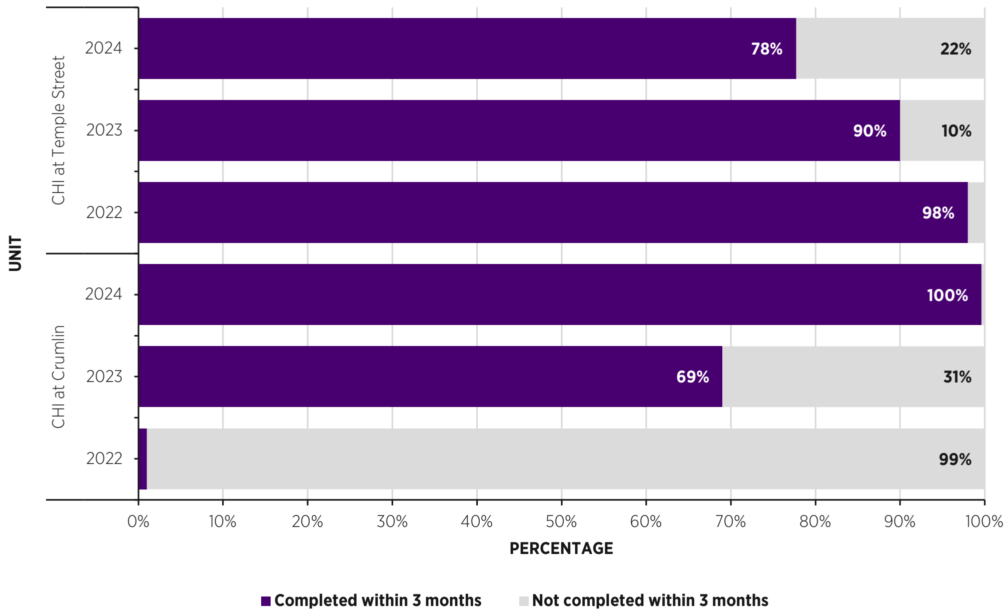


FIGURE 8.1: PROPORTION OF ADMISSION RECORDS COMPLETED WITHIN 3 MONTHS OF DISCHARGE BY CHI AT CRUMLIN AND CHI AT TEMPLE STREET, 2022–2024

A similar case ascertainment process was undertaken and reported for the first time for the 13 transport organisations participating in PICANet, which includes the Irish Paediatric Acute Transport Service (IPATS). In 2024, case ascertainment for these organisations was also 100%.

The timeliness for completeness of patients' transport records by transport teams is also reported for the first time. IPATS achieved 97% completeness within two months after the transfer in 2024.

PICANet METRIC 2: RETRIEVAL MOBILISATION TIMES

Retrieval mobilisation times within 1 hour were achieved for 86% of IPATS journeys in 2024 (n=141).

Figure 8.2 shows the time taken to mobilise a team following a clinical decision that urgent (non-elective) patient transport is needed in the ROI (i.e. using IPATS) for the years 2022–2024. The UK Care Quality Commission and the *NHS England Specialised Services Quality Dashboard* monitor the timeliness of emergency transports and mobilisation times, and the current target is that 95% of journeys should start within 30 minutes of the clinical decision that PIC transport is required (PIC14i) (NHS England, 2021). Standards for mobilisation time have not been defined in the ROI. This metric is considered a measure of system capacity rather than quality of care; starting the journey is only one part of timely access to appropriate care.

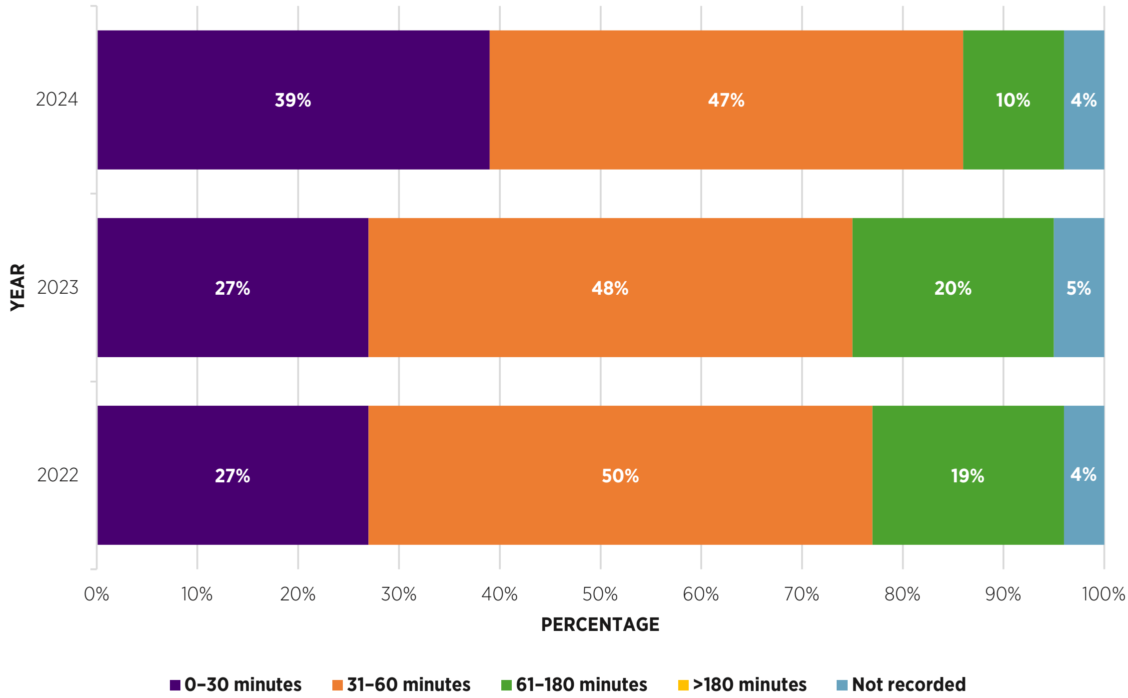


FIGURE 8.2: NON-ELECTIVE TRANSPORTS BY MOBILISATION TIMES (IN MINUTES) IN ROI, 2022–2024 (n=463)

NON-ELECTIVE TRANSPORTS: TIME TO BEDSIDE

In 2024, IPATS achieved the 3-hour time to bedside target for 71% (n=117) of transports.

The *Quality Standards for the Care of Critically Ill or Injured Children, 6th Edition* (PCCS (2021) recommends a target for arrival at the referring Unit within 3 hours of the decision to transfer the child, except in remote areas, where the team should arrive within 4 hours. The IPATS registrar and nurse provide support to PCCUs during their shifts. Following activation, the IPATS team must assemble with the IPATS consultant and the ambulance (or helicopter/aeroplane), which are often not co-located. Retrieval from remote geographical areas may require both road and air travel. In 2024, IPATS achieved the 3-hour time to bedside target for 71% (n=117) of transports (Figure 8.3).

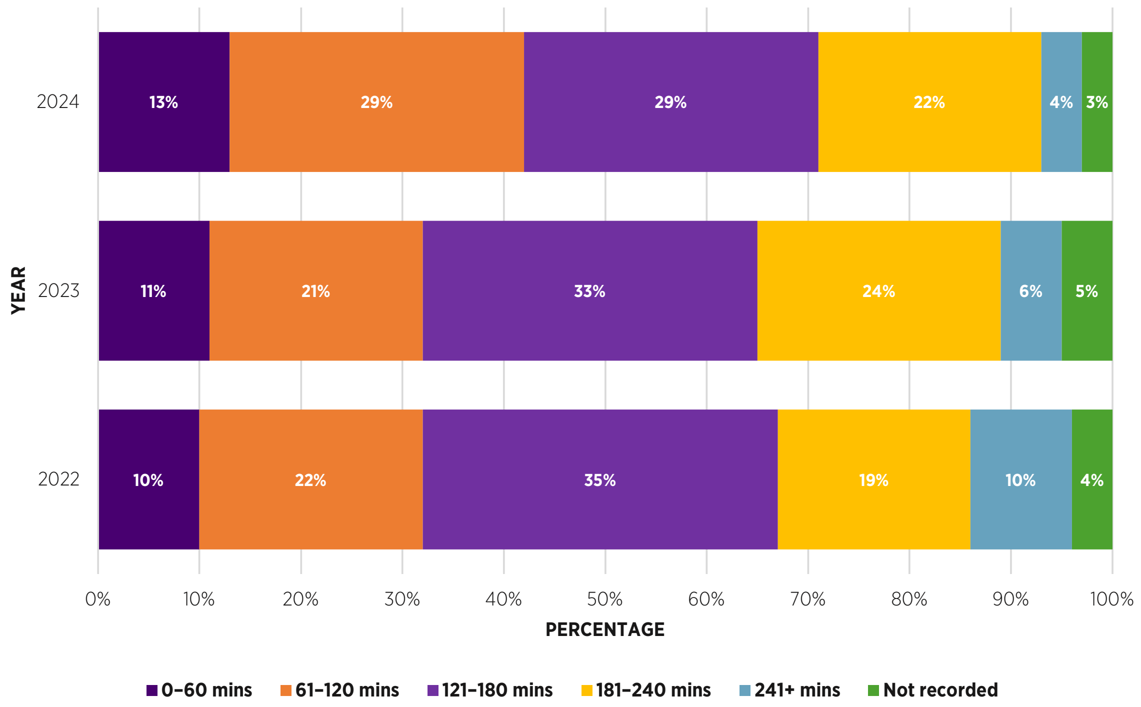


FIGURE 8.3: NON-ELECTIVE TRANSPORTS IN ROI BY TIME (IN MINUTES) TO BEDSIDE, 2022–2024 (n=463)

PICANet METRIC 3: EMERGENCY READMISSIONS WITHIN 48 HOURS

In 2024, the proportion of patients who were readmitted to PCCU within 48 hours of discharge in the ROI was low, at 1.5% (n=26).

Emergency readmissions to the same PCCU within 48 hours of discharge may mean that a child was discharged too early or into the wrong care environment, or that the need for future critical care was not predicted. There is no standard acceptable rate of emergency readmissions to PCCU within 48 hours, but they are considered a rare event. Low readmission rates are accepted as an indicator of high-quality care.

Table 8.1 displays the number and percentage of admissions where the child was readmitted to PCCU within 48 hours of discharge, by country, from 2022 to 2024. The proportion in ROI was lower than in other countries.

TABLE 8.1: EMERGENCY READMISSIONS TO PCCUs WITHIN 48 HOURS OF DISCHARGE, BY COUNTRY, 2022–2024

Country	2022		2023		2024	
	N	%	N	%	N	%
ENGLAND	219	1.5%	224	1.5%	224	1.6%
WALES	5	1.3%	8	2%	11	2.6%
SCOTLAND	30	2.0%	30	2.0%	29	2.0%
NORTHERN IRELAND	~	*	~	*	~	*
REPUBLIC OF IRELAND	24	1.5%	30	1.8%	26	1.5%
TOTAL	**281**	**1.5%**	**296**	**1.6%**	**292**	**1.6%**

~ Denotes five cases or fewer.
* Further suppression required in order to prevent disclosure of five cases or fewer.

Figure 8.4 shows the percentage of emergency readmissions for each individual Unit for 2024. In 2024, the percentage of emergency readmissions within 48 hours of discharge was 0.82% (n=5) in CHI at Temple Street and 1.94% (n=21) in CHI at Crumlin.

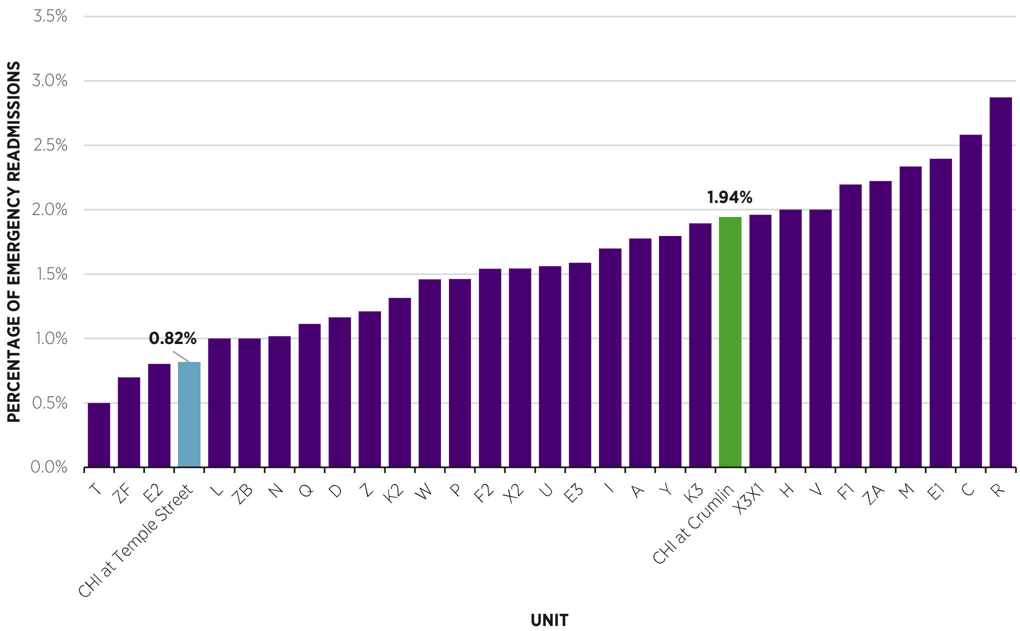


FIGURE 8.4: PERCENTAGE OF EMERGENCY READMISSIONS WITHIN 48 HOURS OF DISCHARGE FROM UNITS PARTICIPATING IN PICANet, 2024[6]

[6] See here for the PICANet organisation key.

PICANet METRIC 4: UNPLANNED EXTUBATIONS IN PCCU

The unplanned extubation rate in the ROI for 2024 was 6.3 per 1,000 invasive ventilation days, which is above the recommended threshold of fewer than 5.0 per 1,000 invasive ventilation days.

Rates of unplanned extubation should be carefully monitored, and PICANet has now included this as a key metric. The *Paediatric Intensive Care (PICU) Quality Dashboard 2021/22* (NHS England, 2021) aims for a threshold of fewer than 5.0 unplanned extubations per 1,000 invasive ventilation days.

Invasive ventilation involves placing a flexible plastic tube in the patient's throat and connecting it to a machine that helps them to breathe. If the tube is accidentally dislodged or removed by the patient, this is referred to as unplanned extubation. Unplanned extubation is still a relatively rare event in PCCUs. It is the most common adverse event in airway management in critical care and can result in clinical complications such as hypoxaemia (very low blood oxygen), hypercarbia (high blood carbon dioxide) or, very rarely, death (Kanthimathinathan *et al.*, 2015). A single-cohort study using routine clinical data from 12,533 admissions to a single PCCU between 2010 and 2013 found an acceptable notional threshold rate of unplanned extubations of fewer than 10 per 1,000 invasive ventilation days (Kanthimathinathan *et al.*, 2015).

The rates of unplanned extubation per 1,000 invasive ventilation days by country of admission for 2024 are shown in Figure 8.5. Most countries reported unplanned extubation rates below 5.0 per 1,000 invasive ventilation days, except for Wales (11.2), and ROI (6.3). It should be noted that the actual number of unplanned extubations in the ROI was small (n=32).

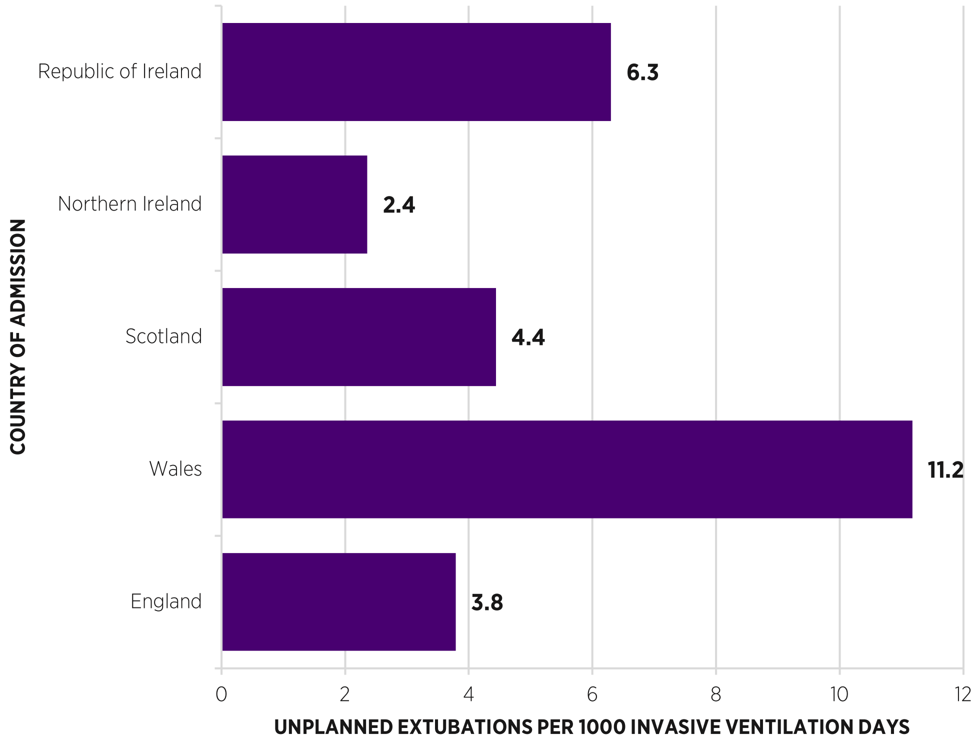


FIGURE 8.5: RATE OF UNPLANNED EXTUBATIONS PER 1,000 DAYS OF INVASIVE VENTILATION BY COUNTRY OF ADMISSION, 2024

Figure 8.6 illustrates the rates of unplanned extubations in both PCCUs in the ROI for the period 2022–2024. Rates in CHI at Crumlin rose slightly to 7.0 per 1,000 invasive ventilation days in 2023 and decreased to 6.1 in 2024. Rates in CHI at Temple Street rose slightly from 5.0 in 2023 to 7.0 in 2024.

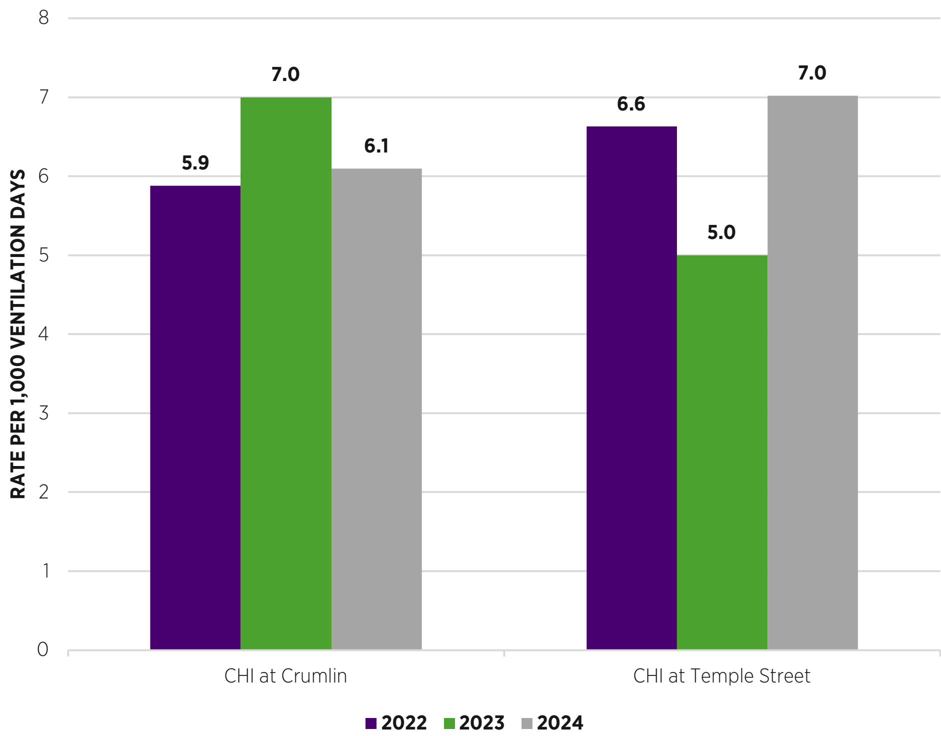


FIGURE 8.6: RATES OF UNPLANNED EXTUBATIONS AT PCCUs IN THE ROI BY YEAR, 2022–2024 (n=90)

PICANet METRIC 5: MORTALITY IN PCCU

In 2024, after allowing for the level of sickness at time of admission, no PCCU in the ROI had a mortality rate that was higher than expected. Risk-adjusted mortality is an important high-level quality indicator.

Mortality rates are assessed for each PCCU based on a statistical approach that accounts for the severity of the child's illness at the time of admission. The risk-adjustment method used is the PIM3. The number of children predicted to die is calculated and compared with the actual number of deaths in order to derive the risk-adjusted standardised mortality ratio (SMR) (Straney *et al.*,2013).

The risk-adjusted SMR for each PCCU in the UK and the ROI for 2024 is displayed in a funnel plot (plotted against the number of admissions) in Figure 8.7. No units were identified as having a higher or lower mortality rate than would have been expected, therefore there were no statistical outliers. Transparent presentation of this information is important in order to assure the public, parents, and health service at large that hospitals are continuously monitoring important outcomes and that there are systems in place to review any areas of concern.

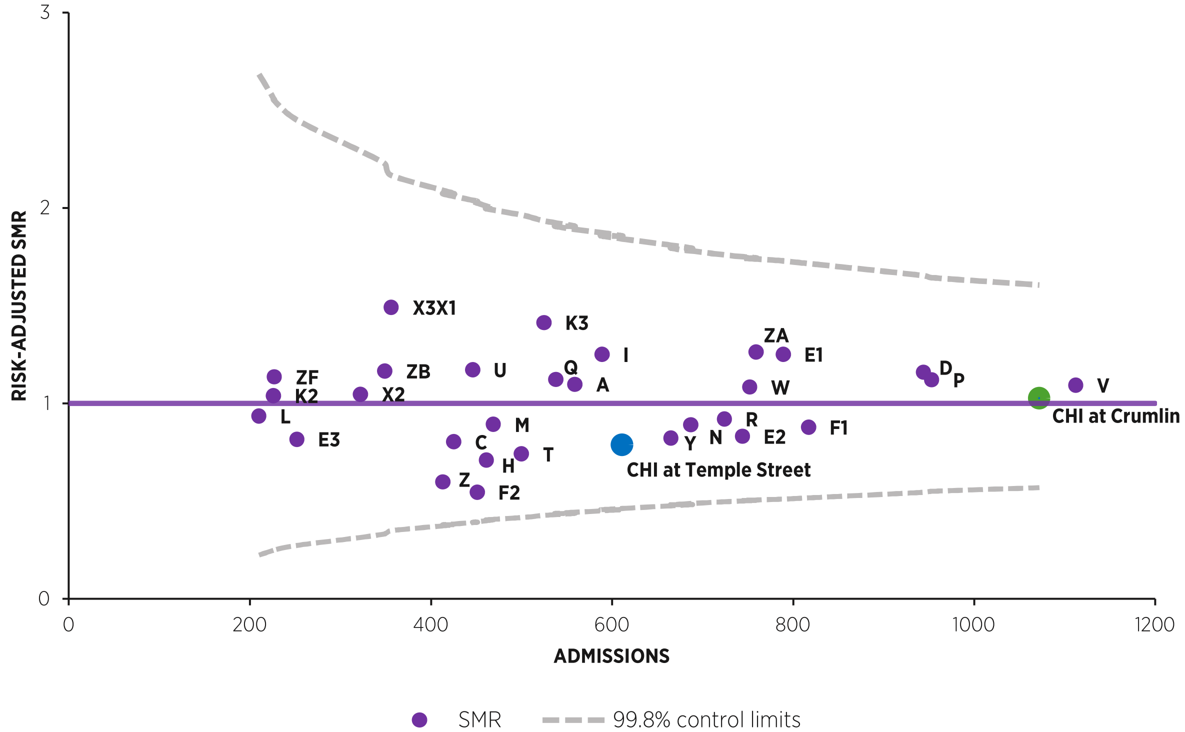


FIGURE 8.7: RISK-ADJUSTED SMRS BY PCCUs PARTICIPATING IN THE PICANet, 2024[7]

[7] See here for the PICANet organisation key.

OUT-OF-HOURS DISCHARGE

The proportion of patients discharged out of hours (between 8.00pm and 7.59am) in 2024 was 13% (n=223) in the ROI, which is above the target of less than 10% of discharges.

The *Quality Standards for the Care of Critically Ill or Injured Children, 6th Edition* (PCCS (2021) states that PCCU operational policy should be that "discharges do not normally occur between 20:00 and 07:59" and that "arrangements for discharge [should be] within four hours of the decision to discharge". The *Paediatric Critical Care: GIRFT Programme National Specialty Report* (Morris and Fortune, 2022) states that the out-of-hours discharge target is less than 10% and that delays in discharge of more than 24 hours should be monitored, with a target of less than 5%.

An out-of-hours discharge of a patient is suboptimal and should be avoided where possible. It is important to record the reason for late discharges. For example, there may be no bed available on the ward, and a direct swap may take place in order to facilitate the admission of a critically ill patient. Annual audits should record the reasons for out-of-hours discharges and clearly show if ward capacity is the issue, communicating this to hospital management. During the evening and night-time, medical and nursing staff availability on the wards is reduced and senior staff are less likely to be available to review a patient. It is also less likely that a parent or guardian will be present to accompany the child if the discharge occurs during the night.

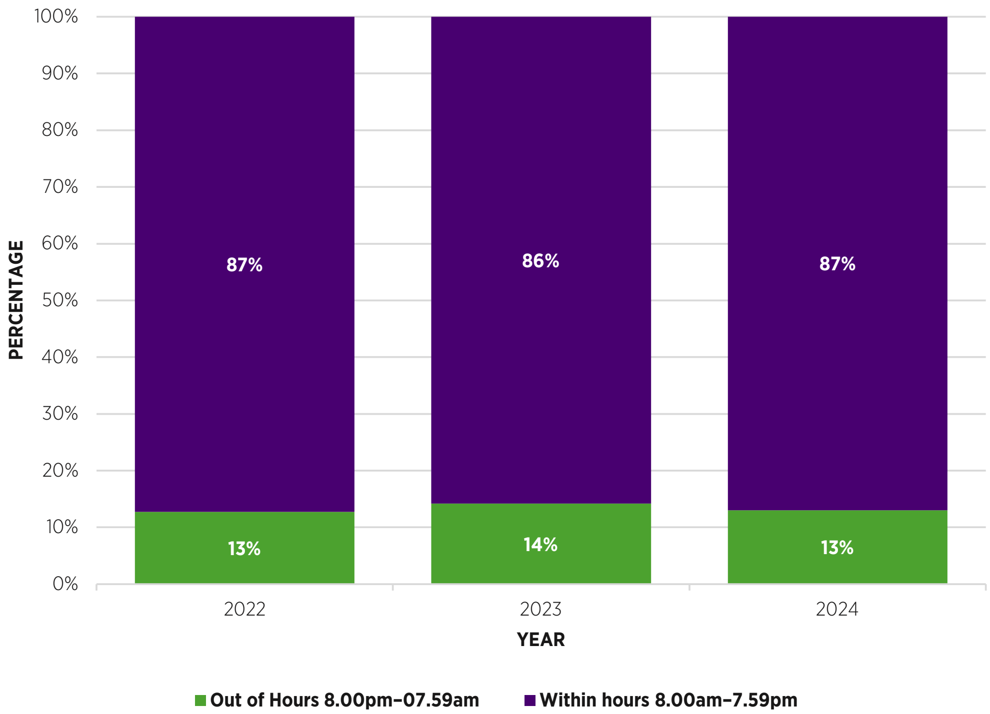


FIGURE 8.8: OUT-OF-HOURS DISCHARGES FROM PCCUs IN THE ROI, 2022–2024 (N=681)

NUMBER OF QUALIFIED NURSES PER BED

CHI at Crumlin and CHI at Temple Street were below the required standard of 5.8 whole-time equivalent (WTE) nurses per critical care bed in 2024.

The *National Standards for Paediatric Critical Care Services* (Joint Faculty of Intensive Care Medicine of Ireland (JFICMI), 2025) recommend that each critical care bed in the ROI should be supported by a minimum of 5.8 WTE staff nurses. The ROI standard of 5.8 WTE nurses per critical care bed pertains to the number of nurses required in direct patient care, which includes the numbers required for one-to-one direct patient care only.

Staffing in CHI PCCUs was below the required standard of 5.8 WTE nurses per critical care bed in 2024.

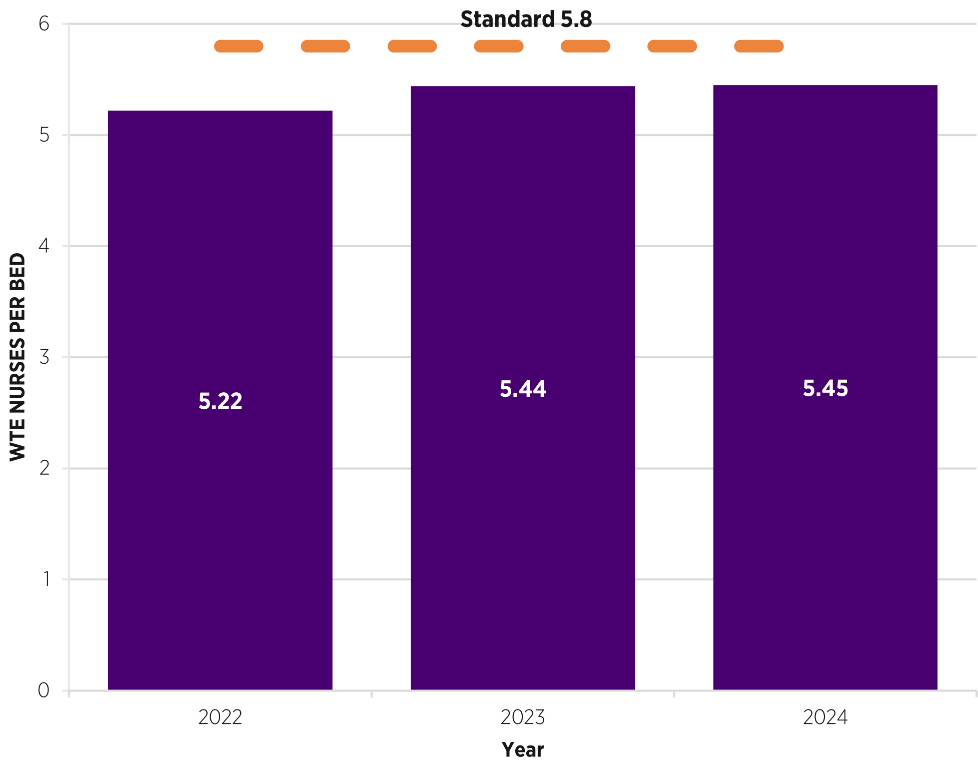


FIGURE 8.9: NUMBER OF NURSES PER CRITICAL CARE BED IN CHI, 2022–2024

Current and Projected Medical and Nurse Staffing

Table 8.2 presents current staffing for PCCUs in Ireland. It also presents projected requirements for opening of both 32 and 42 beds in NCH. These requirements are based on The *National Standards for Paediatric Critical Care Services* (JFICMI, 2025). The *Critical Care Capacity, Workforce and Activity Census Report 2024* (National Clinical Programme for Critical Care, 2025) highlights the need to prioritise increasing the paediatric critical care medicine consultant, trainee, and nursing workforce to meet the requirements of opening the new NCH PCCU with 32–42 beds.

ACCESS Nurses

The *National Standards for Paediatric Critical Care Services* (JFICMI,2025) recommends that each nursing shift should be supported by access nurses – one per six beds or one per four cubicles. These are in addition to bedside nurses, unit managers, team leaders, clinical facilitators and non-nursing support staff. An ACCESS nurse provides ‘on the floor’ assistance, coordination, contingency, education, supervision, and support. Ratio is based on qualifications of current staff: <50% qualified staff = 1 ACCESS nurse per 4 beds, 50–75% qualified staff = 1 ACCESS nurse per 6 beds, >75% qualified staff = 1 access nurse per 8 beds.

TABLE 8.2: CURRENT AND PROJECTED MEDICAL AND NURSE STAFFING FOR PCCUs

Current	CHI 2024			Projected requirements 2026					
	Crumlin	Temple St	Total	NCH 32 Beds	Variance	NCH PCCU	NCH CCU	Total	Variance
Beds	23	9	32	32		20	22	42	10
Medical									
WTE Consultants Anaesthesiology & ICM	29	18	47						
WTE Consultants PICU	7	6	13	20**	7	10	10	20**	7
*WTE NCHDs ICU	14	3	17	40*	23	20	20	40*	23
24 hour retrieval NCHDs	0	0	0	4	4	4	4	8	8
Retrieval Consultants in ICM	0	2.5	2.5	4	1.5	2	2	4	1.5
Nursing									
CNM3			2	2	0	1	1	2	0
CNM2			21.43	24	2.57	12	18	30	8.57
Educators			6	6	0	3.5	4	7.5	1.5
Course co-ordinators			2	2	0	1	1	2	0
S/N (includes ACCESS & Adv therapy)			174.48	237.8	63.32	120.05	156.05	307.4	132.92
ECLS co-ordinator CNM3			1	1	0	0	1	1	0
ECLS Deputies CNM2			2	2	0	0	4	4	2
Audit WTE			1.61	3.2	1.59	2	2.2	4.2	2.59
CIS WTE			1.5	1.5	0	1	1	3	1.5
Family liaison CNS			0	2	2	1	1	2	2
HCA			8.3	18	9,7	7	7	24	15.7

* The design and layout of both ICU and CCU in NCH has major implications for staffing workforce and workflow. This includes consultants, NCHD, nursing, and allied health requirements, e.g., for an NCHD workforce to staff three rotas and two resus teams 'out of hours' and to comply with National Standards will increase staffing requirements from total 32 NCHDs to 40 NCHDs at a minimum. The layout and design also increase the requirement for consultant staff.

** This consultant number includes Consultant in Paediatric Retrieval.

CHAPTER 9
QUALITY IMPROVEMENT AND AUDIT UPDATE

CHAPTER 9: QUALITY IMPROVEMENT AND AUDIT UPDATE

QUALITY INDICATOR: INCLUSION OF HEALTHCARE-ASSOCIATED INFECTION DATA

Healthcare-associated infection rates are an important quality indicator as they provide a measure of patient safety and the effectiveness of infection prevention practices. Data collection for PCCU-acquired central line-associated bloodstream infection (CLABSI) and catheter-associated urinary tract infection (CAUTI) was included in the PICANet dataset in 2024. Expanded definitions are available here on the PICANet website. Ventilator-associated pneumonia (VAP) is also captured locally.

Figure 9.1 shows the central line associated infections for CHI at Crumlin in 2024. The mean CLABSI rate for 2024 was 0.9 per 1,000 CVC days, and this compares favourably with international rates of 0.5–2.2 per 1,000 catheter days.

Figure 9.2 shows the CAUTI rates.

Figure 9.3 shows the ventilator-associated pneumonia (VAP) rates in CHI at Crumlin in 2023 and 2024. Crumlin VAP rates for 2023–2024 are reported at a mean of 2 per 1,000 ventilator days and compare favourably with international rates. The incidence of paediatric VAP reported in countries around the world ranges between 5.2% and 19%, or between 5 and 27 per 1,000 ventilator days.

Table 9.1 provides a summary of the healthcare-associated infection in CHI at Temple Street PCCU in 2023–2024.

Overall, the data demonstrate low healthcare-associated infection rates across both PCCUs and a reduction in central line and ventilator-associated infections over the reporting period.

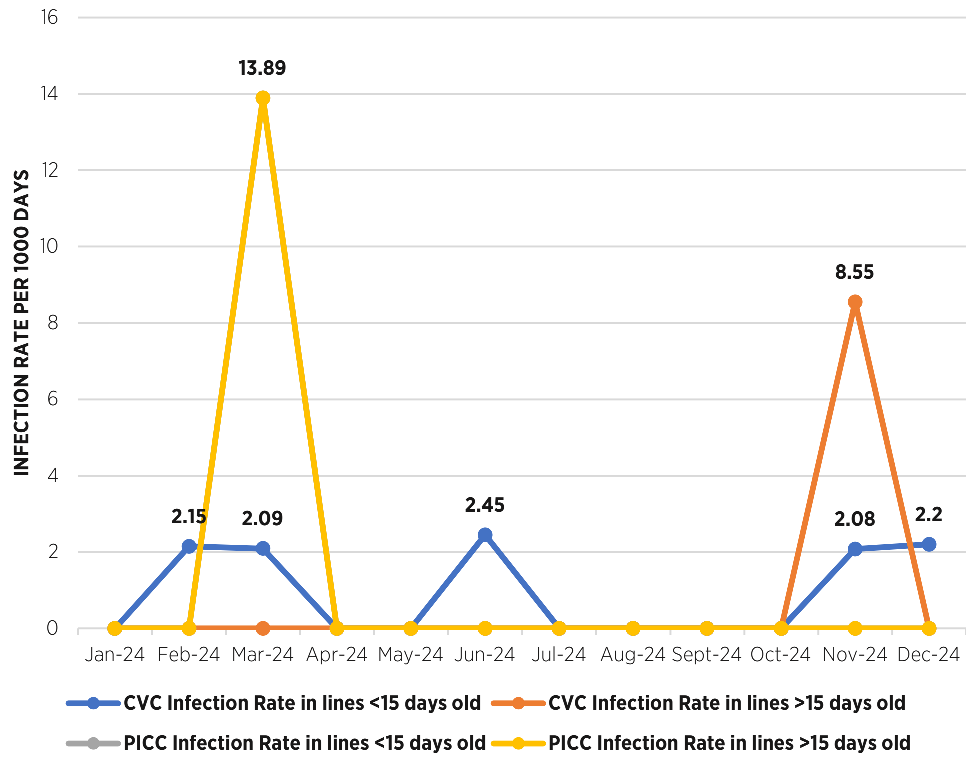


FIGURE 9.1: CENTRAL VENOUS CATHETER (CVC) AND PERIPHERALLY INSERTED CENTRAL CATHETER (PICC) LINE INFECTION RATES PER 1,000 LINE DAYS IN CHI AT CRUMLIN PCCU, 2024

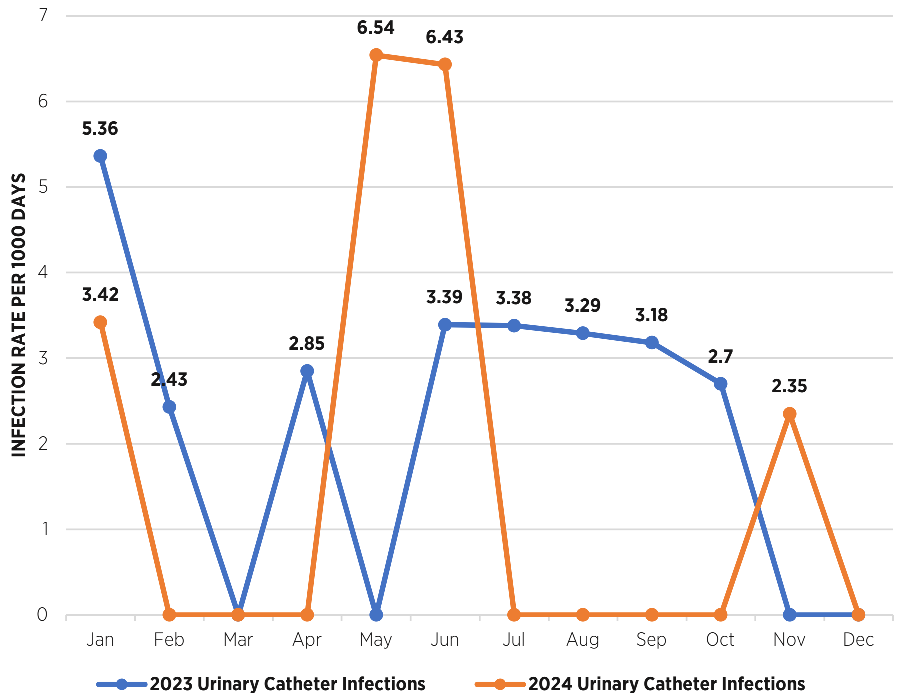


FIGURE 9.2: CAUTI RATES PER 1,000 CATHETER DAYS IN CHI AT CRUMLIN PCCU, 2023–2024

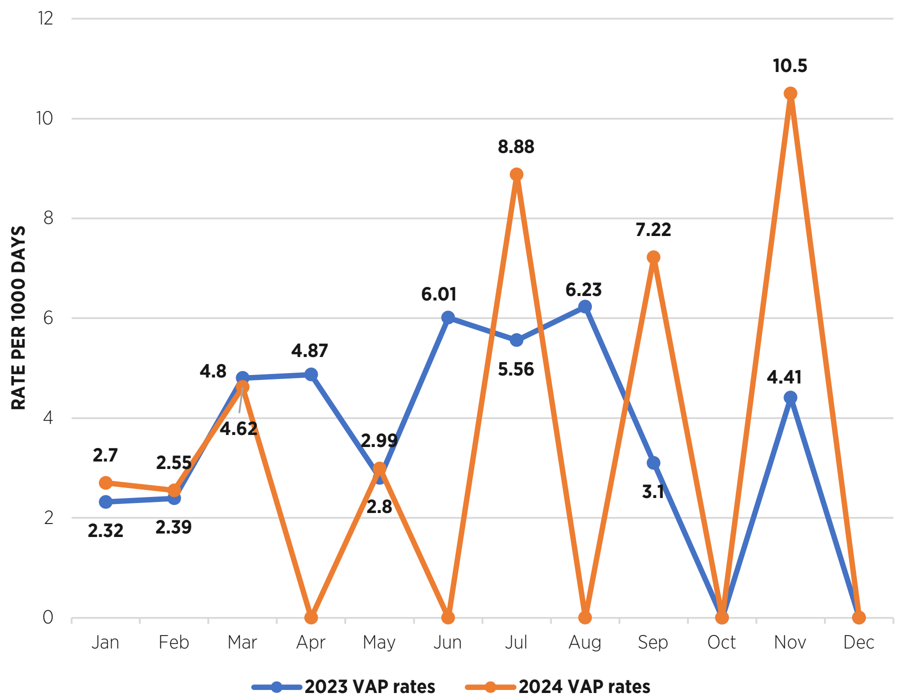


FIGURE 9.3: VAP RATES PER 1,000 VENTILATOR DAYS IN CHI AT CRUMLIN PCCU, 2023–2024

TABLE 9.1: HEALTHCARE-ASSOCIATED INFECTION IN CHI AT TEMPLE STREET PCCU, 2023–2024

Year	CR-BSI	CVC line days	VAP Infections	Invasive Ventilation Days	CR-UTI	Urinary Catheter Line Days
2023	2	1199	3	1695	1	
2024	0	994	0	1201	1	1167

CHI AT CRUMLIN

'Restraint in PICU – Last Resort'[8]

Children in the PICU are at various stages of growth and development, and their capacity to understand and accept the necessity of medical procedures varies based on their age and cognitive abilities. Alongside the use of distraction, analgesia, and parental presence, physical restraint (PR) is sometimes needed to protect critical equipment such as endotracheal tubes (ETTs). Although PR is commonly assumed to reduce unplanned extubations, evidence supporting this is limited (He *et al.*, 2023).PR also raises ethical concerns and causes distress among healthcare professionals, patients, and families.

This study was initiated in 2023 and included both retrospective and prospective review phases. The study found that 26% of unplanned extubations over 18 months were due to patients removing their own ETTs. Restraint use was reported in 59% of cases.

Findings support the need for a structured, consistent approach to restraint use. As a result, a new Restraint Guideline and the 'Restraint ABCDE Pathway' were incorporated into the electronic healthcare record in CHI at Crumlin in 2024 by Andrea Sequeira, Mong Hoi Tan, and Tara Connaughton.

Following implementation, restraint use decreased significantly, with 87% of patients requiring no restraints two years later. These findings demonstrate that a structured restraint pathway, supported by clear guidelines and integration into the electronic healthcare record, can reduce restraint use while promoting a standardized, evidence-based approach to restraint management, patient safety, and quality of care in the PICU.

[8] Working group members: Andrea Sequeira[1], Audit Nurse; Mong Hoi Tan[1], Clinical Nurse Audit and Research Coordinator; Tara Connaughton[1], Clinical Nurse Education Facilitator; Dr Graham King[1], Paediatric Registrar; Dr Saadia Irfan[1], Paediatric Registrar; Susan Kearns[2], Clinical Nurse Manager 3; Dane Del Reyes[1], Staff Nurse; Antoinette Stone[1], Staff Nurse; Claire Talty[2], Staff Nurse; Tara Gaughran[1], Physiotherapist; Laura Keogh[2], Staff Nurse (1 = PICU at CHI Crumlin; 2 = PICU at Temple Street).

RESTRAINT IN ICU ALGORITHM

ASSESSMENT

1. Elevated Comfort / Pain / Delirium score(s)
2. Attempts to remove life preserving devices
3. Injury to self
4. Alternatives
   - Parental supervision, Distraction techniques, Music/white-noise, Positioning aids, adequate supervision
5. Chemical options
   - Give already prescribed analgesia/sedation (regular/PRN)?
   - Discuss the analgesia/sedation needs with ICU team (regular/PRN)?

↓

BE- CAUSE RECOGNITION

1. Safety of life preserving devices: airway devices, etc.
2. Patient safety

↓

CONISDER PHYSICAL RESTRAINT

1. **LAST RESORT**
2. Communicate with child (if applicable)/guardians (at least once per shift)
3. Communicate this with shift leader/medical team (at least once per shift)

↓

DOCUMENTATION & EVALUATION AS PER GUIDELINE

1. Apply the appropriate physical restraint
2. Regular reposition physical restraint at 2 - 4 hours/PRN
3. Colour/movement/sensation check at 2 - 4 hours/PRN
4. Consider discontinuation of physical restraint at 2 - 4 hours/PRN
5. Discontinuation of physical restraint when life preserving device no longer in use
6. **Escalation of care discussed with MDT as needed**
7. Safe securement of all lines and catheters if applicable
8. Limbs and torso in normal anatomical position

↓

Restraint is not an alternative to patient supervision.
On going re-assessment on physical restraint used is necessary

VERSION 1.2 BY PICU RESTRAINT WORKING GROUP, JULY 2024

CHI AT TEMPLE STREET

Towards a Culture of Accurate Weight Recording in the Paediatric Intensive Care Unit

Marie Lawlor RN, Siobhán O'Keefe MB, BCh, BAO

BACKGROUND

Undernutrition affects 20–40% of critically ill children and is associated with need for mechanical ventilation, ICU LOS and higher mortality (Ayalon *et al.*, 2020; Amirjani *et al.*, 2023; Albadi *et al.*, 2022; Yilmaz Ferhatoglu *et al.*, 2022). Nutritional status frequently deteriorates during admission PICU stay (Valla *et al.*, 2019). Accurate patient weights are essential for safe and effective care, as weight-based dosing underpins medication prescribing, parenteral and enteral nutrition delivery, and assessment of fluid accumulation (Gelbart *et al.*, 2021, 2023; Hirata *et al.*, 2019). Estimated PICU weights are inaccurate (Flannigan *et al.*, 2014; Pace *et al.*, 2021). This quality improvement (QI) project aimed to improve the frequency and accuracy of weight recording, with a particular focus on obtaining actual PICU weights rather than estimated or externally sourced values.

METHODS

A baseline assessment was undertaken using two approaches. First, a staff survey was distributed to PICU nursing staff to explore perceived barriers to obtaining accurate patient weights. Second, a retrospective chart review of all patients admitted to the PICU in November 2024 was conducted to establish baseline practice regarding frequency, timing, and source of weight documentation.

A multifaceted QI intervention was then implemented using a Plan–Do–Study–Act (PDSA) framework. Outcome measures included the proportion of patients with an actual PICU weight recorded, the timing of weight recording (particularly on admission), documentation of weight source, and the frequency of repeated weights during admission.

To assess change over time, repeated cross-sectional periodic sampling was undertaken. One-month sampling periods were carried out in April 2025 and November 2025. From August 2025, more frequent one-week intermittent samples were introduced to allow timelier feedback to staff and to support ongoing improvement.

INTERVENTION

Several interventions were implemented in parallel. An electronic medical record (EMR) intervention removed the ability to 'data forward' weights on the ICU flowsheet, reducing the risk of outdated weights being carried forward. Nurses were also required to document the source of the recorded weight, specifying whether it was an actual PICU weight, an estimate, or obtained from another source such as the emergency department, ward, or parent.

Identified modifiable barriers were addressed through targeted equipment and education interventions. A weighing chair was purchased for patients aged 1–5, and education sessions were delivered on the correct use of weighing beds for older children. The importance of accurate PICU weight recording was reinforced through daily safety huddles, departmental meetings, and PICU consultant meetings. WhatsApp staff groups were also used to share results and provide encouragement and feedback.

RESULTS

The staff survey identified multiple barriers to obtaining accurate weights, including time pressures, unfamiliarity with equipment, and limited availability of appropriate weighing devices (see Figure 1). Notably, a persistent equipment gap was identified for toddlers aged 1–5 years, as there were no suitable weight cots available for this age group, making accurate weighing particularly challenging.

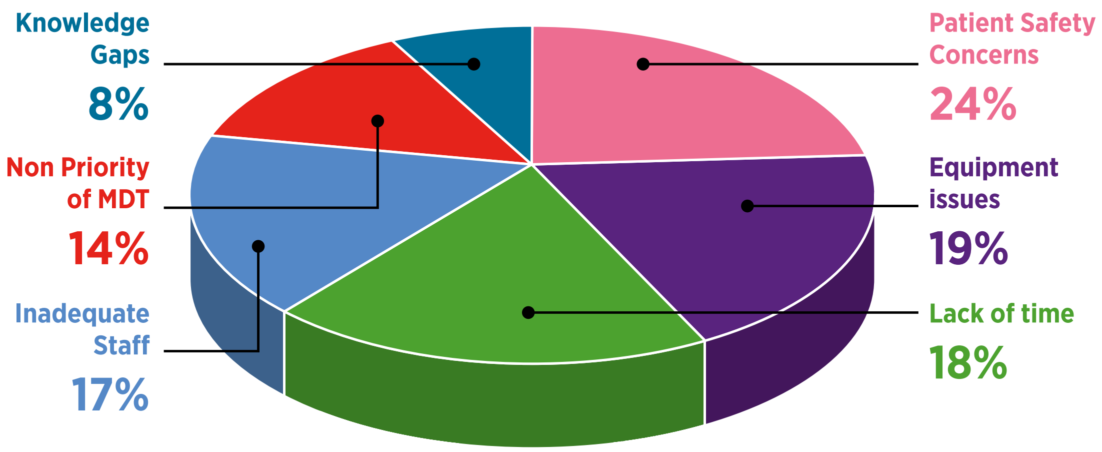


FIGURE 1 IDENTIFIABLE BARRIERS FOR WEIGHING PATIENTS: RESULTS OF STAFF SURVEY

Over the course of the project, the proportion of patients with any actual PICU weight recorded increased from 7% at baseline to 71%, and the proportion of patients with an actual PICU weight recorded on admission improved from 0% to 50% (see Figures 2 and 3). Documentation of the source of weight was variable during the project period (see Figure 4).

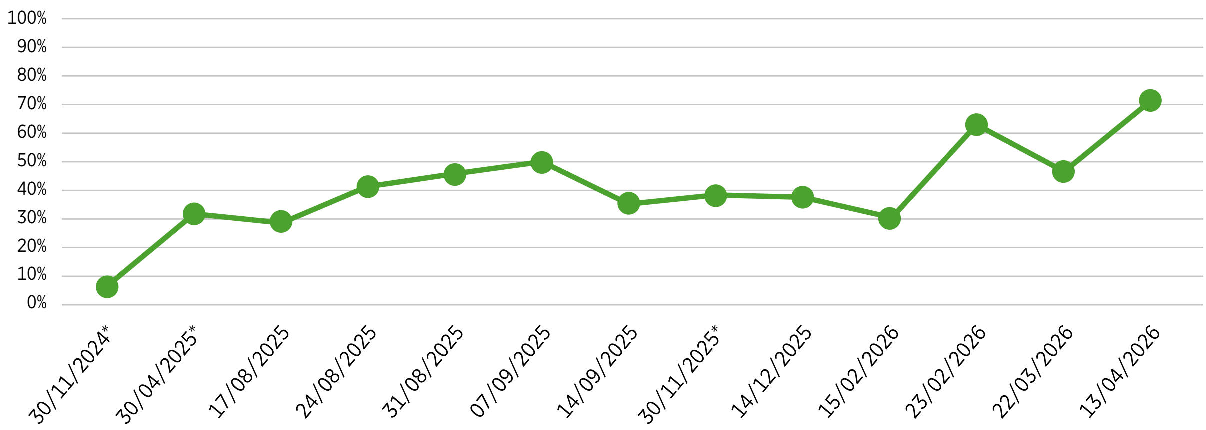


FIGURE 2 PATIENTS WITH ANY ACTUAL PICU WEIGHT RECORDED

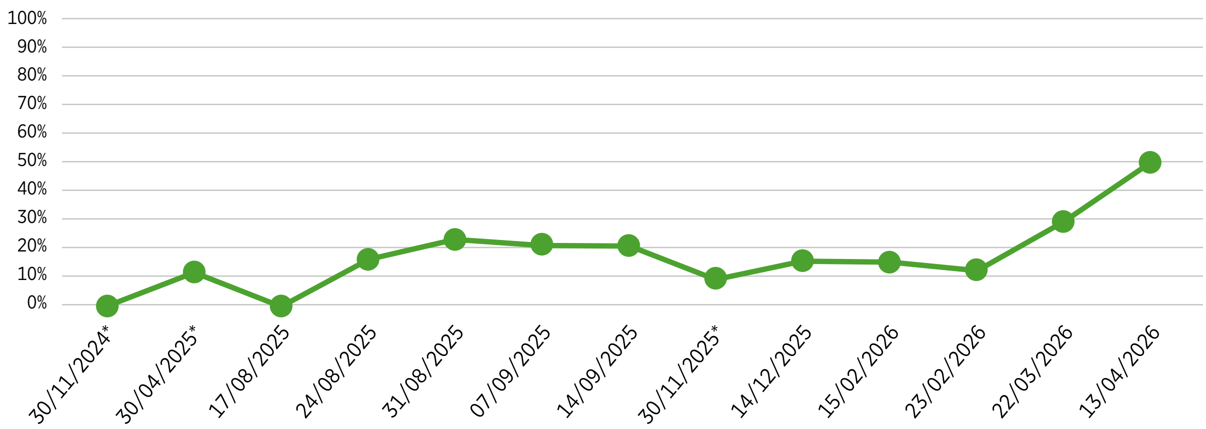


FIGURE 3 PATIENTS WEIGHED ON ADMISSION

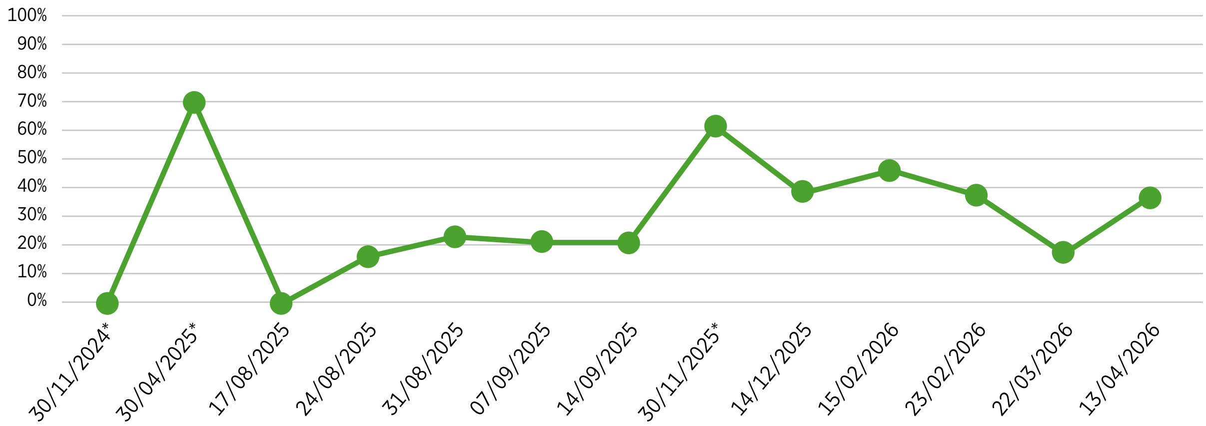


FIGURE 4 PATIENTS WITH SOURCE OF ADMISSION WEIGHT DOCUMENTED

The frequency of accurate weight measurements during admission improved substantially, with the average interval between accurate weights decreasing from 14.9 days at baseline to 2.8 days following intervention.

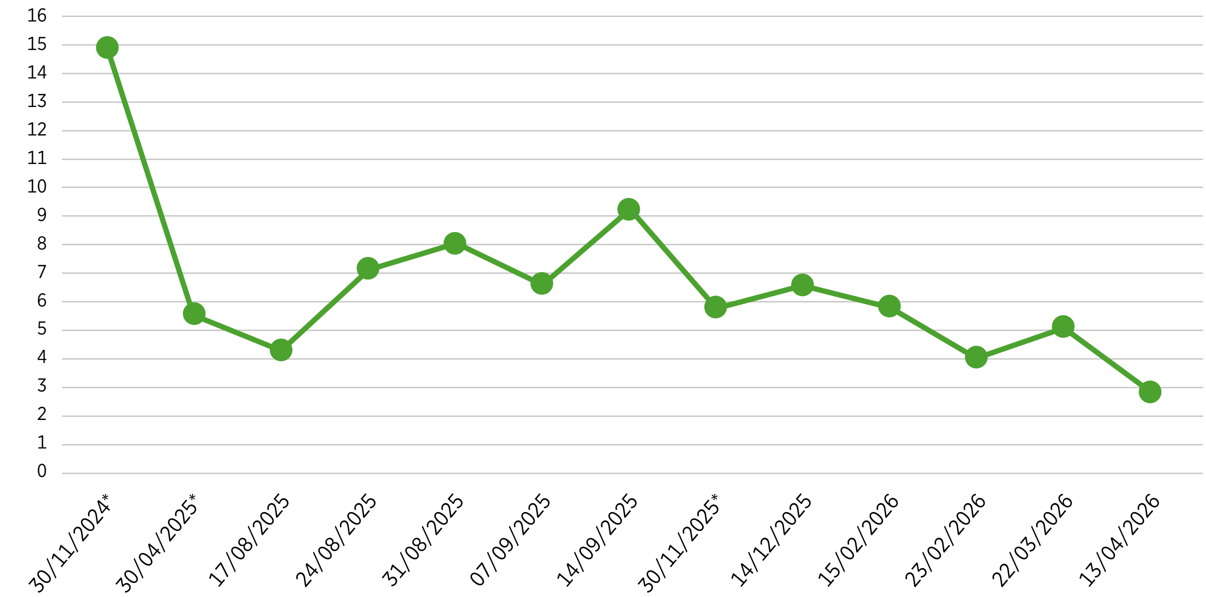


FIGURE 5 ACTUAL PICU WEIGHTS AVERAGE FREQUENCY (GOAL = TOWARDS 1 = DAILY)

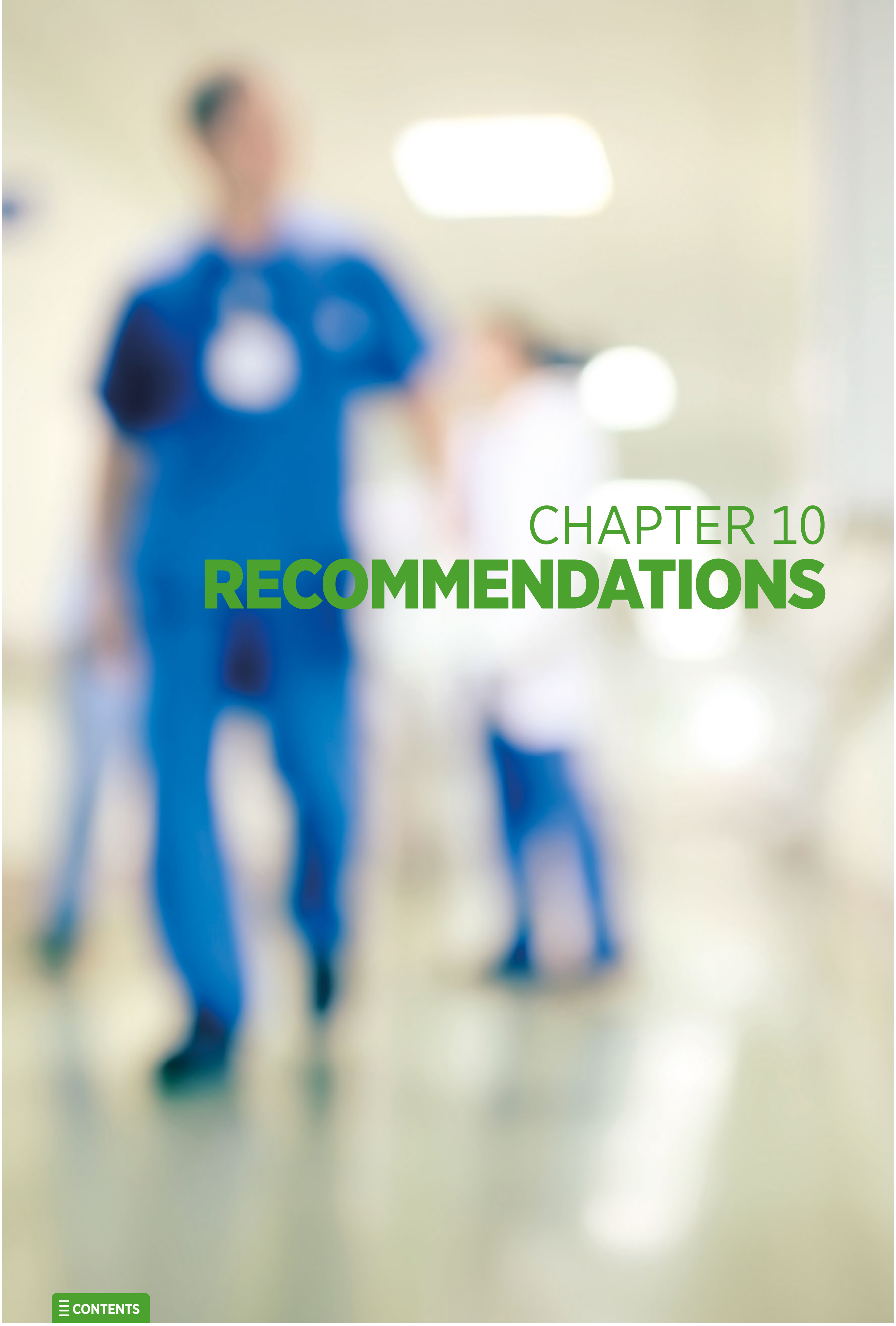
CONCLUSION AND FUTURE STEPS

This quality improvement initiative has significantly improved the recording of accurate weights in our PICU and increased staff awareness of their clinical importance. Key enablers included EMR changes, improved access to weighing equipment, targeted education, and regular feedback.

Future work will focus on addressing remaining equipment gaps, particularly the lack of appropriate weighing beds for toddlers aged 1–5 years. Additional priorities include incorporating accurate height or length measurement on admission and continuing iterative PDSA cycles to further improve the timely recording of actual PICU weights, especially at the point of admission.

AUDIT UPDATE

PICANet
• The audit manager attended PICANet meetings in January and November 2025. This group has now moved to a joint Steering and Clinical Advisory Group meeting from November 2025.
• PICANet delivered a staffing survey in November 2025 supported by the Paediatric Critical Care Society.The survey is designed to collect comprehensive data pertaining to: number of funded PICU beds, number of nursing and medical staff funded for and employed, nursing staff qualifications, and access to support services.
• With the introduction of SNOMED clinical coding system in 2024, an increase in the number of admissions with a primary diagnosis coded as 'Other' was observed. PICANet is forming a working group to look at diagnostic coding.
• PICANet virtual validation visits took place with both CHI Units in February 2026.
DATASET CHANGES
Delayed discharge data: The date and time at which a patient becomes eligible for PICU discharge are now recorded, allowing delays to be measured. PICANet does not prescribe a specific definition of eligibility; this is left to clinical judgement. Units can determine when the decision is made – for example, during ward rounds or handovers. This approach will still support analysis of trends over time and help identify significant delays that may contribute to backlogs.
Additional questions added to the data collection: • Was the patient admitted on a palliative care pathway or receiving palliative care at the time of admission? • Was the patient discharged with home oxygen or long-term ventilation? These dataset changes will allow reporting in future IPCCA reports.



CHAPTER 10
RECOMMENDATIONS

CONTENTS

CHAPTER 10: RECOMMENDATIONS

NEW RECOMMENDATIONS 2024

RECOMMENDATION 1

The RSV immunisation programme should be continued and supported nationally as a preventative measure to reduce severe respiratory illness with the potential to alleviate demand on paediatric critical care services. NOCA will continue to monitor reasons for admission to PCCU and assess the impact of changes to the respiratory syncytial virus (RSV) immunisation programme on paediatric critical care services with findings informing service planning and policy decision-making.

Rationale
Respiratory illness, including RSV, is a major contributor to paediatric critical care admissions, particularly in infants. There has been a 45% (n=66) decrease in respiratory admissions in neonatal infants in 2024 when compared with 2023. This is most significant in the RSV-positive group, with a significantly reduced incidence of PCCU admission and ventilation. This is most likely due to the effect of the RSV Immunisation Pathfinder programme. Ongoing evaluation is required to understand the full impact of the programme on admission patterns, seasonal pressures, and critical care resource utilisation.
What action should be taken?
Department of Health: The national RSV immunisation programme for infants should be continued.
NOCA: Maintain annual analysis of PCCU admissions by diagnostic category, with specific focus on respiratory conditions and RSV-related illness. Evaluate trends over time in the context of immunisation programme changes and report findings to inform service planning.
Who will benefit from this action/recommendation?
Infants and children through improved preventative strategies; PCCU services through better demand forecasting; health service planners through evidence-based decision-making.
Who is responsible for implementing this action/recommendation?
Department of Health and NOCA.
When should this be implemented?
Ongoing, with annual review.
Evidence base for recommendation
International evidence demonstrates that RSV immunisation reduces severe disease, hospitalisation and critical care utilisation. National data is consistent with these findings; the respiratory admission data in this report and the observed reduction in RSV-related admissions following immunisation.

RECOMMENDATION 2

Strengthen data systems and audit infrastructure supported by dedicated local data management resources, to enable comprehensive paediatric critical care reporting, service planning and quality improvement.

Rationale
Current paediatric critical care reporting relies on a combination of PICANet data and additional locally collected and validated datasets to provide meaningful analysis of subspecialty activity, patient outcomes, service complexity and healthcare utilisation. Important patient groups, including congenital cardiac, cardiothoracic, neurosurgical and complex surgical populations, are not adequately captured within existing national datasets alone. The implementation of EPIC presents an opportunity to embed these data requirements within routine clinical documentation, enabling more accurate, efficient and sustainable audit, reporting, workforce planning and quality improvement activities. Dedicated data management resources are required to ensure ongoing data quality, validation, extraction and analysis.
What action should be taken?
• Develop and implement a comprehensive paediatric critical care dataset within EPIC that complements existing PICANet data requirements.
• Configure EPIC to support structured and standardised capture of clinical, subspecialty and outcome data required for national audit and reporting.
• Expand data collection to include classification of complex patient subgroups, including congenital cardiac, cardiothoracic, neurosurgical and complex surgical populations.
• Establish robust local data extraction, analytics and reporting capabilities to support timely audit, quality improvement, service planning and research.
• Provide dedicated data management resources to oversee data quality, validation, governance, extraction and reporting processes.
• Ensure ongoing collaboration between NOCA, CHI Project Ogham, clinical teams and audit personnel to align audit specifications with digital system development.
Who will benefit from this action/recommendation?
• Critically ill children and their families through improved monitoring of outcomes and service quality.
• Paediatric critical care services through access to accurate, timely and meaningful data to support quality improvement initiatives.
• Clinical teams through enhanced understanding of patient complexity, outcomes and resource utilisation.
• Hospital management and healthcare planners through improved workforce planning, capacity modelling and service development.
• NOCA and national audit programmes through strengthened reporting, benchmarking and research capability.

Who is responsible for implementing this action/recommendation?
NOCA in collaboration with CHI:
• **CHI Project Ogham (EPIC Programme Team):** Integration of required data fields, electronic workflows and supporting digital infrastructure within EPIC.
• **NOCA:** Definition of audit specifications, national dataset requirements, data quality standards and reporting requirements.
• **Local Clinical Leads and PCCU Teams:** Clinical engagement, data definition, coding consistency and implementation support.
• **Dedicated Data Manager(s):** Data quality assurance, validation, extraction, analysis and reporting.
When should this be implemented?
• Short-term (within 12 months): Agree national audit specifications, define required datasets and governance frameworks, and identify data management resources.
• Medium-term (12-24 months): Implement structured data capture within EPIC and establish reporting and analytics processes.
• Long-term (24+ months): Deliver comprehensive subspecialty reporting, advanced analytics, benchmarking, research outputs and enhanced quality improvement programmes.
Evidence base for recommendation
International experience demonstrates that integration of audit datasets within electronic health records improves data quality, completeness, efficiency and reporting capability. The current IPCCA report demonstrates the value of detailed locally collected and validated data in understanding subspecialty activity, patient outcomes and service complexity beyond what is currently available through PICANet. Expanding data capture within EPIC and providing dedicated data management support will facilitate accurate risk-adjusted analysis, meaningful benchmarking, workforce planning, research and continuous quality improvement across paediatric critical care services.

UPDATE ON AUDIT RECOMMENDATIONS FROM THE *IRISH PAEDIATRIC CRITICAL CARE AUDIT NATIONAL REPORT 2023*

Recommendation	Status	Update
1. Children's Health Ireland (CHI) should continue planning for the required increase in the workforce of paediatric critical care medicine consultants, trainees, nurses, and allied health professionals for the safe opening and operation of the National Children's Hospital (NCH) Critical Care Unit with 32–42 beds. **This should be part of a comprehensive published CHI workforce document that is in line with medical, nursing, and health and social care professional (HSCP) national standards.**	**ACTIVE**	Funding has been approved for the requested uplift in medical consultant and NCHD staffing numbers. Application forms have been submitted to the Consultant Appointments Advisory Committee – approval pending. A broader NCHD recruitment campaign to attract global talent is yielding positive results, offering clinical fellowships to international applicants. No funding has been provided for additional nurses to open any additional beds beyond the current bed base of 32. Fifteen 'Access' nurses are required to mitigate the risks of all 32 critical care beds in National Children's Hospital Ireland being cubicles (National Standards for Paediatric Critical Care Services 2025 Joint Faculty of Intensive Care Medicine of Ireland in association with The Intensive Care Society of Ireland (ICSI) Version 3.0). Funding was not provided for 'Access' nurses.
2. A national paediatric respiratory extracorporeal life support (ECLS) programme should be progressed in CHI.	**OPEN**	*No response as of 31 March 2026.*
3. The Health Service Executive (HSE) should support the development of regional Paediatric High Dependency Units (PHDUs) in hospitals providing regional paediatric surgical facilities. **It is essential that future planning includes regional investment in the development of regional PHDUs.**	**ACTIVE**	**Regional Executive Office (REO) HSE South West:** The development of a regional PHDU is supported within the region. Critical care services are engaged in governance structures supporting the care of deteriorating paediatric patients, including participation in paediatric deteriorating patient committees and morbidity and mortality reviews. Developments in paediatric stabilisation and transport services have strengthened regional support for the management of critically ill children. Planning and infrastructural work are ongoing to progress the establishment of a dedicated PHDU. **REO HSE West and North West:** It is acknowledged that it will take a number of years to deliver on this plan.

Recommendation	Status	Update
4. Continue the extension of specialist paediatric transport services to operate 24 hours per day, 7 days per week by resourcing the Irish Paediatric Acute Transport Service (IPATS).	**ACTIVE**	Since completion of the audit there has been some progress in terms of job description agreement and moving forward towards Consultant Applications Advisory Committee (CAAC) approval of a number of posts with a 0.5 WTE commitment to IPATS that would go some way towards IPATS transitioning to a 24/7 service. This requires significant input from CHI to develop and progress. This has been aided by recent National Ambulance Service (NAS) appointments into Critical Care and Retrieval Services (CCRS) in the form of a business manager and HR specialist. There is currently no progress on facilitating 24/7 NCHD cover for this service, nor have we begun recruitment for Emergency Medical Technicians (EMTs) or nursing as we are awaiting further progression on consultant appointments ahead of this. Thus 24/7 IPATS remains unattainable at present though progress is slowly ongoing. As regards 7 days per week, we are not currently staffed to provide this within current consultant WTEs, but have achieved 97% cover in the past 12 months utilising locum consultant arrangements.
5. Organ Donation Transplant Ireland (ODTI) and CHI should progress the appointment of organ donation personnel.	**ACTIVE**	Funding has been secured through National Service Plan 2025 and recruitment has commenced to appoint dedicated organ donation personnel in ODTI. CHI has no current organ donation staff and therefore will be prioritised with dedicated organ donation resource. Specific details of level of service will be overseen by Directors of Nursing at ODTI and CHI.
6. Raise awareness of the early recognition of signs of type 1 diabetes and diabetic ketoacidosis (DKA) in order to reduce the number of patients presenting with DKA.	**CLOSED**	To inform prevention and early recognition, this recommendation was highlighted alongside published data from the IPCCA National Report 2023 on DKA epidemiology and was shared with the following key relevant stakeholders: the HSE National Clinical Lead for Paediatric Diabetes, the Diabetes Clinical Lead at the Irish College of GPs (ICGP), the HSE National Clinical Lead for Child Health Public Health / National Healthy Childhood Programme, the NOCA Children and Young People committee, the Clinical Lead for the Irish Audit of Paediatric Diabetes, and the Paediatric Endocrinologist on the RCPI Board of the Faculty of Paediatrics. The IPCCA will continue to monitor trends in DKA admissions to paediatric intensive care. In addition, the Irish Audit of Paediatric Diabetes currently under development at NOCA has defined its dataset and will include monitoring of DKA admissions. Future plans will include ongoing surveillance of DKA admissions, analysis of emerging national audit data, and continued engagement with relevant stakeholders to inform prevention, early recognition, and QI initiatives.

HSE NATIONAL CENTRE FOR CLINICAL AUDIT OBSERVATIONS

- **Across the IPCCA recommendations, progress remains limited, with several key actions dependent on national planning and leadership from CHI, including workforce planning for the National Children's Hospital and development of a national paediatric ECLS programme.**
- **Some regional planning is underway for paediatric high dependency capacity, and incremental progress has been made towards extending the Irish Paediatric Acute Transport Service, although a fully resourced 24/7 service is not yet achievable due to workforce constraints.**
- **While some incremental progress is evident, including consultant workforce approvals, regional HDU provision and advancement of organ donation and transport services, significant workforce gaps continue to constrain implementation, particularly in nursing. A fully resourced 24/7 paediatric transport service remains unachieved.**
- **Work is also progressing to strengthen surveillance and awareness relating to diabetic ketoacidosis (DKA), with national audit data expected to support future quality improvement initiatives.**

TABLE 10.1: DESCRIPTION OF STATUS OF RECOMMENDATIONS OUTLINED IN PREVIOUS REPORTS

Category	Definition	Notes
Closed (Implemented)	Recommendation has been fully implemented and no further action is needed.	A recommendation is only closed if there is clear evidence, e.g. policy updates, system change identified.
Active (In Progress)	Work has started but is not yet complete.	A recommendation is kept active if any part is still incomplete, even if most of the work is done.
Open (Not Started)	No action has been taken yet.	
Deferred/No Longer Applicable	Recommendation is no longer relevant/has been postponed.	

CHAPTER 11
CONCLUSION

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CHAPTER 11: **CONCLUSION**

This report demonstrates that high-quality, life-saving care continues to be delivered to critically ill children across Ireland, with excellent survival outcomes and mortality rates within expected ranges. The audit highlights sustained improvements in key operational metrics, including timeliness of data submission and transport response times, reflecting ongoing commitment to quality improvement. However, the findings also underscore significant and persistent system pressures, including high bed occupancy, workforce constraints, and continued reliance on adult intensive care units for paediatric patients. The opening of the new National Children's Hospital presents a critical opportunity to address capacity challenges and enhance service delivery. Continued investment in workforce, infrastructure, and integrated care pathways will be essential to ensure that paediatric critical care services remain safe, responsive, and sustainable for the future.

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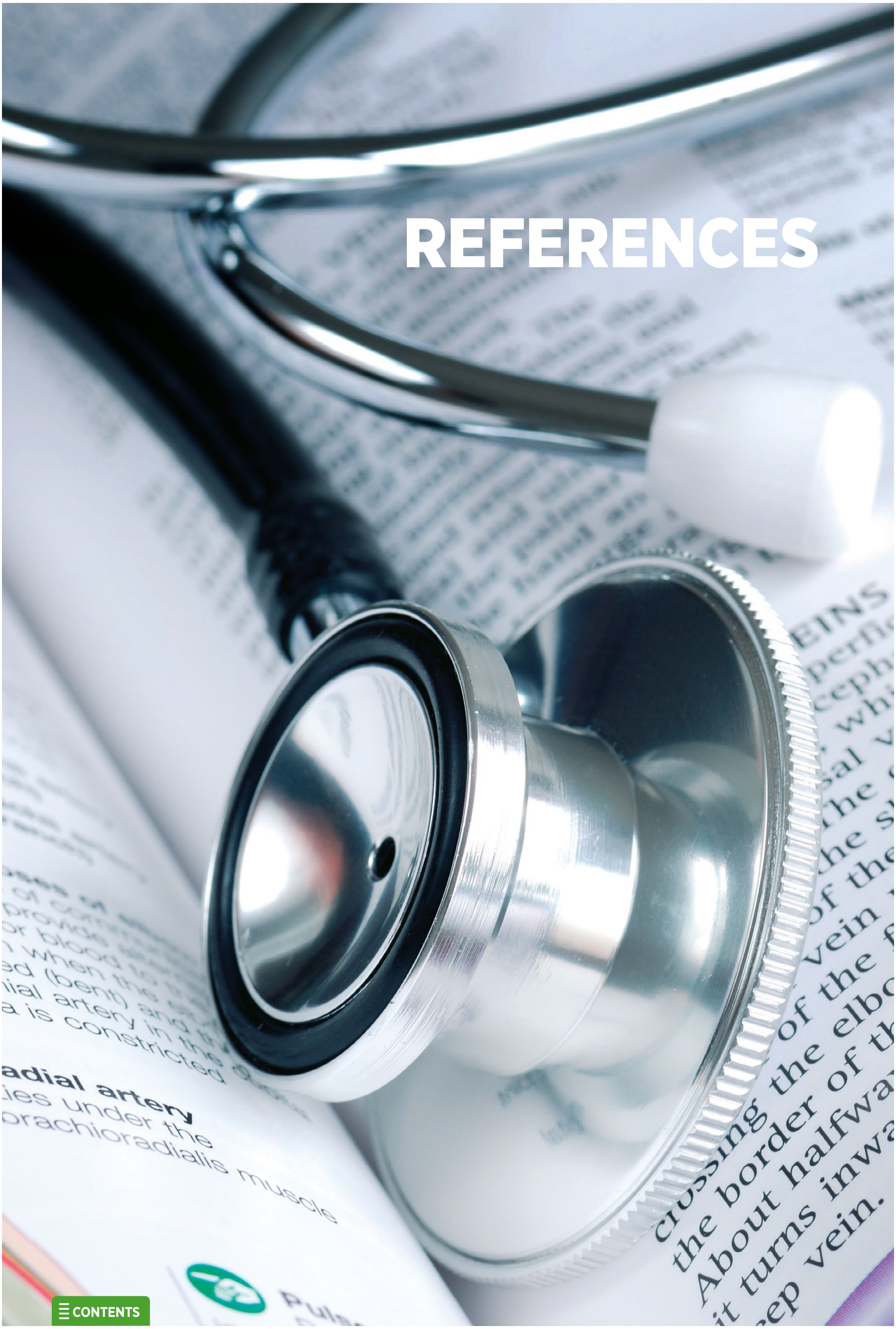

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APPENDIX 2:
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