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Data from 1st January 2023 to 31st December 2023

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The typo is on page 77, chapter 6 – 'COVID-19 PATIENTS (ICU BIS DATA)'. In the second paragraph, the sentence…' These patients occupied 4,688 bed days, which accounted for 40% of all occupied bed days in 2023.' The 40% is incorrect, it should say 5%.	These patients occupied 4,688 bed days, which accounted for 40% of all occupied bed days in 2023.'	These patients occupied 4,688 bed days, which accounted for 5% of all occupied bed days in 2023.'

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The National Office of Clinical Audit (NOCA) was established in 2012 to create sustainable clinical audit programmes at national level. NOCA is funded by the Health Service Executive's (HSE's) Office of the Chief Clinical Officer and operationally supported by the Royal College of Surgeons in Ireland.

The National Clinical Effectiveness Committee defines clinical audit as "a cyclical process that aims to improve patient care and outcomes by systematic, structured review and evaluation of clinical care against explicit clinical standards on a national basis" (National Clinical Effectiveness Committee, 2015, p. 2). NOCA supports hospitals to learn from their audit cycles.

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This work uses patient data collected by their healthcare providers as part of their care.

NOCA works with the Intensive Care National Audit and Research Centre (ICNARC) in the United Kingdom (UK) on data validation, data analysis, and the generation of benchmarked reports on Irish Intensive Care Units (ICUs). ICNARC has been in operation in the UK since 1994 and has been at the forefront of quality and research initiatives in critical care. We acknowledge the tremendous support received from Professor David Harrison, Co-Director; Professor Kathy Rowan, Scientific Advisor; Andrew Fleming, National Clinical Audit Programme Manager; and the ICNARC team. This support has helped to make this report possible.

NOCA would like to thank all participating hospitals and the Irish National Intensive Care Unit Audit (INICUA) Audit Coordinators and Clinical Leads for their valuable contributions. Without their continued support and input, this audit could not continue to produce meaningful analysis of critical care in Ireland.

NOCA greatly appreciates the ongoing commitment and support received from the HSE. We would especially like to thank Dr Colm Henry, Chief Clinical Officer; Dr Orla Healy, National Clinical Director, National Quality and Patient Safety Directorate; Majella Dally, Assistant National Director, National Centre for Clinical Audit; Ms Mary Day in her former role as HSE National Director for Acute Operations; and Dr Ciaran Browne, National Lead, Acute Hospital Services. Their commitment and support have led to major growth and development in ICU audit in Ireland.

NOCA would also like to thank DMF Systems and Civica UK Limited software providers for the INICUA.

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DESIGNED BY SWERVE

NOCA National Office of Clinical Audit

ICU Irish National ICU Audit

IRISH NATIONAL ICU AUDIT
ANNUAL REPORT

Data from 1st January 2023 to 31st December 2023

NOCA National Office of Clinical Audit

Professor Rory Dwyer
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28th April 2025

Dear Professor Dwyer,

On behalf of the NOCA Governance Board, I wish to formally acknowledge receipt of the Irish National ICU Audit Annual Report on 2023 data.

On behalf of NOCA, I extend our sincere congratulations to you and the entire team, including Audit Managers Fionnuala Treanor and Mary O'Dwyer Baggot, Data Analyst Anna Carrigan, the ICU Audit Governance Committee, and our Patient and Public Interest Representatives, for producing this comprehensive and impactful report. I wish to also commend the patient perspective ("Olga's experience of the ICU") which provided a valuable patient insight into ICU care.

This seventh annual report offers a detailed and valuable analysis of activity and outcomes across Ireland's adult intensive care network. Despite persistent challenges such as high bed occupancy, it is reassuring to note that Ireland's ICUs continue to deliver high-quality, risk-adjusted care, comparable to international benchmarks.

This letter serves as the formal endorsement of the NOCA Governance Board for the Irish National ICU Audit Annual Report on 2023 data. We trust that the findings will contribute meaningfully to the ongoing development of Ireland's critical care services and the implementation of the national Critical Care Strategy.

Yours sincerely,

Dr Brian Creedon
Clinical Director
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GLOSSARY OF TERMS AND DEFINITIONS

Acronyms and initialisms

ABBREVIATION	MEANING
AKI	acute kidney injury
APACHE II	Acute Physiology and Chronic Health Evaluation II: measures the illness severity of adult patients admitted to Intensive Care Units (ICUs) using the APACHE II score
ARS	advanced respiratory support: mechanical ventilation of the lungs via a tube into the trachea in order to support lungs that are failing in their function
BMI	body mass index
C. DIFFICILE	clostridioides difficile
COVID-19	coronavirus disease 2019
CPE	carbapenemase-producing Enterobacterales
CCP	critical care programme
CPR	cardiopulmonary resuscitation: restoration of blood circulation by chest compressions with or without ventilation of the lungs
CRRT	continuous renal replacement therapy
CT ICU	Cardiothoracic Intensive Care Unit
CVS	cardiovascular system
DCD	donation after circulatory death
DOH	Department of Health
ED	Emergency Department: also known as Accident and Emergency, or Casualty
FiO_2	fraction of inspired oxygen: the concentration of oxygen in the inhaled gas mixture
GICU	General Intensive Care Unit
GP	General Practitioner
HDU	High Dependency Unit
HSCP	Health and Social Care Professions
HSE	Health Service Executive
ICNARC	Intensive Care National Audit and Research Centre
ICU	Intensive Care Unit
ICU-BIS	Intensive Care Unit Bed Information System; also known as BIS
INEWS	Irish National Early Warning System
INICUA	Irish National Intensive Care Unit Audit
IQR	interquartile range
JFICMI	Joint Faculty of Intensive Care Medicine of Ireland
KDIGO	Kidney Disease: Improving Global Outcomes: a system for the definition and staging of acute kidney injury
kPa	kilopascal: a measurement unit for pressure
KPI	key performance indicator
LOS	length of stay: number of days that a patient spends in ICU and/or hospital
MDRO	multidrug-resistant organism

ACRONYM	FULL TERM
MICAS	Mobile Intensive Care Ambulance Service
MRSA	methicillin-resistant *Staphylococcus aureus*
NAS-CCRS	National Ambulance Service Critical Care Retrieval Services
NOCA	National Office of Clinical Audit
ODTI	Organ Donation Transplant Ireland
OECD	Organisation for Economic Co-operation and Development
OT	operating theatre
PaO_2	partial pressure of oxygen
IPDA	Irish Potential Donor Audit
QI	quality indicator
QQR	Quarterly Quality Report
RCSI	Royal College of Surgeons in Ireland
REO	Regional Executive Officer
ROI	Republic of Ireland
SD	standard deviation
SMR	standardised mortality ratio: the ratio of the number of observed deaths to the number of deaths predicted by the ICNARC risk-prediction model
TBI	traumatic brain injury
UK	United Kingdom
VRE	vancomycin-resistant enterococci

FOREWORD

As Chief Clinical Officer in the HSE, I am delighted to introduce the seventh Irish National ICU Audit (INICUA) annual report: Data from 1 January 2023 to 31 December 2023. NOCA was established in 2012 arising from a recommendation from the Building a Culture of Patient Safety 2008 report and is funded via the National Centre for Clinical Audit (NCCA HSE Office) under my remit. The HSE National Centre for Clinical Audit (NCCA) was established in April 2022 within the National Quality and Patient Safety Directorate. Together with the establishment of the National Steering Group for Clinical Audit, this marked an important step in the HSE's continued efforts to improve the quality and safety of healthcare for patients. This strengthens the development of an end-to-end process for clinical audit in accordance with the recommendations in the 2019 National Review of Clinical Audit report and meets the needs of clinical audit service providers and multi-disciplinary stakeholders.

Legislative basis for Clinical Audit

Under the Patient Safety (Notifiable Incidents and Open Disclosure) Act 2023 Part VI Clinical Audit, Clinical Audits meeting the definition and conditions outlined in the act will now be afforded protections which will foster and enable a culture of clinical audit in Irish Healthcare settings.

This confirms the HSE's commitment to developing clinical audit as an essential quality and patient safety tool in Ireland, promoting improved patient outcomes.

This NOCA report is now in its twelfth year of publication. This report reflects data collection from both INICUA and the ICU Bed Information System on patient outcomes, bed capacity and patient numbers from adult Critical Care Units in the Republic of Ireland. Twenty-six Units across 22 hospitals participated in providing 96% of all Level 3 ICU care in adult hospitals funded by the Health Service Executive (HSE) in 2022.This Audit documented the care of 15,152 admissions of 14,363 patients in 29 ICUs/HDUs in 25 adult public hospitals during 2023 and the hospitals provided 99.8% of all complex (Level 3) ICU care delivered in adult HSE-funded hospitals.

The report clearly shows that our Intensive Care Units continued to be very busy with high occupancy rates. Despite this, risk adjusted mortality rates showed similar outcomes to the UK as an international benchmark which is reassuring as an indicator of the quality of care provided all across the national network of Units.

In recognition of capacity issues which have led to high occupancy levels, we have invested in additional adult critical care capacity, increasing to 340 (December 2024) from 258 (March 2020) before the pandemic. The final phase of this strategy will involve capital builds to develop additional capacity on five 'hub' sites in line with the Critical Care Strategy (2020).

In 2017, the Minister for Health launched the Critical Care Nurse Career Pathway which included a new National Foundation Education Module in Critical Care Nursing. This was a key development in enabling Critical Care nurses to progress onto the Post Graduate Diploma in Critical Care Nursing. To date, over 1000 Nurses have completed this course, supporting the corresponding increase in Critical Care capacity.

I want to acknowledge the continuous extraordinary efforts, and the dedication and flexibility of all staff and thank all staff involved in the high standards of care delivered within the ICUs. Particular thanks to all participating hospitals, INICUA Audit Coordinators and Clinical Leads working on national clinical audits to promote patient safety and improve clinical outcomes for patients.

Thank you to Olga for sharing her story and experience as a patient receiving care in an ICU: listening to the voices and experiences of patients such as Olga and her lived experience enables us to have real and meaningful impact on the design, delivery and evaluation of healthcare services which is essential in conjunction with the collected data. Olga's story will, I hope, influence the multidisciplinary teams and wider HSE to improve the quality of care for patients in ICUs.

Dr Colm Henry
Chief Clinical Officer, HSE

EXECUTIVE SUMMARY

INTRODUCTION

This is the annual report on activity, process and outcomes in Intensive Care Units (ICUs) and High Dependency Units (HDUs) in the Republic of Ireland (ROI) in 2023.

Data are collected as part of the Irish National ICU Audit (INICUA), which is run by the National Office of Clinical Audit (NOCA), with guidance from the NOCA ICU Audit Governance Committee (Appendix 4).

ICU AUDIT METHODOLOGY

Data are collected by clinically experienced ICU Audit Coordinators in each Unit from the time of a patient's admission up until they are discharged from acute hospital. The INICUA provides comprehensive data for all patients on demographics, admission diagnoses, previous health status, physiological status on admission, organ support provided during the ICU stay, measures of the process of care, and outcomes.

The data are analysed by the Intensive Care National Audit and Research Centre (ICNARC), a London-based body that has run ICU audit in the United Kingdom (UK) for 30 years. The data analysis provides comprehensive data for each Unit on activity, bed utilisation, case mix, outcomes and quality of care. Data are also provided on organ donation and on interhospital transfers of critically ill patients.

ICU BED INFORMATION SYSTEM

An ancillary audit to INICUA is the ICU Bed Information System (ICU-BIS). This audit collects data daily on bed availability, bed occupancy, organ support provided, and specific diagnoses (e.g. coronavirus disease 2019 (COVID-19) or influenza). The ICU-BIS was developed to provide real-time operational support to national critical care networks, but data are also available to supplement the more detailed data provided by the INICUA and are included in this report.

PARTICIPATING UNITS, ACTIVITY AND CASE MIX

The INICUA documented the care of 14,363 patients for 15,152 admissions in 29 ICUs/HDUs across 25 adult public hospitals in the ROI during 2023. These hospitals provided 99.8% of all complex (Level 3) ICU care delivered in adult hospitals funded by the Health Service Executive (HSE).

There were 5,826 admissions of patients directly to ICU from the operating theatre (OT) after surgery: 15% (2,242) of all admissions occurred after emergency surgery and 24% (3,584) occurred after scheduled surgery. The remaining ICU admissions came from the ward, the Emergency Department (ED) or another hospital.

A total of 1,130 patients were admitted to ICU after trauma, of whom 372 were admitted to ICU after a traumatic brain injury (TBI). Of patients with a TBI, 206 (55%) were admitted to ICU in a neurosurgical centre (Beaumont Hospital or Cork University Hospital) at some point during their care; the mortality rate in this group was 29%. A total of 166 patients underwent ICU management only in a non-neurosurgical ICU; the mortality rate in this group was 30%. Patients with both a mild TBI and patients with very severe TBI (who are not expected to survive) tend not to be transferred to a neurosurgical centre, which may explain these similar mortality rates. The overall mortality rate for all 1,130 patients admitted after trauma was lower at 19%.

Fifty-one percent of ICU admissions in 2023 had acute kidney injury (AKI) within 24 hours of admission, including 14% with severe AKI (defined as Kidney Disease: Improving Global Outcomes (KDIGO) Stage 3), usually requiring dialysis. Thirty-two percent of patients fulfilled the Sepsis-3 criteria for sepsis on admission to ICU.

Small numbers of admissions had severe liver disease (4.1%), haematological malignancy (3.3%), or metastatic cancer (4.8%). Although patients in these groups had a higher mortality rate, 63%, 66%, and 73%, respectively, survived to leave hospital alive.

A total of 297 patients were admitted with a diagnosis of COVID-19; this accounted for 2% of all admissions to ICU in 2023 (compared with 6% in 2022 and 15% in 2021). Patients with COVID-19 accounted for 5% of all ICU beds occupied in 2023 (compared with 12% in 2022 and 29% in 2021).

There were 148 children aged under 16 years admitted to 13 adult ICUs (1% of all admissions in 2023, compared with 0.6% in 2022). All 31 children aged under 1 year who were admitted to an adult ICU were admitted to hospitals in the Saolta University Healthcare Group.

In 2023, 175 patients who were pregnant (19%) or recently pregnant (81%) were admitted to ICU, representing 1.2% of all admissions to ICU. All these women survived their stay in ICU.

SEVERITY OF ILLNESS AND SUPPORT PROVIDED IN ICU

Acute Physiology and Chronic Health Evaluation II (APACHE II) scores assess the severity of illness when patients are admitted to ICU. Mean APACHE II scores on admission in individual Units ranged from 11 to 20. The mean APACHE II score nationally was 16 (versus 15 in the UK).

Another measure of the severity of illness is the risk of death (as predicted by the $ICNARC_{H\text{-}2023}$ risk-prediction model) at the time of admission to ICU. The median predicted risk of death for all patients in the Republic of Ireland (ROI) in 2023 was 8.6%, compared with 5.6% for patients admitted to ICU in the UK. Higher predicted mortality rates indicate that patients had to be sicker in order to be admitted to ICU in the ROI. This means that critically ill patients who would be in ICU in the UK are being cared for in the ward in the ROI; available data indicate that these patients would have a lower risk of death if they were cared for in ICU earlier in their illness.

In 2023, 45% of ICU patients in the ROI required invasive ventilation (versus 42% in the UK). Twenty-two percent of patients received advanced cardiovascular support (the same figure as for the UK), and 10% of patients in the ROI required dialysis (compared with 11% in the UK). Fourteen Units admitted 200 or more patients requiring multi-organ support (Level 3 patients) in 2023, and 15 smaller Units had fewer than 200 Level 3 admissions.

ICU BED AVAILABILITY AND BED UTILISATION

An average of 298 ICU/HDU beds were open daily in adult public (HSE-funded) hospitals in 2023. This corresponded to 5.6 critical care beds per 100,000 population, which is low by international standards, although comparisons are difficult because of differing definitions of ICU beds. The corresponding value for the UK was 7.0 beds per 100,000 population. By December 2024, the number of ICU beds in the ROI had increased to 329, equivalent to 6.1 beds per 100,000 population.

The ICU-BIS documented 100,536 occupied ICU/HDU bed days across all public hospitals nationally in 2023. Recommended ICU/HDU bed occupancy levels are around 85%. The average ICU/HDU bed occupancy rate (as a percentage of staffed ICU beds) was 96% nationally (compared with 95% in 2022 and 90% in 2021), but some Units had higher occupancy rates than this, including Beaumont Hospital General ICU and Beaumont Hospital (Richmond) Neurosurgical ICU (114% and 110%, respectively); St Vincent's University Hospital ICU (112%); University Hospital Limerick ICU (101%); Cork University Hospital General ICU and Cork University Hospital Cardiothoracic ICU (100% and 99%, respectively); Mater Misericordiae University Hospital ICU and Mater Misericordiae University Hospital HDU (both 98%); Mercy University Hospital Cork ICU (98%); Connolly Hospital ICU (97%); and St James's Hospital Cardiothoracic ICU (97%). These findings indicate that, at times, patients were being cared for in Units with staffing levels below recommended levels.

Private hospital ICUs accounted for 11% of available adult ICU bed capacity and 10% of occupied bed days nationally in 2023.

The mean length of stay for all patients was 5.6 days in 2023, compared with 6.2 days in 2022. Delays in discharge to the ward have been increasing, and bed days occupied by patients who had been cleared for discharge accounted for 7.4% of all bed days in 2023 (8,018 bed days). Delayed discharge leads to delays in the admission of critically ill patients waiting for a bed.

Median Irish National Early Warning System (INEWS) scores before admission to ICU ranged from 4.5 to 10.0, with upper quartile INEWS scores as high as 12.0. This suggests that many patients were extremely ill by the time of ICU admission.

QUALITY INDICATORS AND OUTCOME MEASURES

Delayed admission to ICU worsens outcomes for critically ill patients. The HSE has a target that 50% of ICU admissions from a ward or ED should occur within 1 hour of the decision to admit to ICU, and that 80% should occur within 4 hours. Nationally, 33% of ICU admissions from the ward/ED occurred within 1 hour of the decision to admit, and 87% occurred within 4 hours of the decision to admit. Only three hospitals met the target of 50% of admissions occurring within 1 hour of the decision to admit. Twenty of the 25 participating hospitals met the target of admitting 80% of patients within 4 hours of the decision to admit.

In some cases, organ failure in four or more organ systems within 24 hours of ICU admission can be linked to delayed admission to ICU. If any Unit has an excessive number of patients with four-organ failure within 24 hours of ICU admission, this suggests that there is an issue with a lack of recognition of clinical deterioration in the ward or with delayed access to an ICU bed for critically ill patients. Nationally, 10% of all patients admitted from a ward or ED developed organ failure

in four or more organ systems within 24 hours of admission to ICU. St James's Hospital General ICU and St Vincent's University Hospital ICU were both outside the expected range for this quality indicator (QI) in 2023.

Nationally, 3.7% of ICU discharges to the ward were unplanned and occurred between 22.00 to 06.59, compared with 1.9% in the UK. This suggests that patients were discharged without being fully ready in order to provide a bed for another patient who required ICU admission. Furthermore, patients who are discharged at night tend to go to a ward with lower staffing levels and more junior staff than those who are discharged during the day, and these patients are not known to the ward staff. Eleven Units had more than the expected number of unplanned discharges from ICU at night in 2023.

Unplanned readmission of patients to ICU within 48 hours of discharge to the ward is a key metric for the quality of care of critically ill patients. The overall rate of unplanned readmission to ICU in the ROI in 2023 was 0.9%, which is within the expected range. Letterkenny University Hospital ICU and Sligo University Hospital ICU were outside the expected range for this QI, which may indicate premature discharge of patients from ICU due to a shortage of available ICU beds. All other Units were within the expected range for this metric.

The mortality rate in ICUs nationally in 2023 was 14%, and a further 6% of patients died before leaving acute hospital. Thus, 80% of patients who were admitted to ICU/HDU in 2023 survived to leave hospital alive, versus 76% in both 2022 and 2021.

The mortality rate of patients admitted to ICU depends enormously on the patient population admitted, as well as on the quality of care provided in ICU. To allow for variability in the patient population, a predicted risk of mortality is calculated for each patient who is admitted to ICU. This depends on many factors, including age, pre-existing illness, diagnosis, and the degree of physiological derangement at the time of admission. The observed mortality rate for a Unit is then compared with the predicted mortality rate in order to assess the quality of care in the Unit.

The overall mortality rate nationally (20%) was slightly lower than the mortality rate predicted by the $ICNARC_{H\text{-}2023}$ risk-prediction model. Nationally, the standardised mortality ratio (SMR) – the ratio of the observed to the expected mortality rate – was 0.94. This indicates that the quality of care, as measured nationally, was good. Furthermore, all individual Units were within the expected range for risk-adjusted mortality rates. This important finding demonstrates consistently acceptable outcomes across Units of different sizes and different case mix.

Risk-adjusted mortality was examined for both low-risk patients (those with a predicted risk of death of less than 20% on admission to ICU) and high-risk patients (those with a predicted risk of death greater than 20% on admission to ICU). Nationally, the mortality rate for low-risk patients was below the expected range (SMR: 0.88). All Units had a mortality rate within the expected range for low-risk patients. For high-risk patients, the national SMR was 0.95, and no Units deviated widely from the mean SMR value.

NOCA compared risk-adjusted mortality in high-risk patients (those with greater than a 20% predicted mortality rate) between patients who were initially admitted to smaller Units (those with fewer than 200 Level 3 admissions annually) and those who were admitted to larger Units (those with 200 or more Level 3 admissions annually). The SMR for the aggregated data from the 15 smaller Units was 0.92, compared with an SMR of 0.97 for the 14 larger Units. This provides encouraging data on the outcomes for patients who are initially admitted to smaller Units, showing equality of outcomes with patients who are initially admitted to larger Units. Many patients are transferred within the national network of ICUs in order to avail of specialist services in the larger Units, and this is a major factor in ensuring good outcomes for patients who are initially admitted to smaller Units.

Rates of testing for MDROs were high in most Units in 2023. National rates of colonisation with MDROs at the time of admission to ICU were 2.1% for MRSA, 0.7% for CPE, but 10.2% for VRE. Testing for C difficile was only undertaken in symptomatic patients; the rate of colonisation in those tested was 4.9%. Rates of transmission of MDROs while in ICU were low for MRSA, *C. difficile* and CPE but higher for VRE at 2.6% (Table 7.1).

Hospitals with outlier findings for QIs were asked to review the reasons for these findings and to propose a plan to address the issues involved. Common issues identified by hospitals included: a lack of resources for ICU outreach to support the care of patients in wards; failure to follow guidelines for the management of deteriorating patients on the ward; shortages of ICU beds leading to delayed admissions to ICU; early discharges from ICU; and shortages of ward beds to facilitate discharges from ICU.

Proposals by hospitals to address these issues included better compliance with protocols for deteriorating patients in the wards, adequately resourcing ICU outreach teams, increasing the number of beds in ICUs and HDUs, and prioritising discharges from ICU when patients are declared fit for discharge.

ORGAN DONATION

Deaths diagnosed using neurological criteria (i.e. brain death) are the largest source of organ donations for transplantation. Brain deaths made up 5.4% of all ICU deaths in 2023. Rates of diagnosis of death by neurological criteria (brain death) in individual Units as a proportion of all ICU deaths ranged from 0% to 21% (this was in Beaumont Hospital (Richmond) Neurosurgical ICU).

The proportion of patients diagnosed with brain death who became organ donors was 59% in 2023; this rate had fallen during the COVID-19 pandemic but is now back to the rate seen prior to the pandemic.

The rate of assent by families when organ donation was requested was 75%. This is high by international standards; nevertheless, the most common reason that patients diagnosed with brain death did not become organ donors was that their families did not assent. The other most common reason was that their organs were deemed unsuitable for transplantation.

Ninety-one percent of patients who were diagnosed with brain death in 2023 were referred to organ donation personnel for consideration of organ donation (compared with 79% in 2022).

The rate of organ donation after circulatory death was 1.3% in the ROI in 2023, which is lower than the UK rate (2.7%) but an increase from the rate in the ROI in 2022 (0.7%).

COVID-19 IN ICU IN 2023

During 2023, 297 patients were admitted to ICU with COVID-19 as their primary or secondary diagnosis. Patients with COVID-19 occupied 5% of all ICU bed days in 2023, compared with 12% in 2022 and 29% in 2021.

Demographic data for patients with COVID-19 in the ROI were comparable to those for patients in the UK in 2023. The ICU mortality rate among these patients was 27%, and the hospital mortality rate was 37%. This compares to a hospital mortality rate of 20% for the overall ICU patient population. The SMR for patients with COVID-19 admitted to ICU in 2023 was 0.78 (i.e. only 78% of the predicted number of deaths occurred).

Only six hospitals participating in the INICUA in 2023 had enough patients with COVID-19 to allow the calculation of individual SMRs. All these hospitals had an SMR value within the expected range, indicating that the quality of care provided in these hospitals was acceptable.

The SMR for patients with COVID-19 who were initially admitted to smaller Units (those with fewer than 200 Level 3 admissions per annum) in 2023 was 0.77, compared with an SMR for patients who were initially admitted to larger Units (those with 200 or more Level 3 admissions annually) of 0.78. This suggests that outcomes for patients, as assessed by risk-adjusted mortality rates, were not adversely impacted by the patients being initially admitted to a smaller Unit rather than a larger one.

INTERHOSPITAL TRANSFERS OF CRITICALLY ILL PATIENTS

The INICUA estimated that 895 critically ill patients were transferred from one hospital to ICU in another hospital in 2023 (i.e. 6% of all ICU admissions). Beaumont Hospital received the largest number of interhospital transfers into ICU (n=167).

Forty-four percent of transfers occurred at night (i.e. between 20:00 and 07:59); 25% occurred at weekends or on bank holidays. This has significant implications for the provision of safe care in the referring hospital, as the on-call ICU doctor will have been absent from the Unit during these transfers, often for prolonged periods.

The highest percentages of transfers out from one ICU directly to another ICU were from Naas General Hospital ICU, Wexford General Hospital ICU, Mayo University Hospital ICU, and Portiuncula University Hospital ICU. The specialties with the largest numbers of patients transferred from one ICU to another ICU were general medicine, general surgery, respiratory medicine and paediatrics.

QUALITY IMPROVEMENT PROJECTS

Coverage of ICU activity by the INICUA has increased to almost 100%, and the data collected provide a comprehensive overview of the activity and quality of care in the national network for ICUs. Gaps in the data from Units participating in the INICUA decreased from 21% of activity in 2022 to 4% in 2023.

Despite strenuous efforts by hospitals to improve measures of the quality of care provided in ICUs, many quality indicators remain unchanged, such as indicators of delayed access to ICU and night-time discharges to the ward. However, there were marginal improvements in the time between a decision to admit and the actual time of admission to ICU in 2023.

Reassuringly, a key outcome measure (the risk-adjusted mortality rate) improved slightly in 2023 compared with 2022, and no Units were outliers for risk-adjusted mortality rate. The percentage of patients who required cardiopulmonary resuscitation (CPR) in the 24 hours before admission to ICU decreased slightly in 2023 compared with 2022, which suggests better care in the wards or better decision-making regarding appropriate limitations to care. There has been significant investment in the provision of ICU outreach services to support the care of deteriorating patients in the wards, and this is likely to have contributed to better care, which is suggested by lower rates of high-risk admissions to ICU from the ward.

The proportion of potential organ donors who were referred to organ donation personnel increased compared with 2022 and there was a marginal increase in the percentage of patients diagnosed with brain death who progressed to organ donation. However, with the decreasing numbers of patients diagnosed with brain death, this did not translate into more organ donors in 2023. An encouraging finding was an increase in the rate of organ donation after circulatory death, from 0.7% of circulatory deaths in 2022 to 1.3% in 2023.

The number of QI outlier findings in 2023 was similar to that in 2022 but remained considerably higher than in earlier years of the INICUA. This may reflect the ongoing pressures on ICU beds and on hospital beds generally.

In a survey of hospital ICU Clinical Leads for the INICUA, 9 of the 10 respondents noted that it was routine in their Units for patients to remain in ICU until their bed was needed for another patient.

Two Units with QI outlier findings participated in a detailed process to review and address the issues underlying the outlier findings, using a quality improvement approach.

Ongoing quality improvement education was provided to INICUA Audit Coordinators throughout 2023 and 2024, and NOCA conducted a follow-up organisational survey in order to assess their knowledge and learning outcomes. The results were positive, with 100% of respondents confirming that the training met their expectations. Additionally, 84% of participants reported that the course was practical and easy to apply in their roles.

CONCLUSIONS

Critically ill patients in the ROI are cared for in a network of 29 ICUs in 25 HSE-funded acute hospitals across the country. The numbers of ICU beds per 100,000 population are low by international standards, and many Units are under severe pressure to cope with the needs of acutely ill patients who require complex levels of care. There has been a 30% increase in the number of ICU beds nationally since 2020, and this expansion is planned to continue.

Bed occupancy levels are high, which means that patients have to be seriously ill in order to be admitted to ICU, and there is evidence that admission to ICU is often delayed because no ICU bed is available. A key finding was that the mean predicted risk of death in 2023 for patients admitted to ICU in the ROI was 8.6%, compared with 5.6% for patients admitted to ICU in the UK. Higher predicted mortality rates indicate that patients had to be sicker to be admitted to ICU in the ROI. This means that patients who are critically ill are being cared for in the ward; available data indicate that these patients would have a lower risk of death if they were cared for in ICU earlier in their illness.

The demands on ICU beds are likely to increase as the population ages and as improving therapies in ICU mean that more patients are likely to benefit from such care.

The national network of ICUs operates effectively to ensure that beds and appropriate care are made available when needed, even if this requires transfer to another hospital for an available bed or for specialist care.

Our outcome data suggest that the overall quality of care nationally is equivalent to international comparators. Our data also suggest that outcomes after admission to ICU are similar across all participating hospitals, with the proviso that this is achieved through a high rate of transfers from smaller to larger Units in major hospitals for more specialised care. However, the data also indicate that patients who would benefit from ICU care are being admitted later than is desirable, and this is likely to affect their chances of survival.

NOCA monitors a number of QIs for care in ICU. If a Unit is identified as an outlier for one of these QIs, NOCA initiates a process for the hospital to review the factors contributing to this finding and propose a plan to address the issues identified. To date, most of the QI outliers have related to a lack of ICU bed capacity, and the review process has been helpful for hospitals to become aware of issues and work to improve the care provided.

It is noteworthy how similar the findings in the INICUA reports are from year to year, except for the peak years of the COVID-19 pandemic. Our findings from 2023 indicate a return to the patterns and activity seen before the pandemic.

The INICUA continues to provide assurance that the availability of ICU beds and the quality of care are being maintained in our ICUs nationally.

RECOMMENDATIONS

RECOMMENDATION 1

Continue the ongoing HSE programme to expand ICU capacity in line with the HSE critical care strategic plan (National Clinical Programme for Critical Care, HSE 2020).

Such capacity planning should include expansion of both Level 2 (HDU) and Level 3 (ICU) beds in order to enhance the efficiency and safety of both admissions to and discharges from appropriate levels of care; the exact configuration of both can be informed by hospital case mix, supported by INICUA annual reports.

RECOMMENDATION 2

Implement a national policy that each Unit should keep one staffed ICU bed empty for urgent admissions, whenever it is possible to achieve this by discharging a patient who is clinically ready for discharge.

RECOMMENDATION 3

Continue the implementation of measures to improve the care of critically ill patients outside ICU, including 24-hour provision of outreach services from ICU, uniform documentation of Irish National Early Warning System (INEWS) scores, and compliance with protocols for the escalation of care for deteriorating patients.

RECOMMENDATION 4

Complete the development of the INICUA database at NOCA in order to allow full utilisation of the data being collected.

ACKNOWLEDGEMENTS

The INICUA has received universal support from medical and nursing staff, hospital management and the HSE, all of whom have seen it as a positive input into improving the quality of care rather than a punitive exercise. ICU Audit Coordinators in each hospital have been hard-working and meticulous in ensuring the quality of their data. The HSE and hospitals have continued to fund expansion of the audit programme to now provide 100% coverage of all public hospitals in the ROI. We look forward to the inclusion of private hospitals in the INICUA by the end of 2025.

KEY FINDINGS

REASONS FOR ADMISSION

Common reasons for admission to ICU were respiratory failure, sepsis, malignancy, trauma, cardiac arrest and for post-operative care.

COVID ADMISSIONS

2%

COVID admissions fell from 6% in 2022 to 2% in 2023.

DELAYS IN DISCHARGE

7.4%

Delays in discharge to the ward accounted for 7.4% of all bed days in 2023. Delayed discharge leads to a delay in admission of critically ill patients waiting for a bed.

SEPSIS ON ADMISSION

32%

32% of patients had sepsis on admission to the Unit.

LENGTH OF STAY

5.6 DAYS

The average length of stay for all patients was 5.6 days (6.2 days in 2022).

TIME OF DISCHARGE

4%

4% of ICU discharges to the ward occurred between 22.00 and 07.00, (2% in the UK).

QUALITY INDICATORS

ACCESS TIME TO ICU

Once a decision is made to admit a critically ill patient to ICU, this should happen immediately; 33% of admissions from the ward or ED were within 1 hour of the decision to admit, 87% were within 4 hours - a slight improvement since 2022.

87% 4HRS

10% of patients admitted from a ward developed multi-organ failure within 24 hours of ICU admission. This suggests admissions to ICU were delayed, possibly because of a shortage of ICU beds.

10%

TRANSFERS TO ICU BETWEEN HOSPITALS

895 critically ill patients were transferred from one hospital ICU to ICU in another hospital in 2023 i.e. 6% of all ICU admissions.

MICAS

895

44% of transfers occurred at night (20.00 - 08.00); 25% occurred at weekends/bank holidays. This means the on-call ICU doctor was absent from the referring hospital, with significant implications for the provision of safe care.

"It is disheartening there is no progress to improve the Mobile Intensive Care Ambulance Service. A 24/7 ICU inter-hospital transfer service would maximise the outcome for the critically ill patient. Essential staff would not be called away from ICU where their expertise is needed."

Barbara Egan, *Patient and Public Interest (PPI) Representative, Irish National ICU Audit Governance Committee.*

ORGAN DONATION

Organ donation as a percentage of all deaths

2018	2019	2020
4.3%	4.7%	3.6%
2021	**2022**	**2023**
3.0%	3.7%	4.4%

Rates of organ donation have returned to pre-COVID rates.

FAMILY CONSENT

75% of patient's families agreed to organ donation when requested - this is high by international standards. 59% of 'brain death' patients became organ donors.

CIRCULATORY DEATH

The rate of organ donation after 'circulatory death' was 1.3%; less than the UK (2.7%) but an increase from 0.7% in 2022.

The return to pre-COVID donation figures is so encouraging. I and many grieving families applaud the great work of the organ donor coordinators in hospitals. On meeting families of donors' years afterwards at 'The Circle of Life' organ donor commemoration garden in Galway, they often say that their loved one's organs having given life to another person has been a huge and often their only comfort."

Damien Nee, *Patient and Public Interest (PPI) Representative, ICU Audit Governance Committee & Trustee www.organdonation.ie*

A PATIENT PERSPECTIVE: **OLGA'S EXPERIENCE OF THE INTENSIVE CARE UNIT**

INTRODUCTION

My story began with me feeling unwell in March 2023. I was working abroad and feeling unwell, and I knew as I was getting on the plane home that I would need to see my general practitioner (GP) as soon as possible. When I saw him, he diagnosed me with double pneumonia. I was relieved, weirdly. I was sort of reassured that it was more than a chest infection.

I went to bed that night and woke up at 4.00am unable to breathe. I called an ambulance and was unconscious when it arrived. And so began 10 weeks where I journeyed through three hospitals and three Intensive Care Units (ICUs).

OLGA'S ICU STAY

I have no memory of Hospital 1/ICU 1 – a lot of my story was relayed to me after 6 weeks of treatment, including all of what happened in Hospital 1 and the first 5–6 weeks of what happened in Hospital 2/ICU 2. I had pneumonia, sepsis, and mitral valve regurgitation from an undiagnosed rheumatic fever as a child.

I 'woke up' at the end of April in ICU 2, having had a tracheostomy in an attempt to get me off a ventilator after 5 weeks. I was very agitated when I woke up, and most definitely in a delirious state; I was totally reliant on the people who worked in that ICU. I had a strong sense of gratitude.

When things calmed down, I had an overwhelming sense of people being very patient with me. I was being hoisted to be moved; all of that was told to me afterwards. I'm pretty sanguine about it and I'm not particularly grossed out, but I felt sorry sometimes for the people looking after me.

I'm a bit of a sucker for a medical drama on TV, and I was going, "This is all reinforcing my understanding of how a hospital operates." Because I had the tracheostomy, I couldn't speak and I had a temporary voice box that the staff tried to show me how to use, but I couldn't move my hands properly in order to use it. So my overwhelming sense of all of that was to just do what I was told. Considering how busy medical staff are in this country, all that we know about resourcing and staff shortages and the demands on services, it still strikes me how patient they were and how much time they took to explain things to me; they waited for me to give a thumbs up to everything they did. At one point I thought we were in a TV show. My notes say that I had persistent delirium.

"I WAS VERY AGITATED WHEN I WOKE UP, AND MOST DEFINITELY IN A DELIRIOUS STATE; I WAS TOTALLY RELIANT ON THE PEOPLE WHO WORKED IN THAT ICU. I HAD A STRONG SENSE OF GRATITUDE."

I remember quite comfortably chatting to people, or at least thinking I was, and just sort of 'treading water' until I figured things out in my head. In some cases, I was thinking everything was just in preparation for filming later. The first time I wore pyjamas was a big deal; the staff told my sister to bring in ones with buttons, as doing them up would be a task that would get my fingers moving. The poor therapist was showing me what to do, but I was thinking and then saying, "I'll do it later when the cameras are rolling." I did later have some memory of delirium, where I thought I was being drugged. I dreamed about being kidnapped, but not all the crazy dreams were bad. Some were upsetting with traumatic content, while others were kind of heroic or great fun, like one where I was in a play with Olivia Coleman. Like, I wasn't just going to be in a play with any old eejit! But there was something about the play that involved me being in a hospital bed.

I couldn't hold a pen properly and I couldn't hold my phone. Although I was very frustrated with that, I do remember that quite a few people told me at the time that I was very good-humoured. But in the main I felt mostly grateful.

The other key thing that stood out for me in Hospital/ ICU 2 was exhaustion. My reality was that everything took enormous effort, and I was 'managed' around the clock: the air-pumped bed to stop me getting sores, the movement of the machines, the amount of wires and gadgets and tubes that were involved, and the hole in my throat.

Everything was just very weird. My body didn't feel like my own, and what a momentous occasion it was to stand up! But it felt like climbing a mountain. It's humbling. The best thing was the kindness of the staff, even when I was still having wonky nightmares. My first shower was a weird mix of it being very normal for the staff, but a very special thing for me. I felt like I was special to them. I remember that one day I was really cross, properly angry; maybe I'd had a crazy delirium moment again, but it felt more rooted in the reality of being in that state, in a hospital. I had a suction tube to clear my own secretions from my lungs. It was really gluey, and I threw up. On lying down, I remember feeling very sorry for the nurse cleaning up all of that stuff. That combination of the nasal feeding tube, tracheostomy, and gluey suction was pretty awful.

I remember that I became slightly fixated on the feeding tube because it was making me feel unwell. I was kind of ranting and raving, without sound, pointing at it. I really felt like I was trapped, and I was sick of throwing up – and probably also tired of the lack of independence.

But even then, I also felt incredibly well looked after. The dietitian was amazing, explaining about what I was being fed. I remember that when they took the tracheostomy tube out, they made sure that I gave the thumbs up. I remember laughing, being so impressed by being awake for a procedure! I guess it felt like I had some control again.

Before the tracheostomy tube removal, I had been asleep for all previous procedures. There was a huge amount of plastic coming out, and I was fascinated seeing what it looked like. I was also fascinated by the hole, and someone later offered to take a picture of it on my phone for me. I found that respectful and considerate, and basically, patient-centric.

I felt more in control now, being awake, and happy to use that control. This was another kind of stand-up moment for me because I felt able to talk and ask questions. I didn't yet know that I had sepsis, obviously, but then it had developed pretty quickly. Thinking about sepsis and Savita Halappanavar, I didn't want to become a famous coroner case in that way. I felt really well looked after by all the staff, even when I was leaving the ICU. They kept me longer than usual because they were not prepared to release me onto an ordinary ward, as I needed to be in a room on my own.

"I REMEMBER THAT WHEN THEY TOOK THE TRACHEOSTOMY TUBE OUT, THEY MADE SURE THAT I GAVE THE THUMBS UP. I REMEMBER LAUGHING, BEING SO IMPRESSED BY BEING AWAKE FOR A PROCEDURE! I GUESS IT FELT LIKE I HAD SOME CONTROL AGAIN."

There were still further investigations to be done, and I had to be on a cardiac ward for that. The ICU staff told me that it was very unusual not be able to bring someone around quickly and that they suspected I had another underlying problem. On my last night in ICU 2, while I was literally being tucked in and made really comfortable for the night, I joked to the nurse, "Who's going to tuck me in tomorrow?"

I think I spent 30 minutes in the private room that I had been moved into from ICU before I got bumped so that a patient with COVID-19 could have an isolation room. The ward was just as amazing as the ICU. I still needed assistance with a lot of things; for example, I was to have assisted showers, as I hadn't yet had a shower on my own. I was pretty 'unplugged', but I still had the feeding tube and some lines. I probably would have waited 3 days if I'd waited for an assisted shower. They just didn't have enough staff or nurses to assist me; I felt so sorry for them. That's to do with resources, and that's the nature of public hospitals in Ireland. I didn't want to be that person saying "I need this, I need that, I need the other." Then I thought, you know something, if I just go and shower by myself, what is the worst that can happen? I didn't mean to be glib about it, but it was a bit of a sharp change being on a ward. But I also remember thinking this was ridiculous; how are the nurses meant to do their jobs when they're so understaffed?

In the ICU, the staff made sure that I was very comfortable when I was going to sleep, knowing that sleep is so valuable for healing in an ICU setting. But in the ward, it becomes more about what the system needs. In the ICU, it was all about one individual being especially cared for.

I spent a total of 2 weeks in the cardiac ward of Hospital 2. I was due to have the heart valve surgery there, but it got bumped due to pressure on that hospital's operating theatres. I started doing rehabilitation to recover from the 6 weeks I had spent in a coma or lying down on a ventilator and being artificially moved. I was pounding the hallways by the cardiac ward; it was a big day when I was allowed to go farther than the end of the corridor. I was very motivated about getting my strength back. I got off the feeding tube by negotiating with the dietitian

"I DECIDED NOT TO TELL TOO MANY PEOPLE THAT I WAS GOING TO HAVE OPEN-HEART SURGERY. I DIDN'T REALLY TALK ABOUT IT TOO MUCH; I NEEDED TO KEEP MY HEAD TOGETHER. BUT WHEN THE SURGEON CAME AND SAW ME, HE SAID, "YOU LOOK A WHOLE LOT BETTER THAN WHAT I WAS EXPECTING. YOU'RE ON THE RIGHT SIDE OF 50 TO HAVE THIS KIND OF SURGERY." HE WAS REALLY KIND AND GAVE ME SOME CONFIDENCE ABOUT IT."

who followed me after discharge from ICU. "You'll never be able to eat enough calories," she said. "We have to build you up." I was like, "You haven't seen me go. I can absolutely eat as much ice cream and custard as is necessary." I found all of that really positive in terms of follow-on care. I was in a ward with a lot of older men with diabetes who were all on sugar-free diets, and I was like, "I'm having more ice cream here. My high-calorie, high-energy diet!" I was so lucky to have been given such a good start to my recovery.

When I left Hospital 2 to go for surgery in Hospital 3, I brought a card and chocolates to the ICU in Hospital 2. I really wanted to say thanks in some way. When I was writing the card, I found myself saying I really felt like they had given me an almost maternalistic or paternalistic type of care, and that they had given me a really good start to my real recovery, emotionally and psychologically as well as physically. There were two consultants who I saw quite a bit of. One was a heart consultant and the other was an ICU specialist; I keep thinking of them as 'players' on my 'TV show'. I remember thinking, "These people are like, like the big brains, the biggest brains," and they were just so human and straight-talking, but not condescending. There was also a specialist tracheostomy nurse who I just thought was great craic. I remember being fascinated about why someone would want to work in an ICU as a specialist in nursing. It was kind of obvious to me afterwards what a clinical level they operate at. I asked each of them at one point or another why they were doing what they do.

I had a lot of support from my family and friends. But then I had to face the fact that I needed open-heart surgery. It turned out there was something very wrong with my heart, which explained why they couldn't get me out of the coma for so long. That, I think, was very overwhelming.

I decided not to tell too many people that I was going to have open-heart surgery. I didn't really talk about it too much; I needed to keep my head together. But when the surgeon came and saw me, he said, "You look a whole lot better than what I was expecting. You're on the right side of 50 to have this kind of surgery." He was really kind and gave me some confidence about it. I remember asking the cardiologist, "What would you do if you were me?" She said, "I guess there's something to be said for doing the surgery now before you go home", it all in one go." Which is where I was heading to anyway. She wasn't taking the ultimate decision away but was giving me another bit of confidence. That surgery didn't end up happening in Hospital 2 because the operating theatres were blocked up. These blockages in the public health system are not anyone's fault; there were people in there who were undergoing tests for a very long time. I became very aware of that while I was in the hospital. At one point I was to have an angiogram, and it got delayed by 2 days because that hospital deals with every emergency cardiac case for half the city, so of course scheduled surgeries get bumped for things like emergency stents.

But on the brighter side, there was a sense of community and great camaraderie on that ward in hospital 2. There was one really wealthy man who I christened 'the Chair of the Board'; he was great fun and very positive. He was retired and had made a small fortune. But he was there for 3 weeks waiting for his treatment because he wasn't an emergency. It's kind of interesting because the best part about the public health system is that hospitals don't kick you out; it's not all about commerce. There was a homeless person on that ward who was equally fascinating and had a very interesting life. He was clearly very smart and well educated, but he'd just had a run of bad luck and a very toxic divorce, and was living in a hostel. The staff were trying to organise a lot of social care stuff for him.

I ended up staying on the ward in Hospital 2 for 4 days longer than I needed to. My surgeon also worked in Hospital 3, so I ended up going there to have the surgery done because the operating theatres weren't available in Hospital 2. I suppose the more political 'citizen Olga' was fully engaged, having all this debate about this blended public health system, because what was happening to me was making me anxious. I went from a public to a private hospital, and having experienced both, the care in both is all that it should be. I remember going into the operating theatre in Hospital 3 and people being incredibly kind there, and really reassuring. I remember waking up and feeling like I was in a scene from *Star Trek*, with the sliding doors; it all fell very high-tech and really interesting, a little bit like being in a TV show. I remembered it feeling very clean, clinical, and high-powered in the clinical sense.

In ICU 3 I remember being awake and in an awful lot of pain. The nurse who was assigned to me was very nice and really kind, even though they were clearly busy. There were only two times when I felt like I was a burden to people in the whole 10 weeks I spent in hospital, and both of them, unfortunately, were in Hospital 3. Which is

a pity, because the staff were so good in so many other ways. Hospital 3 had all the salubrious surroundings; the meals were restaurant quality compared with Hospital 2, and the bathroom was amazing and spotless compared with a shared one. But for all that, they were still under huge pressure all the time. They told me that I was going to be in ICU for 2 days, and I wasn't. They let me back up to a room on a ward after only one day, which I took as a good sign even though I wasn't expecting that quite so early. I was discharged from Hospital 3 with a list of the things I needed to do to protect myself after open-heart surgery, but these weren't really compatible with what I had been through for the 9 weeks prior to that surgery. Like all the stuff about how you move, not moving or using your arms. I couldn't actually do any of those things because my legs weren't strong enough yet, and I couldn't seem to absorb and retain the information. This is going to make me sound a bit smart-alecky, but we got such a laugh out of the book about what you can expect after surgery: things like croquet and what kind of golf you could play and what you could do in the garden. I wasn't a private patient booking in with my private consultant, and that book highlighted that there was something slightly class-based about Hospital 3.

I knew I couldn't play croquet for 4 weeks, but there was no answer to how I would get my drain stitches out a week after discharge, which, I was told, was essential. They just told me to go to my GP. But my GP was 100 miles away, so I ended up going to a Vhi clinic.

The hospital staff did a 1-hour session with me on going home, all based on not using my arms to get out of bed or a chair, but they didn't really have an answer when I explained about my 'coma legs 'from being in ICU for so long.

The hospital gave me a number for a nurse who would liaise with me if I needed additional scar management, including the option of texting a picture. My scar did 'weep', and they had sort of terrified me about movement and not damaging the wiring that closed my breastbone after the surgery. I sent a photo in to ask if it was OK, and I never heard back. I was also going to be on warfarin for life, and because of that, they told me I would need to go to my GP to have my bloods tested every week. I found that disconnect to be very prevalent in retrospect – they told me that I couldn't do anything for 6 weeks, and my GP was 100 miles away. How was that going to work?

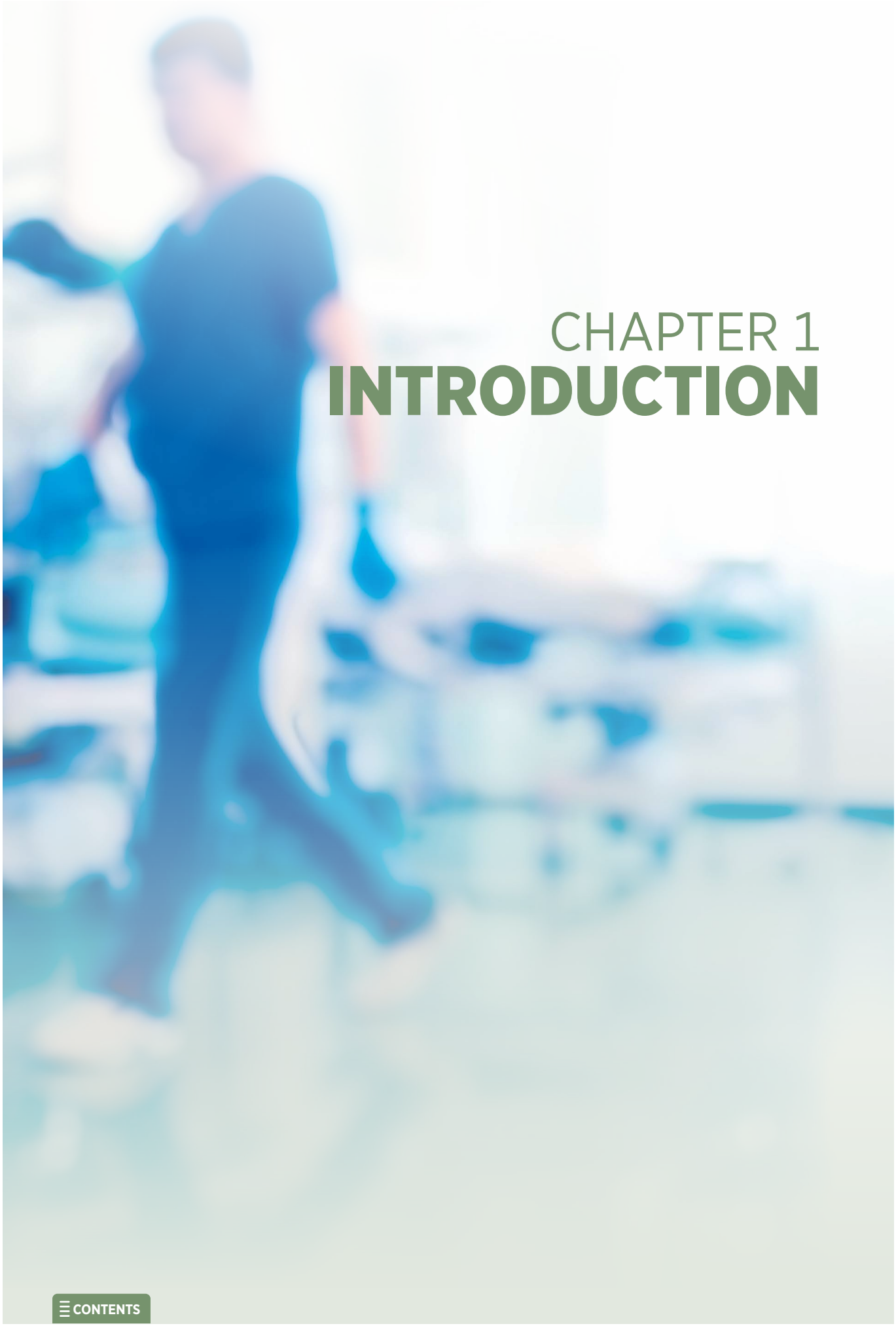
"THE HOSPITAL STAFF DID A 1-HOUR SESSION WITH ME ON GOING HOME, ALL BASED ON NOT USING MY ARMS TO GET OUT OF BED OR A CHAIR, BUT THEY DIDN'T REALLY HAVE AN ANSWER WHEN I EXPLAINED ABOUT MY 'COMA LEGS 'FROM BEING IN ICU FOR SO LONG."

In fairness, Hospital 2 initially told me that I would go over to Hospital 3 for surgery and then come back to Hospital 2 for my recovery. Then they said no, I was going to stay in Hospital 3 for my recovery, but then I would come back and attend Hospital 2 for my outpatients. But it actually became really tricky to get back into Hospital 2. I was stuck; I fell between two stools. Luckily for me, Hospital 2 did take me back, and I went to the warfarin clinic there.

Presumably, my heart surgery rehabilitation in Hospital 3 would have been something like, 'sell a kidney to pay for rehab'. Then I got a call from a very nice woman in Hospital 1 who offered for me to attend rehabilitation there. Hospital 1 was in Kilkenny, and even though I was living back with my sister in Dublin, I've always kind of split my time between Kilkenny and Dublin. But I was impressed that they followed up with me even though I had spent only 2 days there. But then I was like, God, this is interesting; Hospital 3 couldn't even take out two stitches, but now two public hospitals were saying, "You can do your rehab here, let's bring you in for your assessment." I found the heart rehabilitation in Hospital 2 brilliant, because again, there were people there from all walks of life. Some were great craic, real characters, and very motivating. It's fascinating to see the difference between two types of hospital. I can't say I didn't get great care in Hospital 3; I did. But it cost the insurance company tens of thousands of euro for 7 days. In Hospital 2, I was a citizen getting 7 weeks of ICU care without charge, and with huge kindness on top of that. The health care assistants in both Hospitals 2 and 3 were an unbelievable bunch of people. Smart, and totally professional in every way.

I had had my birthday while I was unconscious in ICU in Hospital 2. I told myself that a year after my discharge from Hospital 3 would be plenty of time to be going on about my medical journey. Beyond that, another birthday would have passed and after a certain point, you can turn into a bit of a bore. I was asked to do an interview for *The Irish Times*, with a journalist I admire a lot, and I decided that was a good way to draw a line under my experience and to tell my story. It gave it context and helped me articulate how positive I feel about it. That might seem counter-intuitive, but overall, being in ICU was a wake-up call, and I felt that I was given the best chance of a full recovery because of my treatment in ICU 2 in particular.

On the first anniversary of my leaving the hospital, I sent a card to the ICU in Hospital 2 to say that I was still grateful.



CHAPTER 1
INTRODUCTION

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CHAPTER 1: **INTRODUCTION**

This is the annual report on activity, process and outcomes in Intensive Care Units (ICUs) in Ireland in 2023. Data are collected as part of the Irish National ICU Audit (INICUA), which is run by the National Office of Clinical Audit (NOCA) with guidance from the National ICU Audit Governance Committee.

This INICUA report provides comprehensive data on ICU admissions across hospitals funded by the Health Service Executive (HSE) in Ireland in 2023.

NATIONAL OFFICE OF CLINICAL AUDIT

NOCA is committed to a culture of shared learning from national clinical audits in order to promote patient safety and improve clinical outcomes. NOCA is committed to meeting best-practice standards in how clinical audit is governed in the Republic of Ireland (ROI). The National ICU Audit Governance Committee governs the output from the INICUA.

NOCA works with the Intensive Care National Audit and Research Centre (ICNARC) in the United Kingdom (UK), which provides validation and analysis of data and formal reports on activity in adult ICUs in the UK. ICNARC reports provide data on indicators of the quality of care in ICU that are benchmarked between participating Units in the ROI and those in the UK.

WHO IS THIS REPORT AIMED AT?

This INICUA report on 2023 data informs patients requiring ICU care and their families. It informs the multidisciplinary teams caring for patients in ICU, the hospital managers who support them, and the national structures for administration of the health service.

The report has been designed in two parts:

1. The *Irish National ICU Audit Annual Report* provides a critical review of INICUA data collected in Ireland in 2023. This presents the key findings regarding case mix, severity of illness and organs supported in ICU, bed availability and utilisation, outcome measures, organ donation, and interhospital transfers. The report also highlights quality improvement initiatives where hospitals used INICUA data to improve patient care in their Units.

2. The *Irish National ICU Audit Summary Report* provides a summary of some of the details within the main report that will be of particular interest to patients, patient organisations and the public. The summary report is aimed at a general audience and is designed to provide insight into ICU care for everyone.

Chapters 2 and 3 of this report describe the INICUA's methodology and data quality. Chapters 4–10 present the audit findings with clinical commentary. Chapter 11 presents the audit's value and the quality improvement initiatives that have been undertaken in order to improve the quality of care provided to patients in ICU. Chapter 12 gives an audit update and includes updates on the recommendations from the *Irish National ICU Audit Annual Report 2021* (NOCA, 2023). Chapter 13 sets out this report's recommendations based on the clinical audit findings and any other relevant findings identified while undertaking the analysis of the audit data. The closing chapter presents the conclusions from the data within this report.

At the heart of this audit report are the patients and their families who have been cared for in Irish ICUs. This report tells the story of Olga, who was a patient in three separate ICUs in three different hospitals in the ROI during 2023. By sharing her experience, Olga provides us with a detailed account of an ICU patient's experiences. The inclusion of this personal account seeks to ground this report in the lived patient experience and to highlight the real impact of ICU care on patients' lives.

"I was very agitated when I woke up…I was totally reliant on the people who worked in that ICU. I had a strong sense of gratitude." - *Olga Barry*

In total, 29 Units in 25 hospitals participated in the INICUA in 2023. These 29 Units provided 99.8% of all Level 3 ICU care in adult hospitals funded by the HSE in 2023. Data coverage in participating Units during 2023 is illustrated in Table 1.1.

No data were collected for quarters 1 and 2 in Midland Regional Hospital Portlaoise because that hospital had not yet implemented the INICUA. Wexford General Hospital is missing data for quarters 2 and 3 because of a vacancy in the ICU Audit Coordinator post. Data from one quarter were not included for University Hospital Kerry and Tallaght University Hospital, leading to gaps in data coverage. These gaps were a result of inadequate ICU Audit Coordinator staffing. The recommended staffing level is 1 ICU Audit Coordinator for every 10 Unit beds to be audited. Gaps in data coverage reduce the validity of the findings and make comparisons of activity data between Units difficult.

Data collection was complete for the remaining 25 Units (out of the total 29) for the full year 2023.

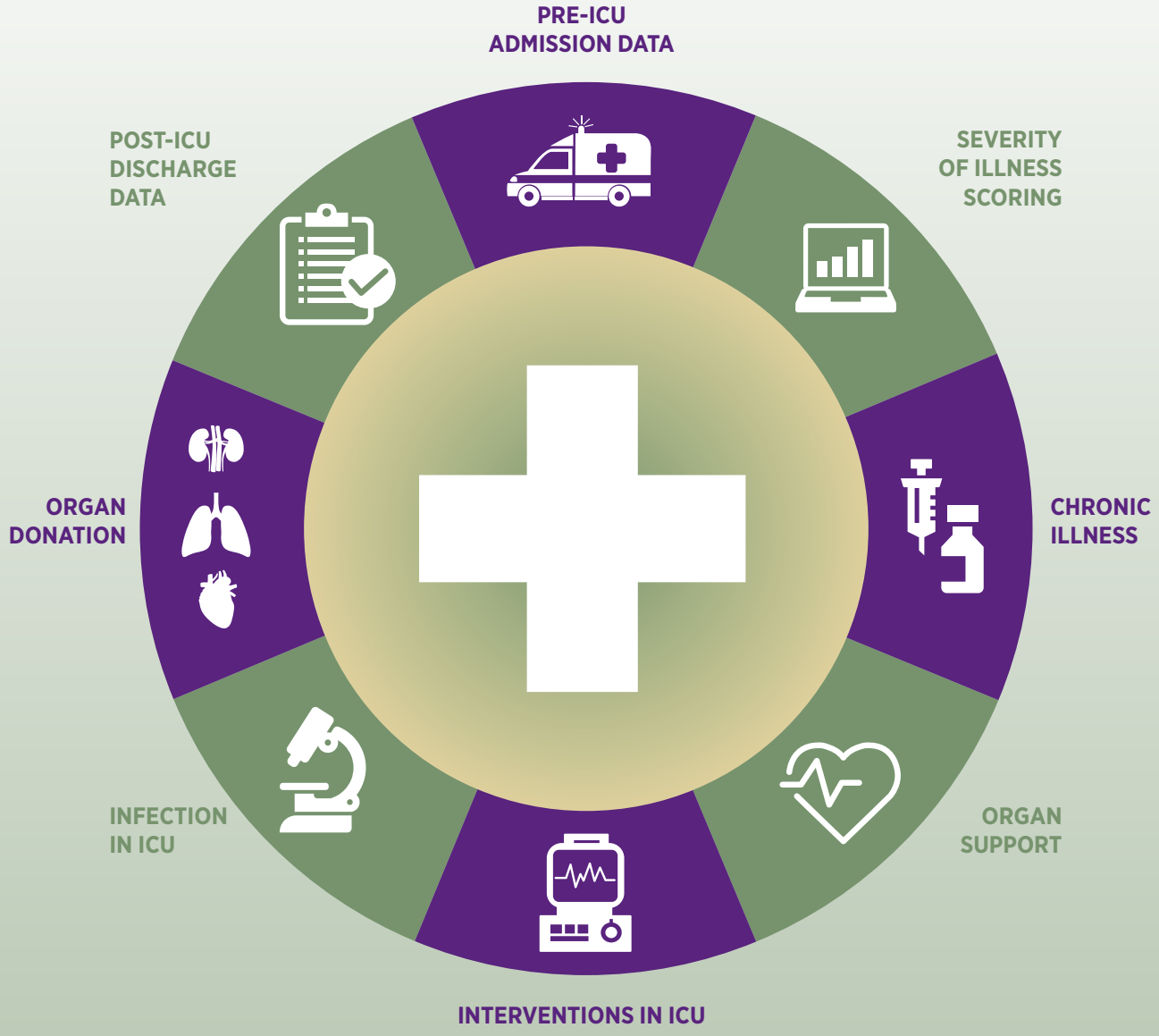
TABLE 1.1: DATA COVERAGE IN INTENSIVE CARE UNITS PARTICIPATING IN THE IRISH NATIONAL INTENSIVE CARE UNIT AUDIT, 2023

KEY	HOSPITAL NAME	UNIT NAME	Q1	Q2	Q3	Q4
A	Beaumont Hospital	Beaumont Hospital General ICU	Y	Y	Y	Y
B	Beaumont Hospital	Beaumont Hospital (Richmond) Neurosurgical ICU	Y	Y	Y	Y
C	Mater Misericordiae University Hospital	Mater Misericordiae University Hospital HDU	Y	Y	Y	Y
D	Mater Misericordiae University Hospital	Mater Misericordiae University Hospital ICU	Y	Y	Y	Y
E	Our Lady of Lourdes Hospital Drogheda	Our Lady of Lourdes Hospital Drogheda ICU	Y	Y	Y	Y
F	St James's Hospital	St James's Hospital Cardiothoracic ICU	Y	Y	Y	Y
G	St James's Hospital	St James's Hospital General ICU	Y	Y	Y	Y
H	Tallaght University Hospital	Tallaght University Hospital ICU	Y	Y	Y	N
I	University Hospital Galway	University Hospital Galway ICU	Y	Y	Y	Y
J	University Hospital Limerick	University Hospital Limerick ICU	Y	Y	Y	Y
K	University Hospital Waterford	University Hospital Waterford ICU	Y	Y	Y	Y
L	Regional Hospital Mullingar	Regional Hospital Mullingar ICU	Y	Y	Y	Y
M	Wexford General Hospital	Wexford General Hospital ICU	Y	N	N	Y
N	Connolly Hospital	Connolly Hospital ICU	Y	Y	Y	Y
O	Midland Regional Hospital Tullamore	Midland Regional Hospital Tullamore ICU	Y	Y	Y	Y
P	Naas General Hospital	Naas General Hospital ICU	Y	Y	Y	Y
Q	St Luke's General Hospital, Carlow/Kilkenny	St Luke's General Hospital Carlow/Kilkenny ICU	Y	Y	Y	Y
R	St Vincent's University Hospital	St Vincent's University Hospital ICU	Y	Y	Y	Y
S	Cork University Hospital	Cork University Hospital Cardiothoracic ICU	Y	Y	Y	Y
T	Cork University Hospital	Cork University Hospital General ICU	Y	Y	Y	Y
U	Letterkenny University Hospital	Letterkenny University Hospital ICU	Y	Y	Y	Y
V	Tipperary University Hospital	Tipperary University Hospital ICU	Y	Y	Y	Y
W	University Hospital Kerry	University Hospital Kerry ICU	Y	Y	Y	N
X	Cavan General Hospital	Cavan General Hospital ICU	Y	Y	Y	Y
Y	Mercy University Hospital	Mercy University Hospital Cork ICU	Y	Y	Y	Y
Z	Sligo University Hospital	Sligo University Hospital ICU	Y	Y	Y	Y
AB	Mayo University Hospital	Mayo University Hospital ICU	Y	Y	Y	Y
AC	Portiuncula University Hospital	Portiuncula University Hospital ICU	Y	Y	Y	Y
AD	Midland Regional Hospital Portlaoise	Midland Regional Hospital Portlaoise ICU	N	N	Y	Y

Note: The order in which Units are listed in this table reflects the order in which they began participating in the INICUA; this order is repeated in tables and figures throughout this report.

Y **DATA INCLUDED IN REPORT** N **NO DATA**

CHAPTER 2
METHODOLOGY



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CHAPTER 2: **METHODOLOGY**

This is the seventh INICUA national report. The INICUA dataset provided most of the data for this report. Also included are data from the national ICU Bed Information System (ICU-BIS). The methodologies from these two systems are different and are described under the following sections, 'Irish National ICU Audit' and 'ICU Bed Information System'.

IRISH NATIONAL ICU AUDIT

NOCA established the INICUA in 2013 to focus on the care provided to patients in adult ICUs. It is an audit of patient outcomes from adult Critical Care Units that fall into one of three categories: ICUs, combined ICUs/High Dependency Units (HDUs), and standalone HDUs.

ICUs are defined as Units that can provide multi-organ support, a 1:1 nurse–patient ratio, and appropriate staffing by trained medical and nursing staff. A key distinguishing feature of ICUs is their capacity to care for patients undergoing invasive ventilation.

NOCA has defined HDUs for the purpose of inclusion in the INICUA according to the following criteria:

1. The Unit provides a 1:2 nurse–patient ratio.
2. The Unit is staffed by medical and nursing staff with appropriate training and ongoing experience in the care of critically ill patients.
3. The Unit has the necessary equipment to allow safe care of Level 2 patients (invasive pressure monitoring, non-invasive ventilation equipment, infusion pumps, etc.).
4. The ICU medical team provides administrative and clinical governance.
5. The Unit should ideally be in close proximity to the existing ICU in order to allow sharing of medical and nursing staffing and supervision.
6. The Unit has adequate numbers of Level 2 patients to maintain staff skills and justify the resources provided.
7. There are adequate levels of medical and surgical services to support the care of critical care patients.

Patients cared for in ICUs and HDUs are the sickest patients in the hospital. The INICUA is a quality and patient safety initiative that measures the quality of care in each ICU, benchmarking the findings against international standards. The quality measures relate to both processes and outcomes. Activity within the participating ICUs is measured in order to improve efficiency and the utilisation of scarce ICU beds. Outcome measures provide assurance that ICUs are safe environments for patient care.

Data collection, validation and analysis

The INICUA is a partner of ICNARC, an organisation in the UK, for data validation and the benchmarking of quality indicators (QIs) as measures of care. The INICUA collects data on all patients admitted to Units across the ROI. Data are securely submitted to ICNARC and run against more than 600 validation checks, which identify potential errors as well as missing or unusual data. Once the data have passed all validation checks, they are ready for analysis. ICNARC send reports back to the Units and NOCA, based on the data, detailing QIs and identifying trends over time. ICNARC issues a national network quality report to NOCA. This is used as the basis for further NOCA analysis presented in this report.

In performing the analysis for this report, NOCA handled gaps in data coverage by extrapolating full-year estimates from the available data. This approach was applied to Unit data that did not cover all four quarters and was used for any graphs that compare counts of data items between Units. In such cases, the Unit data were augmented with an estimate for quarters that were not included in the data. Throughout this report, such uplifts are clearly labelled as 'estimated' and shown in lighter shading in bar/column charts. Extrapolation was performed at Unit level by determining the average count per quarter for each Unit and increasing the count for the Unit by the number of quarters for which data were missing.

The INICUA dataset

This dataset covers the patient journey before and after admission to ICU as shown in Table 2.1.

TABLE 2.1: IRISH NATIONAL INTENSIVE CARE UNIT AUDIT DATASET

Dataset	Examples of data collected
Pre-ICU admission data	Demographics; NOCA ethnicity data; patient admission pathway to the hospital and ICU; hospital transfer details; length of stay (LOS) in hospital; treatment goals on admission to ICU.
Severity of illness scoring systems	ICNARC$_{H\text{-}2023}$ model for predicted risk of acute hospital mortality (physiological and non-physiological data feed directly into the model); Sequential Organ Failure Assessment (SOFA) score; Acute Physiology and Chronic Health Evaluation II (APACHE II) score; Irish National Early Warning System (INEWS) score prior to admission to the Unit (captures high-risk admissions from a ward and Emergency Department).
Chronic illness data	Metastatic, cardiovascular, respiratory, and other chronic disease. This list was extended in 2022 and now includes grading of functional limitations, including frailty and the addition of comorbidities (e.g. diabetes, stroke).
Data on interventions in ICU	Ventilation, invasive monitoring, dialysis, nutrition, and transfers to operating theatre and radiology. Additional interventions during Unit stay show more complete organ-supported data in the dataset.
Data on organ support	Respiratory, cardiovascular, dermatological, neurological, liver, renal, and gastrointestinal support.
Data to support Hospital In-Patient Enquiry coding and activity-based funding	Diagnosis during ICU stay, hours of ventilation, and organs supported.
Data on infection in ICU	Unit-acquired and hospital-acquired infection.
Data on organ donation	Potential and actual organ donation. NOCA extended the organ donation dataset to support and inform Organ Donation Transplant Ireland (ODTI). Chapter 8 of this report includes data on organ donation.
Post-ICU discharge data	Treatment goals and limitations in place at Unit discharge/death; outcome and LOS in Unit, ward, and hospital (to complete the ICU patient journey).

The INICUA dataset on the INICUA database InfoFlex contains variables specific to Ireland, which are defined in the *NOCA National ICU Audit Data Definition Manual* (NOCA, 2024). Examples of data collected in order to support service requirements in Ireland include:

- data on Unit-acquired infection, including Unit-acquired bloodstream infection (UABSI)
- data on organ donation, which supports the activities of ODTI and the NOCA Irish Potential Donor Audit
- obstetric data on existing or recent pregnancy.

Each Unit has full access to its own data, which are stored in the INICUA database InfoFlex on the HSE servers. Data retrieval from the database is possible by downloading data to an Excel file or by running one of the pre-formatted national reports available within the database.

NOCA is developing a national database of INICUA data. This contains pseudo-anonymised data from all the INICUA participating Units. This project is progressing, and the benefits will include:

- support of the provision of dashboards on activity and quality of care, which will be populated as soon as the data are entered in each Unit
- timely and efficient analysis of the aggregated dataset from all Units
- availability of wider reporting to support service and quality improvement initiatives
- support of research projects using INICUA data.

Data inclusion criteria

The analysis in this report is based on data entered on InfoFlex, the INICUA database software. It includes patients who were admitted to a participating ICU or HDU between 1 January and 31 December 2023.

Data exclusion criteria

This report excludes patients who were admitted to a paediatric ICU or paediatric HDU. Coronary Care Unit admissions are also excluded from the INICUA.

ICU BED INFORMATION SYSTEM

Background

On 26 March 2020, the ICU-BIS went live for the 26 adult public hospitals in the ROI that have an ICU. This coincided with a marked increase in the number of coronavirus disease 2019 (COVID-19) patients in ICU at the time. On 2 April 2020, the five private hospitals in the ROI with ICU capacity were added to the system, and on 6 April 2020 the two paediatric hospitals with an ICU were added. Since then, the ICU-BIS has provided a comprehensive national picture of bed capacity and patient numbers (including patients with or without COVID-19) in ICU. Data in this report from the ICU-BIS relate to the 26 adult public (HSE-funded) hospitals in the ROI. Chapter 6 contains a section on aggregated data from the five private hospitals that have an ICU.

Criteria for inclusion of Units in ICU-BIS

NOCA collected data from all ICUs with the ability to provide invasive ventilation on an ongoing basis. Data were also collected from HDUs (defined as Units with the ability to provide organ support short of invasive ventilation via an endotracheal tube, and the ability to undertake invasive monitoring, such as direct arterial pressure monitoring). Other criteria for a HDU include Units with a nurse–patient ratio of 1:2, and clinical and administrative management of the Unit by the ICU medical team.

Exclusion criterion

Coronary Care Units are excluded from the ICU-BIS.

ICU-BIS dataset

Data collected by the ICU-BIS are grouped into two categories: ICU occupancy data and COVID-19-specific patient data. Data collected and reported by the ICU-BIS include:

1. the numbers of open ICU beds (with appropriate staffing), beds occupied, beds reserved for a new patient, patients cleared for discharge from ICU, and beds available
2. data on patients with COVID-19, defined as those who have tested positive for COVID-19 during the current hospital admission; data include: (1) the number of patients in each Unit, (2) the number of invasively ventilated patients, (3) the number of new admissions in the last 24 hours, (4) the number of discharges in the last 24 hours, and (5) the number of deaths in the last 24 hours
3. the total number of patients (with and without COVID-19) who are invasively ventilated
4. the total number of patients (with and without COVID-19) who are undergoing renal replacement therapy (both intermittent and continuous)
5. patient-level data on patients with COVID-19, including age, sex, comorbidities, vaccination status, whether they are currently or were recently pregnant (if female), whether COVID-19 was the primary reason for admission to ICU, and source of COVID-19 infection (if known)
6. data on critically ill patients who are being managed by the ICU team outside normal ICU locations, including the number of patients, the number of invasively ventilated patients, and the number of patients receiving renal replacement therapy.

CHAPTER 3
DATA QUALITY

CONTENTS

CHAPTER 3: **DATA QUALITY**

The purpose of this data quality statement is to assess the quality of the data within this report.

The INICUA reports on 11 QIs with expected value and predicted ranges. In this report, each Unit's observed value for each QI is compared with an expected value. For most QIs, the expected value represents the overall percentage or rate across all Case Mix Programme and INICUA Units during the reporting period.

For risk-adjusted mortality, the expected value is the expected mortality according to the $ICNARC_{H\text{-}2023}$ model, calculated as the mean predicted risk of death for all eligible admissions to a Unit. In order to compare the observed value with the expected value, predicted ranges are calculated based on the expected value and the number of eligible admissions (or bed days for rates) for a Unit. A Unit's observed value is expected to lie within the 95% predicted range 19 times out of 20, and within the 99.8% predicted range 998 times out of 1,000.

In 2023, ICNARC recalibrated its mortality prediction model to a newer version termed $ICNARC_{H\text{-}2023}$. This will be further updated when an adequate volume of data from the latest dataset (version 4) is available. Regular recalibration ensures that data are benchmarked against current (not historic) performance.

An admission to ICU is not included in the calculation of the $ICNARC_{H\text{-}2023}$ model's predicted risk of death if the patient is admitted solely for organ donation; if the patient is deceased upon arrival; or if all active treatment has been withdrawn at the time of admission to the Unit. In rare cases, there may be insufficient data to calculate a risk prediction. Readmissions of the same patient within the same acute hospital stay and admissions missing the ultimate acute hospital outcome are excluded from comparisons of observed and expected mortality.

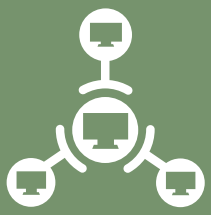
In 2023, ICNARC addressed further areas for improvement, including the handling of missing data, continuous non-linear modelling of physiological predictors, and making better use of available data from the hierarchical coding of reasons for admission to the Critical Care Unit.

Tables 3.1, 3.2 and 3.3 provide an assessment of the quality of the INICUA and ICU-BIS data in this report. This assessment uses internationally agreed dimensions of data quality, as laid out by the Health Information and Quality Authority (2018).

TABLE 3.1: CONTEXT OF DATA QUALITY STATEMENT

SCOPE	This data quality statement assesses the data released for this report. This statement focuses solely on the data quality dimension of accuracy and reliability, and specifically on: • coverage of data release • completeness of data release • accuracy of data release.
PURPOSE	This data quality statement will help the reader decide whether the data are fit for the user's specific purpose.
DATA SOURCE	The sources of data for this report are the INICUA dataset and the ICU-BIS. Unless otherwise stated, the source of data for individual figures and tables is the INICUA dataset
TIMEFRAME OF DATA RELEASE	The data published in this report are based on data collected between 1 January and 31 December 2023.
TYPE OF DATA	Final.

TABLE 3.2: CHARACTERISTICS OF DATA QUALITY

Coverage of data release 	**a) INICUA** The INICUA collected data on patients admitted to 29 Units in 25 adult public hospitals in the ROI. This included the three new hospitals that began participating in the audit in 2023 (Mayo University Hospital, Portiuncula University Hospital, and Midland Regional Hospital Portlaoise). The INICUA now documents activity in Units that provided 99.8% of all Level 3 ICU care in adult public hospitals in 2023. Our Lady's Hospital Navan ICU is the only Unit with the capacity for invasive ventilation that has not been included in the INICUA pending the outcome of a reconfiguration review and because of low patient volumes. Our Lady's Hospital Navan ICU provided just 58 bed days with invasive ventilation in 2023 – 0.16% of all ventilated bed days nationally (Table 6.3). Data completeness in participating Units during 2023 is illustrated in Table 1.1. There was significant improvement in data completeness in 2023 compared with 2022. The reasons for these improvements were adequate numbers of ICU Audit Coordinators and the backlog caused by the COVID-19 pandemic having been cleared. Data for one quarter are missing for two Units only, while one Unit is missing data for two quarters because of the ICU Audit Coordinator post being vacant during that period. Data collection was completed for 25 Units (out of a total of 29) for the full year.[1] **b) ICU-BIS** The ICU-BIS collected a much smaller dataset than the INICUA dataset but had 100% coverage of all patients in ICU and HDU in the 26 adult public hospitals (see Chapter 4) and 5 private hospitals (see Chapter 6) that use the ICU-BIS.
Completeness of data release 	**a) INICUA** Missing fields in the INICUA dataset are identified by: • inbuilt validation prompts at the point of data entry • validation of the encrypted data export file before it is sent to ICNARC • validation during the file upload to the ICNARC portal, Platform X • data validation upon data receipt at ICNARC. Data are then corrected by each Unit or are deemed 'unavailable' before being reported on. Data gaps for specific quarters of the year in individual Units are documented in this report. **b) ICU-BIS** NOCA supports the ICU-BIS 7 days a week in order to ensure the completeness and accuracy of data. This support involves contacting Units that have not entered their daily data in the ICU-BIS portal or where the data entered differ from those expected. There are also inbuilt validation rules at the point of data entry. NOCA is confident that patient coverage for the ICU-BIS data presented in this report was 100%.

[1] Patient data integrity is important in providing timely and appropriate care. Data completeness is an internationally agreed dimension of data quality. In order to ensure that we have data completeness by having no gaps in the data reported, NOCA recommends that staffing should be 1 whole-time equivalent (WTE) ICU Audit Coordinator for every 10 beds audited.

TABLE 3.2: CHARACTERISTICS OF DATA QUALITY *CONTINUED*

Accuracy of data release 	**a) INICUA** Units collect data on all patients admitted. Detailed dataset process flow rules and rigorous data validation are key parts of the INICUA dataset. Data are collected according to set definitions and analysed once they have successfully passed the validation process. Data are run against more than 600 validation checks, which identify potential errors as well as checking for completeness, invalid/unusual values, and consistency. Online data validation reports are instantly available upon uploading data to the ICNARC portal. The ICU Audit Coordinators in each Unit can begin reviewing the validation queries and resolving data issues right away and can re-export data without delay. This process continues until the data are validated and free from errors. Once the data have passed all validation checks, they are submitted for analysis. Quarterly Quality Reports (QQRs) based on these data are then sent to Units, identifying trends over time for QI values. **b) ICU-BIS** Inbuilt validation rules identify entry errors at the time of data entry. NOCA supports the system 7 days a week in order to ensure data accuracy. We check any anomalies and missing or unusual data by contacting the Units, and these data are corrected by the Unit or NOCA. Further validation checks are carried out by comparing new data against the previous day's data in order to identify any anomalies before the data are analysed and reports distributed. Daily reports are sent to the Health Protection Surveillance Centre; Irish Epidemiological Modelling Advisory Group; the HSE Special Delivery Unit the Department of Health; the Economic and Social Research Institute; the HSE Quality Improvement Division; Hospital Groups/Health Regions; and ICU clinicians and Critical Care Retrieval Team Leads. Weekly key performance indicators are sent to the Department of Health (DOH), HSE Special Delivery Unit, and European Centre for Disease Prevention and Control.

TABLE 3.3: ASSESSMENT OF DATA QUALITY

Strengths of data in this report	• **The INICUA** has developed a comprehensive dataset that is collected by clinically experienced ICU Audit Coordinators. It documents the complete ICU patient journey, including diagnosis, interventions and outcomes, and all data are rigorously validated for reporting. • **The ICU-BIS** dataset is concise, with clearly defined variables, and is rigorously validated daily by NOCA staff. There is full coverage of all acute hospitals in the ROI throughout the reporting period.
Limitations of data in this report	The data in this report reflect the available data from Units in 2023. Having data for all quarters from Units is dependent on the full complement of ICU Audit Coordinator posts being filled. Data gaps for specific quarters of the year in individual Units are documented in this report (Chapter 1, Table 1.1).

CHAPTER 4

PARTICIPATING UNITS, ACTIVITY AND CASE MIX

CONTENTS

CHAPTER 4: **PARTICIPATING UNITS, ACTIVITY, AND CASE MIX**

A total of 29 ICUs in 25 adult public hospitals funded by the HSE participated in the INICUA in 2023.

Units providing care for critically ill patients are classified as either ICUs (providing Level 3 care with multi-organ support) or HDUs (providing Level 2 care with single-organ support or invasive monitoring). The Units vary in their bed configuration, offering: (1) ICU (Level 3) beds only, (2) a mixture of ICU and HDU beds, or (3) HDU (Level 2) beds only. Some Units care for patients from a single specialty (e.g. cardiac surgery or neurosurgery). These differences explain some of the variability between Units in this report. Table 4.1 briefly summarises the characteristics of each Unit.

TABLE 4.1: UNITS PARTICIPATING IN THE IRISH NATIONAL INTENSIVE CARE UNIT AUDIT

Key	Unit	Description	Unit admissions in 2023§ (N=15152)	Open beds; daily average during 2023 (source: ICU-BIS)
A	**Beaumont Hospital General ICU**	General ICU (GICU) for medical and surgical patients, with a significant number of neurosurgical patients as overflow from the hospital's neurosurgical ICU.	1107	18.1
B	**Beaumont Hospital (Richmond) Neurosurgical ICU**	Specialist Unit for neurosurgical patients.	368	9.6
C	**Mater Misericordiae University Hospital HDU**	HDU for general medical and surgical patients.	1339	16.0
D	**Mater Misericordiae University Hospital ICU**	GICU for medical and surgical patients. Significant influences on case mix include cardiothoracic surgery, heart and lung transplantation, and extracorporeal life support.	1092	19.3
E	**Our Lady of Lourdes Hospital Drogheda ICU**	General Unit (mixed ICU/HDU) for medical and surgical patients.	440	9.7
F	**St James's Hospital Cardiothoracic ICU**	Specialist Cardiothoracic ICU (CT ICU) for patients after cardiothoracic surgery.	313	5.3
G	**St James's Hospital General ICU**	GICU for medical and surgical patients. This report also includes data from two Level 3 beds in the Burns Unit.	1030	24.2
H	**Tallaght University Hospital ICU**	GICU for medical and surgical patients. This report also includes data from four Level 3 beds in the Post-Anaesthesia Care Unit.	719*	21.6
I	**University Hospital Galway ICU**	The GICU and separate HDU are combined for INICUA purposes. Case mix includes medical, surgical, obstetric and paediatric patients.	1047	17.9
J	**University Hospital Limerick ICU**	GICU for medical and surgical patients. The hospital also has a 16-bed HDU, which is not included in this report.	480	9.9
K	**University Hospital Waterford ICU**	GICU for medical and surgical patients. The hospital also has a HDU, which is not included in this report.	626	9.9

* No data for one quarter.
** No data for two quarters.
§ Number of admissions as documented by INICUA without extrapolation.

TABLE 4.1: UNITS PARTICIPATING IN THE IRISH NATIONAL INTENSIVE CARE UNIT AUDIT

Key	Unit	Description	Unit admissions in 2023§ (N=15152)	Open beds; daily average during 2023 (source: ICU-BIS)
L	**Regional Hospital Mullingar ICU**	General Unit (mixed ICU/HDU) for medical and surgical patients.	433	6.2
M	**Wexford General Hospital ICU**	General Unit (mixed ICU/HDU) for medical and surgical patients.	145**	4.7
N	**Connolly Hospital ICU**	General Unit (mixed ICU/HDU) for medical and surgical patients.	280	5.1
O	**Midland Regional Hospital Tullamore ICU**	General Unit (mixed ICU/HDU) for medical and surgical patients.	315	5.7
P	**Naas General Hospital ICU**	General Unit (mixed ICU/HDU) for medical and surgical patients.	156	3.8
Q	**St Luke's General Hospital Carlow/Kilkenny ICU**	General Unit (mixed ICU/HDU) for medical and surgical patients.	367	4.6
R	**St Vincent's University Hospital ICU**	General ICU for medical and surgical patients, with a significant number of patients with liver-related illness.	798	17.4
S	**Cork University Hospital Cardiothoracic ICU**	Specialist CT ICU for patients after cardiothoracic surgery, with some general patients admitted also.	614	6.0
T	**Cork University Hospital General ICU**	GICU for medical, surgical and neurosurgical patients.	706	16.8
U	**Letterkenny University Hospital ICU**	General Unit (mixed ICU/HDU) for medical and surgical patients.	371	5.2
V	**Tipperary University Hospital ICU**	General Unit (mixed ICU/HDU) for medical and surgical patients.	221	5.0
W	**University Hospital Kerry ICU**	General Unit (mixed ICU/HDU) for medical and surgical patients.	185*	4.9
X	**Cavan General Hospital ICU**	General Unit (mixed ICU/HDU) for medical and surgical patients.	272	4.7
Y	**Mercy University Hospital Cork ICU**	General Unit (mixed ICU/HDU) for medical and surgical patients.	373	6.0
Z	**Sligo University Hospital ICU**	General Unit (mixed ICU/HDU) for medical and surgical patients.	341	4.9
AB	**Mayo University Hospital ICU**	General Unit (mixed ICU/HDU) for medical and surgical patients.	448	6.0
AC	**Portiuncula University Hospital ICU**	General Unit (mixed ICU/HDU) for medical and surgical patients.	404	5.9
AD	**Midland Regional Hospital Portlaoise ICU**	General Unit (mixed ICU/HDU) for medical and surgical patients.	162**	3.6

* No data for one quarter.
** No data for two quarters.
§ Number of admissions as documented by INICUA without extrapolation.

ACTIVITY IN CRITICAL CARE

Coverage of national ICU activity

Units participating in the INICUA provided 99.8% of all Level 3 ICU care in adult HSE-funded hospitals (i.e. all except Our Lady's Hospital Navan ICU) in 2023 according to the NOCA ICU-BIS, using the number of days that patients received invasive ventilation as a measure of Level 3 care.

The INICUA documented 15,152 admissions of 14,363 patients to ICU in the 25 participating hospitals and 29 Units (there were 789 readmissions) (Table 4.1). Bed days where patients underwent invasive ventilation made up 39% of all bed days in 2023. The crude mortality rate was 20%.

Four of the 29 Units had gaps in data coverage for 2023. Tallaght University Hospital ICU and University Hospital Kerry ICU submitted data for only 9 months, and Wexford General Hospital ICU and Midland Regional Hospital Portlaoise ICU submitted data for only 6 months (Figure 4.1). If Units had gaps in data, estimated numbers for the entire year were calculated by extrapolation from the available data. When the data for the four Units with gaps were extrapolated for the full year, the total number of admissions for 2023 was estimated as 15,761, and the total number of patients admitted was estimated as 14,945.

The actual numbers of patients admitted to each Unit documented by the INICUA are shown in Figure 4.1 (represented by the dark green bars). Additional admissions as estimated by extrapolation for Units with gaps in data coverage are shown in light green. This extrapolation allowed an estimation of the true numbers of admissions to each Unit.

"And so began 10 weeks where I journeyed through three hospitals and three ICUs." - *Olga Barry*

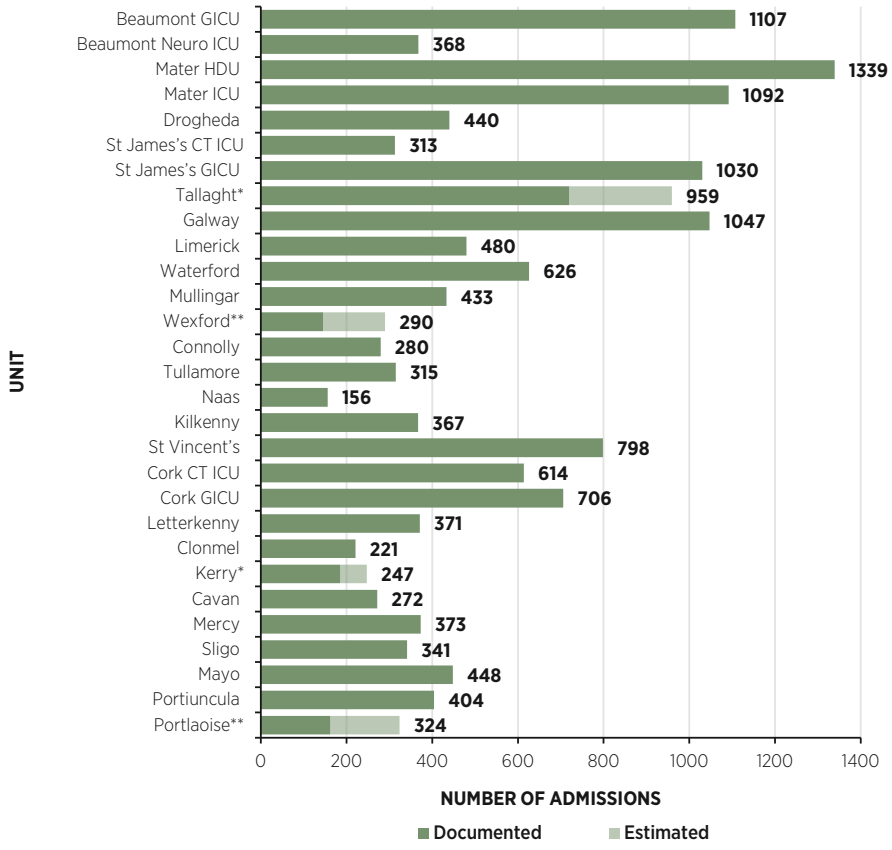


FIGURE 4.1: NUMBER OF ADMISSIONS TO EACH UNIT IN 2023

* No data for one quarter.
** No data for two quarters.

DEMOGRAPHICS

The mean age of patients admitted to ICU in 2023 was 61 years, and 60% were male (Appendix 2).

Source of admissions: non-theatre and theatre locations

Sixty-two percent of patients came to ICU from a location other than the operating theatre (OT) (Figure 4.2). Sources of admission included 22% from wards, 32% from the Emergency Department and 8% direct to ICU from another hospital. Patients admitted from a non-theatre location often suffer from a variety of serious conditions (e.g. sepsis, COVID-19, cardiac arrest, liver disease, haemorrhage, or postoperative complications). These patients are usually admitted to ICU as an emergency; their admission is typically unplanned and unpredictable; they tend to be sicker than patients admitted from the OT; and they have a greater risk of death. Patients coming from a non-theatre location ranged from 8% of all admissions (Cork University Hospital Cardiothoracic ICU) to 94% of all admissions (Midland Regional Hospital Portlaoise ICU).

Patients admitted directly from the OT after elective surgery made up 24% of all ICU admissions in 2023. A smaller proportion of admissions to ICU after elective surgery may reflect changing surgical practice (e.g. increased numbers of laparoscopic procedures), decreased access to ICU beds, or the development of Post-Anaesthesia Care Units specifically for the care of patients after surgery, or it may indicate that increased ICU capacity has primarily been required for non-operative patients.

Unit admissions after emergency surgery varied from 40% of all admissions (Beaumont Hospital (Richmond) Neurosurgical ICU) to 2% (Midland Regional Hospital Portlaoise ICU) (Figure 4.2). Patients admitted to ICU after emergency surgery are known to have a higher mortality rate in ICU than those admitted after elective surgery.

"In the ICU, it was all about one individual being especially cared for." *- Olga Barry*

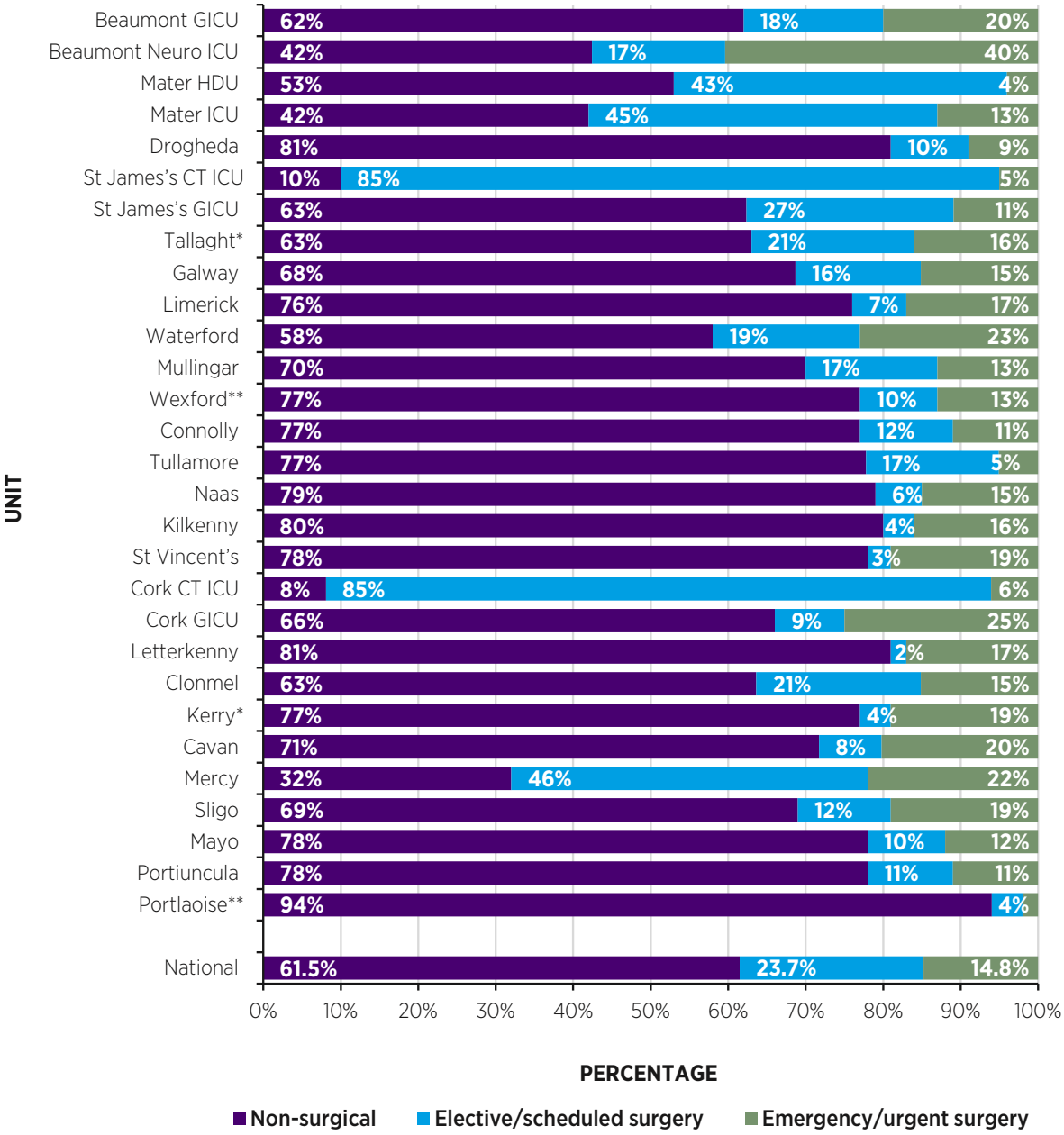


FIGURE 4.2: ADMISSIONS TO EACH UNIT AS A PERCENTAGE OF ALL UNIT ADMISSIONS: (1) FROM A NON-THEATRE LOCATION; (2) DIRECTLY FROM OT AFTER ELECTIVE/SCHEDULED SURGERY; AND (3) DIRECTLY FROM OT AFTER EMERGENCY/URGENT SURGERY

* No data for one quarter.
** No data for two quarters.

There were 1,244 recorded admissions of 1,130 patients to ICU after trauma in 2023; the mortality rate for these patients was 19%.

There were 423 recorded admissions of 372 patients to ICU after a traumatic brain injury (TBI) (there were 51 readmissions).

Of these 372 TBI patients, 206 (55%) were admitted to ICU in a neurosurgical centre (in Beaumont Hospital or Cork University Hospital) at some point during their care; the mortality rate in this group was 29%. A total of 166 patients underwent ICU management only in a non-neurosurgical ICU; the mortality rate in this group was 30%. Patients with either a mild TBI or with very severe TBI (who are not expected to survive) tend not to be transferred to a neurosurgical centre, which may explain these similar mortality rates.

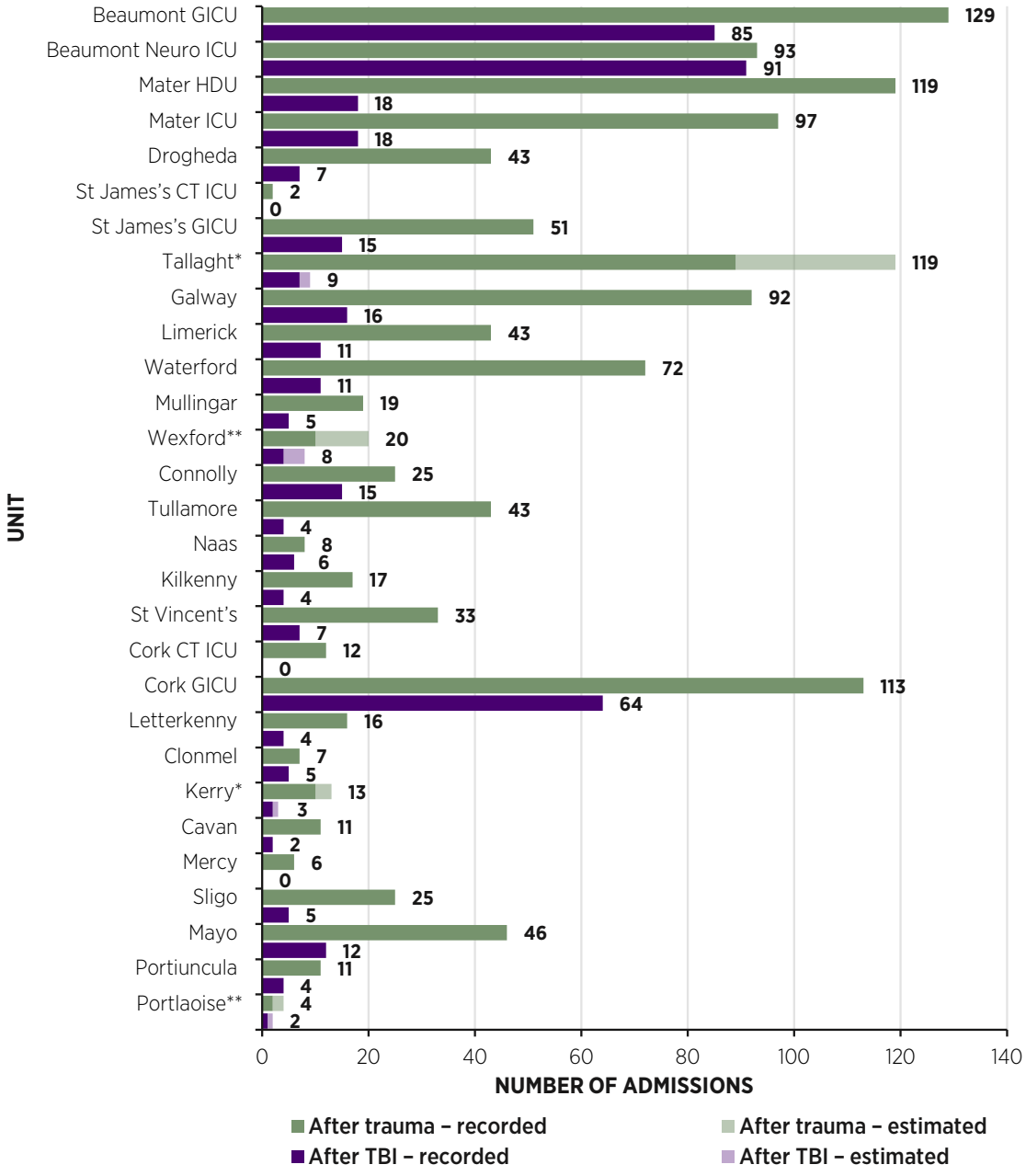


FIGURE 4.3: NUMBER OF ADMISSIONS TO EACH UNIT: (1) AFTER ANY TRAUMA (TOTAL = 1289~), AND (2) AFTER TRAUMATIC BRAIN INJURY (TBI) (TOTAL = 431~)

~ Includes both recorded and estimated numbers.
* No data for one quarter.
** No data for two quarters.

ICU ADMISSIONS WITH ACUTE KIDNEY INJURY

Acute kidney injury (AKI) is associated with increased mortality and morbidity, both during the current hospital admission and in the longer term. The Kidney Disease: Improving Global Outcomes (KDIGO) classification system is used to define and grade AKI as KDIGO Stages 1–3 (Kidney Disease: Improving Global Outcomes (KDIGO) Acute Kidney Injury Workgroup, 2012). KDIGO Stage 1 is defined as an increase in serum creatinine to more than 1.5 times above the baseline value, or oliguria (urine output of less than 0.5 ml/kg per hour for more than 6 hours). Nationally, 51% of patients had AKI (KDIGO Stages 1–3) in the first 24 hours after ICU admission in 2023 (Figure 4.4). AKI within 24 hours of ICU admission usually reflects kidney injury that occurred before admission to the ICU.

KDIGO Stage 3 is defined as an increase in serum creatinine to more than three times the baseline value, or more prolonged oliguria. KDIGO Stage 3 indicates a greater severity of AKI with a greater requirement for dialysis and an increased risk of death. The incidence of KDIGO Stage 3 (severe AKI) within 24 hours of admission to ICU ranged from 3% (Beaumont Hospital (Richmond) Neurosurgical ICU, St James's Hospital Cardiothoracic ICU, Cork University Hospital Cardiothoracic ICU, and Midland Regional Hospital Portlaoise ICU) to 22% (Cork University Hospital General ICU). Nationally, 13.7% of patients had KDIGO Stage 3 AKI within 24 hours of ICU admission, which is similar to the percentage in the United Kingdom (UK) (12.3%).

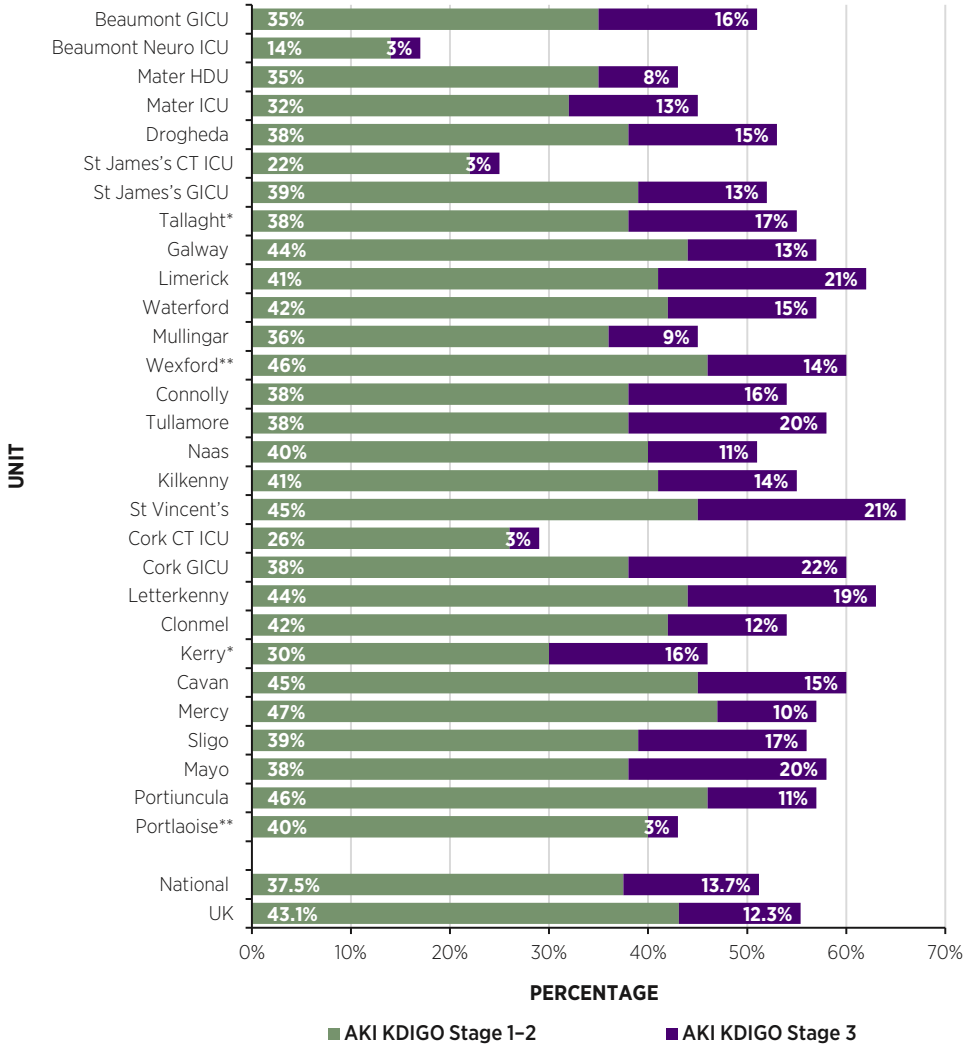
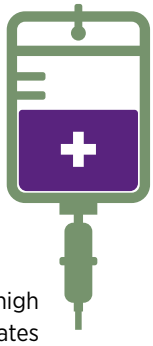


FIGURE 4.4: PATIENTS WITH AKI DURING THE FIRST 24 HOURS AFTER ADMISSION TO THE ICU (KDIGO (KIDNEY DISEASE: IMPROVING GLOBAL OUTCOMES STAGES 1–3), AS A PERCENTAGE OF ALL UNIT ADMISSIONS

* No data for one quarter.
** No data for two quarters
Source: INICUA (ROI) and ICNARC (UK) data

ICU ADMISSIONS WITH SEPSIS



A total of 4,907 admissions (32% of all admissions) were admitted to adult ICUs with a diagnosis of sepsis (Sepsis-3 criteria) at the time of admission (Figure 4.5) in 2023. The National Sepsis Report documented 14,795 adult patients with sepsis in 2023; our data suggest that 31% of patients documented in the INICUA were admitted to ICU or HDU. This is comparable to the *National Sepsis Report 2023* value of 28% of sepsis patients being admitted to a Critical Care Unit.

Sepsis associated with dysfunction in four or more organ systems indicates severe illness and has a high mortality rate. Developing this severity of illness within 24 hours of ICU admission commonly indicates delayed admission to ICU. The proportion of patients with sepsis and dysfunction in four or more organ systems within 24 hours of admission ranged from 0% (St James's Hospital Cardiothoracic ICU) to 7% (Our Lady of Lourdes Hospital Drogheda ICU, Connolly Hospital ICU, and Cork University Hospital General ICU). Nationally, patients admitted with sepsis and dysfunction in four or more organ systems made up 3.5% of all ICU admissions in 2023 (this figure was also 3.5% in 2022).

"I didn't yet know that I had sepsis, obviously, but then it developed pretty quickly. Thinking about sepsis and Savita Halappanavar, I didn't want to become a famous coroner case..." - *Olga Barry*

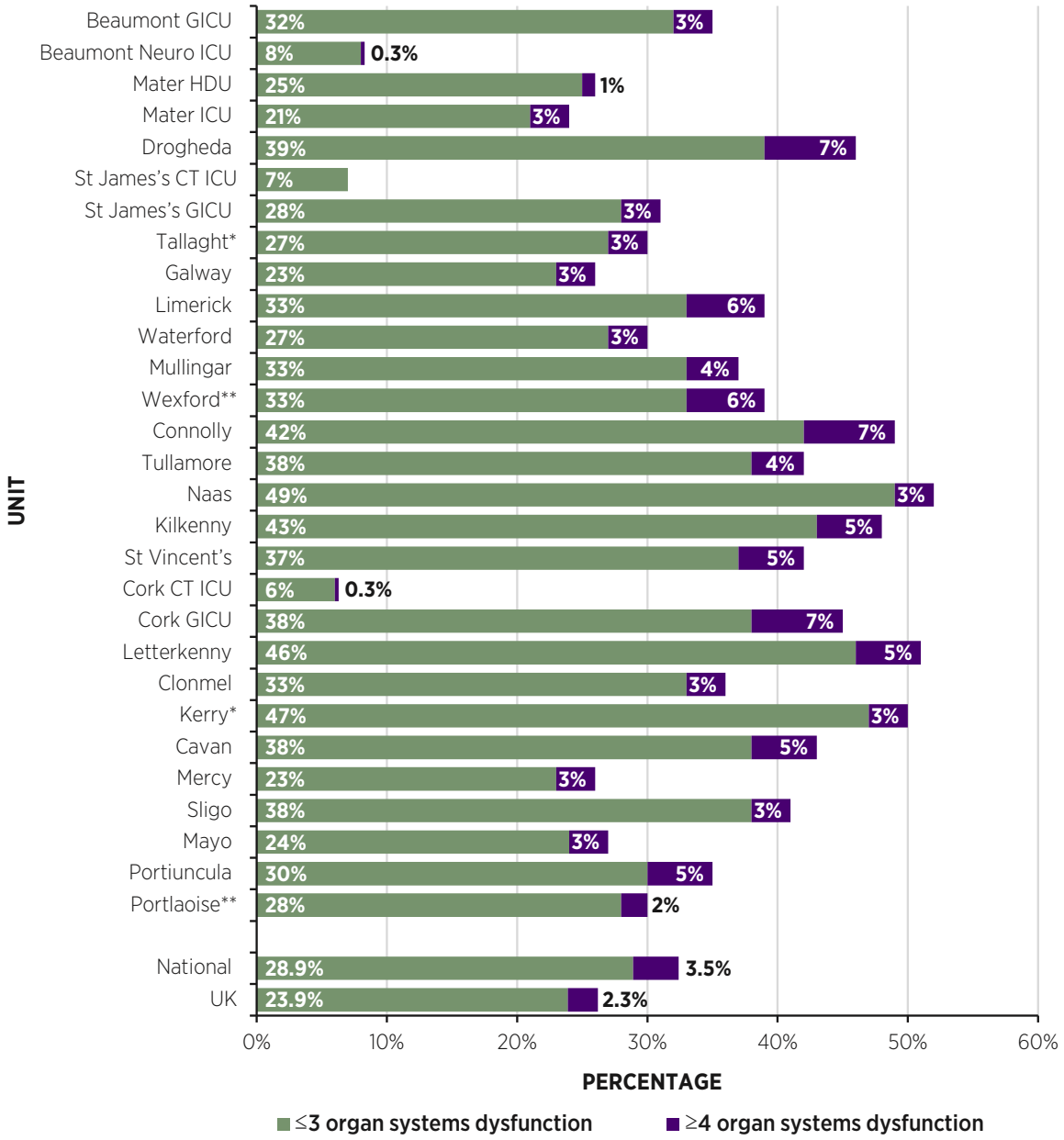


FIGURE 4.5: ADMISSIONS TO THE UNIT WITH A DIAGNOSIS OF SEPSIS (SEPSIS-3) WITH DYSFUNCTION IN: (1) THREE OR FEWER OR (2) FOUR OR MORE ORGAN SYSTEMS WITHIN 24 HOURS OF ADMISSION, AS A PERCENTAGE OF ALL UNIT ADMISSIONS

* No data for one quarter.
** No data for two quarters
Source: INICUA (ROI) and ICNARC (UK) data

ADMISSIONS TO ICU AFTER CARDIOPULMONARY RESUSCITATION

A requirement for cardiopulmonary resuscitation (CPR) before ICU admission is a negative prognostic indicator. The proportion of patients who underwent CPR within 24 hours before admission to ICU in 2023 ranged from 0.2% to 14% (Figure 4.6). The overall proportion of ICU admissions that followed CPR was 6% in both the ROI and the UK (the corresponding percentages in 2022 were 7% and 6%, respectively).

Admissions to ICU after in-hospital CPR ranged from 0.2% (Mater Misericordiae University Hospital HDU) to 9.0% (Naas General Hospital ICU) of all admissions. The reasons why some Units have higher rates of in-hospital CPR before ICU admission include a failure to recognise deterioration in patients in the ward or delay in ICU admission. NOCA suggests that hospitals should review the reasons for variation in their rates compared with other hospitals and with historical rates in their own hospital. Units should incorporate the measures outlined in the HSE document *Patient Safety Strategy 2019–2024* (HSE, 2019a), including ICU Outreach and improved access to ICU beds.

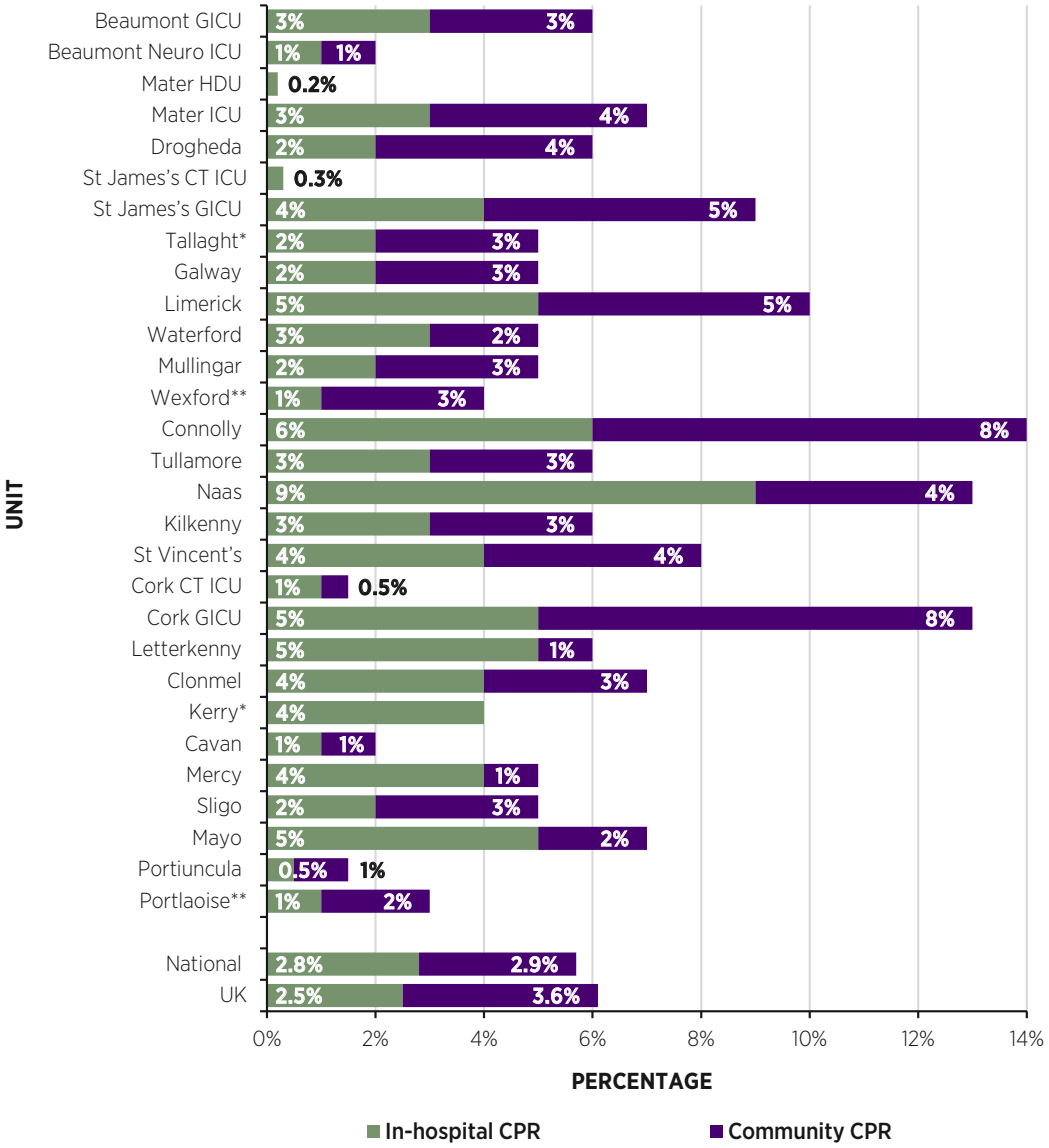


FIGURE 4.6: UNIT ADMISSIONS FOLLOWING CARDIOPULMONARY RESUSCITATION IN THE COMMUNITY OR IN HOSPITAL, AS A PERCENTAGE OF ALL UNIT ADMISSIONS

* No data for one quarter.
** No data for two quarters
Source: INICUA (ROI) and ICNARC (UK) data

SEVERE LIVER DISEASE, HAEMATOLOGICAL MALIGNANCY, AND METASTATIC CANCER

Certain subgroups of patients – patients with severe liver disease, patients with haematological malignancy and patients with metastatic cancer – make up a small proportion of ICU admissions but are important to document. These patients tend to be sicker, have high mortality rates and use more ICU resources than others admitted to ICU.

Severe liver disease is defined for the INICUA by a diagnosis of cirrhosis, hepatic encephalopathy or portal hypertension (with or without variceal bleed). Admissions of patients with severe liver disease ranged from 1% to 8% of all admissions (Figure 4.7A).

Patients with cancer and haematological malignancy are likely to make up an increasing proportion of ICU admissions as the population ages and as developments in treatment improve the prognosis for these conditions. In 2023, admissions of patients with haematological malignancy made up between 0.3% to 8% of all admissions (Figure 4.8A), and admissions of patients with metastatic cancer accounted for between 0.3% to 14% (Figure 4.9A).

The percentages of admissions to ICU with each of these three diagnoses were slightly higher in the ROI compared with the UK.

For each of these three conditions, mortality rates varied widely between Units (Figures 4.7B, 4.8B and 4.9B). This may be due to differing admission policies or to the small numbers of patients admitted with these three conditions.

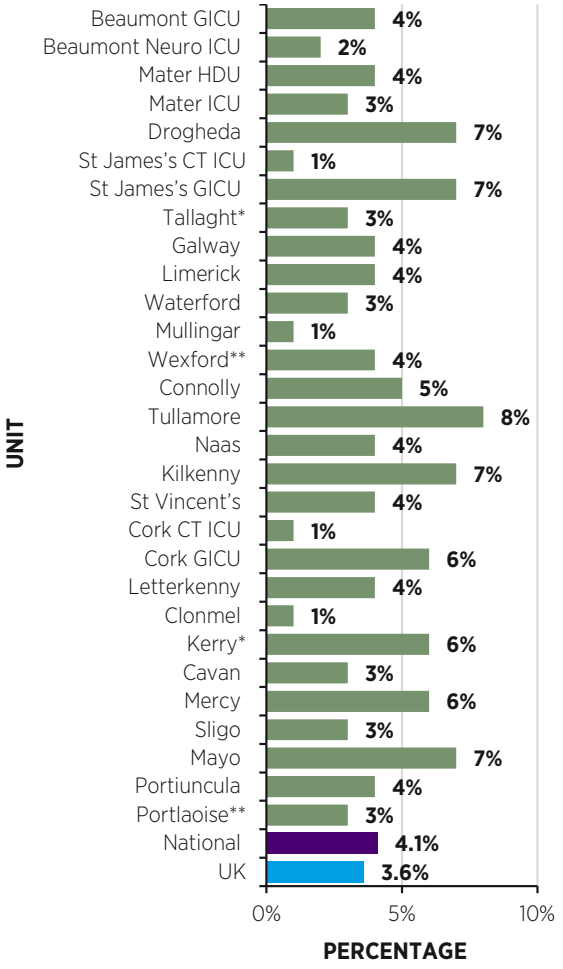


FIGURE 4.7A: UNIT ADMISSIONS WITH SEVERE LIVER DISEASE, AS A PERCENTAGE OF ALL UNIT ADMISSIONS

* No data for one quarter.
** No data for two quarters.
Source: INICUA (ROI) and ICNARC (UK) data

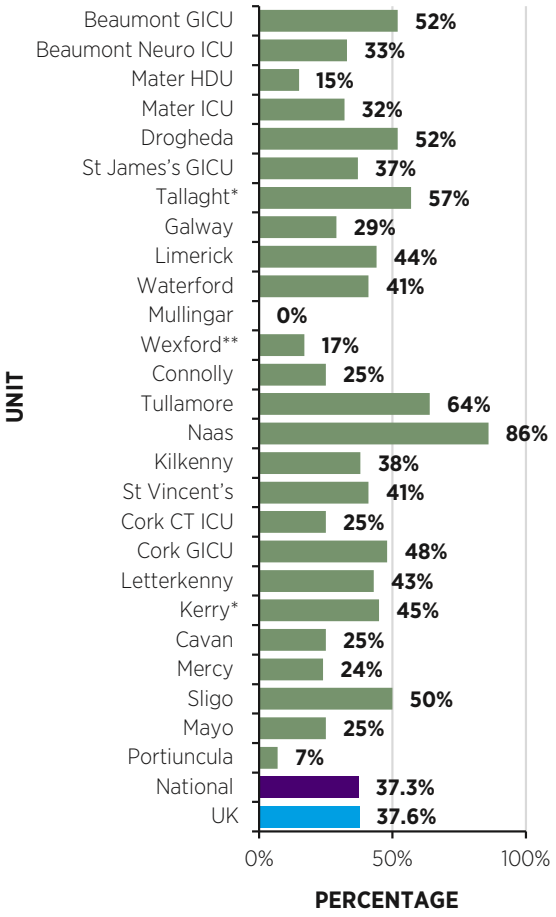


FIGURE 4.7B: HOSPITAL MORTALITY RATE FOR UNIT ADMISSIONS WITH SEVERE LIVER DISEASE (UNITS WITH FIVE OR MORE ADMISSIONS ONLY)

* No data for one quarter.
** No data for two quarters.
Source: INICUA (ROI) and ICNARC (UK) data

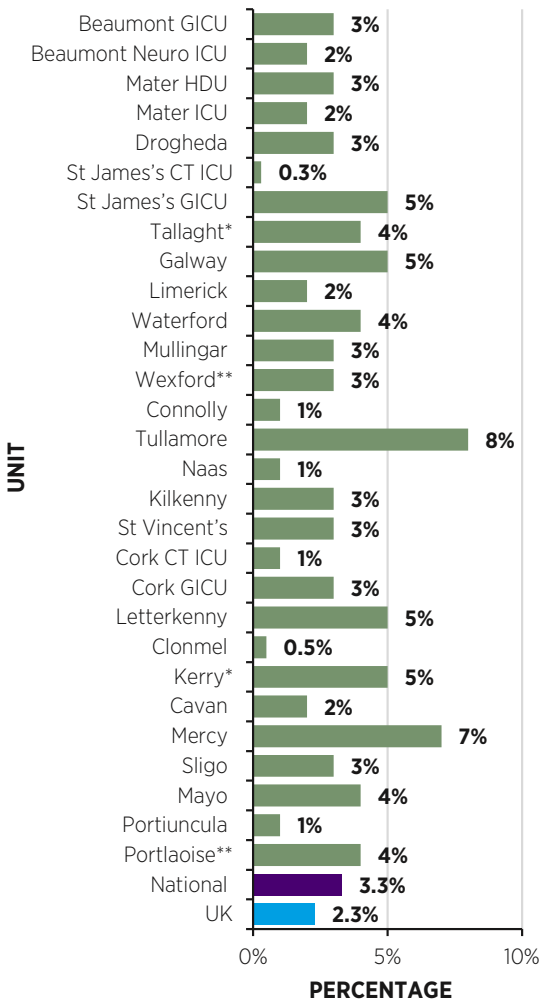


FIGURE 4.8A: UNIT ADMISSIONS WITH HAEMATOLOGICAL MALIGNANCY, AS A PERCENTAGE OF ALL UNIT ADMISSIONS

* No data for one quarter.
** No data for two quarters.
Source: INICUA (ROI) and ICNARC (UK) data

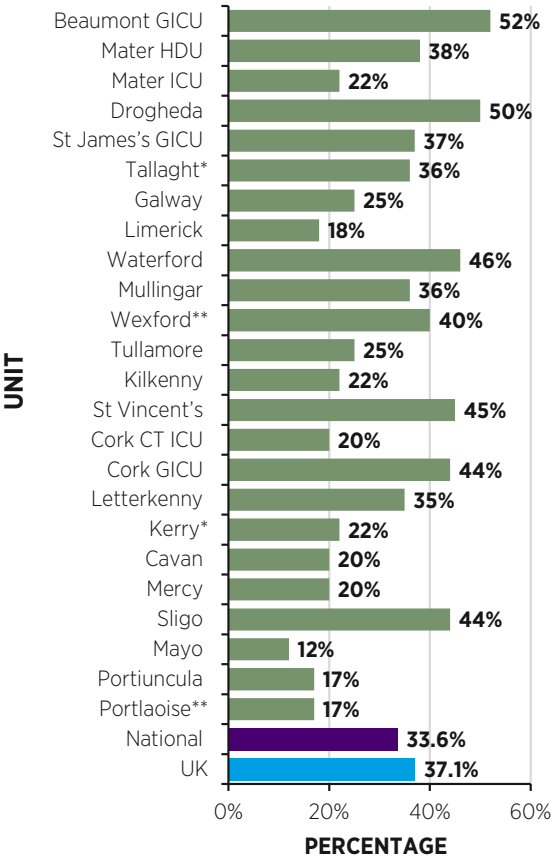


FIGURE 4.8B: HOSPITAL MORTALITY RATE FOR UNIT ADMISSIONS WITH HAEMATOLOGICAL MALIGNANCY (UNITS WITH FIVE OR MORE ADMISSIONS ONLY)

* No data for one quarter.
** No data for two quarters.
Source: INICUA (ROI) and ICNARC (UK) data

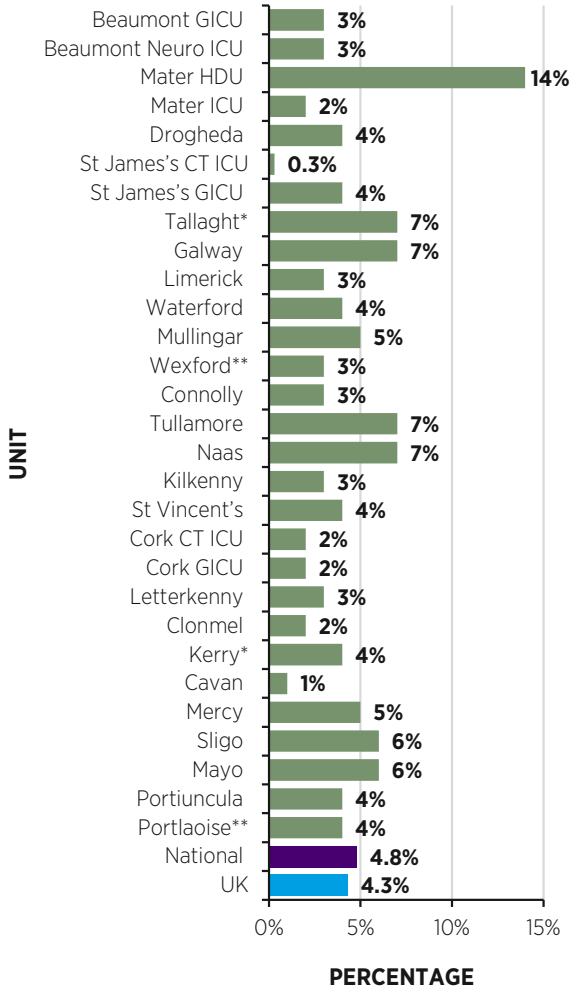


FIGURE 4.9A: UNIT ADMISSIONS WITH METASTATIC DISEASE, AS A PERCENTAGE OF ALL UNIT ADMISSIONS

* No data for one quarter.
** No data for two quarters.
Source: INICUA (ROI) and ICNARC (UK) data

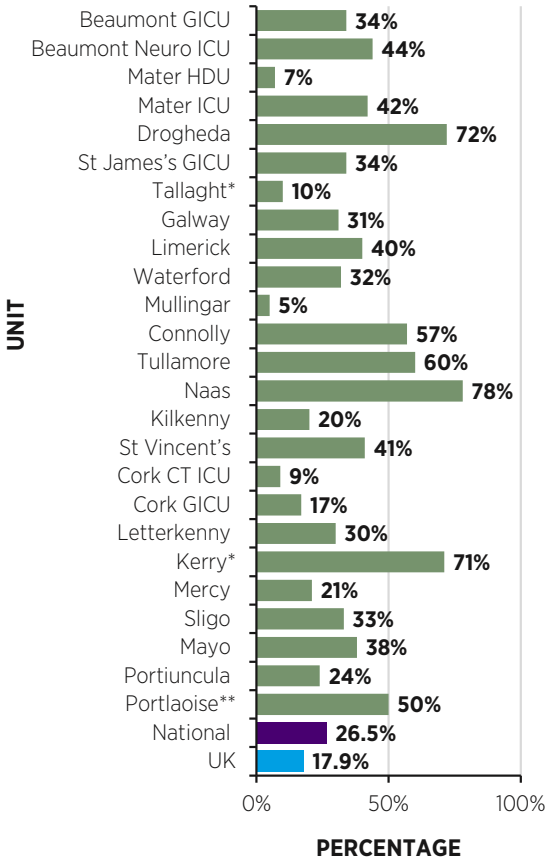


FIGURE 4.9B: HOSPITAL MORTALITY RATE FOR UNIT ADMISSIONS WITH METASTATIC DISEASE (UNITS WITH FIVE OR MORE ADMISSIONS ONLY)

* No data for one quarter.
** No data for two quarters.
Source: INICUA (ROI) and ICNARC (UK) data

COVID-19 ACTIVITY IN IRELAND

The INICUA documented 309 ICU admissions of 297 patients with COVID-19 in 2023. This represented 2% of all admissions to ICU in 2023, compared with 6% of all Unit admissions in 2022 and 15% in 2021 (INICUA data). Patients with COVID-19 accounted for 5% of all ICU beds occupied in 2023, compared with 12% in 2022 and 29% in 2021 (ICU-BIS data). The mortality rate for patients with COVID-19 before discharge from acute hospital was 37% (versus 38% in 2022 and 36% in 2021), compared with a 20% mortality rate for the overall ICU population.

Chapter 9 provides a more detailed description of COVID-19 activity in ICUs in 2023.

CHILDREN IN ADULT ICUs

Ideally, all patients aged under 16 years should be admitted to a specialist paediatric ICU if they require ICU care. In 2023, the INICUA documented 148 children aged under 16 years who were admitted to 13 adult ICUs, which accounted for 1% of all Unit admissions (compared with 0.6% in 2022) (Table 4.2).

TABLE 4.2: CHILDREN AGED UNDER 16 YEARS ADMITTED TO ADULT INTENSIVE CARE UNITS: AGE, CASE MIX, VENTILATION, LENGTH OF STAY, AND RATES OF SURVIVAL TO HOSPITAL DISCHARGE, 2020–2023

Parameter	2020	2021	2022	2023
Number of patients aged <16 years (% of all Unit admissions)	68 (0.6%)	53 (0.4%)	64 (0.6%)	148 (1.0%)
Mean age in years (median; interquartile range (IQR))	9 (12; 5–14)	8 (7; 1–14)	8 (11; 2–14)	6 (5; 1–12)
Number of patients aged <1 year	5	7	10	31
Number of patients aged 1–5 years	16	16	15	45
Number of admissions after surgery	7	8	8	14
Number of admissions with sepsis	11	9	17	43
Number of patients on invasive ventilation (%)	21 (31%)	20 (38%)	20 (31%)	46 (31%)
Mean Unit length of stay (LOS), in hours (median; IQR)	38 (16; 10–32)	24 (16; 6–35)	68 (15; 8–21)	18 (12; 5–1)
Number of Unit survivors (%)	67 (99%)	50/52 (96%) *	64 (100%)	146 (99%)
Number of hospital survivors (%)	65 (96%)	47/52 (90%) *	62 (97%)	141 (95%)

* Status at discharge was unavailable for one admission.

Most Units had very small numbers of children admitted, with the exception of hospitals in the Saolta University Healthcare Group (University Hospital Galway, Letterkenny University Hospital, Sligo University Hospital, Mayo University Hospital, and Portiuncula University Hospital), which admitted 78% of all children who were admitted to adult ICUs in 2023 (Table 4.3). This presumably reflects the geographical distance of these hospitals from the specialist paediatric hospitals. LOS was very short in these hospitals, indicating that there was rapid transfer to a paediatric Unit if ICU care was going to be prolonged.

The five Units in the Saolta University Healthcare Group were the only adult ICUs that admitted children aged under 1 year in 2023 (Table 4.3). Admission of children to adult ICUs is not considered best practice, especially for very young children, and these data suggest that there should be a review of how best to manage these children.

The INICUA data show a sharp increase in the numbers of children in all age groups who were admitted to adult ICUs in 2023 compared with 2022. This is partly explained by the 38% increase in the total number of admissions documented by the INICUA in 2023 due to additional Units participating and fewer gaps in data. Two hospitals that joined the INICUA in 2023 (Portiuncula University Hospital and Mayo University Hospital) accounted for half of the increase in the number of patients aged under 1 year and aged 1–5 years who were admitted to adult ICUs. The mini-epidemic of respiratory syncytial virus (RSV) cases in infants in winter 2023 also contributed to this increase.

TABLE 4.3: PATIENTS AGED UNDER 16 YEARS ADMITTED TO ADULT ICUs BY AGE GROUP, MEAN LENGTH OF STAY, AND NUMBERS VENTILATED

	Patients aged <1 year (n)	Patients aged 1-5 years (n)	Patients aged 6-15 years (n)	Mean LOS, in hours (median)	Ventilated (n)
University Hospital Galway	8	24	19	16 (12)	15
University Hospital Waterford	0	0	5	31 (20)	1
Midland Regional Hospital Tullamore	0	0	1	-	0
St Luke's General Hospital, Carlow/Kilkenny	0	0	1	-	0
St Vincent's University Hospital	0	0	2	211 (211)	2
Cork University Hospital	0	0	6	27 (22)	3
Letterkenny University Hospital	3	3	4	10 (8)	3
Tipperary University Hospital	0	0	2	14 (14)	0
University Hospital Kerry*	0	0	3	23 (16)	1
Mercy University Hospital	0	0	2	82 (82)	1
Sligo University Hospital	6	3	8	14 (4)	9
Mayo University Hospital	3	7	9	9 (6)	7
Portiuncula University Hospital	11	8	10	10 (8)	4

Note: LOS data were omitted where they may be considered identifiable data.
* No data for one quarter.

OBSTETRIC ADMISSIONS TO ICU IN 2023

The INICUA documented the admission of 175 patients who were pregnant or recently pregnant (delivered within the previous 6 weeks) to ICU in 2023; these admissions made up 1.2% of all ICU admissions in 2023 (Table 4.4). Of these obstetric admissions, 19% were still pregnant on admission to ICU, with gestations ranging from 4 to 36 weeks, while 81% had already delivered, usually just before ICU admission (Table 4.5). We do not have data on foetal outcomes for these patients.

Obstetric patients were younger than the average ICU admission and had lower illness severity scores. Nevertheless, 19% of them required invasive ventilation, 6% required advanced cardiovascular support, and 2% required dialysis.

Patient demographics and clinical features were similar in 2022 and 2023. The median LOS in ICU for obstetric patients was relatively short, at 31 hours. All obstetric patients were discharged alive from ICU.

Only one recently pregnant patient was admitted to ICU with COVID-19 during 2023. This compares with 7% of all obstetric admissions being admitted with COVID-19 in 2022 and 36% in 2021. The 2023 patient with COVID-19 required only basic respiratory support.

TABLE 4.4: OBSTETRIC PATIENTS (PREGNANT OR RECENTLY PREGNANT ADMITTED TO ICU OR HDU: DEMOGRAPHICS, ILLNESS SEVERITY, SUPPORT PROVIDED, AND OUTCOME, 2020–2023

	2020	2021	2022	2023
Total number of obstetric admissions (as % of all Unit admissions)	**149 (1.3%)**	**196 (1.6%)**	**144 (1.3%)**	**175 (1.2%)**
Mean age in years (standard deviation, SD)	33 (6)	32 (6)	33 (6)	33 (7)
Age range years	18–50	17–46	17–47	14–51
Mean body mass index (BMI, in kg/m²) (SD)	27 (5.4)	29 (7)	29 (7)	30 (7)
BMI range	18–41	14–58	17–56	19–51
Median APACHE II score (IQR)	8 (6–11)	9 (7–13)	9 (7–13)	9 (6–11)
Median ICNARC Physiology Score (IQR)	8 (6–12)	10 (7–15)	10 (7–13)	8 (6–12)
Mean % predicted risk of death (SD)	3% (10%)	3% (7%)	4% (11.4%)	2% (7%)
Invasive ventilation (% of total admissions)	24%	30%	24%	19%
Advanced cardiovascular support	1%	3%	4%	6%
Dialysis	1%	4%	2%	2%
Median Unit LOS, in hours (IQR)	40 (20–71)	43 (19–113)	34 (21–74)	31 (18–57)
Number of obstetric patients discharged alive from ICU (%)	148 (99%)	195 (99%)	142 (99%)	175 (100%)
Number of obstetric admissions with a diagnosis of COVID-19 (as % of all admissions with COVID-19)	3/536 (0.6%)	71/1671 (4%)	10/615 (2%)	1/297 (0.3%)

TABLE 4.5: CURRENTLY PREGNANT AND RECENTLY PREGNANT ADMISSIONS TO ICUS, 2020–2023

	2020	2021	2022	2023
Currently pregnant admissions, as % of all obstetric admissions	19%	31%	31%	19%
Currently pregnant admissions: mean gestation of pregnancy on ICU admission, in weeks (range)	24 (5–38)	25 (4–37)	27 (10–38)	26 (4–36)
Recently pregnant admissions (n)	120	135	99	142
Mean gestation at delivery of recently pregnant patients, in weeks (range)	34 (5–41)	35 (3–41)	34 (2–41)	35 (4–43)

FINDINGS FROM CHAPTER 4

- The INICUA documented the activity that occurred in 29 ICUs/HDUs in 25 adult public hospitals in the ROI during 2023. These hospitals provided 99.8% of all Level 3 ICU care delivered in adult HSE-funded hospitals. The INICUA documented 15,152 admissions of 14,363 patients within these Units.
- The mean age of patients admitted to ICU in 2023 was 61 years, and 60% of patients were male.
- There were 5,826 admissions of patients directly to ICU from the operating theatre (OT) after surgery: 15% (2,242) of all admissions occurred after emergency surgery and 24% (3,584) occurred after elective surgery. The remaining ICU admissions came from the ward, the Emergency Department or another hospital.
- In 2023, 1,130 patients were admitted to ICU after trauma; the mortality rate for these patients was 19%.
- There were 372 patients admitted to ICU after a traumatic brain injury (TBI) in 2023. Of these patients, 206 (55%) were admitted to ICU in a neurosurgical centre (in Beaumont Hospital or Cork University Hospital) at some point during their care; the mortality rate in this group was 29%. A total of 166 patients underwent ICU management only in a non-neurosurgical ICU; the mortality rate in this group was 30%. Patients with either a mild TBI or with very severe TBI (who are not expected to survive) tend not to be transferred to a neurosurgical centre, which may explain these similar mortality rates.
- A total of 7,763 (51%) ICU admissions in 2023 had AKI within 24 hours of admission, including 2,075 (14% of admissions) with severe AKI (KDIGO Stage 3).
- There were 4,907 admissions of patients (32% of all admissions) who fulfilled the Sepsis-3 criteria for sepsis on admission to ICU.
- In 2023, 424 patients required in-hospital CPR during the 24 hours before ICU admission. The percentage of admissions that followed in-hospital CPR varied across Units, from less than 1% up to 9%.
- Small numbers of admissions had severe liver disease (4.1%), haematological malignancy (3.3%), or metastatic cancer (4.8%), and patients in these groups had high mortality rates; nevertheless, 63%, 66%, and 73%, respectively, survived to leave hospital alive.
- There were 309 admissions of 297 patients with a diagnosis of COVID-19. This accounted for 2% of all admissions to ICU in 2023, compared with 6% in 2022 and 15% in 2021. Patients with COVID-19 accounted for 5% of all ICU beds occupied in 2023, compared with 12% in 2022 and 29% in 2021.
- The hospital mortality rate for patients with COVID-19 who were admitted to ICU in 2023 was 37% (versus 38% in 2022 and 36% in 2021), compared with a 20% mortality rate for the overall ICU population.
- A total of 148 children aged under 16 years were admitted to 13 adult ICUs in 2023 (1% of all admissions, compared with 0.6% in 2022).
- All 31 children aged under 1 year who were admitted to an adult ICU were admitted to hospitals in the Saolta University Healthcare Group.
- There were 175 patients who were pregnant (19%) or recently pregnant (81%) admitted to ICU, representing 1.2% of all admissions to ICU in 2023. All these obstetric patients were discharged alive from ICU.

CHAPTER 5

SEVERITY OF ILLNESS AND PROVISION OF ORGAN SUPPORT IN ICU

CONTENTS

CHAPTER 5: SEVERITY OF ILLNESS AND PROVISION OF ORGAN SUPPORT IN ICU

ASSESSING ILLNESS SEVERITY ON ADMISSION TO ICU

ICU patients vary widely in the severity of their illness, and data from two separate illness severity scoring systems are presented in this report: (1) APACHE II and (2) the risk of mortality as predicted by the ICNARC$_{H\text{-}2023}$ model.

The APACHE II scoring system is the most widely used measure of illness severity in critically ill patients. APACHE II scores are based on patient age, pre-existing health conditions and acute physiological derangement during the first 24 hours after ICU admission.

In 2023, mean APACHE II scores ranged from 11 to 20 across the Units participating in the INICUA, reflecting differences in case mix between Units (Figure 5.1). The mean APACHE II score for all admissions in participating Units in the ROI was 15.9 (versus 14.7 in the UK). The values for 2022 were 16.2 and 14.5, respectively.

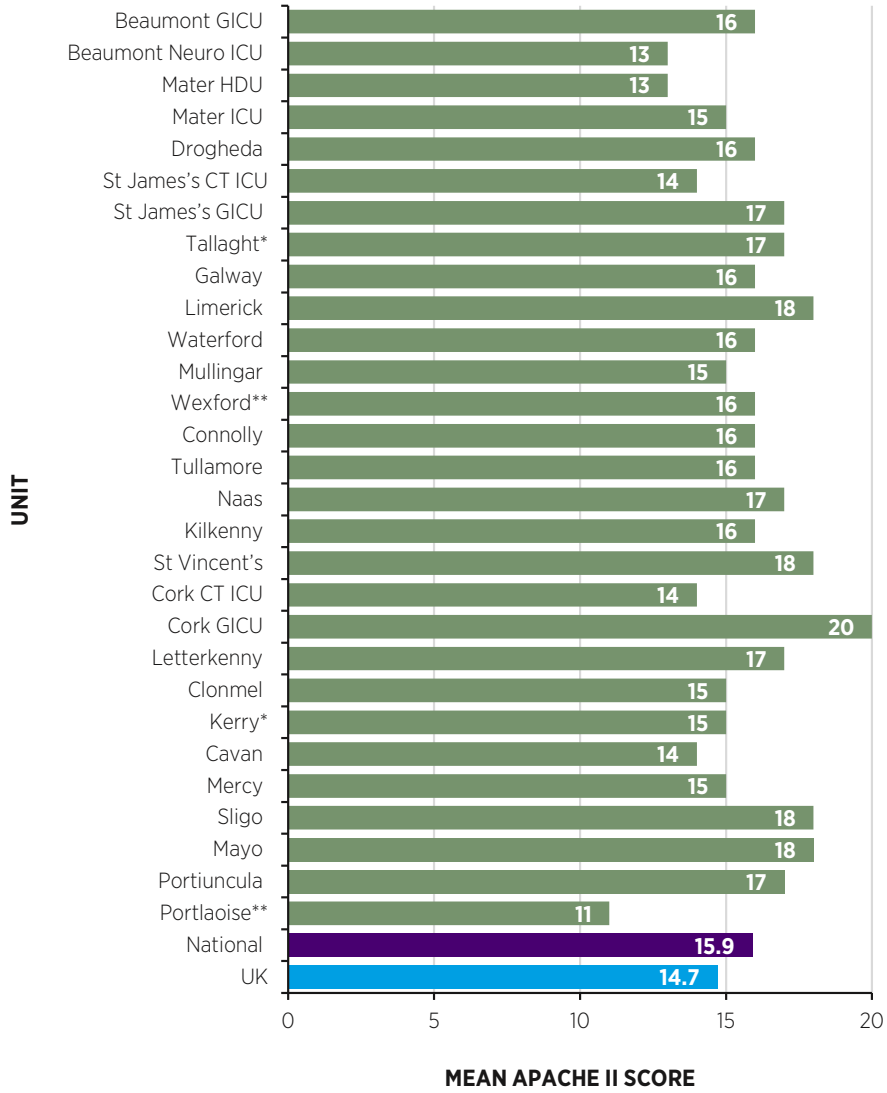


FIGURE 5.1: MEAN APACHE II SCORES FOR EACH UNIT

* No data for one quarter.
** No data for two quarters
Source: INICUA (ROI) and ICNARC (UK) data

PREDICTED RISK OF DEATH ON ADMISSION TO ICU

The calculation of the predicted mortality risk for each patient is based on a number of prognostic indicators, including illness severity as assessed by the ICNARC$_{H\text{-}2023}$ model, which ICNARC has validated as a reliable predictor of mortality rates for general ICU populations.

The ICNARC$_{H\text{-}2023}$ model is based on multiple variables, including age, pre-existing medical conditions, dependency before admission, requirement for CPR before ICU admission, admission diagnosis, source of admission, physiological parameters, and requirement for organ support in the first 24 hours after admission.

The predicted mortality rate (Figure 5.2) shows more variability between Units than the APACHE II scores (Figure 5.1), which reflects important differences between Units in case mix and severity of illness, and in some cases may reflect different admission policies regarding patients who are approaching the end of life. The highest median predicted mortality rate in 2023 was for Cork University Hospital General ICU (26%).

The median predicted mortality rate in 2023 was 8.6% for patients in the ROI versus 5.6% for patients in the UK. The corresponding values for 2022 were 10.3% and 5.1%, respectively. Higher predicted mortality rates indicate that patients had to be sicker in order to be admitted to ICU in the ROI. This means that patients who are critically ill are being cared for in the ward; available data indicate that these patients would have a lower risk of death if they were cared for in ICU earlier in their illness.

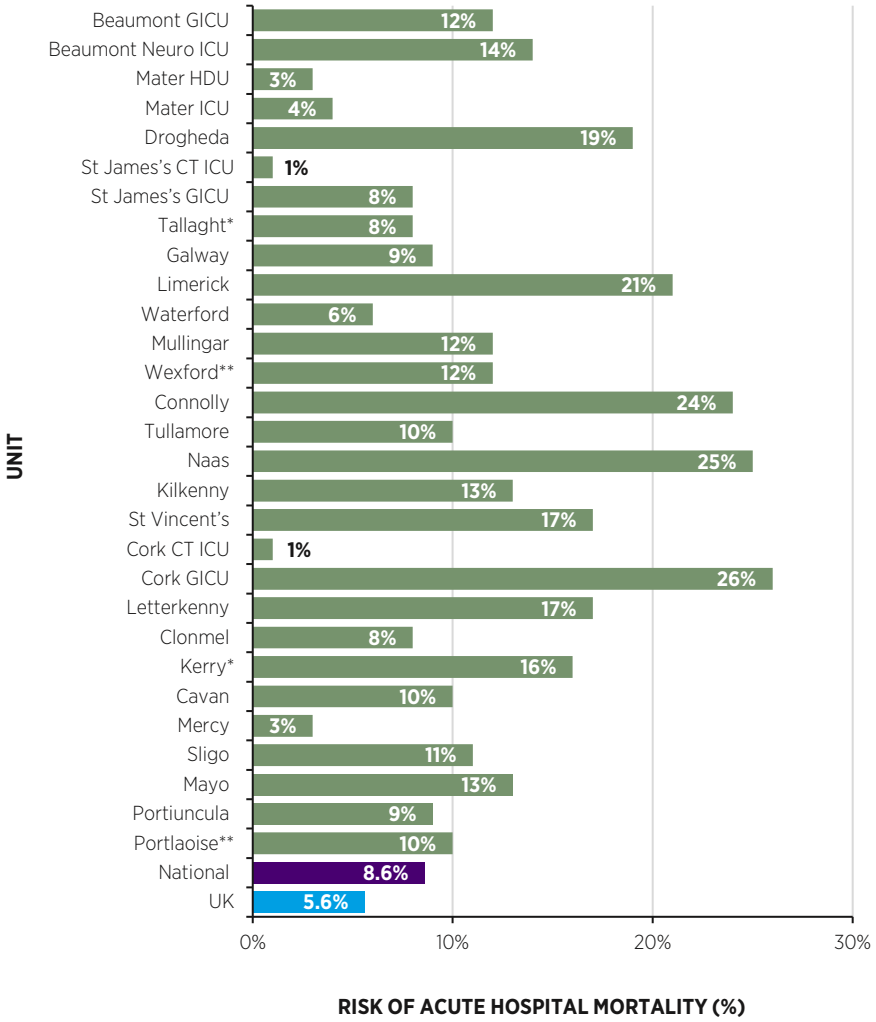


FIGURE 5.2: MEDIAN PREDICTED RISK OF ACUTE HOSPITAL MORTALITY (ICNARC$_{H\text{-}2023}$ MODEL)

* No data for one quarter.
** No data for two quarters
Source: INICUA (ROI) and ICNARC (UK) data

ADVANCED RESPIRATORY SUPPORT AFTER ADMISSION TO ICU

Advanced respiratory support (ARS) is defined as mechanical ventilation via an invasive airway (endotracheal tube or tracheostomy). Patients receiving ARS cannot be safely managed outside ICU, although patients who are ventilated long term via a tracheostomy may be managed on a ward if staff are adequately trained. Therefore, data on the provision of ARS are useful for comparison of illness severity between Units and as an indicator of the ICU bed capacity requirements in different Units.

There was wide variability in the percentage of patients receiving ARS in different Units (Figure 5.3), which included a pure HDU, mixed ICUs/HDUs, and specialist cardiothoracic ICUs. Forty-five percent of patients in Units in the ROI received ARS in 2023 (versus 42% in the UK). The figures for 2022 were 51% and 43%, respectively.

"Because I had the tracheostomy, I couldn't speak." - *Olga Barry*

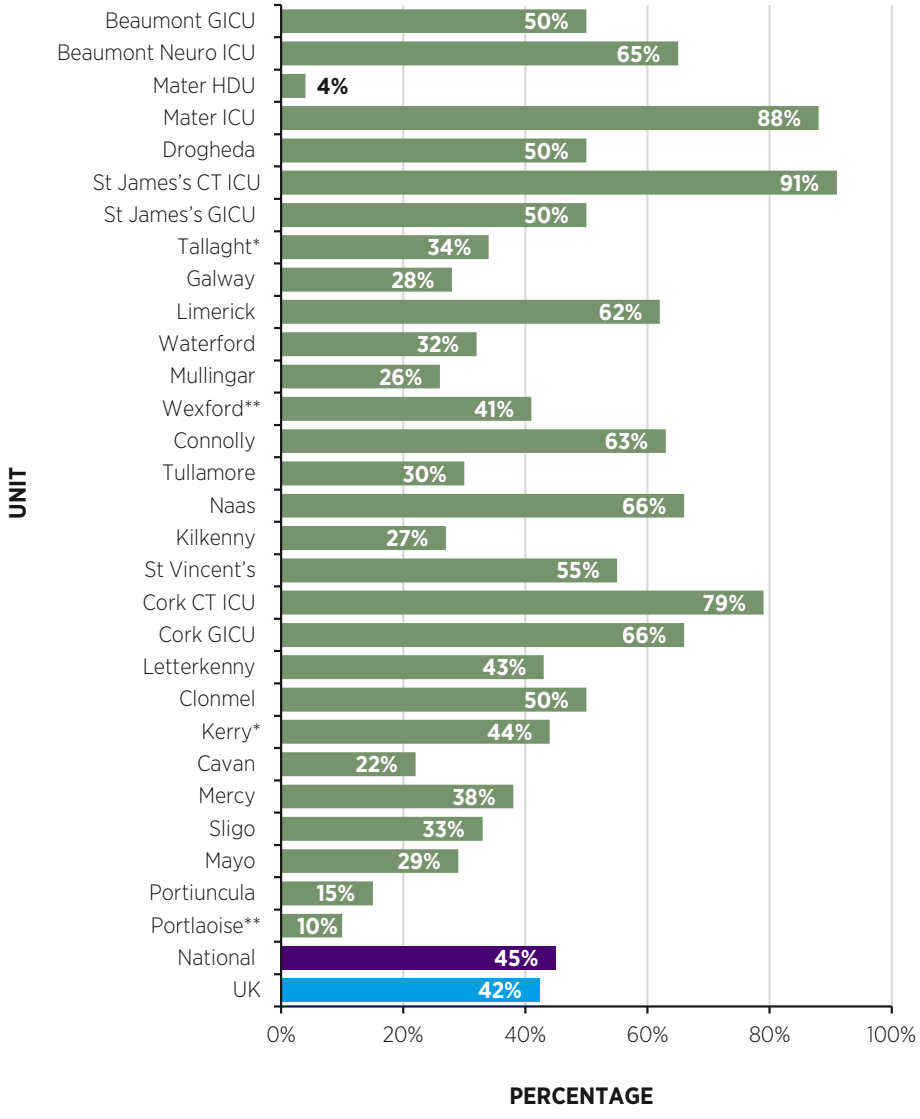


FIGURE 5.3: PATIENTS WHO UNDERWENT INVASIVE VENTILATION (ADVANCED RESPIRATORY SUPPORT), AS A PERCENTAGE OF ALL UNIT ADMISSIONS

* No data for one quarter.
** No data for two quarters
Source: INICUA (ROI) and ICNARC (UK) data

The duration of organ support provided indicates the severity of illness treated in each Unit and the resources required to provide care. The number of days with organ support provided is calculated by counting each day or part of a day as 1 day of organ support.

The percentage of patient days that ARS was provided (Figure 5.4) followed a similar pattern to the percentage of patients who received ARS (Figure 5.3). ARS was provided on 38.6% of patient days in ROI Units versus 38.7% in UK Units. The respective figures for 2022 were 46% and 40%, while in 2021 they were 53% and 50% (reflecting activity related to COVID-19).

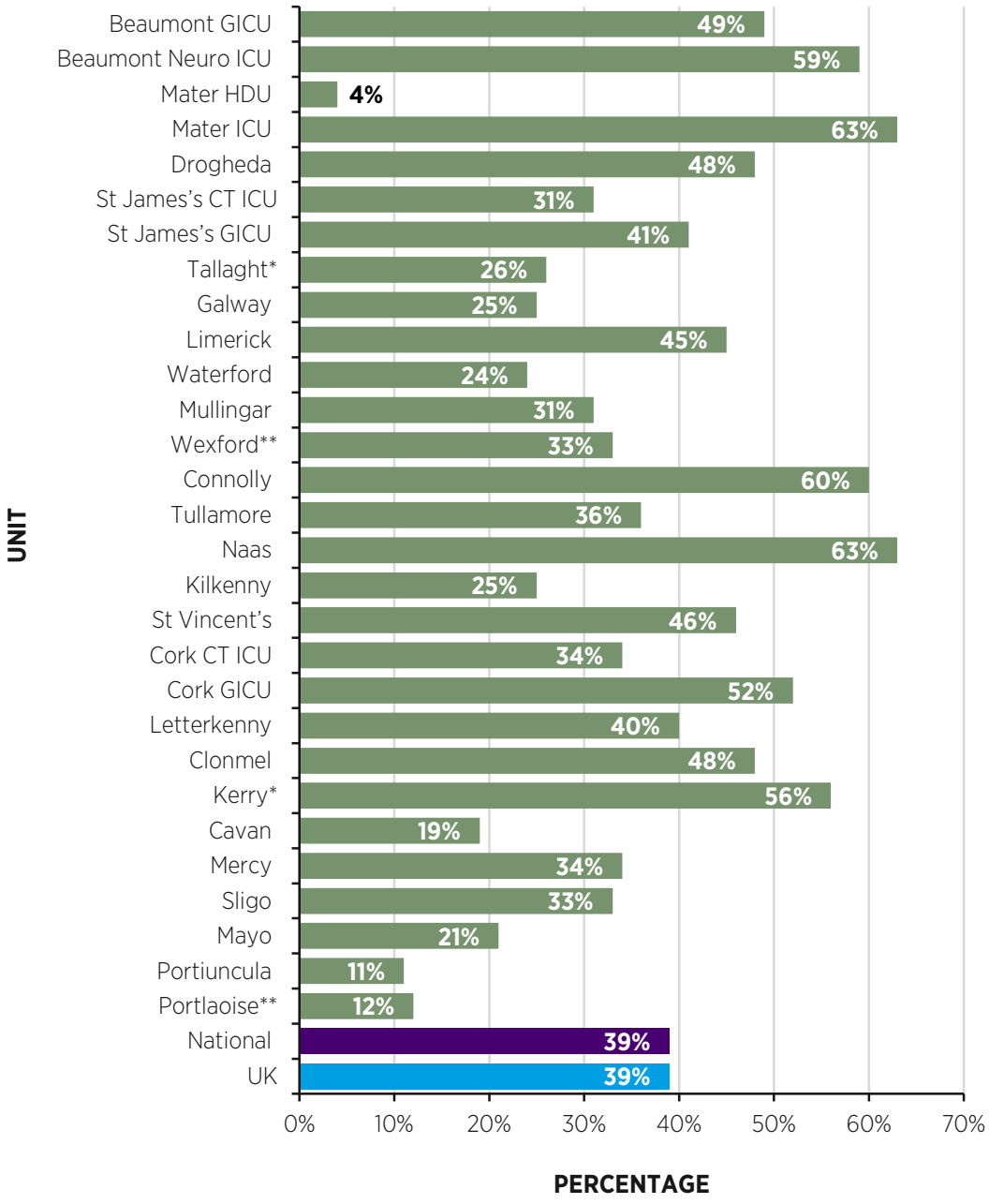


FIGURE 5.4: PATIENT DAYS THAT PATIENTS RECEIVED INVASIVE VENTILATION (ADVANCED RESPIRATORY SUPPORT), AS A PERCENTAGE OF ALL PATIENT DAYS IN UNITS

* No data for one quarter.
** No data for two quarters
Source: INICUA (ROI) and ICNARC (UK) data

PATIENTS RECEIVING LEVEL 3 CARE

ARS is not the only determinant of a requirement for ICU care, and many patients need to be in ICU without requiring ARS (e.g. patients who require vasopressors, dialysis or invasive monitoring, or high-risk patients who require close observation). A standard way of defining the type of patients being cared for in a Unit is to classify them according to the level of support they require, ranging from Level 0 (no support) to Level 3 (a high level of support that requires a nurse–patient ratio of 1:1.

The European Society of Intensive Care Medicine (ESICM) defines those requiring Level 3 ICU care as patients with "multiple (two or more) acute vital organ failure of an immediate life-threatening character" (Valentin *et al*., 2011, pp. 1575-1587). The guidelines of the Joint Faculty of Intensive Care Medicine of Ireland (JFICMI) and Intensive Care Society of Ireland (ICSI) (2019) recommend that Units providing Level 3 care should treat at least 200 patients requiring such care per annum in order to maintain an appropriate level of skills and expertise.

Figure 5.5 shows the number of patients admitted to each Unit who received Level 3 care at some point during their ICU admission in 2023. Level 3 care is defined by ICNARC, using UK Intensive Care Society definitions (2021), as organ support for two or more organ systems, excluding gastrointestinal support. Patients receiving basic respiratory and basic cardiovascular support only are classified as receiving Level 2 care. Numbers were estimated for Units with incomplete data by extrapolating from the available data.

In 2023, 14 Units participating in the INICUA admitted 200 or more Level 3 patients, and 15 Units admitted fewer than 200 Level 3 patients. Data in Chapters 7 and 9 indicate that outcomes were similar whether patients were initially admitted to a larger Unit or a smaller Unit (Figures 7.7A, 7.8A, 7.9B and 9.2). While this finding is somewhat unexpected, it is explained by the fact that many patients who require specialist treatment (e.g. neurosurgery, cardiac surgery, extracorporeal membrane oxygen, continuous renal replacement therapy, and other specialist services that may not be available in the admitting hospital) are transferred from Model 3 hospitals to ICU in a Model 4 hospital. The finding of similar outcomes after admission to smaller or larger Units suggests that the 'hub and spoke' model of care for ICU is working effectively.

"I was very agitated when I woke up, and most definitely in a delirious state; I was totally reliant on the people who worked in that ICU. I had a strong sense of gratitude." *- Olga Barry*

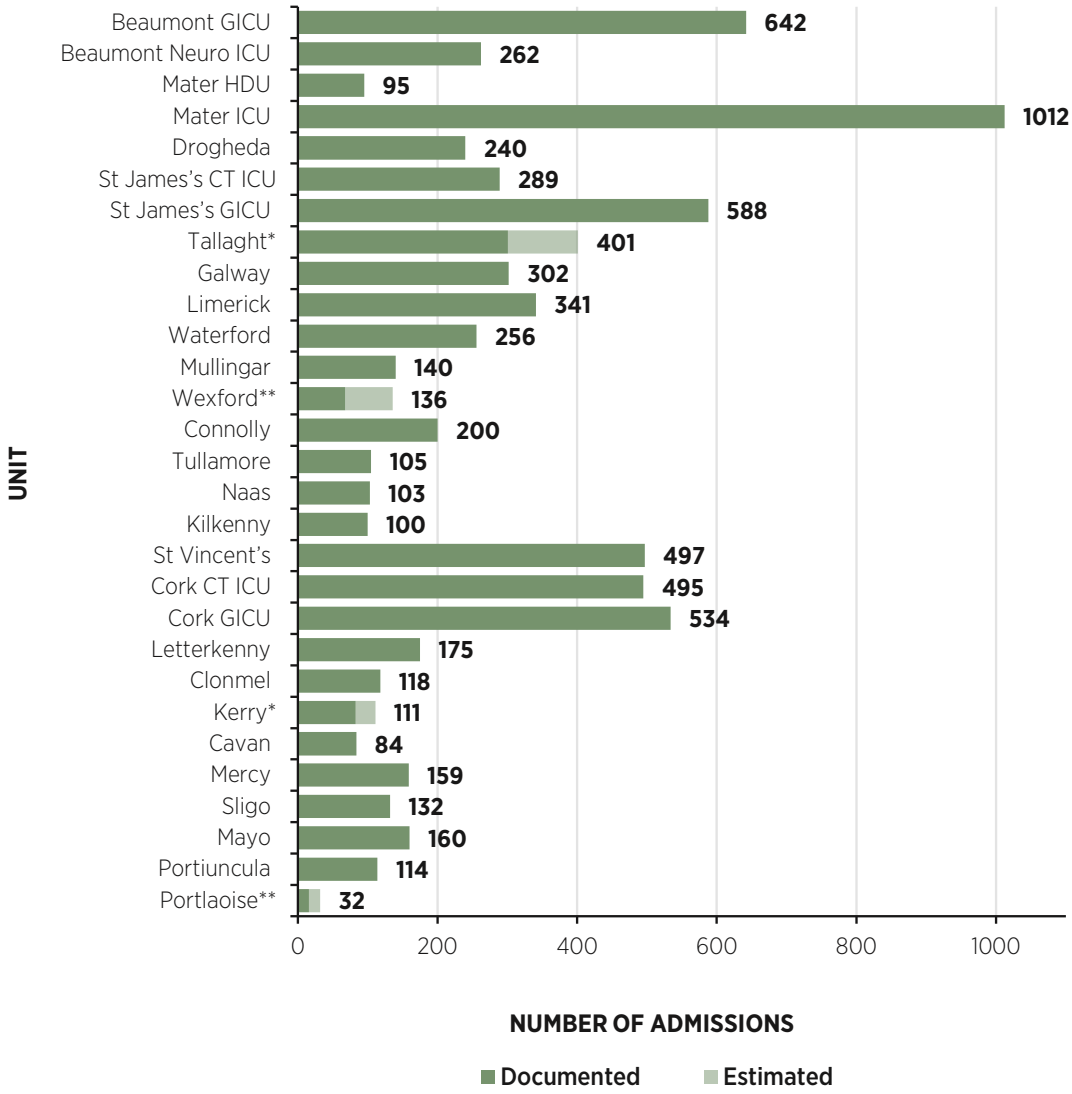


FIGURE 5.5: NUMBER OF PATIENTS IN EACH UNIT WHO RECEIVED LEVEL 3 CARE

Note: Numbers have been estimated where data coverage was incomplete.
* No data for one quarter.
** No data for two quarters.

ADVANCED CARDIOVASCULAR SUPPORT AFTER ADMISSION TO ICU

Advanced cardiovascular support is defined by the receipt of complex care for the cardiovascular system (CVS), e.g. a vasopressor plus another intravenous infusion acting on the CVS, an intra-aortic balloon pump, a temporary pacemaker, or continuous cardiac output measurement. Patients requiring advanced CVS support normally require care in ICU and will commonly also require ventilation as well as support for other organ systems.

The number of patients in each Unit requiring advanced CVS support correlates with other measures of complexity (Figure 5.6). The number of patients requiring advanced CVS support and the proportion of bed days with advanced CVS support were greatest in Units that admit patients after cardiac surgery (Figure 5.7). Nationally, the proportion of patients receiving advanced CVS support and the percentage of total bed days that patients received advanced CVS support were 22% and 10%, respectively.

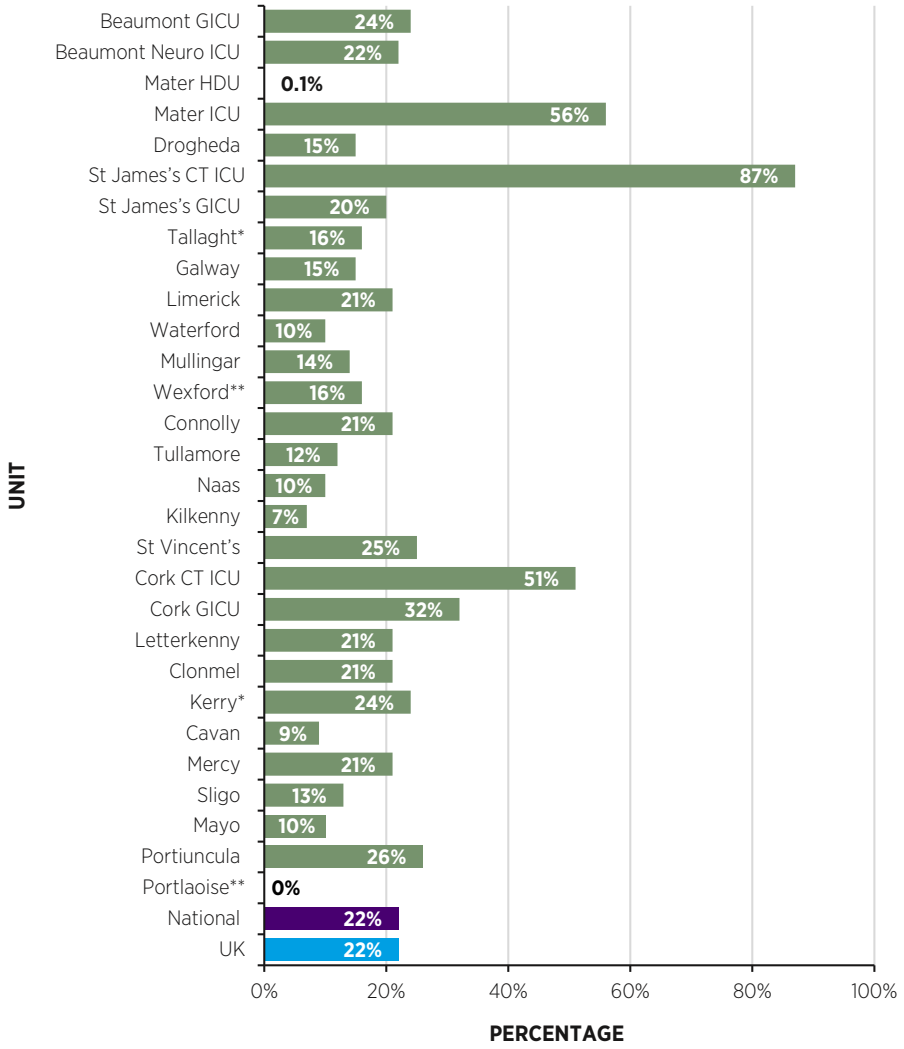


FIGURE 5.6: PATIENTS WHO RECEIVED ADVANCED CARDIOVASCULAR SYSTEM SUPPORT, AS A PERCENTAGE OF ALL UNIT ADMISSIONS

* No data for one quarter.
** No data for two quarters.
Source: INICUA (ROI) and ICNARC (UK) data

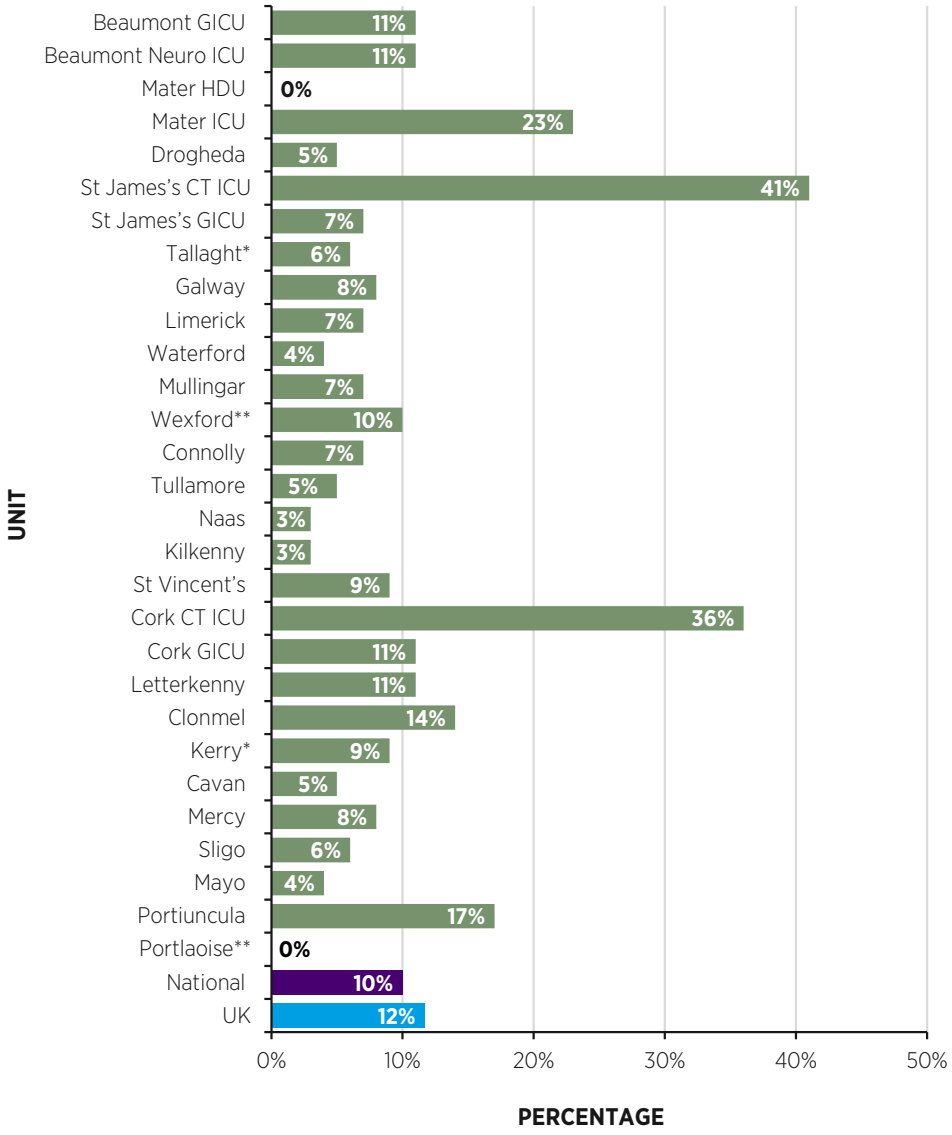


FIGURE 5.7: BED DAYS THAT PATIENTS RECEIVED ADVANCED CARDIOVASCULAR SYSTEM SUPPORT, AS A PERCENTAGE OF ALL PATIENT DAYS IN THE UNIT

* No data for one quarter.
** No data for two quarters.
Source: INICUA (ROI) and ICNARC (UK) data

RENAL SUPPORT AFTER ADMISSION TO ICU

Renal support (i.e. dialysis) in ICU may be required either for patients with AKI (which is common in acutely ill patients) or for patients on long-term dialysis who require ICU care. Dialysis may be provided by continuous renal replacement therapy (CRRT) or by intermittent haemodialysis. Most dialysis in ICU is provided through CRRT. The data in Figures 5.8 and 5.9 do not distinguish between CRRT and HD.

In 2023, there was considerable variability between Units in the percentage of patients requiring renal support and the percentage of total patient days when renal support was provided (Figures 5.8 and 5.9). Four smaller Units did not provide dialysis, and patients who required it had to be transferred to a larger Unit. Overall, 10% of patients admitted to ICU received renal support in 2023, compared with 12% in 2022.

Patients who require dialysis in ICU tend to be very ill, with multi-organ failure. These patients are commonly ventilated, on vasopressors, and receiving enteral or parenteral feeding; they may also have an impaired level of consciousness. Care of these patients is complex, requiring skilled nursing. If Units have a high proportion of patient days providing renal support, this puts additional pressure on finite skilled nursing resources.

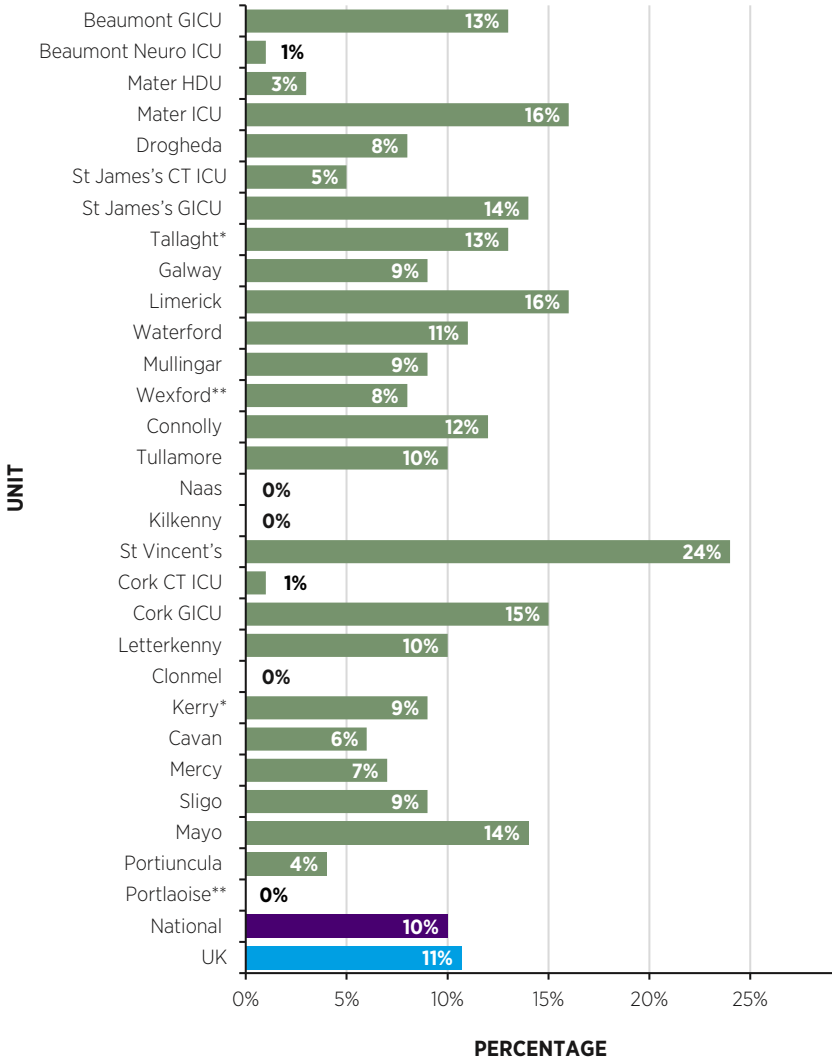


FIGURE 5.8: PATIENTS WHO UNDERWENT DIALYSIS, AS A PERCENTAGE OF ALL UNIT ADMISSIONS

Note: Dialysis was not provided in Naas General Hospital ICU, St Luke's General Hospital Carlow/Kilkenny ICU, Tipperary University Hospital Clonmel ICU, or Midland Regional Hospital Portlaoise ICU in 2023.

* No data for one quarter.
** No data for two quarters.
Source: INICUA (ROI) and ICNARC (UK) data

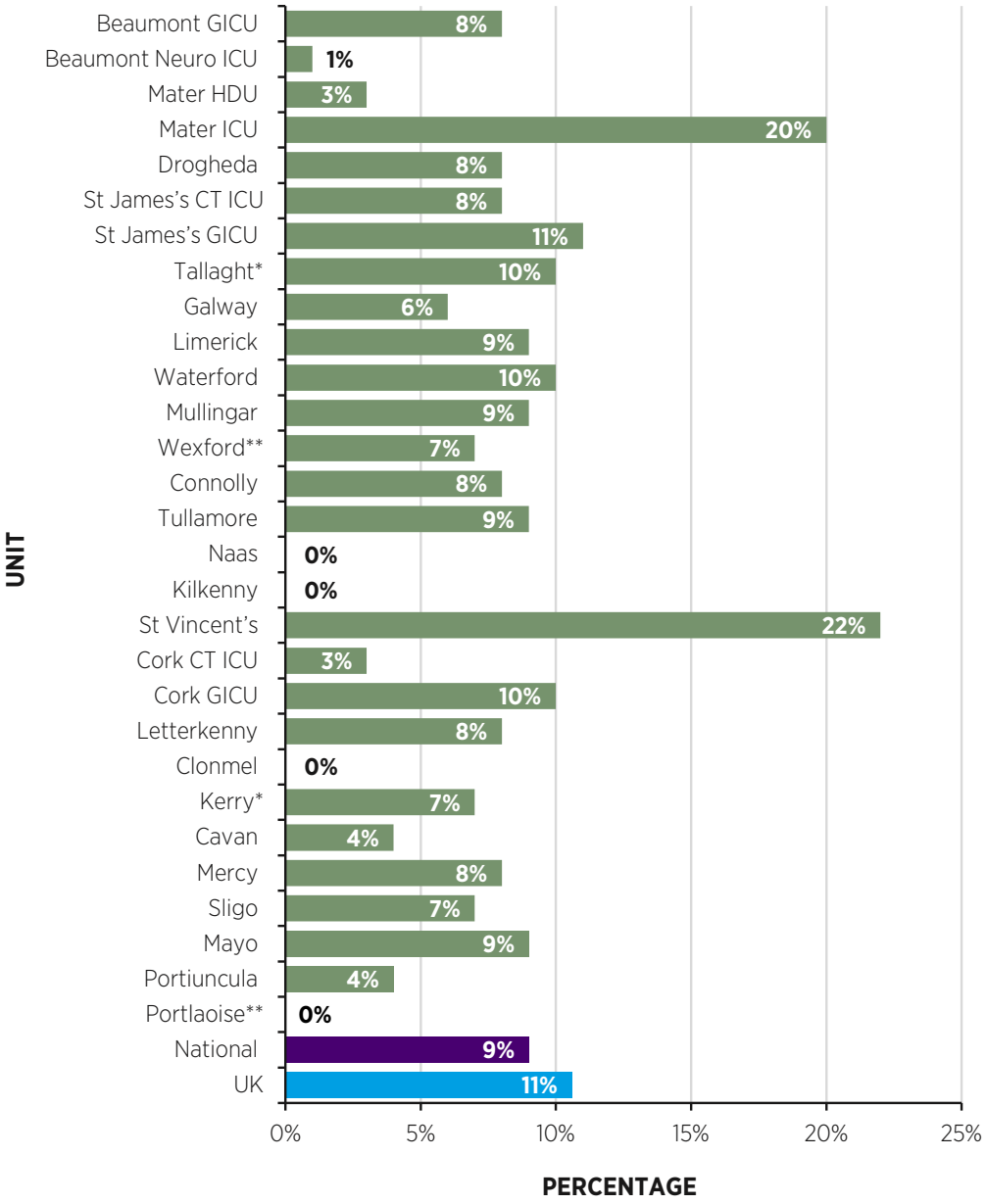


FIGURE 5.9: PATIENT DAYS THAT PATIENTS RECEIVED DIALYSIS, AS A PERCENTAGE OF TOTAL UNIT PATIENT DAYS

Note: Dialysis was not provided in Naas General Hospital ICU, St Luke's General Hospital Carlow/Kilkenny ICU, Tipperary University Hospital Clonmel ICU, or Midland Regional Hospital Portlaoise ICU in 2023.

* No data for one quarter.
** No data for two quarters.
Source: INICUA (ROI) and ICNARC (UK) data

GASTROINTESTINAL SUPPORT AFTER ADMISSION TO ICU

Enteral nutrition is provided via a tube into the stomach or small intestine. Parenteral nutrition is provided by infusion into a large vein. These methods of nutrition are required if patients are unable to eat due to coma or impaired swallowing, or if the gut is not working properly. Enteral or parenteral nutrition is not needed if the patient is able to eat or if the period without nutrition is short – after surgery, for example. If the period without nutrition is prolonged, it is good practice to initiate artificial nutritional support.

Figure 5.10 shows the proportion of patients who received enteral or parenteral nutrition at some point during their ICU stay in 2023. While higher values indicate good practice, some of the lower values are explained by patients having a short stay in the Unit or being able to eat normally while still in the Unit, e.g. after cardiothoracic surgery.

"I also felt incredibly well looked after. The dietitian was amazing, explaining about what I was being fed." *- Olga Barry*

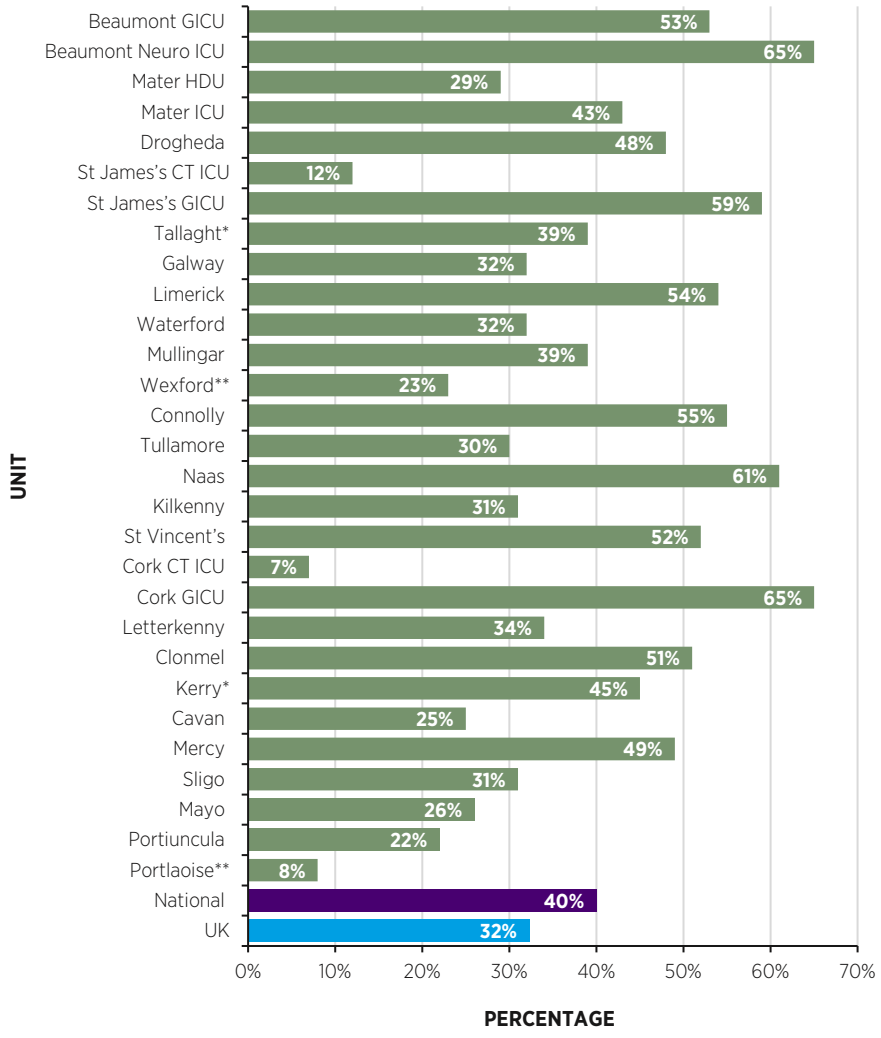


FIGURE 5.10: PATIENTS WHO RECEIVED ENTERAL OR PARENTERAL NUTRITION, AS A PERCENTAGE OF ALL UNIT ADMISSIONS

* No data for one quarter.
** No data for two quarters.
Source: INICUA (ROI) and ICNARC (UK) data

FINDINGS FROM CHAPTER 5

- The most commonly used measure of illness severity in ICU is the APACHE II score. Mean APACHE II scores in individual Units participating in the INICUA during 2023 ranged from 11 to 20. The mean APACHE II score nationally was 16 (versus 15 in the UK).
- The median predicted risk of acute hospital mortality across all participating Units in 2023 was 8.6% (versus 5.6% for patients in the UK). This high value indicates that critically ill patients who would be in ICU in the UK are being cared for in the ward in the ROI. This lack of access to ICU is likely to negatively impact on morbidity and mortality rates.
- Forty-five percent of ICU patients required invasive ventilation in the ROI in 2023 (versus 42% in the UK). The days patients spent undergoing invasive ventilation represented 38.6% of all patient days in the ROI (38.7% in the UK).
- Twenty-two percent of patients received advanced CVS support in 2023 (the same figure as for the UK).
- Ten percent of patients required dialysis in the ROI in 2023, compared with 11% in the UK.
- Fourteen Units participating in the INICUA admitted 200 or more Level 3 patients (who required multi-organ support) in 2023, and 15 smaller Units had fewer than 200 Level 3 admissions.
- These data provide insights into variations between Units in the complexity of illness treated and into the Units' resource requirements.

CHAPTER 6

ICU BED AVAILABILITY AND UTILISATION

CONTENTS

CHAPTER 6: **ICU BED AVAILABILITY AND UTILISATION**

The ICU Bed Information System (ICU-BIS) was set up by the National Office of Clinical Audit (NOCA) in March 2020 at the start of the COVID-19 pandemic. The purpose was to provide information on ICU bed utilisation and to facilitate transfers between Units in order to optimise the availability of ICU beds. The structures put in place have been useful since their implementation, and the ICU-BIS has continued to provide real-time data on ICU bed utilisation and availability.

NOCA obtains data from all Units each morning on the number of fully staffed ICU beds, the number of open beds, and the number of patients occupying ICU beds. The ICU-BIS website displays these data to provide real-time information on bed occupancy and bed availability in all ICUs, including in paediatric hospitals and the five private hospitals in the ROI that have an ICU. Bed occupancy is defined as the proportion of staffed beds that are occupied by a patient at the time ICU-BIS data are collected each morning. The ICU-BIS also collects data on patient case mix and the level of organ support provided.

The numbers of staffed ICU beds and the occupancy rates of those beds in Units during 2023 are shown in Table 6.1. The national ICU bed occupancy rate (as a percentage of staffed beds in INICUA Units) was 95% in 2023 (ICU-BIS data).

Recommendations on appropriate bed occupancy rates range from 75% (Valentin *et al*., 2011) to 85% (JFICMI and ICSI, 2024). Lower bed occupancy rates indicate unnecessary ICU capacity and underutilised resources, while higher occupancy rates mean that patients are, at times, being cared for in Units with staffing levels below recommended levels.

"It would seem that ICU beds are quite rare." - *Olga Barry*

TABLE 6.1: ICU BED OCCUPANCY RATES OF INDIVIDUAL UNITS DURING 2023

UNIT	Staffed bed days	Occupied bed days	Occupancy rate
Beaumont Hospital General ICU	5751	6571	114%
Beaumont Hospital (Richmond) Neurosurgical ICU	3134	3444	110%
Mater Misericordiae University Hospital HDU	5840	5737	98%
Mater Misericordiae University Hospital ICU	7028	6879	98%
Our Lady of Lourdes Hospital Drogheda ICU	3536	2963	84%
St James's Hospital Cardiothoracic ICU	1893	1844	97%
St James's Hospital General ICU	8799	8033	91%
Tallaght University Hospital ICU	7850	7244	92%
University Hospital Galway ICU	6480	5919	91%
University Hospital Limerick ICU	3397	3421	101%
University Hospital Waterford ICU	3583	3214	90%
Regional Hospital Mullingar ICU	2236	2049	92%
Wexford General Hospital ICU	1698	1241	73%
Connolly Hospital ICU	1799	1744	97%
Midland Regional Hospital Tullamore ICU	2011	1915	95%
Naas General Hospital ICU	1389	1200	86%
St Luke's General Hospital Carlow/Kilkenny ICU	1612	1537	95%
St Vincent's University Hospital ICU	5611	6286	112%
Cork University Hospital Cardiothoracic ICU	2172	2151	99%
Cork University Hospital General ICU	5933	5910	100%
Letterkenny University Hospital ICU	1880	1509	80%
Tipperary University Hospital ICU	1816	1606	88%
University Hospital Kerry ICU	1786	1534	86%
Cavan General Hospital ICU	1723	1410	82%
Mercy University Hospital Cork ICU	2167	2129	98%
Sligo University Hospital ICU	1730	1536	89%
Mayo University Hospital ICU	2174	1766	81%
Portiuncula University Hospital ICU	2138	1925	90%
Midland Regional Hospital Portlaoise ICU	1275	1116	88%
Total for all HSE Units participating in the INICUA	**98441**	**93833**	**95%**

The data in Table 6.1 refer only to patients admitted to the 29 Units participating in the INICUA.

The ICU-BIS also collected data on patients admitted to other Units not participating in the INICUA: Our Lady's Hospital Navan ICU, University Hospital Limerick HDU, and Tallaght University Hospital HDU did not participate in the INICUA in 2023. Data on bed occupancy in these Units, along with data for ICUs in five private hospitals, are shown in Table 6.2.

Including data from these additional Units, the ICU-BIS documented 100,536 bed days occupied across all 26 adult HSE-funded hospitals nationally. Of these, 4,688 bed days (5% of total bed days) were occupied by 534 patients with COVID-19 (compared with 11,708 bed days (12%) in 2022 and 28,054 (28%) in 2021). The total number of fully staffed bed days available during 2023 in adult HSE-funded hospitals was 105,123, giving an overall bed occupancy rate for all staffed critical care beds (in ICUs and HDUs) in HSE-funded hospitals of 96% (compared with 95% in 2022).

Five private hospitals have an ICU that can manage Level 3 ICU patients for a prolonged period: Galway Clinic ICU/HDU, Bon Secours Hospital Cork ICU/HDU, Blackrock Clinic Dublin ICU, Mater Private Hospital Dublin ICU, and Beacon Hospital Dublin ICU. Aggregated ICU-BIS data for these hospitals show that 12,816 bed days were available in 2023, of which 11,377 were occupied. The ICU bed occupancy rate for these private hospitals was 89% in 2023. Private hospital ICUs accounted for 11% of available adult ICU bed capacity and 10% of occupied bed days nationally.

In 2023, patients with COVID-19 occupied 167 bed days in private hospital ICUs, which was 3.4% of all ICU bed days occupied by patients with COVID-19 nationally and 1.5% of all bed days in private hospital ICUs.

TABLE 6.2: ICU BED OCCUPANCY RATES DURING 2023 IN ALL UNITS, INCLUDING UNITS NOT PARTICIPATING IN NATIONAL ICU AUDIT

Hospitals (including those not participating in the INICUA)	Staffed bed days	Occupied bed days	Occupancy rate
University Hospital Limerick HDU	5178	5434	105%
Our Lady's Hospital Navan ICU	1334	1058	79%
Tallaght University Hospital HDU	170	211	124%
Total for HSE-funded hospitals not participating in the INICUA	**6682**	**6703**	**100%**
Aggregated total for five private hospital ICUs	12816	11377	89%
Overall national total (for all adult Units: public and private)	**117939**	**111913**	**95%**
National total for all adult HSE-funded hospitals (excluding private hospitals)	**105123**	**100536**	**96%**

Source: ICU-BIS.

TABLE 6.3: ICU BED DAYS OCCUPIED BY PATIENTS: (1) WITH A DIAGNOSIS OF COVID-19, (2) UNDERGOING INVASIVE VENTILATION, (3) RECEIVING CONTINUOUS RENAL REPLACEMENT THERAPY AND (4) RECEIVING INTERMITTENT HAEMODIALYSIS, AS A PERCENTAGE OF ALL OCCUPIED BED DAYS

Unit	Occupied bed days	Bed days with COVID-19	Bed days undergoing invasive ventilation	Bed days receiving CRRT	Bed days receiving intermittent HD
	n	n (%)	n (%)	n (%)	n (%)
Beaumont Hospital General ICU	6571	427 (6.5%)	3318 (50%)	412 (6.3%)	138 (2.1%)
Beaumont Hospital (Richmond) Neurosurgical ICU	3444	0 (0.0%)	2002 (58%)	7 (0.2%)	17 (0.5%)
Mater Misericordiae University Hospital HDU	5737	178 (3.1%)	221 (4%)	2 (0.0%)	166 (2.9%)
Mater Misericordiae University Hospital ICU	6879	251 (3.6%)	3916 (57%)	1264 (18.4%)	115 (1.7%)
Our Lady of Lourdes Hospital Drogheda ICU	2963	118 (4.0%)	1419 (48%)	162 (5.5%)	0 (0.0%)
St James's Hospital Cardiothoracic ICU	1844	36 (2.0%)	397 (22%)	185 (10.0%)	26 (1.4%)
St James's Hospital General ICU	8033	225 (2.8%)	3575 (45%)	908 (11.3%)	121 (1.5%)
Tallaght University Hospital ICU	7244	329 (4.5%)	1985 (27%)	523 (7.2%)	100 (1.4%)
University Hospital Galway ICU	5919	214 (3.6%)	1557 (26%)	302 (5.1%)	119 (2.0%)
University Hospital Limerick ICU	3421	139 (4.1%)	1525 (45%)	258 (7.5%)	64 (1.9%)
University Hospital Waterford ICU	3214	130 (4.0%)	769 (24%)	177 (5.5%)	163 (5.1%)
Regional Hospital Mullingar ICU	2049	110 (5.4%)	682 (33%)	200 (9.8%)	2 (0.1%)
Wexford General Hospital ICU	1241	67 (5.4%)	340 (27%)	45 (3.6%)	4 (0.3%)
Connolly Hospital ICU	1744	44 (2.5%)	1029 (59%)	138 (7.9%)	0 (0.0%)
Midland Regional Hospital Tullamore ICU	1915	142 (7.4%)	910 (48%)	91 (4.8%)	51 (2.7%)
Naas General Hospital ICU	1200	197 (16.4%)	761 (63%)	0 (0.0%)	0 (0.0%)
St Luke's General Hospital Carlow/Kilkenny ICU	1537	185 (12.0%)	407 (26%)	0 (0.0%)	1 (0.1%)
St Vincent's University Hospital ICU	6286	263 (4.2%)	2911 (46%)	1303 (20.7%)	107 (1.7%)
Cork University Hospital Cardiothoracic ICU	2151	27 (1.3%)	328 (15%)	64 (3.0%)	6 (0.3%)
Cork University Hospital General ICU	5910	764 (12.9%)	3077 (52%)	529 (9.0%)	6 (0.1%)
Letterkenny University Hospital ICU	1509	57 (3.8%)	619 (41%)	109 (7.2%)	45 (3.0%)
Tipperary University Hospital ICU	1606	58 (3.6%)	773 (48%)	0 (0.0%)	0 (0.0%)
University Hospital Kerry ICU	1534	141 (9.2%)	878 (57%)	89 (5.8%)	2 (0.1%)
Cavan General Hospital ICU	1410	16 (1.1%)	536 (38%)	43 (3.0%)	8 (0.6%)
Mercy University Hospital Cork ICU	2129	45 (2.1%)	735 (35%)	165 (7.8%)	4 (0.2%)
Sligo University Hospital ICU	1536	99 (6.4%)	633 (41%)	77 (5.0%)	12 (0.8%)
Mayo University Hospital ICU	1766	130 (7.4%)	377 (21%)	130 (7.4%)	20 (1.1%)
Portiuncula University Hospital ICU	1925	6 (0.3%)	163 (8%)	42 (2.2%)	0 (0.0%)
Midland Regional Hospital Portlaoise ICU	1116	82 (7.3%)	140 (13%)	0 (0.0%)	0 (0.0%)
Total for all HSE Units participating in the INICUA	**93833**	**4480 (4.8%)**	**35983 (38%)**	**7225 (7.7%)**	**1297 (1.4%)**
University Hospital Limerick HDU	5434	106 (2.0%)	15 (0.3%)	5 (0.1%)	183 (3.4%)
Our Lady's Hospital Navan ICU	1058	97 (9.2%)	58 (5%)	0 (0.0%)	0 (0.0%)
Tallaght University Hospital HDU	211	5 (2.4%)	1 (0.5%)	1 (0.5%)	0 (0.0%)
Total for HSE-funded hospitals not participating in the INICUA	**6703**	**208 (3.1%)**	**74 (1%)**	**6 (0.1%)**	**183 (2.7%)**
Aggregated total for five private hospital ICUs	11377	167 (1.5%)	1029 (9%)	404 (3.6%)	52 (0.5%)
Overall national total (for all adult Units)	**111913**	**4855 (4.3%)**	**37086 (33%)**	**7635 (6.8%)**	**1532 (1.4%)**
National total for all adult HSE-funded hospitals (excluding private hospitals)	**100536**	**4688 (4.7%)**	**36057 (36%)**	**7231 (7.2%)**	**1480 (1.5%)**

Note: Data presented in this table differ from similar data sourced from the INICUA due to different calculation methods.
Source: ICU-BIS

Figure 6.1 shows the numbers of patients with and without COVID-19 infection in Units participating in the INICUA during 2023. The number of patients with COVID-19 remained low throughout 2023 relative to the previous years of the pandemic.

Figure 6.1 also shows the total number of staffed ICU beds and of occupied ICU beds nationally each day. The figure shows that ICU occupancy approximated ICU bed capacity throughout 2023.

In the ROI, the average number of ICU/HDU beds open daily in adult public (HSE-funded) hospitals in 2023 was 298 (ICU-BIS data), compared with 289 ICU/HDU beds open daily in 2022. This corresponded to 5.6 critical care beds per 100,000 population.[2] This is low by international standards, although comparisons are difficult because of differences in defining a critical care bed.

Across 26 Organisation for Economic Co-operation and Development (OECD) countries, the average number of ICU beds per 100,000 population in 2022 was 20. This figure may have been inflated by temporary expansion for COVID-19 patients, as the OECD average for 2020 was only 12 beds per 100,000 population. Furthermore, the data for some countries include beds in private hospitals and Levels 1, 2 and 3 ICU beds, whereas ROI data include Level 2 and 3 beds only. The equivalent figure for the UK in 2023 was 7.0 beds per 100,000 population.

The number of ICU beds has increased in the ROI since 2023; there are now 329 ICU beds open, equivalent to 6.1 adult ICU beds per 100,000 population (December 2024).[3]

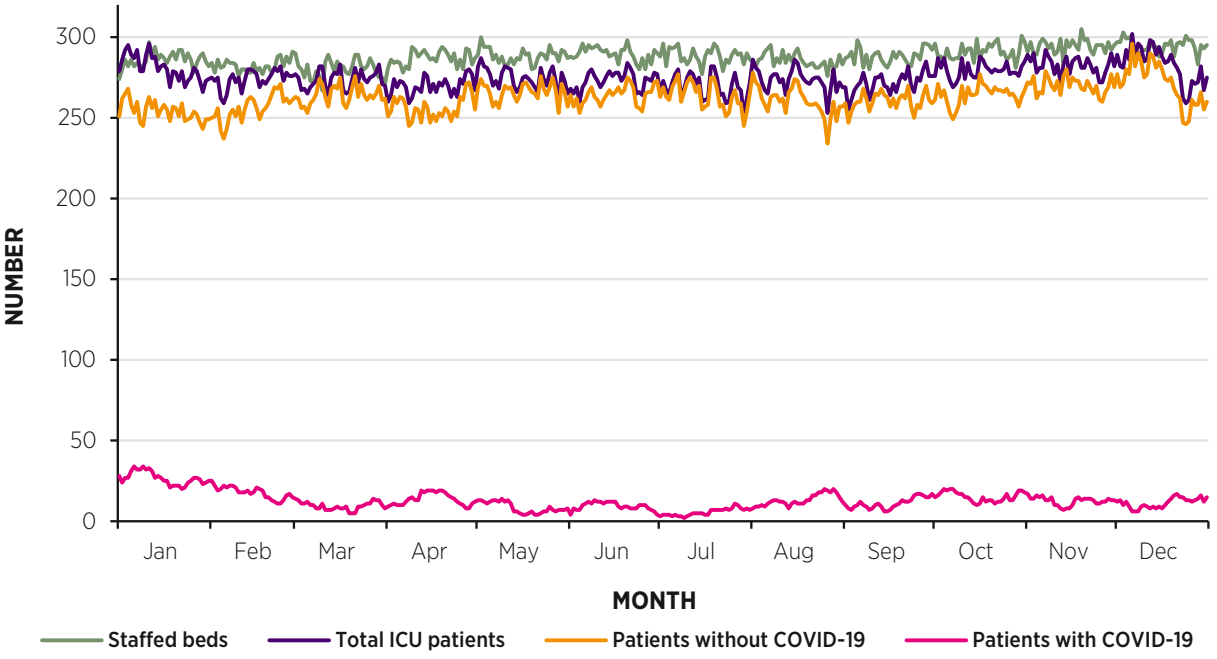


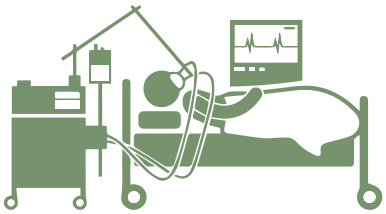
FIGURE 6.1: ICU BED OCCUPANCY, 2023: BEDS STAFFED, BEDS OCCUPIED, AND NUMBER OF PATIENTS WITH AND WITHOUT COVID-19

Note: This figure shows data from all ICUs and HDUs in all 26 adult HSE-funded public hospitals.
Source: ICU-BIS

"I went from a public to a private hospital, and having experienced both, the care is all that it should be in both" - *Olga Barry*

[2] Estimated population in 2023: 5,281,600.
[3] Estimated population in 2024: 5,380,000.

BED UTILISATION



Patients requiring invasive ventilation (advanced respiratory support (ARS)) are a core patient population in ICUs who cannot be cared for in any other area. There are many other patients who could not be managed outside ICU (e.g. patients on CRRT or advanced CVS support, patients who were recently on invasive ventilation or who are close to needing invasive ventilation, and patients who need invasive monitoring), but comparing the numbers of patients undergoing invasive ventilation between Units allows comparisons between Units of the relative complexity of care provided.

Figure 6.2 shows the number of bed days of invasive ventilation provided by each Unit in 2023. Where there were gaps in data for some Units, estimates of the values for the full year were obtained by extrapolating appropriately from the data available. The total (documented plus estimated) number of bed days that patients underwent invasive ventilation nationally was 39,605, and the number of bed days that patients were not provided with invasive ventilation was 64,169; the corresponding figures for 2022 were 42,466 and 51,244 bed days, respectively.

"I 'woke up' at the end of April in ICU 2, having had a tracheostomy in an attempt to get me off a ventilator after 5 weeks." - *Olga Barry*

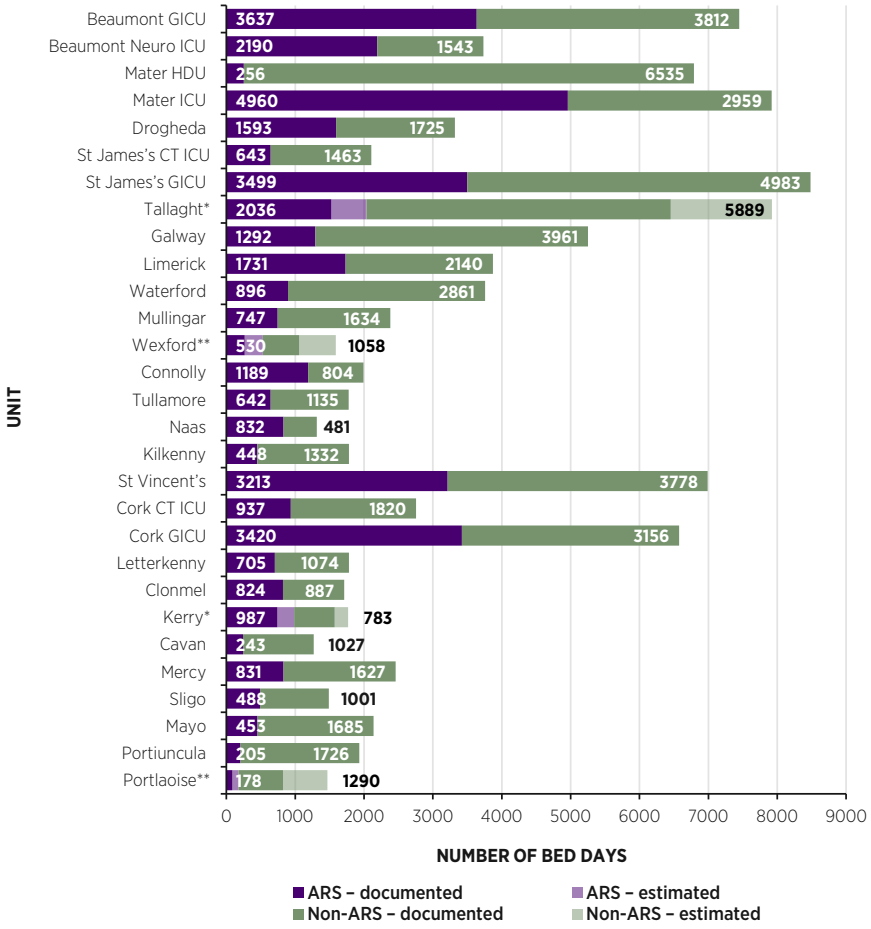


FIGURE 6.2: BED DAYS OCCUPIED IN ICU, WITH AND WITHOUT INVASIVE VENTILATION

Notes: Values have been estimated for Units with incomplete data coverage. Values shown in the chart are the sum of documented and estimated bed days with and without invasive ventilation. For the INICUA data presented in this chart, a part of a day receiving ARS or other critical care is counted as a full day, resulting in higher numbers of bed days compared with those presented in Tables 6.1 and 6.3.

* No data for one quarter.
** No data for two quarters.
Source: INICUA data

LENGTH OF STAY IN ICU

The mean length of stay (LOS) of patients in ICU varied considerably between Units in 2023 (Figure 6.3). Individual factors in each Unit contributed to this, including case mix, whether hospitals had a step-down (HDU) facility to accept recovering patients, and the availability of ward beds to accept ICU discharges. LOS tended to be longer in Units with greater illness severity scores (Figures 5.1 and 5.2), and shorter in Units classified as mixed ICU/HDU and in Units caring for patients after cardiothoracic surgery (see Table 4.1). LOS may also be influenced by demand for beds; if ICU beds are not required for new admissions, patients can stay longer in ICU. The mean LOS in 2023 was similar in the ROI (5.6 days) and the UK (5.2 days).

Different methods of calculating LOS lead to different values. The INICUA uses a precise method to calculate LOS by adding the exact proportion of each day a patient occupies a bed in order to calculate the total LOS for that patient (Figure 6.3). This method gives a lower estimation of the LOS compared with other common methods, such as documenting the number of patients in the Unit at a single time point each day (this is the method used by the ICU-BIS; see Tables 6.1–6.3) or counting each day or part of a day that a bed is occupied as a full day of bed occupancy (this is the method used to calculate the number of bed days that invasive ventilation was provided; see Figure 6.2).

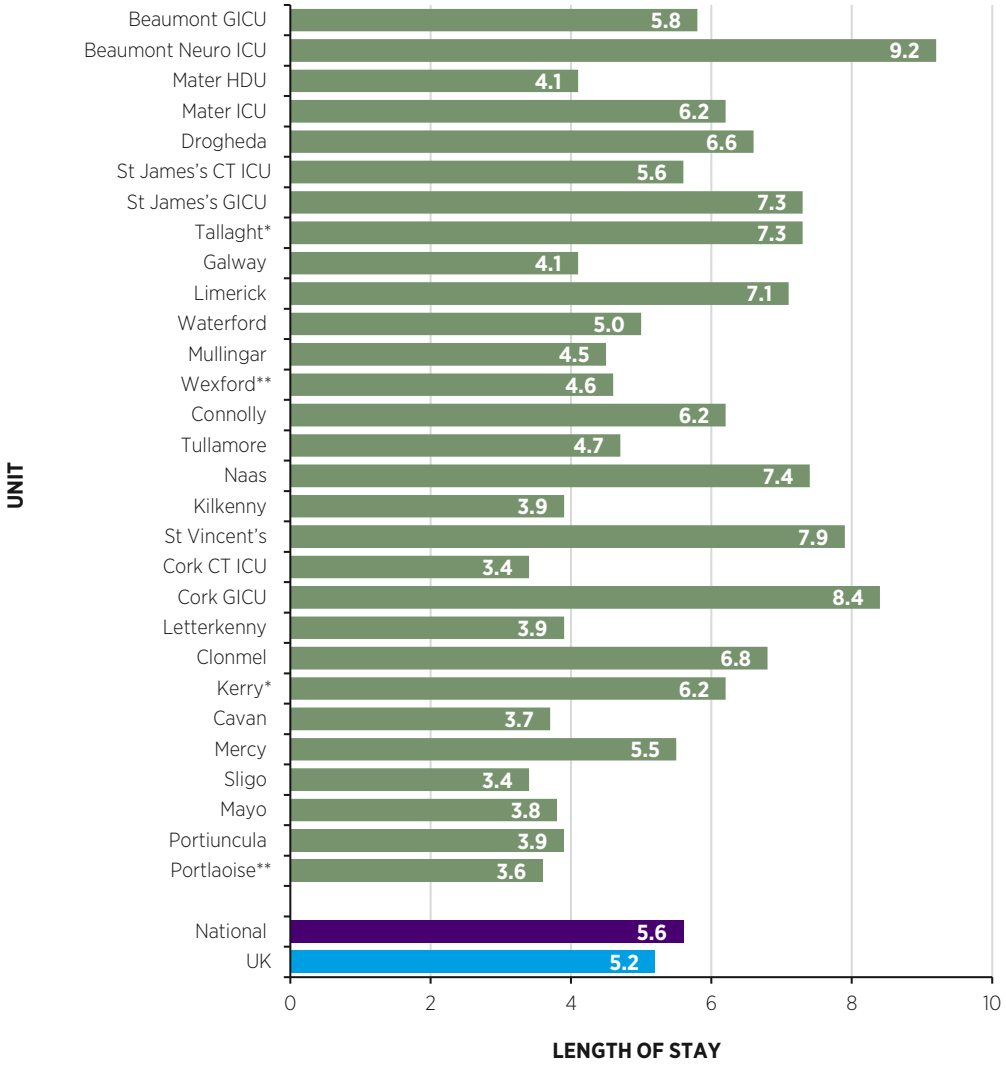


FIGURE 6.3: MEAN LENGTH OF STAY IN EACH UNIT, IN DAYS

Note: Median LOS in the Unit for all admissions is presented in the frequency table for Figure 6.3 in Appendix 1.
* No data for one quarter.
** No data for two quarters.
Source: INICUA (ROI) and ICNARC (UK) data

LOS: UNIT SURVIVORS VERSUS NON-SURVIVORS

Comparing the LOS for ICU survivors and non-survivors provides useful insights into activity in each Unit, although local insights are needed in order to fully explain the variability between Units.

Survivors in some Units had a longer mean LOS in 2023 than non-survivors, while in other Units the opposite was seen (Figure 6.4, INICUA data). It is possible that this finding is random, that it reflects the case mix in certain Units, or that it reflects earlier decision-making regarding end-of-life decisions in some Units.

The mean LOS for ICU survivors in the ROI was 5.6 days in 2023, compared with 6.2 days in 2022 and 6.3 days in 2021. The mean LOS for non-survivors was 6.0 days in 2023, compared with 6.6 days in 2022 and 8.3 days in 2021. We believe that this is related to fewer patients with COVID-19 dying in ICU in 2023, as patients with COVID-19 tend to have a longer LOS in ICU.

Cork University Hospital General ICU and Beaumont Hospital (Richmond) Neurosurgical ICU had a mean LOS for ICU survivors of 9.5 days and 9.3 days, respectively; both these Units have a high proportion of neurosurgical patients, who tend to spend a long time in ICU before being ready for discharge.

The longest mean LOS for Unit non-survivors was in St James's Hospital Cardiothoracic ICU, with a mean LOS of 12.3 days (median: 6.3 days). A median value considerably lower than the mean indicates that the prolonged mean LOS arises from a relatively small number of patients who had a lengthy stay in ICU before they died.

St James's Hospital Cardiothoracic ICU has been the Unit with the longest mean LOS for non-survivors each year since the INICUA began publishing annual reports in 2017. Correspondence from this Unit indicated that the majority of patients with a prolonged LOS had undergone elective surgery, mostly thoracic surgery for carcinoma of the lung; these tend to be frail patients with poor respiratory function. The survival rate in patients who had spent more than 30 days in the Unit was 44%, indicating that patient selection for prolonged care in ICU was appropriate. The fact that the overall mortality rate in the Unit was low (7.9%) indicates that a small number of non-survivors with prolonged ICU stays had a disproportionate effect on the mean LOS of non-survivors.non-survivors.

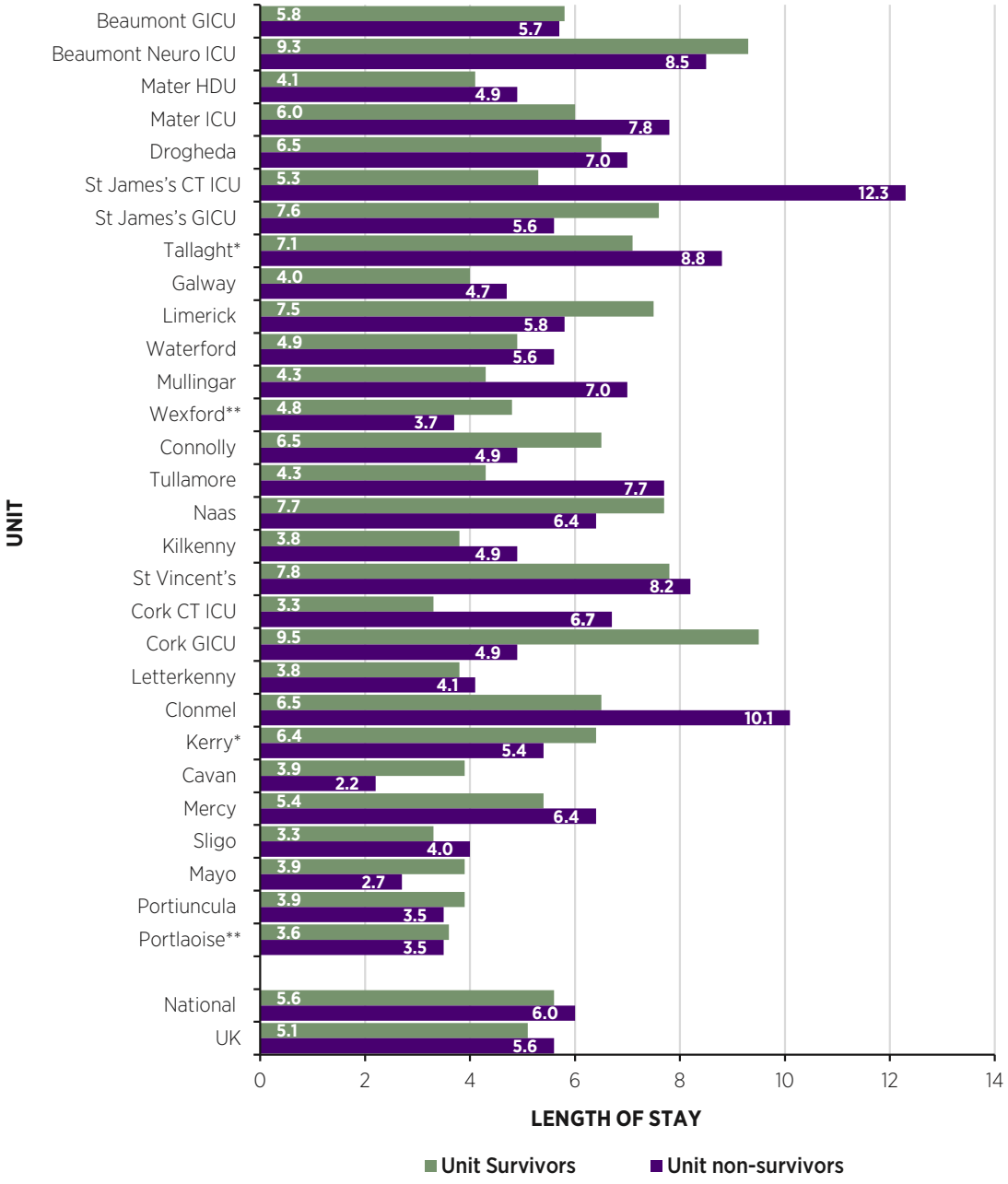


FIGURE 6.4: MEAN LENGTH OF STAY IN ICU FOR UNIT SURVIVORS VERSUS NON-SURVIVORS, IN DAYS

Note: Median LOS for Unit survivors and Unit non-survivors is presented in the frequency table for Figure 6.4 in Appendix 1.
* No data for one quarter.
** No data for two quarters.
Source: INICUA (ROI) and ICNARC (UK) data

COVID-19 PATIENTS (ICU-BIS DATA)

The ICU-BIS recorded 534 patients with COVID-19 admitted to ICU across all 26 adult public (HSE-funded) hospitals during 2023 (compared with 1,100 in 2022 and 1,766 in 2021).

These patients occupied 4,688 bed days, which accounted for 5% of all occupied bed days in 2023. The mean LOS for patients with COVID-19 was 8.8 days in 2023 (compared with 10.6 days in 2022 and 15.9 days in 2021, indicating less severe disease in 2023) (ICU-BIS data).

The data on patients with COVID-19 in ICU that were provided by the ICU-BIS differ considerably from those provided by the INICUA (see Chapter 9); for instance, the INICUA only documented 309 admissions of patients with COVID-19 during 2023. Several factors explain the disparity between the ICU-BIS and INICUA data:

- Many admissions of patients with COVID-19 were to Units that are not included in the INICUA, mainly HDUs.
- The INICUA documented patients who were admitted because of COVID-19, whereas the ICU-BIS documented all patients with a positive COVID-19 test before or during their ICU stay.
- There were gaps in the data for Units participating in the INICUA.

Despite the disparities, both sets of data are valuable. The ICU-BIS data provide an overview of all cases of COVID-19 in critical care nationally, with no gaps in the data. This allows a comprehensive overview of the impact of COVID-19 and comparisons with previous years. The INICUA data provide detailed insight into patient demographics, illness severity, interventions and outcomes (see Chapter 9).

DELAYED DISCHARGES

Patients commonly stay in ICU after being declared clinically ready for ward care if no ward bed is available (Figure 6.5). During 2023, 7.4% of available bed days were occupied by patients who had been declared ready for discharge more than 8 hours earlier. This is equivalent to 8,018 ICU bed days provided for patients who were ready for ward care.

Tallaght University Hospital ICU was an outlier for the metric "Bed days of care post-8-hour delay". In response to this outlier finding, NOCA and the hospital jointly ran a quality improvement project, mapping discharge procedures in order to identify blocks in the process and setting targets for discharge times. The impact of these changes on measures of timely discharge will be noted in future quarterly reports.

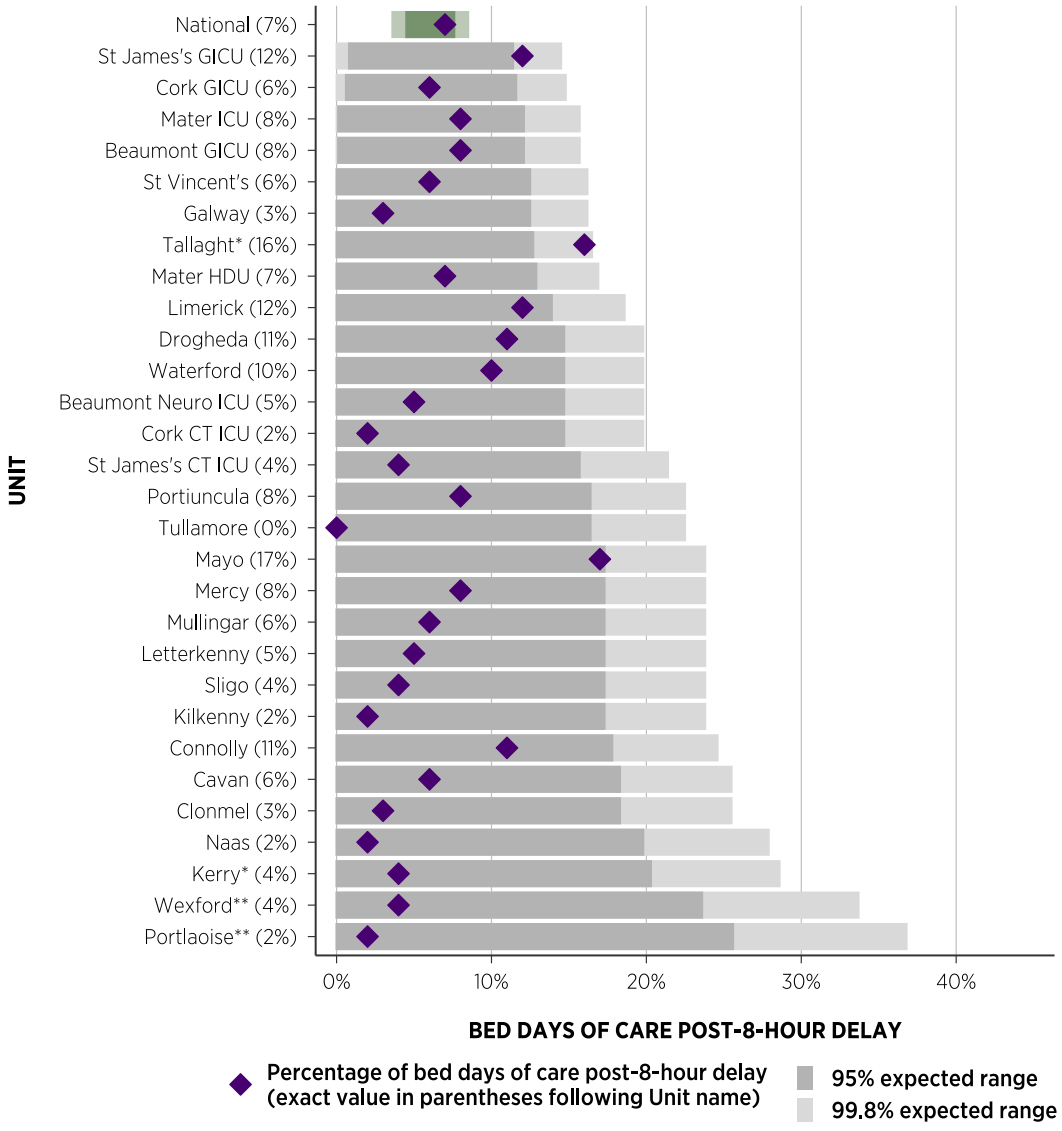


FIGURE 6.5: BED DAYS SPENT IN THE UNIT MORE THAN 8 HOURS AFTER DECISION TO DISCHARGE, AS A PERCENTAGE OF ALL AVAILABLE BED DAYS IN THE UNIT

Note: The sequence of Units shown in the chart is determined by the number of available bed days, with Units listed in decreasing order.
* No data for one quarter.
** No data for two quarters.
Source: INICUA data

Delayed discharge from ICU has increased over the period 2021–2023 (Figures 6.6A and 6.6B).

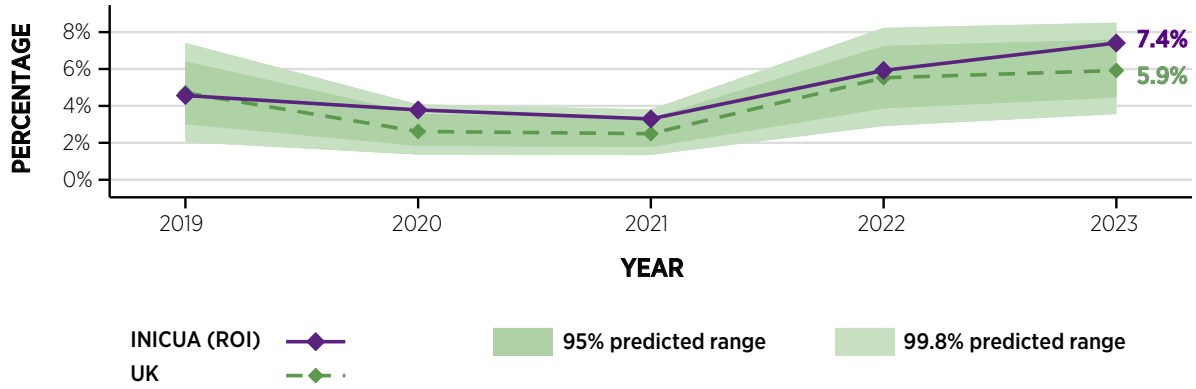


FIGURE 6.6A: BED DAYS SPENT IN ALL UNITS MORE THAN 8 HOURS AFTER DECISION TO DISCHARGE, AS A PERCENTAGE OF ALL AVAILABLE BED DAYS, 2019–2023

Source: INICUA (ROI) and ICNARC (UK) data

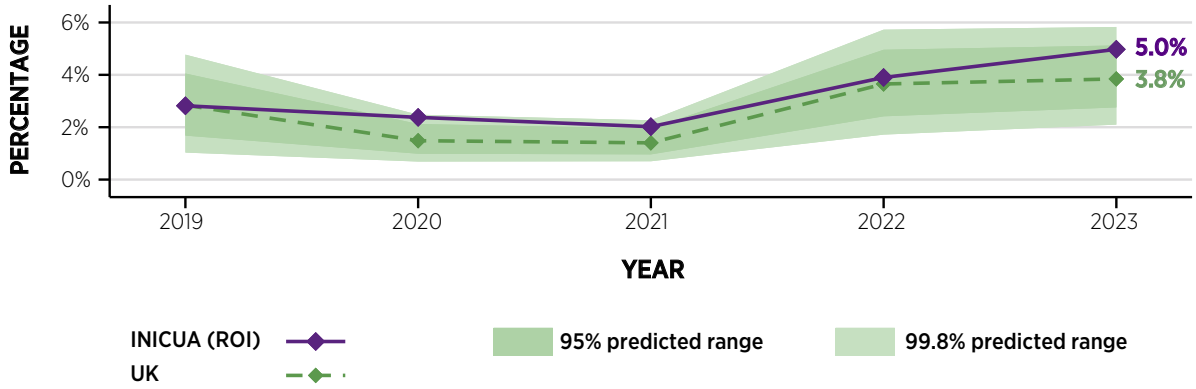


FIGURE 6.6B: BED DAYS SPENT IN ALL UNITS MORE THAN 24 HOURS AFTER DECISION TO DISCHARGE, AS A PERCENTAGE OF ALL AVAILABLE BED DAYS, 2019–2023

Source: INICUA (ROI) and ICNARC (UK) data

Figure 6.7 shows the percentage of patients in each Unit who spent more than 24 hours in ICU waiting for a ward bed after being cleared for discharge. Nationally, 28% of all discharges to the ward in 2023 were delayed for more than 24 hours, compared with 27% in 2022.

"They kept me longer than usual because they were not prepared to release me onto an ordinary ward, as I needed to be in a room on my own." *- Olga Barry*

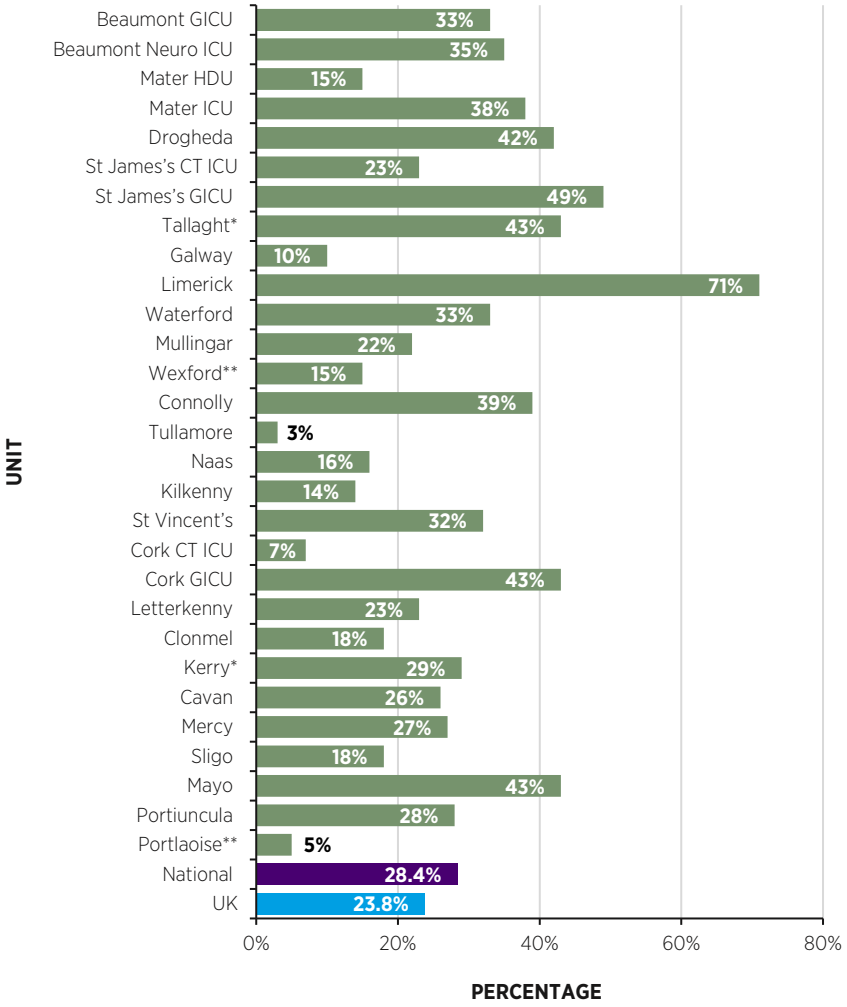


FIGURE 6.7: DISCHARGES TO WARDS DELAYED MORE THAN 24 HOURS, AS A PERCENTAGE OF ALL DISCHARGES TO WARDS

* No data for one quarter.
** No data for two quarters.
Source: INICUA (ROI) and ICNARC (UK) data

The ICU-BIS collects data each morning on the number of patients in each Unit who have been declared clinically ready for discharge. This is useful to identify which Units are likely to have empty beds available later that day. It also indicates how many ICU beds are occupied by patients who no longer need to be in ICU, although many of these patients will be discharged later that day, making their ICU bed available. Data from the ICU-BIS showed that in 2023, 15% of available beds were occupied by patients who had been cleared for discharge (compared with 14% in 2022 and 10% in 2021) (Figure 6.8). Nationally, the daily numbers of patients still in ICU after being cleared for discharge decreased during times of maximum pressure on ICU beds (Figure 6.1).

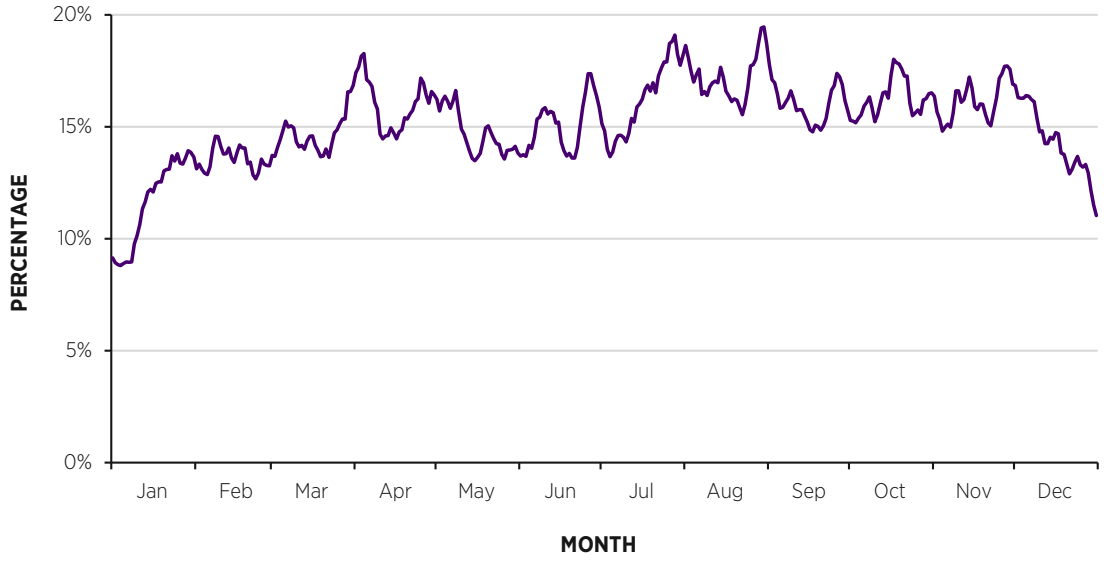


FIGURE 6.8: PATIENTS CLEARED FOR DISCHARGE EACH DAY IN 26 ADULT PUBLIC HOSPITALS, AS A PERCENTAGE OF OPEN ICU BEDS, 2023

Source: ICU-BIS, rolling 7-day average

ICNARC also reports two other metrics relating to the utilisation of ICU beds: discharges from ICU direct to home, and transfers to another Unit for non-clinical reasons (usually to make a bed available for a sicker patient in the transferring Unit). For both metrics, rates in the ROI were lower than those in the UK in 2023. There were no outliers for the metric 'Discharges from ICU direct to home' in 2023. University Hospital Kerry ICU was an outlier for the metric "Non-clinical transfers to another ICU".

EARLY WARNING SCORES ON ADMISSION TO THE UNIT

The Irish National Early Warning System (INEWS) score is a score for patients in the ward. The INEWS score is a composite score based on respiratory and cardiovascular observations, temperature, and level of consciousness. If a patient deteriorates, an increase in the INEWS score should trigger an intervention or a referral to ICU to prevent further clinical deterioration. Standard recommendations are for an INEWS score of 7 or higher to trigger a referral for assessment by a critical care team regarding admission to ICU.

Figure 6.9 presents data for the last INEWS scores recorded prior to a patient being referred from a ward or Emergency Department for critical care review.

The median INEWS score before ICU admission in 2023 ranged from 4.5 to 10.0. The upper quartile INEWS scores for some Units were 11 or 12, meaning that 25% of patients had an INEWS score of this value or higher at the time of admission. The lower quartile INEWS scores ranged from 3 for some Units to 7 or 8 for others.

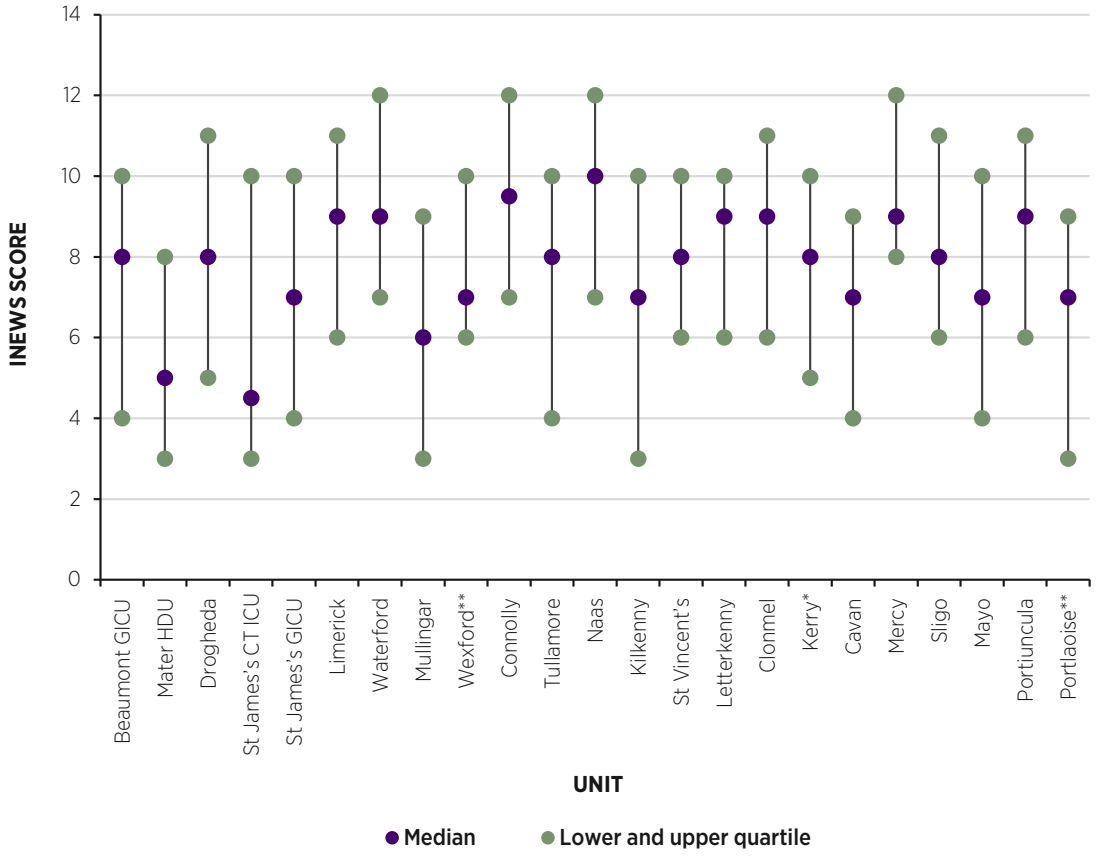


FIGURE 6.9: INEWS SCORES AT TIME OF REFERRAL TO ICU TEAM (MEDIANS AND LOWER AND UPPER QUARTILES), 2023

Note: Data are presented only for Units with INEWS scores documented for at least 50% of admissions.

* No data for one quarter.
** No data for two quarters.

Documentation of INEWS scores in the ward at the time of referral to the ICU team has been inconsistent; Table 6.4 shows the percentage of patients for whom INEWS scores have been documented.

TABLE 6.4: ADMISSIONS TO ICU FROM WARD OR EMERGENCY WITH INEWS SCORES DOCUMENTED

UNIT	Admissions with INEWS scores recorded (%)
Beaumont Hospital General ICU	64%
Beaumont Hospital (Richmond) Neurosurgical ICU	44%
Mater Misericordiae University Hospital HDU	57%
Mater Misericordiae University Hospital ICU	47%
Our Lady of Lourdes Hospital Drogheda ICU	90%
St James's Hospital Cardiothoracic ICU	60%
St James's Hospital General ICU	86%
Tallaght University Hospital ICU*	43%
University Hospital Galway ICU	0.2%
University Hospital Limerick ICU	73%
University Hospital Waterford ICU	97%
Regional Hospital Mullingar ICU	93%
Wexford General Hospital ICU**	81%
Connolly Hospital ICU	85%
Midland Regional Hospital Tullamore ICU	83%
Naas General Hospital ICU	95%
St Luke's General Hospital Carlow/Kilkenny ICU	93%
St Vincent's University Hospital ICU	89%
Cork University Hospital Cardiothoracic ICU	0%
Cork University Hospital General ICU	0%
Letterkenny University Hospital ICU	94%
Tipperary University Hospital ICU	84%
University Hospital Kerry ICU*	96%
Cavan General Hospital ICU	94%
Mercy University Hospital Cork ICU	62%
Sligo University Hospital ICU	92%
Mayo University Hospital ICU	88%
Portiuncula University Hospital ICU	99%
Midland Regional Hospital Portlaoise ICU**	96%
National	**69%**

* No data for one quarter.
** No data for two quarters.

LOS AFTER ICU DISCHARGE

Hospital LOS after discharge from ICU varied between hospitals (Figure 6.10). This may reflect differences in case mix or differences in local community or convalescent facilities. The national mean LOS in hospital after ICU discharge (20 days) was twice the median LOS (10 days), indicating that a small number of patients stayed in hospital for a long time after discharge from ICU. The mean and median values for the UK in 2023 were 16 and 7 days, respectively.

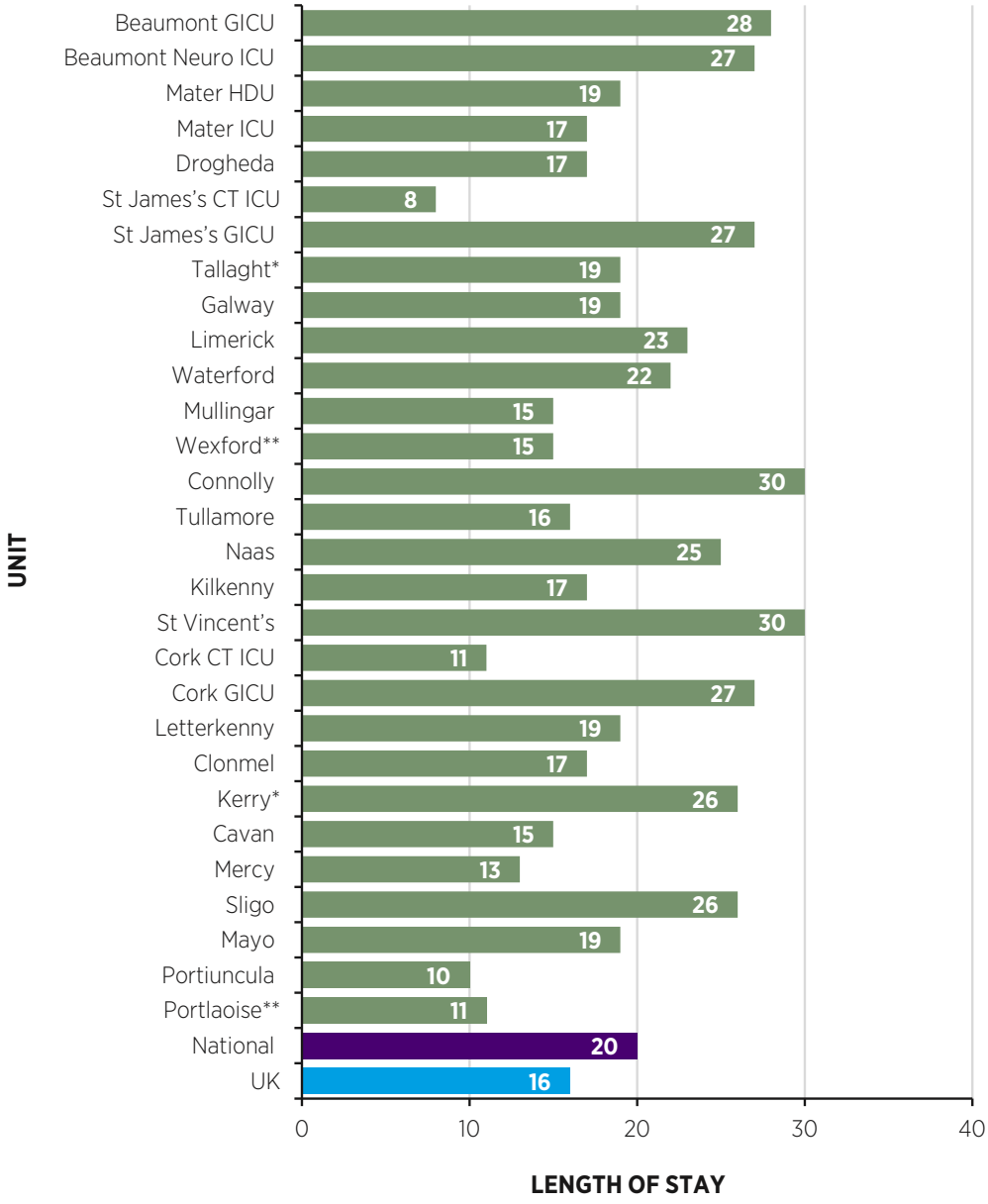


FIGURE 6.10: MEAN LENGTH OF STAY IN ACUTE HOSPITAL FOR UNIT SURVIVORS AFTER DISCHARGE FROM ICU, IN DAYS

Note: Median LOS in acute hospital after Unit discharge for Unit survivors is presented in the frequency table for Figure 6.10 in Appendix 1.

* No data for one quarter.
** No data for two quarters.
Source: INICUA (ROI) and ICNARC (UK) data

FINDINGS FROM CHAPTER 6

- An average of 298 ICU/HDU beds were open daily in adult public (HSE-funded) hospitals in 2023. This corresponded to 5.6 critical care beds per 100,000 population, which is low by international standards, although comparisons are difficult because of differing definitions of ICU beds. The corresponding value for the UK was 7.0 beds per 100,000 population. By December 2024, the number of ICU beds in the ROI had increased to 329, which is 6.1 beds per 100,000 population.
- The ICU-BIS documented 100,536 occupied bed days across all ICUs/HDUs in public hospitals nationally in 2023. The occupancy rate of all staffed critical care beds nationally was 96% in 2023 (compared with 95% in 2022 and 90% in 2021). Recommended occupancy levels are around 85%, but some Units had higher occupancy rates than this, particularly: Beaumont Hospital General ICU and Beaumont Hospital (Richmond) Neurosurgical ICU (114% and 110%, respectively); St Vincent's University Hospital ICU (112%); University Hospital Limerick ICU (101%); Cork University Hospital General ICU and Cork University Hospital Cardiothoracic ICU (100% and 99%, respectively); Mater Misericordiae University Hospital ICU and Mater Misericordiae University Hospital HDU (both 98%); Mercy University Hospital Cork ICU (98%); Connolly Hospital ICU (97%); and St James's Hospital Cardiothoracic ICU (97%).
- Private hospital ICUs accounted for 11% of available adult ICU bed capacity and 10% of occupied bed days nationally in 2023.
- Five percent of all bed days were occupied by 534 patients with COVID-19 in 2023. The mean LOS in ICU for patients with COVID-19 was 9 days (ICU-BIS data).
- The number of bed days that patients were undergoing invasive ventilation is a useful measure of core ICU activity for comparisons between Units. The hospitals with the largest numbers of invasive ventilation bed days were Beaumont Hospital, Mater Misericordiae University Hospital, Cork University Hospital, St James's Hospital, and St Vincent's University Hospital.
- The mean Unit LOS for all patients was 5.6 days in 2023, compared with 6.2 days in 2022 (INICUA data). The mean Unit LOS for ICU survivors was 5.6 days, compared with 6.0 days for Unit non-survivors.
- Delays in discharge to the ward have been increasing, and bed days occupied by patients who had been cleared for discharge accounted for 7.4% of all bed days in 2023 (8,018 bed days). Delayed discharge leads to delays in the admission of critically ill patients waiting for a bed.
- Median INEWS scores before admission to ICU ranged from 4.5 to 10.0 in 2023, with upper quartile INEWS scores as high as 11 or 12. This suggests that many patients were extremely ill by the time of ICU admission.
- The mean hospital LOS after ICU discharge in 2023 was 20 days.

CHAPTER 7

OUTCOME MEASURES AND QUALITY INDICATORS

CONTENTS

CHAPTER 7: **OUTCOME MEASURES AND QUALITY INDICATORS**

This chapter presents data on measures of the quality of care and of outcomes for patients admitted to ICU or HDU in Units participating in the INICUA in 2023.

TIMELINESS OF ADMISSION TO ICU

Prompt admission to ICU for acutely ill patients improves outcomes (Harris *et al.*, 2018). However, delays in admission to ICU are inevitable with the high levels of ICU bed occupancy seen in Units in the ROI in 2023 (Table 6.1).

The HSE has defined two key performance indicators for timely admission to ICU from the ward or Emergency Department (ED): 50% of patients should be admitted within 1 hour of the decision to admit, and 80% of patients should be admitted within 4 hours of the decision to admit. Data for each hospital participating in the INICUA in 2023 (rather than for individual Units) are shown in Figure 7.1.

With the exception of Tallaght University Hospital, all participating hospitals had data on the time of decision to admit for at least 50% of admissions to ICU from the ward or ED in 2023 (Figure 7.1). Three hospitals achieved the target of 50% of patients being admitted to ICU within 1 hour of the decision to admit: St James's Hospital, Letterkenny University Hospital, and Portiuncula University Hospital. Twenty hospitals achieved the target of admitting 80% of patients to ICU within 4 hours of the decision to admit (Figure 7.1). Nationally, 33% of admissions to ICU happened within 1 hour of the decision to admit, and 87% of admissions happened within 4 hours of the decision to admit.

Once a decision is made to admit a critically ill patient to ICU, the patient should be admitted immediately. The *Irish National ICU Audit Annual Report 2022,* formally recommended a national policy for each Unit to keep one staffed ICU bed empty so that it would be available for immediate admission of critically ill patients (if this can be achieved by discharging patients who are clinically ready for discharge).

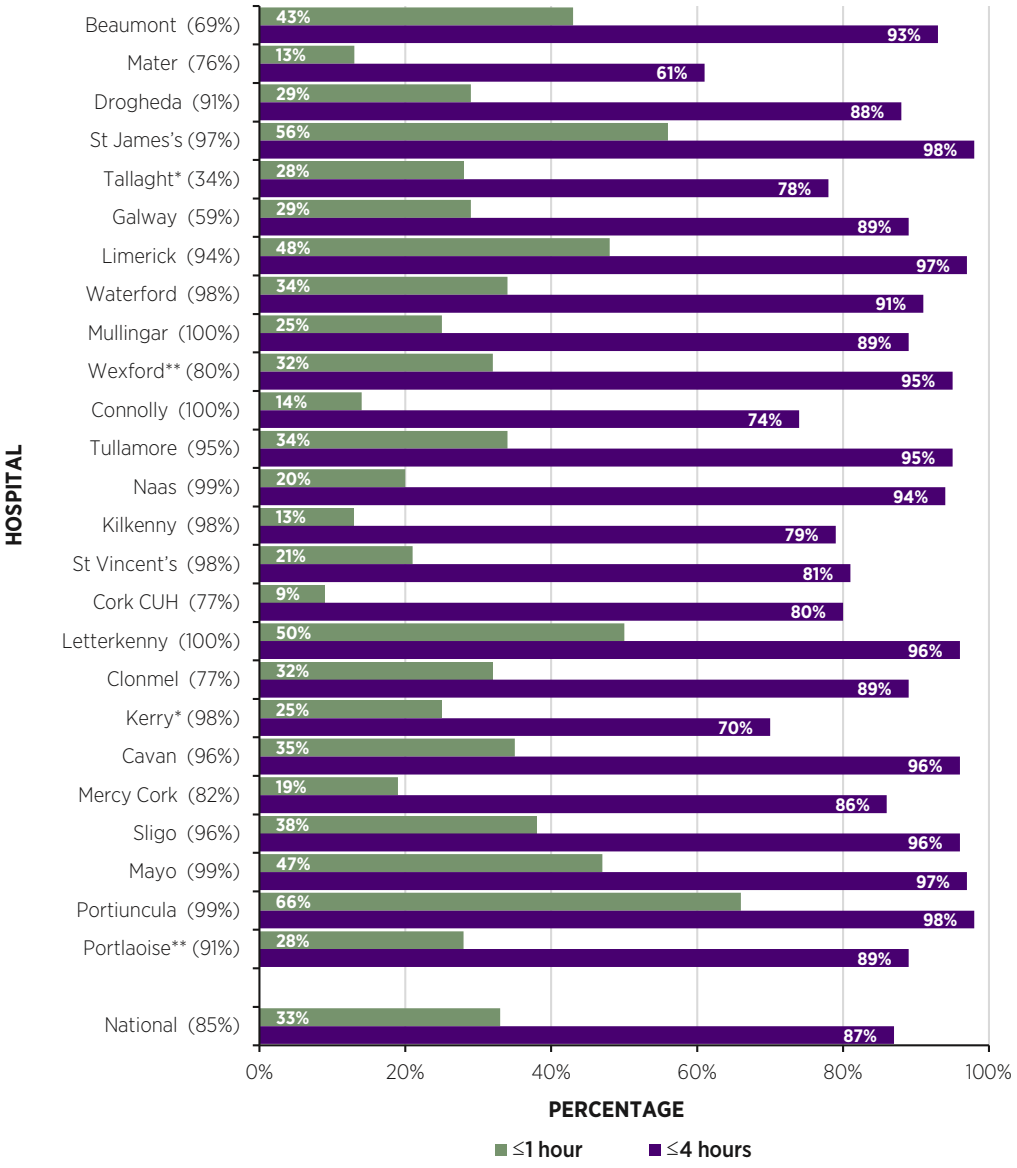


FIGURE 7.1: ADMISSIONS TO EACH UNIT FROM THE WARD OR EMERGENCY DEPARTMENT: (1) WITHIN 1 HOUR OF THE DECISION TO ADMIT AND (2) WITHIN 4 HOURS OF THE DECISION TO ADMIT, AS A PERCENTAGE OF ALL ADMISSIONS FROM THE WARD OR EMERGENCY DEPARTMENT[4]

Note: The parentheses after the hospital names show the percentage of admissions where the time of decision to admit was known.

* No data for one quarter.
** No data for two quarters.
Source: INICUA data

[4] These data refer only to patients whose time of decision to admit was recorded.

HIGH-RISK ADMISSIONS FROM THE WARD

This quality indicator (QI) measures the proportion of patients admitted to ICU from a ward in the same hospital who experienced multi-organ failure (defined as dysfunction in four or more organ systems) within 24 hours of admission to ICU. Some patients may be admitted to ICU in a timely fashion but then deteriorate quickly to experience multi-organ failure. However, an excessive number of patients developing multi-organ failure within 24 hours after ICU admission suggests that some of these patients should have been admitted to ICU earlier.

There are several possible reasons why patients were not admitted to ICU in a timely fashion: ward or ICU staff did not recognise the need for ICU admission, no ICU bed was available, or the criteria for admission to ICU were so restrictive that very sick patients were being cared for in the ward. If admission to ICU is delayed until patients are extremely ill, this leads to worsened outcomes for them. Caring for very sick patients on wards increases the burden on ward staff and is linked to higher mortality rates for these patients.

Patients admitted from a ward or ED who experienced organ failure in four or more organ systems within 24 hours of admission to ICU made up 10% of all admissions to Units participating in the INICUA in 2023 (Figure 7.2A). This compares with 8% in the UK (Figure 7.2B), and 12% in the ROI in 2022.

St James's Hospital General ICU and St Vincent's University Hospital ICU reported values outside the expected range for this QI in 2023; all other Units participating in the INICUA were within the expected range (Figure 7.2A).

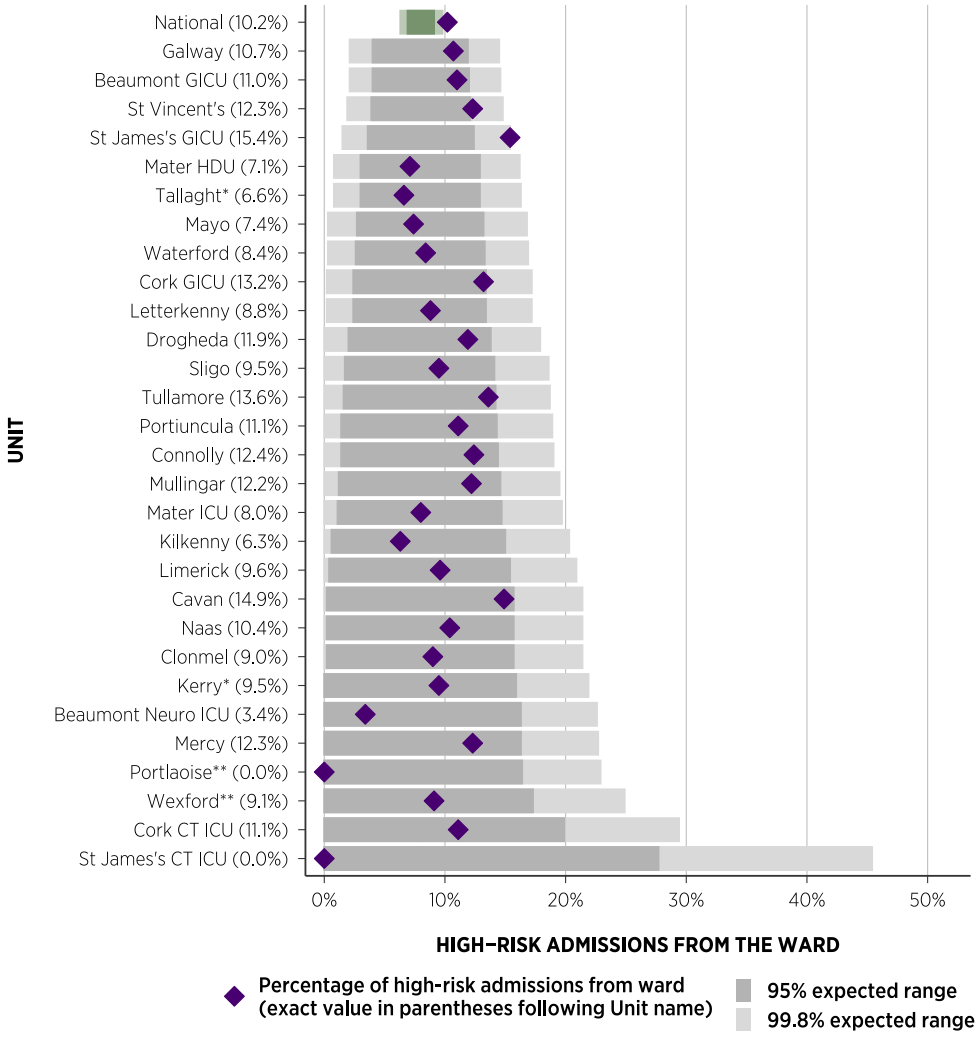


FIGURE 7.2A: ADMISSIONS TO EACH UNIT FROM A WARD WHO DEVELOPED ORGAN FAILURE IN FOUR OR MORE ORGAN SYSTEMS WITHIN 24 HOURS OF ADMISSION, AS A PERCENTAGE OF ALL UNIT ADMISSIONS FROM A WARD

Note: The sequence of Units shown in the chart is determined by the number of eligible admissions, with Units listed in decreasing order.
* No data for one quarter.
** No data for two quarters.
Source: INICUA data

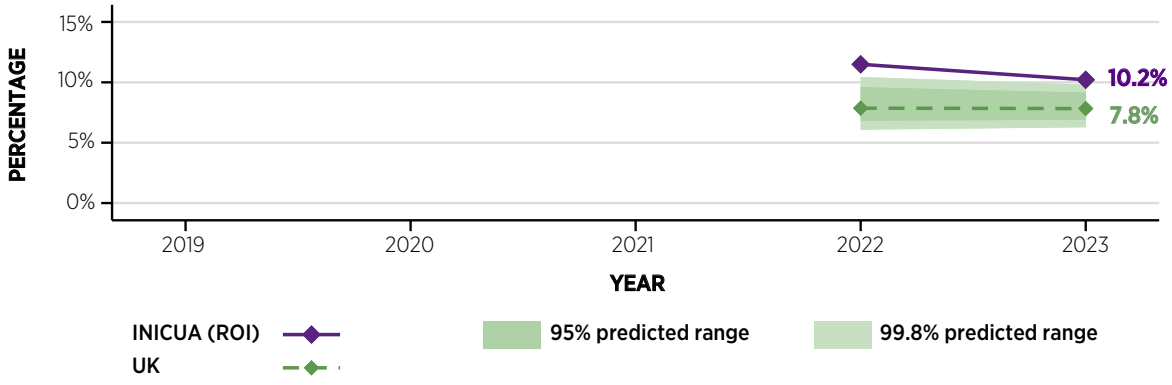


FIGURE 7.2B: ADMISSIONS TO ALL UNITS FROM A WARD WITH ORGAN FAILURE IN FOUR OR MORE ORGAN SYSTEMS WITHIN 24 HOURS OF ADMISSION, AS A PERCENTAGE OF ALL UNIT ADMISSIONS FROM A WARD, 2022–2023

Source: INICUA (ROI) and ICNARC (UK) data

HIGH-RISK ADMISSIONS TO ICU OF PATIENTS WITH SEPSIS

Sepsis is an important condition in critically ill patients and is notoriously difficult to diagnose in the early stages. Failure in four or more organ systems within 24 hours of ICU admission suggests that ICU admission was delayed. Data on patients admitted with sepsis (Sepsis-3 criteria) who experienced failure in four or more organ systems within 24 hours of ICU admission are shown in Figure 7.3A; note that the patients described in Figures 7.3A and 7.3B are a subset of the patients described in Figures 7.2A and 7.2B.

In the ROI, patients with failure in four or organ systems made up 10.5% of all ICU admissions from the ward with sepsis compared with 8.9% in the UK. This finding for the ROI is outside the expected range for this metric and suggests either a failure to recognise the severity of illness in these patients in the ward or a delay in accessing an ICU bed (Figure 7.3B).

St James's Hospital General ICU and Cork University Hospital General ICU were outliers for this QI in 2023. All other Units participating in the INICUA were within the expected range.

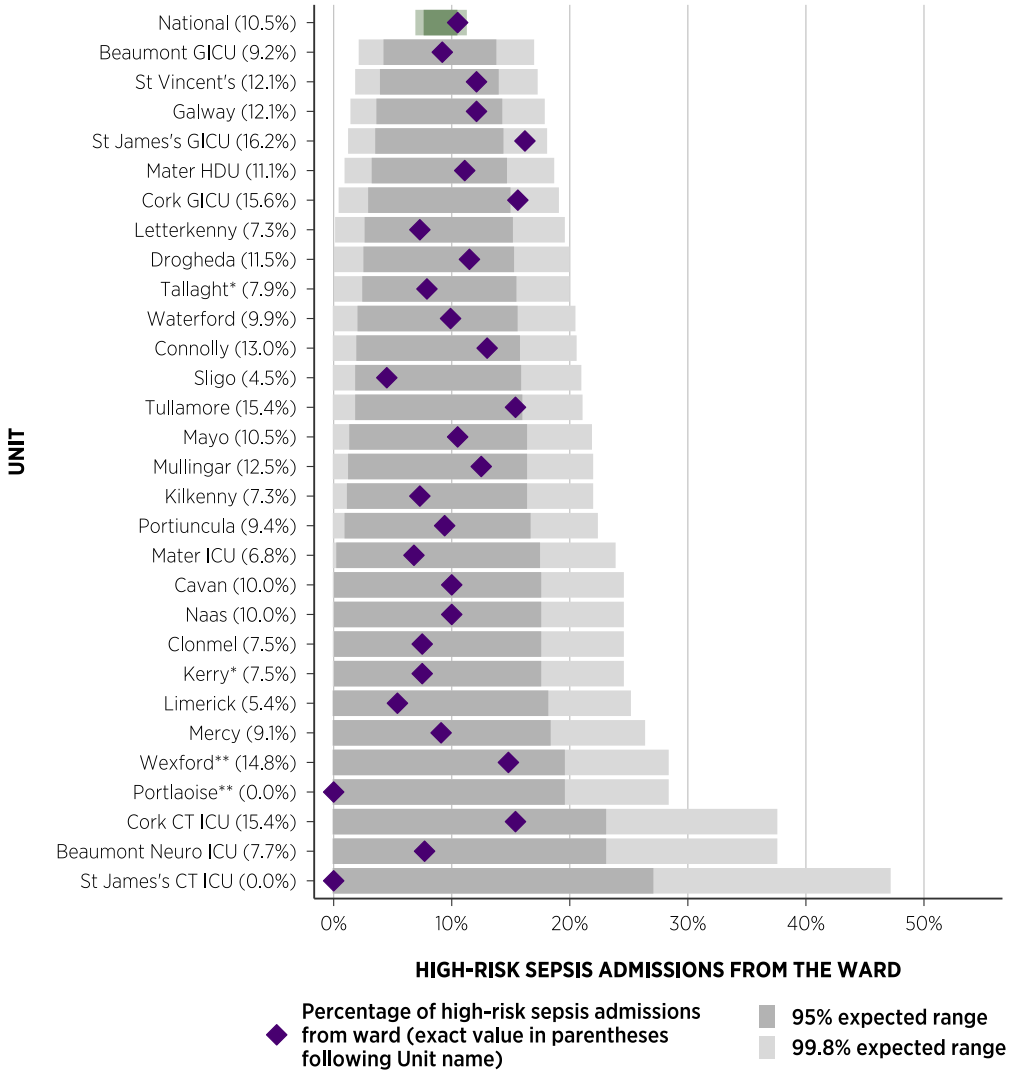


FIGURE 7.3A: ADMISSIONS TO EACH UNIT FROM A WARD WITH SEPSIS (SEPSIS-3) AND ORGAN FAILURE IN FOUR OR MORE ORGAN SYSTEMS WITHIN 24 HOURS OF UNIT ADMISSION, AS A PERCENTAGE OF ALL ADMISSIONS WITH SEPSIS FROM A WARD

Note: The sequence of Units shown in the chart is determined by the number of eligible admissions, with Units listed in decreasing order.

* No data for one quarter.
** No data for two quarters.
Source: INICUA data

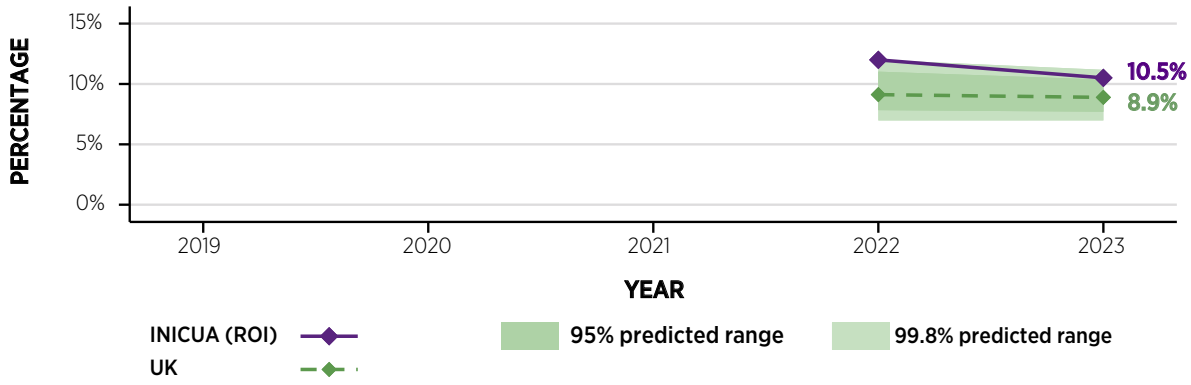


FIGURE 7.3B: ADMISSIONS TO ALL UNITS FROM A WARD OF PATIENTS WITH SEPSIS (SEPSIS-3) AND ORGAN FAILURE IN FOUR OR MORE ORGAN SYSTEMS WITHIN 24 HOURS OF UNIT ADMISSION, AS A PERCENTAGE OF ALL ADMISSIONS OF PATIENTS WITH SEPSIS FROM A WARD, 2022–2023

Source: INICUA (ROI) and ICNARC (UK) data

UNPLANNED DISCHARGES FROM ICU AT NIGHT

Discharges to the ward from ICU should take place during normal working hours because discharges at night worsen outcomes (Azevedo *et al.*, 2015) due to reduced staffing levels and less experienced staff on wards, as well as lack of knowledge of the patient's history. Commonly, discharges from ICU at night are unplanned, i.e. patients have not been formally cleared for discharge by 6.00pm on the evening before discharge. Unplanned discharges arise when an ICU bed is needed for an urgent admission and a patient is discharged in order to create an available bed, although that patient may not yet be ready for ward care.

If a high proportion of patients are discharged to the ward out of hours (i.e. between 22.00 and 06.59) without having been cleared for discharge by 18.00 the previous evening, this suggests that patients have been discharged without being fully ready or there is a failure by ICU staff to document which patients are fit for discharge.

In 2023, 3.7% of discharges from ICU occurred between 22.00 and 06.59 without having been cleared for discharge by 18.00 the previous evening (Figure 7.4A). This national value was outside the expected range and was almost twice as high as the UK figure (1.9%) (Figure 7.4B).

Eleven Units participating in the INICUA had outlier values for this QI in 2023 (Figure 7.4A): Mayo University Hospital ICU, Portiuncula University Hospital ICU, Midland Regional Hospital Portlaoise ICU, Regional Hospital Mullingar ICU, Wexford General Hospital ICU, Connolly Hospital ICU, Letterkenny University Hospital ICU, Tipperary University Hospital ICU, University Hospital Kerry ICU, Cavan General Hospital ICU, and Mercy University Hospital Cork ICU. The rates of unplanned discharges from ICU at night were within expected limits for all other Units in 2023.

These data show that a majority of Units in Model 3 hospitals were outliers for this metric, whereas values for Model 4 hospitals were within the expected range. This is surprising, especially as other metrics suggest that Model 4 hospitals are under greater pressure for ICU bed availability than Model 3 hospitals are. A possible explanation is a failure to document readiness for discharge in Model 3 hospitals, especially if there are no consultant or trainee staff specifically allocated to ICU. Several hospitals participating in the INICUA have highlighted that many of these patients go to step-down Units that have better staffing and monitoring than a normal ward. Whatever the reason, discharging patients from ICU at night is suboptimal in terms of patient safety.

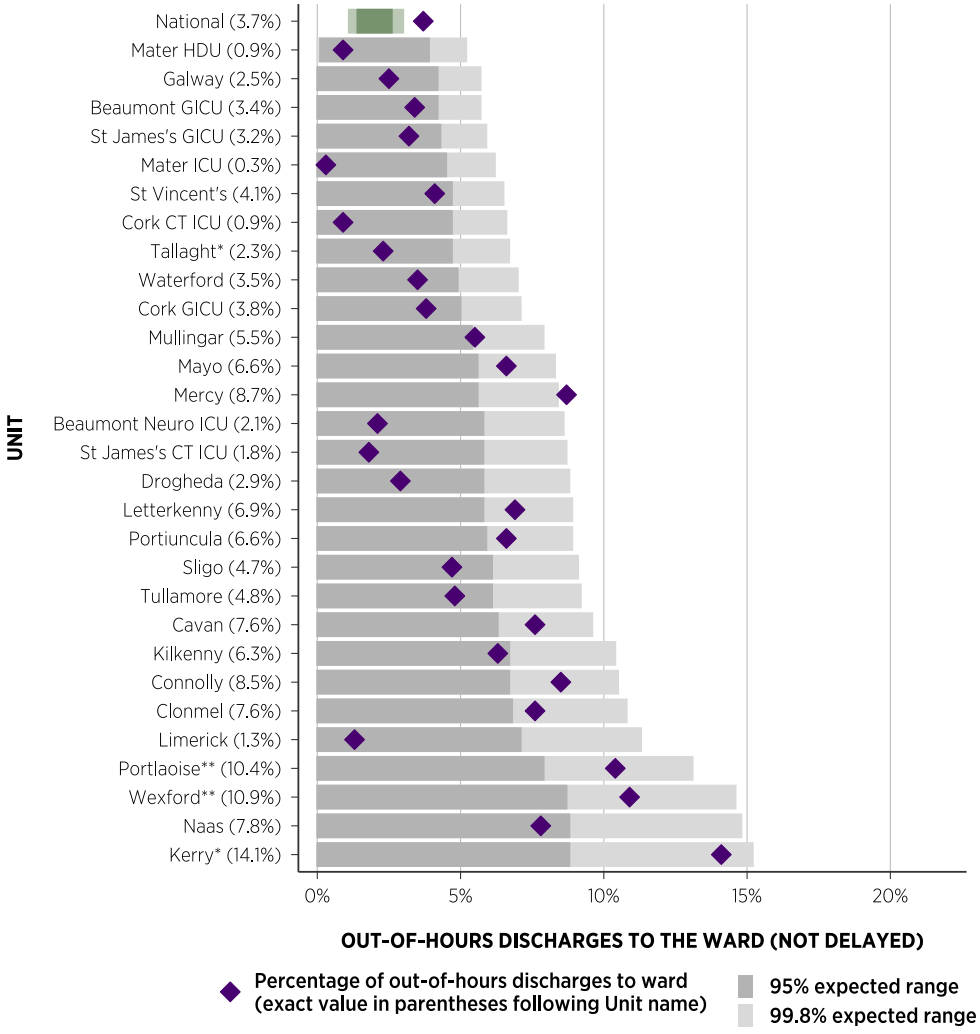


FIGURE 7.4A: PATIENTS DISCHARGED TO THE WARD AT NIGHT (22.00–06.59) FROM EACH UNIT WITHOUT BEING CLEARED FOR DISCHARGE BY 18.00, AS A PERCENTAGE OF ALL UNIT DISCHARGES TO THE WARD

Note: The sequence of Units shown in the chart is determined by the number of eligible admissions, with Units listed in decreasing order.
* No data for one quarter.
** No data for two quarters.

Source: INICUA data

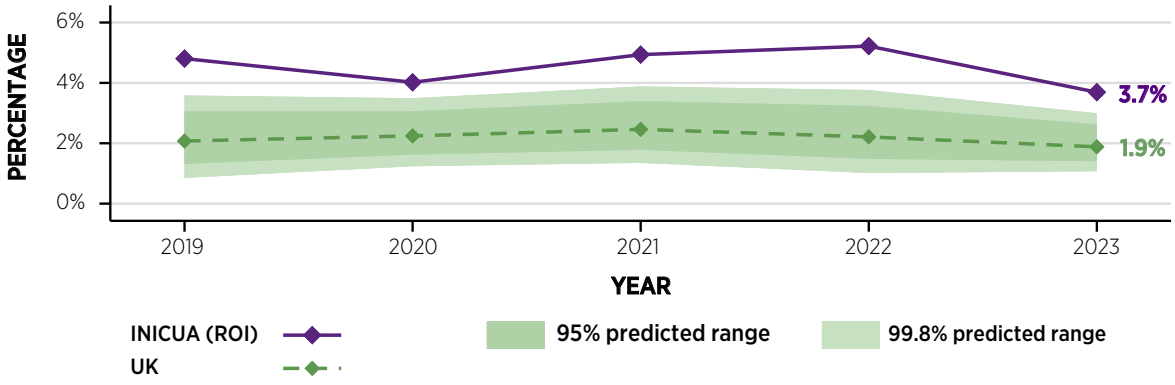


FIGURE 7.4B: PATIENTS DISCHARGED TO THE WARD AT NIGHT (22.00–06.59) FROM ALL UNITS WITHOUT BEING CLEARED FOR DISCHARGE BY 18.00, AS A PERCENTAGE OF ALL UNIT DISCHARGES TO THE WARD, 2019–2023

Source: INICUA (ROI) and ICNARC (UK) data

UNPLANNED READMISSION TO ICU

Unplanned readmission of patients to the Unit within 48 hours of discharge to the ward is an important indicator of the quality of care in ICU. Unplanned readmission may occur due to an unexpected clinical deterioration after appropriate Unit discharge, because a patient was discharged before they were ready for ward care, or because of shortcomings in their care in the ward. An excessive number of unanticipated readmissions to ICU suggests that patients were discharged too early, probably to make an ICU bed available for a sicker patient.

The overall national rate of unplanned readmission to ICU within 48 hours of discharge was 0.9% in 2023 (Figure 7.5A), while the UK rate was 1.1% (Figure 7.5B). Letterkenny University Hospital ICU and Sligo University Hospital ICU were outliers for this QI in 2023. Rates of unplanned readmission for all other Units were within the expected range (Figure 7.5A).

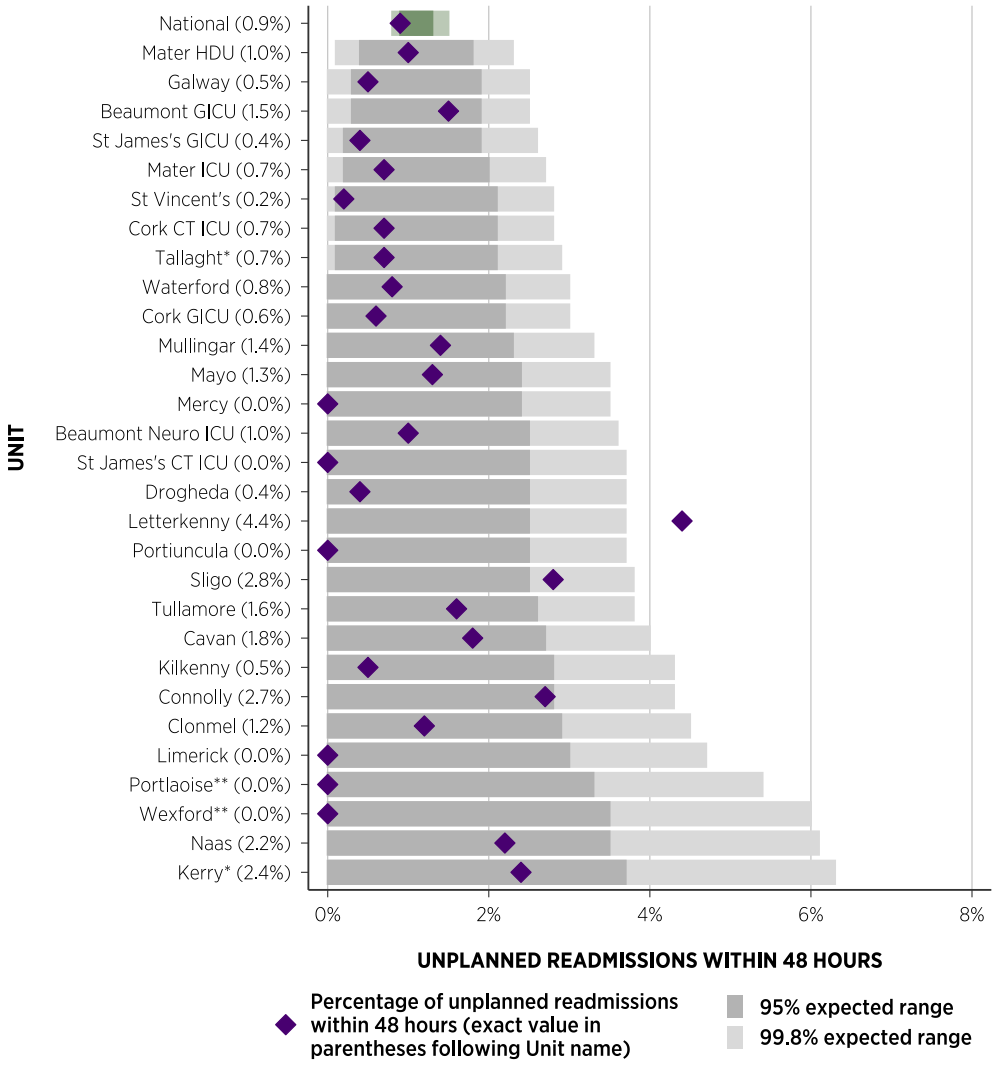


FIGURE 7.5A: UNPLANNED READMISSIONS TO EACH UNIT WITHIN 48 HOURS OF DISCHARGE FROM THE SAME UNIT, AS A PERCENTAGE OF UNIT DISCHARGES TO A WARD

Note: The sequence of Units shown in the chart is determined by the number of eligible admissions, with Units listed in decreasing order.
* No data for one quarter.
** No data for two quarters.

Source: INICUA data

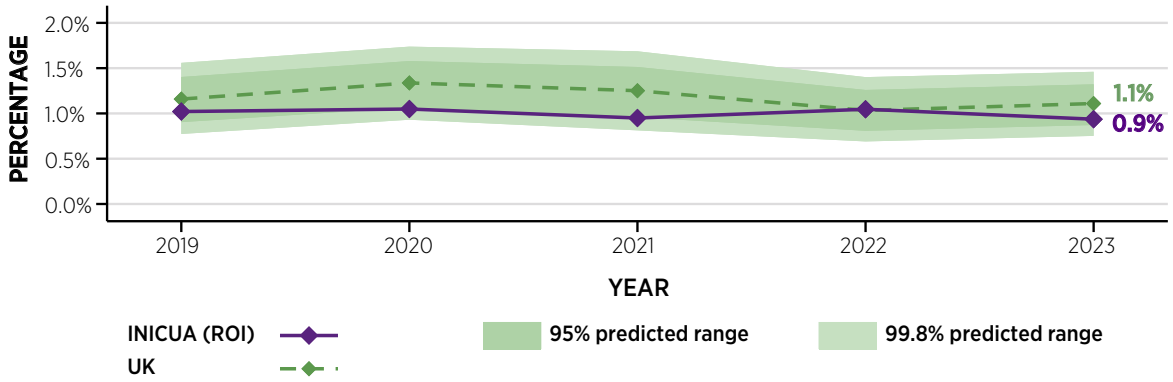


FIGURE 7.5B: UNPLANNED READMISSIONS TO ALL UNITS WITHIN 48 HOURS OF DISCHARGE FROM THE SAME UNIT, AS A PERCENTAGE OF ALL UNIT DISCHARGES TO A WARD, 2019–2023

Source: INICUA (ROI) and ICNARC (UK) data

MORTALITY AFTER ADMISSION TO CRITICAL CARE

Patients admitted to ICU or HDU are the sickest patients in the hospital; in addition, they often have significant coexisting illnesses, and many are elderly. Figure 7.6 shows the percentage of patients admitted to ICU in 2023 who survived to be discharged alive from acute hospital.

Eighty-six percent of ICU patients survived to discharge from ICU or HDU in 2023, and 80% survived to be discharged from acute hospital (Figure 7.6). This mortality rate is significant, but this reflects (1) the severity of illness of patients admitted to ICU, (2) the existence of serious pre-existing conditions (e.g. cardiac disease or metastatic cancer), and (3) patient age. The mortality rates in ICU in the ROI are in line with international comparators that have a similar patient profile.

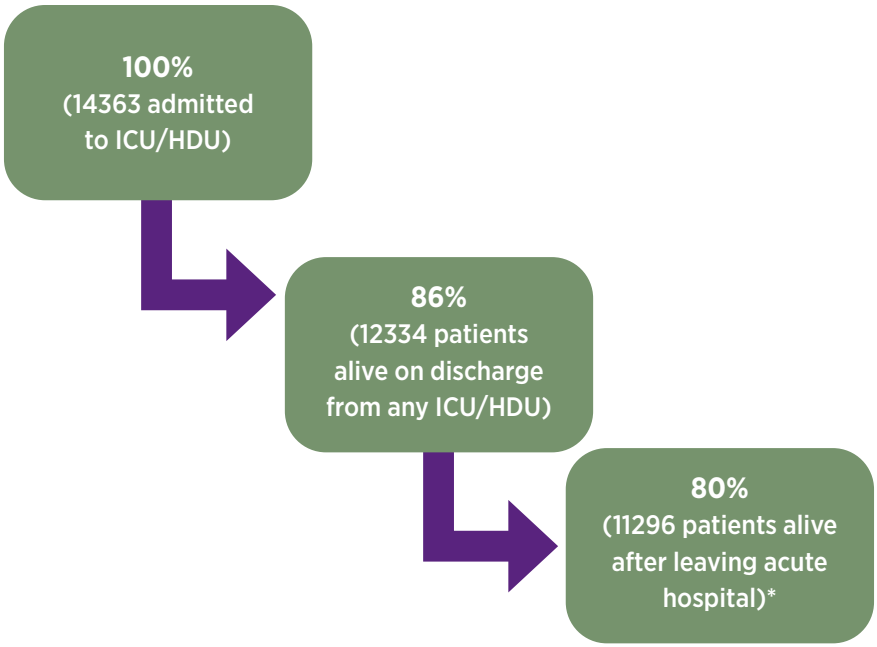


FIGURE 7.6: PERCENTAGES OF PATIENTS ADMITTED TO A UNIT (N=14363) WHO WERE ALIVE: (1) ON DISCHARGE FROM ANY UNIT AND (2) ON DISCHARGE FROM ACUTE HOSPITAL IN 2023

* Outcome unknown for 214 patients.

ACUTE HOSPITAL MORTALITY

Mortality rates in ICU depend primarily on the case mix of patients admitted to a Unit. Units with a large proportion of high-risk patients will have a high mortality rate, regardless of the quality of care provided. Benchmarking mortality rates between Units requires adjustment for the relative risk of death of the patient populations in each Unit.

ICNARC uses a mathematical model to predict the risk of death of individual patients. This model incorporates data on age, pre-existing conditions, source of referral, admission diagnosis, and illness severity, as assessed by physiological and laboratory data. The analytic model is based on ICNARC's large database of ICU patients, collected since 1995. The model is updated and recalibrated regularly in order to account for changes in ICU practice and demographics, as well as for the generally improving ICU outcomes observed in recent years. We have used the $ICNARC_{H\text{-}2023}$ model for the analyses in this report.

ICNARC calculates the expected number of deaths for each Unit based on this mathematical model. Readmissions to the Unit during the same acute hospital stay are excluded from analysis in order to ensure that patients are included in the observed mortality figures only once. With variability in case mix and unavoidable limitations in the mortality prediction model, some variability between the predicted and observed numbers of deaths is expected. To allow for this variability, 95% confidence intervals are calculated around the mean expected mortality rate (Figure 7.7A). An observed mortality rate outside the 95% expected range is considered an outlier for this QI. When a Unit is found to be an outlier, this finding acts as a signal to consider whether the quality of care is affecting clinical outcomes in the Unit.

The ratio of the observed to the predicted numbers of deaths is the standardised mortality ratio (SMR). If the SMR is 1, it means that the Unit had exactly the expected number of deaths. SMR data for 2023 for Units in the ROI are shown in Figures 7.7C, 7.8C and 7.9B.

RISK-ADJUSTED MORTALITY

Figure 7.7A shows the observed hospital mortality rate for patients admitted to each Unit participating in the INICUA in 2023, and the 95.0% and 99.8% predicted ranges for mortality rates. All Units had observed mortality rates either within or below the expected range, indicating an acceptable mortality rate.

Nationally, the observed mortality rate of 20% in 2023 was slightly lower than the predicted mortality rate (21%), giving an SMR of 0.94 (Figures 7.7A and 7.7B). This compares to an SMR of 1.00 in 2022 and 1.16 in 2021; we believe that the higher SMR in 2021 was because the earlier $ICNARC_{H\text{-}2018}$ mortality prediction model did not reflect the true risk of death for patients with COVID-19.

Figure 7.7C shows the SMR for individual Units plotted against the expected number of deaths in each Unit. The SMR for aggregated data for all patients who were initially admitted to the 15 smaller Units (those with fewer than 200 Level 3 admissions per annum; Figure 5.5) was 0.91, while the SMR for all patients who were initially admitted to the 14 larger Units (those with 200 or more Level 3 admissions per annum) was 0.96. These SMRs, suggesting that the number of observed deaths was below the number of expected deaths in both groups of Units, indicate equality of outcomes regardless of whether patients were initially admitted to smaller-volume Units or to larger-volume Units. The data in Chapter 10 show the large volume of transfers from smaller Units to 'hub' Units for specialist care (National Standards for Adult Critical Care Services, 2024); this is likely to have contributed to this equality of outcomes.

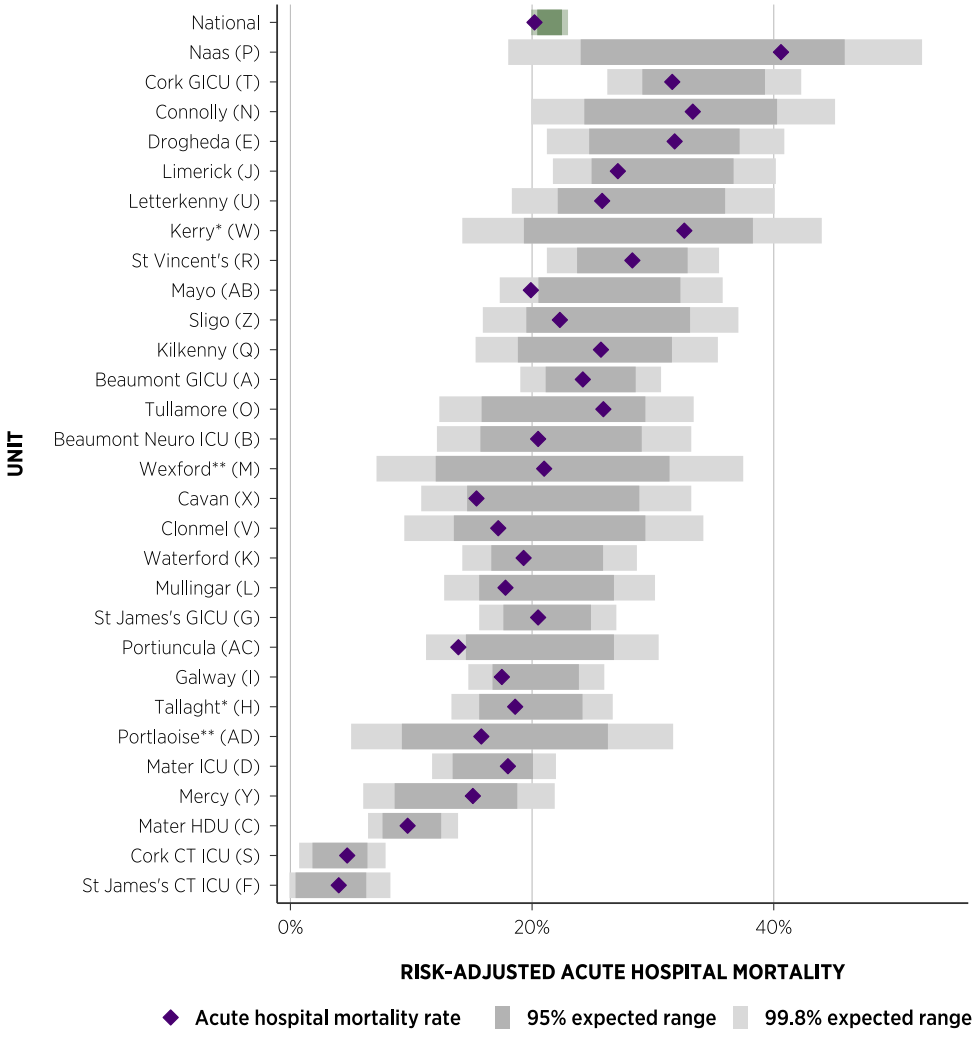


FIGURE 7.7A: MORTALITY RATES FOR EACH UNIT: OBSERVED RATES AND EXPECTED RANGES (ICNARC$_{H\text{-}2023}$ MODEL)

Note: Units are listed according to their predicted mortality rates, in decreasing order.

* No data for one quarter.
** No data for two quarters.
Source: INICUA data

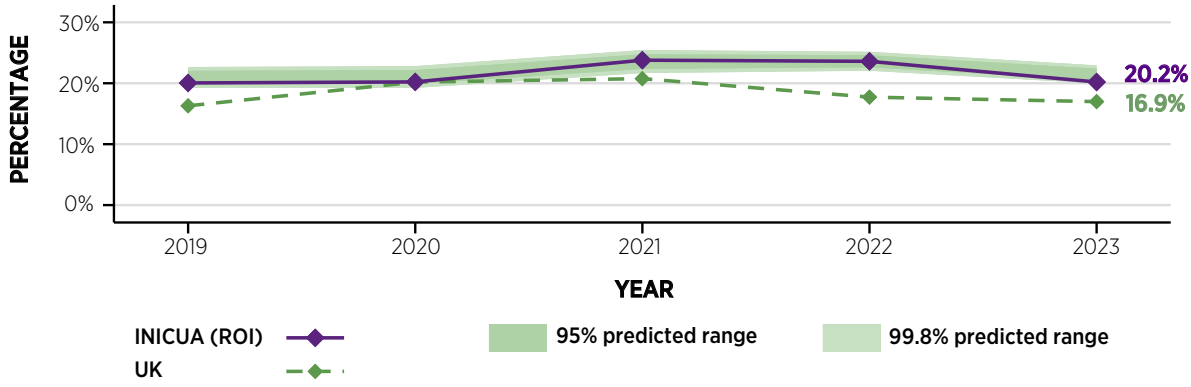


FIGURE 7.7B: HOSPITAL MORTALITY RATES AFTER ADMISSION TO ALL UNITS, 2019–2023

Source: INICUA (ROI) and ICNARC (UK) data

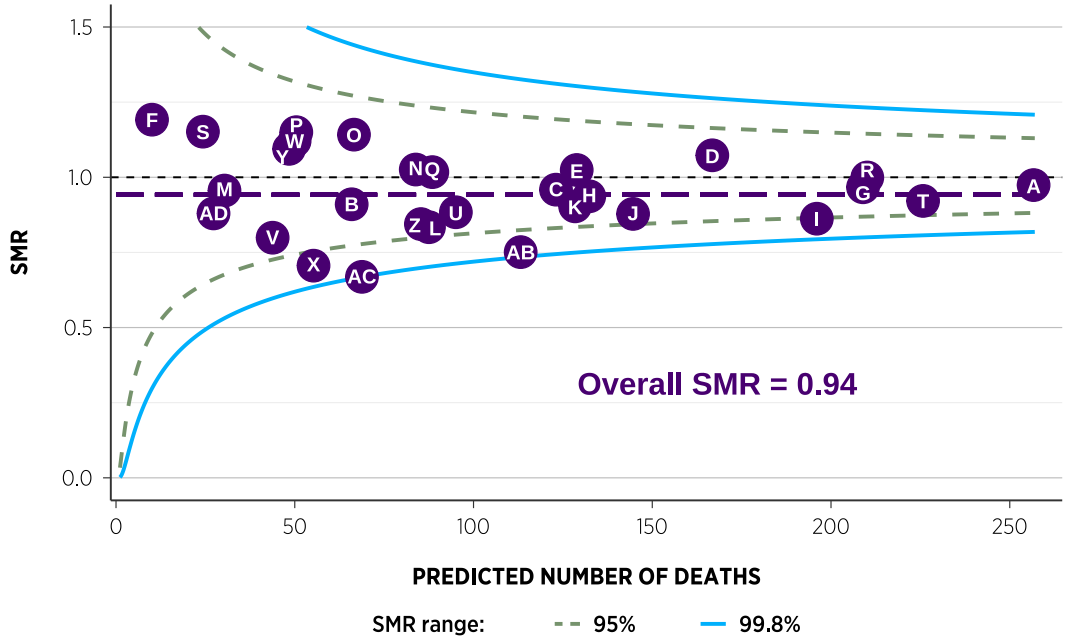


FIGURE 7.7C: STANDARISED MORTALITY RATIOS FOR EACH UNIT (ICNARC$_{H\text{-}2023}$ MODEL), 2023

Note: Each purple circle with a letter denotes a Unit in the ROI (see Table 4.1 for key).

MORTALITY IN LOW-RISK PATIENTS

Figure 7.8A shows the observed acute hospital mortality rate for patients whose predicted mortality rate ($ICNARC_{H\text{-}2023}$) was less than 20% when they were admitted to ICU. These patients are a subset of the patients shown in Figure 7.7A. An excess number of deaths in this low-risk group could raise concerns about the quality of care in a Unit.

There were no outlier Units for this QI in 2023 (Figure 7.8A); values for all Units were within or better than the expected range. The overall hospital mortality rate for low-risk admissions in the ROI was 4.3% (Figure 7.8B). The ratio of observed to expected deaths (SMR) for all low-risk admissions nationally in 2023 was 0.88 (Figure 7.8C). This compares with SMRs for these patients of 1.03 in 2022 and 1.38 in 2021.

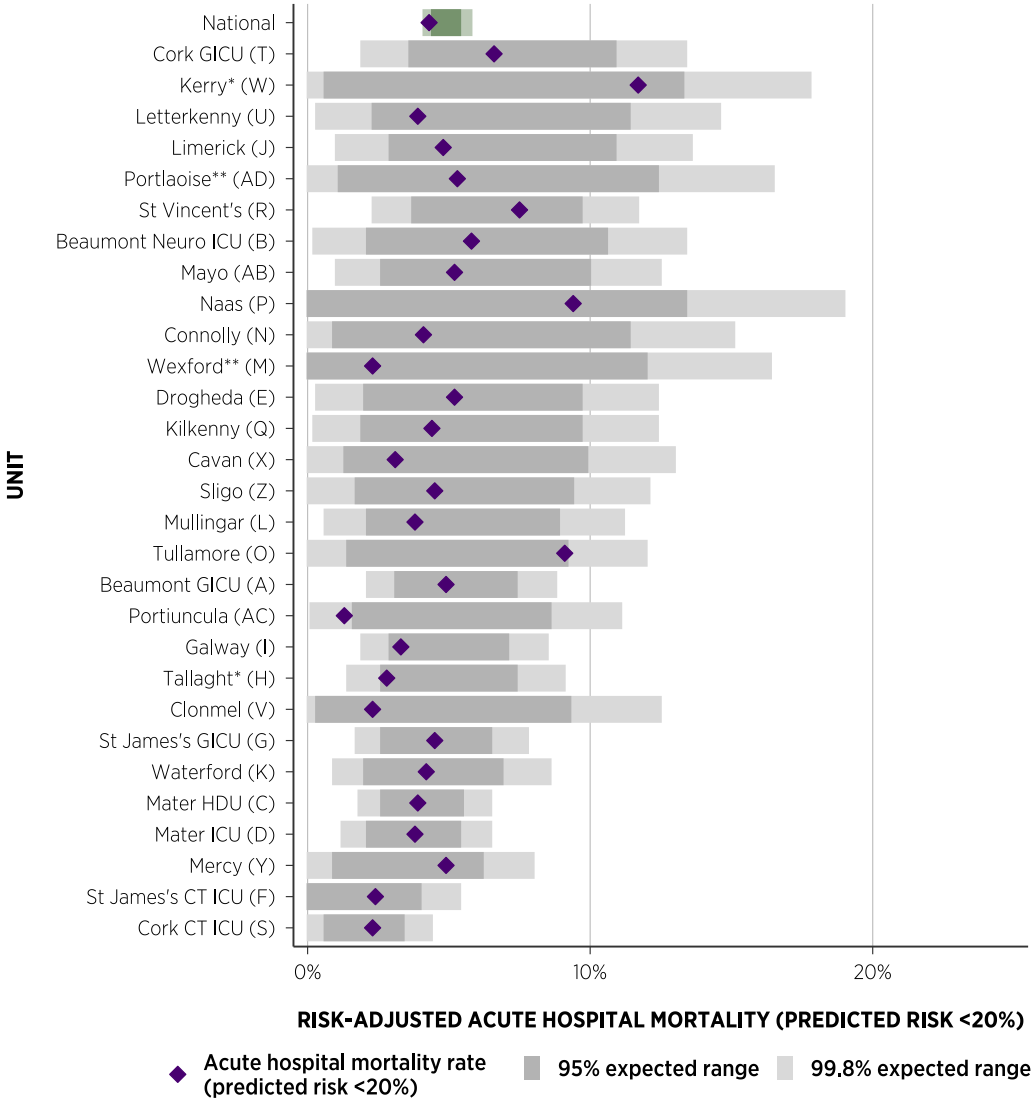


FIGURE 7.8A: HOSPITAL MORTALITY RATE FOR PATIENTS WHOSE PREDICTED RISK OF DEATH WAS LESS THAN 20% ON ADMISSION TO A UNIT: OBSERVED RATES AND EXPECTED RANGES ($ICNARC_{H\text{-}2023}$ MODEL)

Note: Units are listed according to their predicted mortality rates, in decreasing order.
* No data for one quarter.
** No data for two quarters.
Source: INICUA data

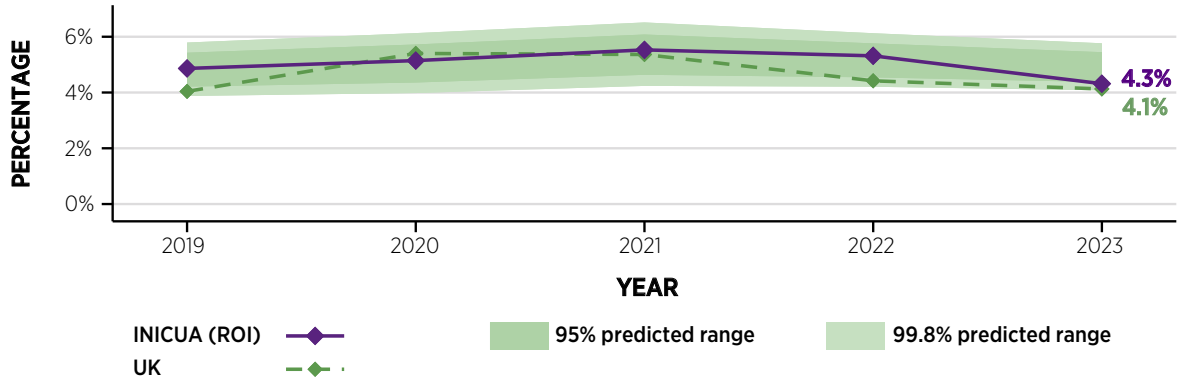


FIGURE 7.8B: HOSPITAL MORTALITY RATE FOR PATIENTS WHOSE PREDICTED RISK OF DEATH WAS LESS THAN 20% ON ADMISSION TO ALL UNITS (ICNARC$_{H\text{-}2023}$ MODEL), 2019–2023

Source: INICUA (ROI) and ICNARC (UK) data

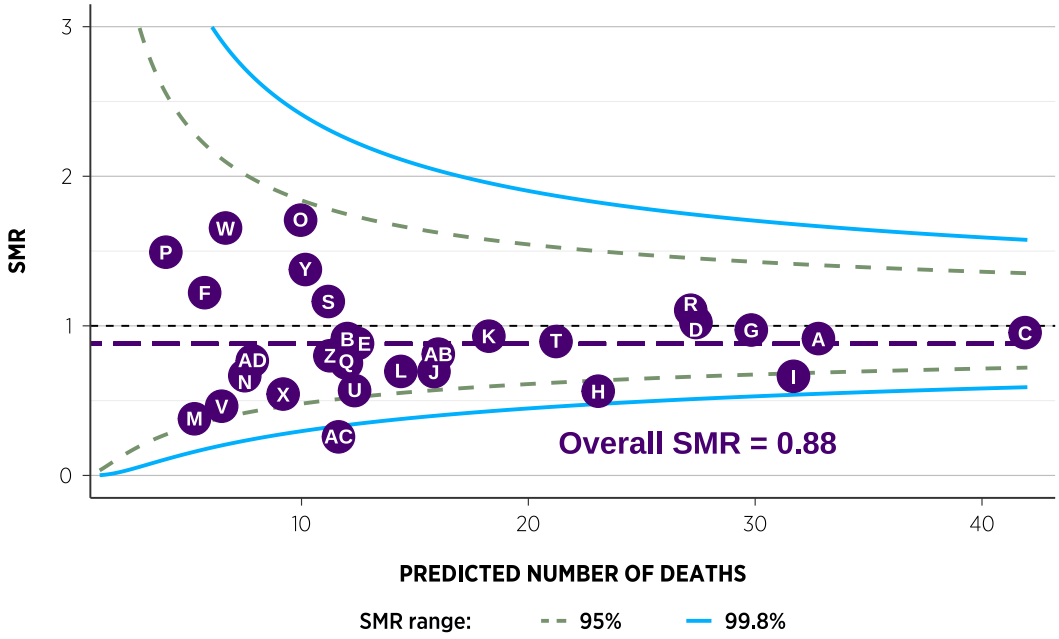


FIGURE 7.8C: STANDARDISED MORTALITY RATIOS FOR EACH UNIT FOR LOW-RISK PATIENTS (ICNARC$_{H\text{-}2023}$ MODEL)

Note: Each purple circle with a letter denotes a Unit in the ROI (see Table 4.1 for key).

MORTALITY IN HIGH-RISK PATIENTS

NOCA analysed the INICUA data to identify patients with a predicted risk of death greater than 20% (ICNARC$_{H\text{-}2023}$ risk-prediction model). The percentages of patients admitted to each Unit with a predicted risk of death greater than 20% are shown in Figure 7.9A.

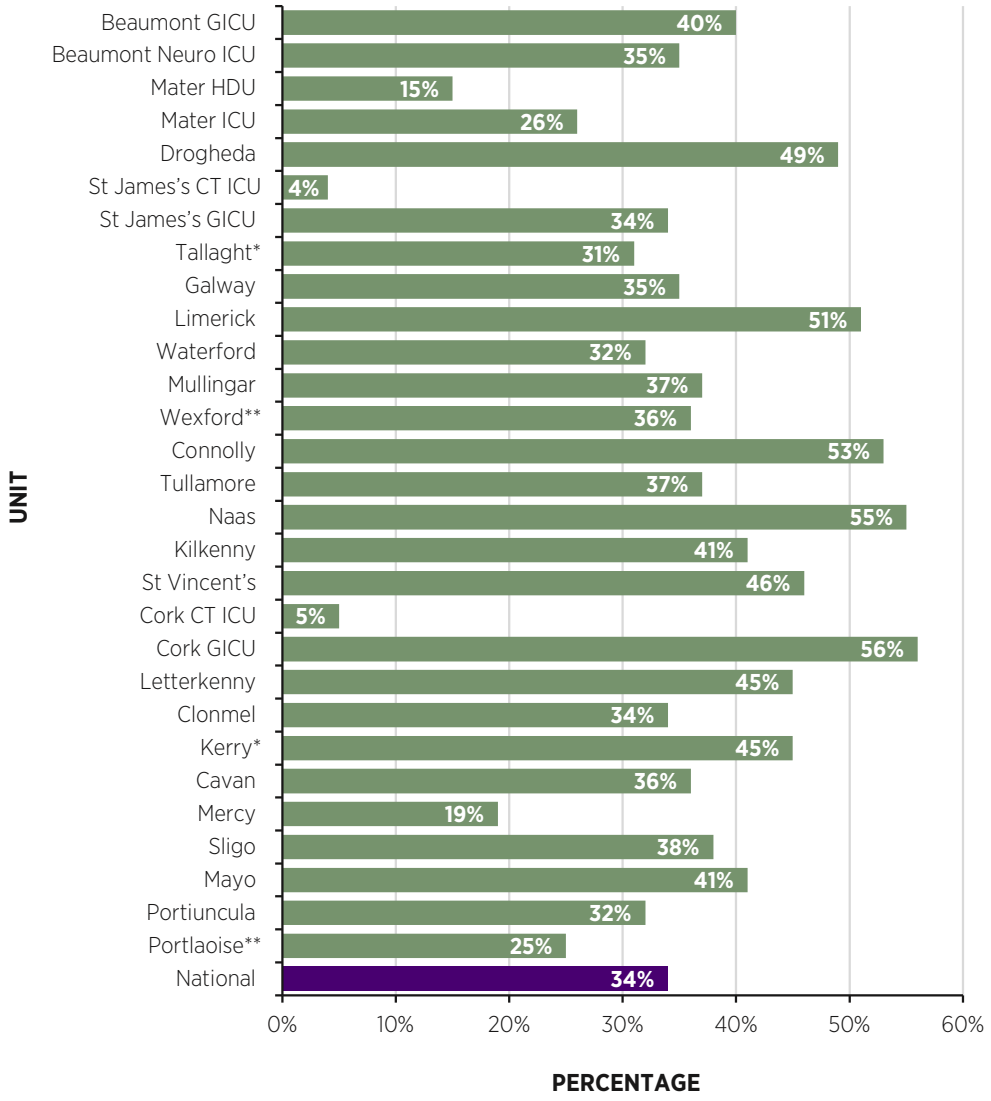


FIGURE 7.9A: PATIENTS WHOSE PREDICTED RISK OF DEATH WAS GREATER THAN 20%, AS A PERCENTAGE OF ALL UNIT ADMISSIONS (n=14064)

NOCA identified the patients in each Unit whose predicted risk of death was greater than 20% and calculated the SMR for these patients. The SMR for these high-risk patients in each Unit was plotted against the predicted number of deaths for each Unit (Figure 7.9B).

There was a wider variation in SMRs between Units with fewer admissions, as would be expected statistically. The national mean SMR for all patients with a greater than 20% predicted risk of death was 0.95, meaning that the mortality rate aligned closely with the rate predicted by the $ICNARC_{H\text{-}2023}$ predictive model. There was no large variation above the mean for any Unit (Figure 7.9B).

NOCA aggregated the 2023 data on high-risk patients (those with a greater than 20% predicted risk of death) from the 15 smaller Units (those with fewer than 200 Level 3 admissions per annum) (Figure 5.5). The SMR for these patients was 0.92, compared with an SMR of 0.97 for high-risk patients admitted to the 14 larger Units (those with 200 or more Level 3 admissions annually). This information suggests that outcomes for seriously ill patients who were initially admitted to smaller-volume Units are comparable to outcomes for patients who were initially admitted to larger-volume Units. Many patients were transferred from smaller- to larger-volume Units during their care, and these data suggest that the national network for ICUs works well to ensure equality of outcomes as measured by risk-adjusted mortality.

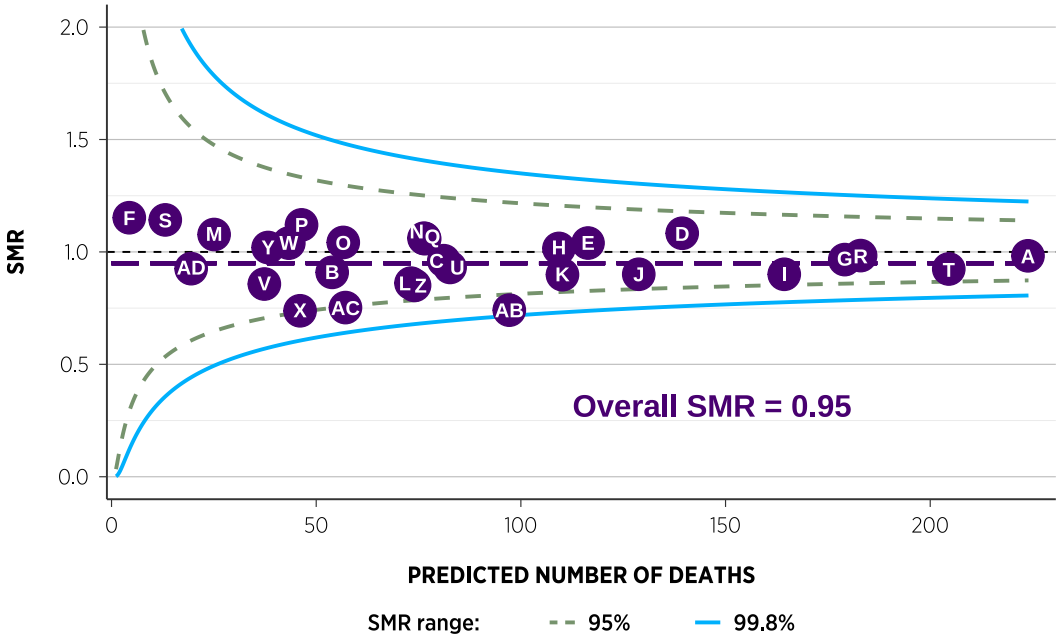


FIGURE 7.9B: OBSERVED DEATHS IN EACH UNIT AS A PROPORTION OF PREDICTED DEATHS (STANDARDISED MORTALITY RATIO) FOR PATIENTS WITH AN INDIVIDUAL PREDICTED RISK OF DEATH GREATER THAN 20%

Note: Each purple circle with a letter denotes a Unit in the ROI (see Table 4.1 for key). Units are shown in order of increasing numbers of eligible patients.

INFECTION

Multidrug-resistant organisms (MDROs) are a major problem in ICUs. It is important to routinely screen patients who are admitted to ICU for MDROs in order to monitor the prevalence of these organisms and to isolate patients with positive cultures to prevent cross-infection (Table 7.1). Our data indicate that most ICU patients who had MDROs detected in 2023 were colonised before ICU admission.

Our data refer to colonisation with MDROs rather than to clinically significant infections; normally only a small proportion of patients who are colonised develop clinically significant infections.

It is not routine practice to test for *Clostridioides difficile* (*C. difficile*) unless the patient is symptomatic.

TABLE 7.1: NATIONAL RATES OF: (1) TESTING FOR MULTIDRUG-RESISTANT ORGANISMS ON ADMISSION TO THE UNIT, (2) COLONISATION ON ADMISSION TO THE UNIT, (3) COLONISATION ACQUIRED IN THE UNIT, AND (4) COLONISATION IN THE UNIT PER 1,000 PATIENT DAYS (FOR PATIENTS IN THE UNIT FOR MORE THAN 48 HOURS)

Organism	Testing for MDROs; percentage of all admissions	Colonisation on admission to Unit; percentage of those tested	Unit-acquired colonisation; percentage of those tested	Unit-acquired colonisation; rate per 1000 patient days
Methicillin-resistant *Staphylococcus aureus* (MRSA)	95.2%	2.1%	0.3%	0.5
C. difficile	15.7%	4.9%	1.8%	0.5
Vancomycin-resistant enterococci (VRE)	88.8%	10.2%	2.6%	3.9
Carbapenemase-producing Enterobacterales (CPE)	93.9%	0.7%	0.1%	0.2

TESTING FOR MDROs

Most Units undertook testing of a high proportion of patients for MRSA, VRE and CPE (Figure 7.10). In keeping with national guidelines, *C. difficile* is only tested for when there are clinical indications.

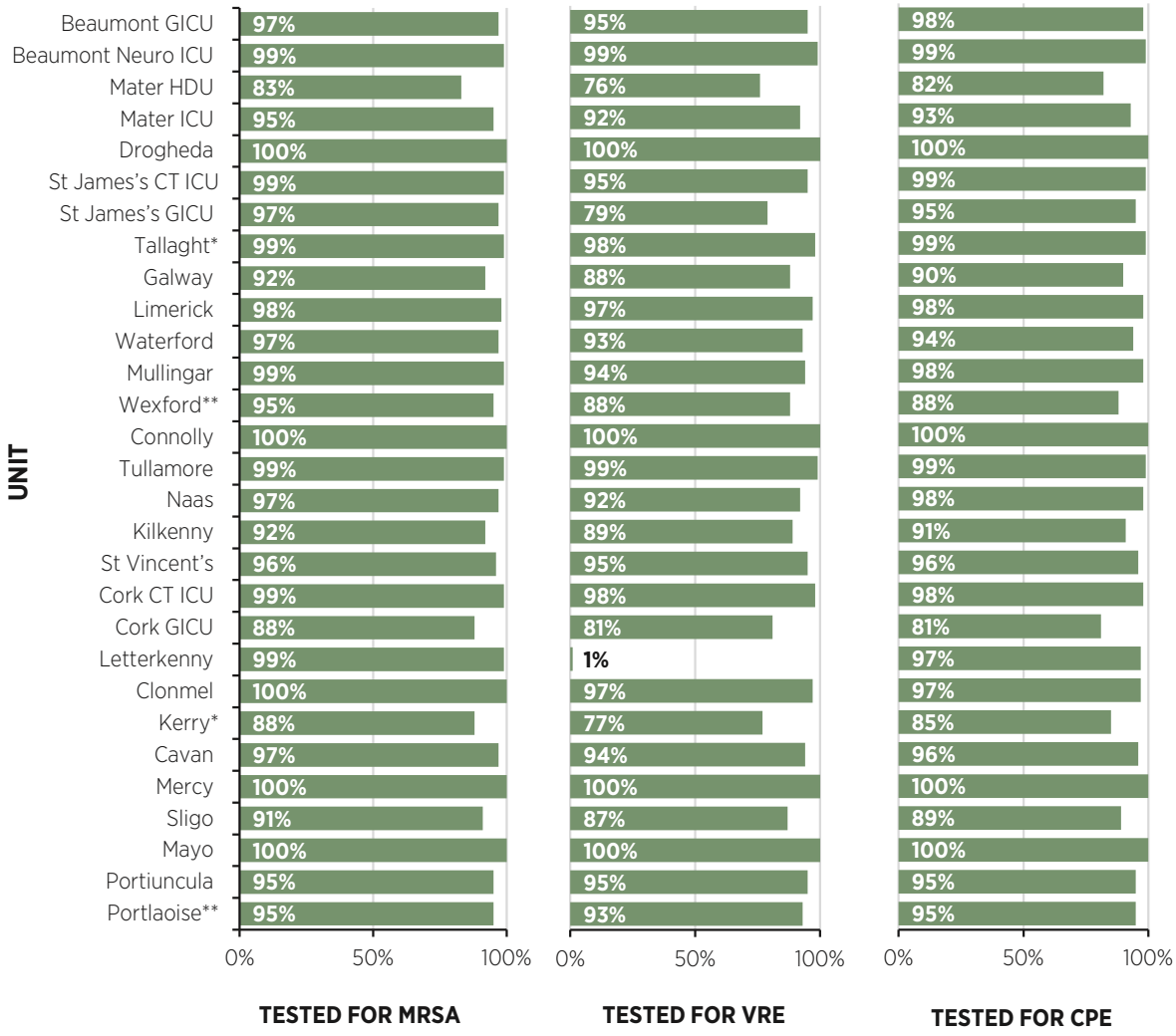


FIGURE 7.10: PERCENTAGE OF PATIENTS TESTED FOR MDROS (MRSA, VRE, AND CPE) IN EACH UNIT

* No data for one quarter.
** No data for two quarters.

COLONISATION BEFORE ADMISSION TO ICU

Rates of colonisation with MDROs at the time of admission to ICU, as a percentage of the patients who were tested, are shown in Table 7.2.

The lowest rates of colonisation on admission tended to be in specialist Units (e.g. Beaumont Hospital (Richmond) Neurosurgical ICU and Cork University Hospital Cardiothoracic ICU), possibly reflecting the admission of fewer patients who had spent many days in hospital before requiring ICU care.

TABLE 7.2: RATES OF COLONISATION BY MULTIDRUG-RESISTANT ORGANISMS ON ADMISSION TO EACH UNIT, AS A PERCENTAGE OF PATIENTS TESTED

Unit	Colonised on admission to unit		
	MRSA	VRE	CPE
Beaumont Hospital General ICU	1.8%	9.4%	0.6%
Beaumont Hospital (Richmond) Neurosurgical ICU	1.6%	3.0%	0.3%
Mater Misericordiae University Hospital HDU	0.9%	10.4%	0.5%
Mater Misericordiae University Hospital ICU	0.8%	6.2%	0.6%
Our Lady of Lourdes Hospital Drogheda ICU	1.8%	6.4%	0.0%
St James's Hospital Cardiothoracic ICU	0.6%	7.7%	0.0%
St James's Hospital General ICU	2.2%	15.7%	0.7%
Tallaght University Hospital ICU*	2.0%	13.2%	1.3%
University Hospital Galway ICU	2.8%	9.7%	1.4%
University Hospital Limerick ICU	2.6%	10.1%	1.9%
University Hospital Waterford ICU	3.0%	18.1%	1.2%
Regional Hospital Mullingar ICU	2.8%	8.9%	0.7%
Wexford General Hospital ICU**	5.1%	11.0%	0.8%
Connolly Hospital ICU	0.7%	5.7%	0.4%
Midland Regional Hospital Tullamore ICU	4.8%	20.4%	1.3%
Naas General Hospital ICU	7.9%	21.7%	1.3%
St Luke's General Hospital Carlow/Kilkenny ICU	4.2%	11.0%	1.5%
St Vincent's University Hospital ICU	1.3%	12.8%	0.7%
Cork University Hospital Cardiothoracic ICU	1.8%	4.8%	0.2%
Cork University Hospital General ICU	1.0%	10.5%	0.9%
Letterkenny University Hospital ICU^	3.6%	-	0.0%
Tipperary University Hospital ICU	1.8%	15.9%	0.0%
University Hospital Kerry ICU*	2.5%	7.0%	0.0%
Cavan General Hospital ICU	1.5%	5.5%	0.0%
Mercy University Hospital Cork ICU	0.8%	6.5%	0.0%
Sligo University Hospital ICU	1.3%	6.1%	0.7%
Mayo University Hospital ICU	3.8%	10.3%	1.8%
Portiuncula University Hospital ICU	3.1%	11.7%	0.5%
Midland Regional Hospital Portlaoise ICU**	2.6%	6.6%	0.6%

* No data for one quarter.
** No data for two quarters.
^ VRE not tested for

UNIT-ACQUIRED COLONISATION

Unit-acquired colonisation is defined as positive cultures of a new organism in any sample taken more than 48 hours after admission to the Unit and before the patient has left the Unit. This underestimates the true rate of Unit-acquired colonisation, as data on samples taken on the wards after Unit discharge are not included and positive cultures identified within 48 hours after discharge from ICU will be omitted. Nevertheless, the available data indicate that Unit-acquired colonisation by MDROs in 2023 was relatively rare (Table 7.3).

Rates of colonisation also depend on the frequency of testing; the more testing that is undertaken, the more cases that will be detected. Our data documented whether the patient was tested at least once but did not specify how many times any patient was tested.

Testing for these organisms – including testing of asymptomatic patients – is carried out routinely in most Units, and rates of Unit-acquired colonisation with MDROs were relatively low.

TABLE 7.3: UNIT-ACQUIRED COLONISATION BY MDROS (RATE PER 1,000 PATIENT DAYS; INCLUDES ONLY PATIENTS WHO WERE IN ICU FOR MORE THAN 48 HOURS)

Unit	Unit-acquired colonisation (rate per 1000 patient days)			
	MRSA	*C. difficile*	VRE	CPE
Beaumont Hospital General ICU	1.5	1.2~	4.2	0.3
Beaumont Hospital (Richmond) Neurosurgical ICU	1.4	1.1~	2.0	0.0
Mater Misericordiae University Hospital HDU	0.2~	0.2~	1.9~	0.0~
Mater Misericordiae University Hospital ICU	0.4	0.6~	3.5	0.6
Our Lady of Lourdes Hospital Drogheda ICU	0.3	0.7~	1.7	0.3
St James's Hospital Cardiothoracic ICU	0.0	0.0~	5.8	0.5
St James's Hospital General ICU	0.0	0.2~	8.1~	0.1
Tallaght University Hospital ICU*	0.2	0.0~	3.1	0.5
University Hospital Galway ICU	0.7	0.0~	1.6~	0.0~
University Hospital Limerick ICU	0.5	0.0~	3.3	0.3
University Hospital Waterford ICU	0.3	0.0~	2.8	0.3
Regional Hospital Mullingar ICU	0.5	0.0~	8.1	0.5
Wexford General Hospital ICU**	0.0	1.5~	4.5~	0.0~
Connolly Hospital ICU	0.6	0.0~	3.9	0.0
Midland Regional Hospital Tullamore ICU	0.0	0.7~	7.3	0.0
Naas General Hospital ICU	0.0	0.0~	8.4	0.0
St Luke's General Hospital Carlow/Kilkenny ICU	1.4	1.4~	5.5~	0.0
St Vincent's University Hospital ICU	0.5	0.8~	5.5	0.0
Cork University Hospital Cardiothoracic ICU	1.0	1.0~	1.9	0.0
Cork University Hospital General ICU	0.3~	0.5~	4.0~	0.2~
Letterkenny University Hospital ICU	0.0	0.7~	1.4~	0.0
Tipperary University Hospital ICU	1.3	0.0~	5.6	0.0
University Hospital Kerry ICU*	0.0~	2.5~	2.5~	0.0~
Cavan General Hospital ICU	0.0	1.0~	0.0	0.0
Mercy University Hospital Cork ICU	0.5	0.5~	3.2	0.0
Sligo University Hospital ICU	0.9	0.0~	1.8~	0.0~
Mayo University Hospital ICU	0.0	0.0~	0.0	0.0
Portiuncula University Hospital ICU	0.6	0.0~	6.2	0.6
Midland Regional Hospital Portlaoise ICU**	0.0	1.7~	0.0	0.0

* No data for one quarter.
** No data for two quarters.
~ Less than 90% of patients were tested during their stay in the Unit.

QUALITY IMPROVEMENT USING QI FINDINGS

NOCA considers a number of metrics to be related to quality of care in ICU, and to potentially influence patient outcomes. ICNARC, the UK body that analyses INICUA data, calculates a mean value for each of these metrics based on the data from all participating Units in the UK and the ROI. ICNARC also calculates an 'expected' or acceptable range of approximately ±2 standard deviations (SDs) around the mean for individual Units.

Units with values outside the expected range for any metric are identified as outliers and are asked to review the causes of this finding and to propose actions to bring the metric within the acceptable range. To avoid triggering a review because of short-term variability in the data, the outlier finding is considered relevant only if noted for two consecutive quarters (3-month periods) or if the QI value is outside the values expected for more than 99% of the population (approximately ±3 SDs outside of the population mean) for a single quarter.

An example of the type of dashboard report on QIs received by each Unit every 3 months is shown in Figure 7.11. This includes examples of outlier findings for delayed admissions (outside the range predicted to include 99.8% of patients) and Unit-acquired infections in blood (outside the range expected to include 95.0% of patients).

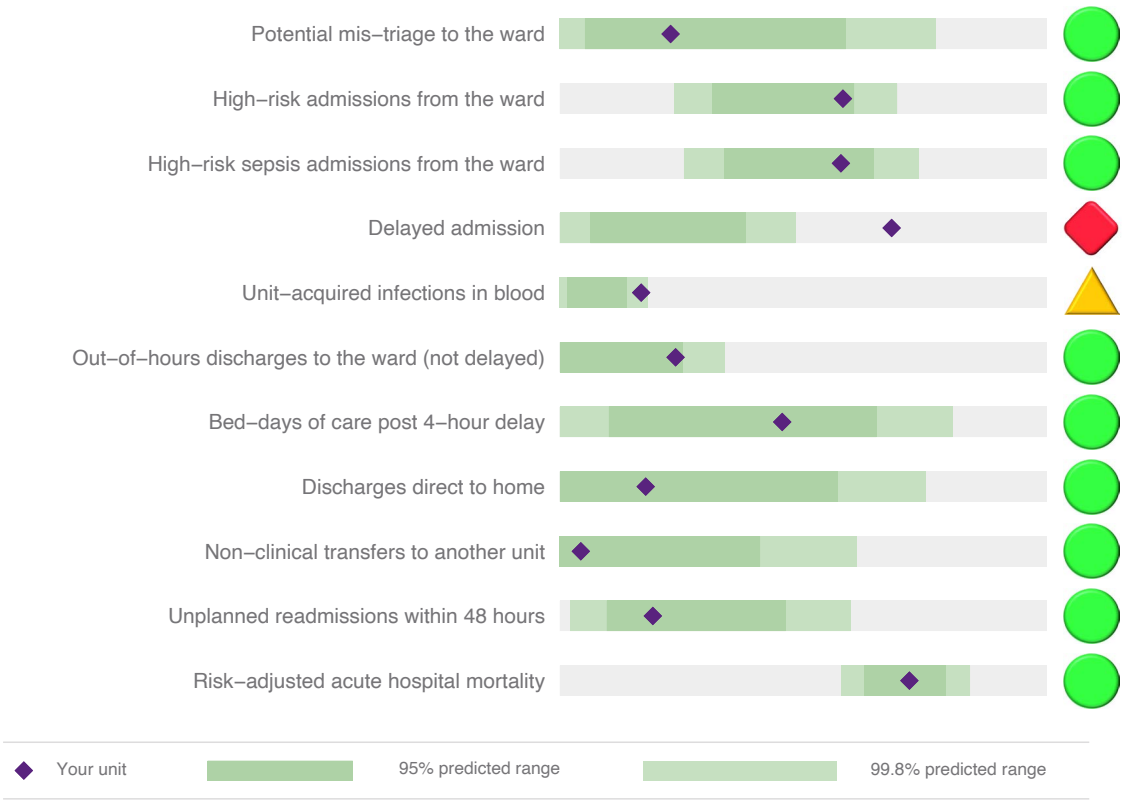


FIGURE 7.11: SAMPLE OF AN IRISH NATIONAL INTENSIVE CARE UNIT AUDIT QUALITY INDICATOR DASHBOARD

OUTLIER FINDINGS

Outlier findings for QI metrics are listed in Tables 7.4–7.9. The responses from the relevant hospitals are summarised with outlines of the contributory factors identified by the hospitals, as well as outlines of plans to address these issues.

High-risk admissions from the ward

High-risk admissions from the ward are defined as those involving patients who develop organ failure in four or more organ systems within 24 hours after admission to ICU. If excessive numbers of patients deteriorate to this extent within 24 hours of Unit admission, it is assumed that admission to ICU for some patients should have occurred earlier. Units that were outliers for this QI during 2023 are listed in Table 7.4.

A subgroup of high-risk admissions from the ward are patients with sepsis (Sepsis-3) who developed failure of more than four organ systems within 24 hours of admission to ICU. Units that were outliers for this subgroup during 2023 are also listed in Table 7.4.

TABLE 7.4: UNITS WITH OUTLIER FINDINGS FOR THE QUALITY INDICATORS 'HIGH-RISK ADMISSIONS FROM THE WARD' AND 'HIGH-RISK SEPSIS ADMISSIONS FROM THE WARD' DURING 2023

QI outlier	Unit
High-risk admissions from the ward	St James's Hospital General ICU
High-risk admissions from the ward	St Vincent's University Hospital ICU
High-risk sepsis admissions from the ward	St James's Hospital General ICU
High-risk sepsis admissions from the ward	Cork University Hospital General ICU

Reviews by Units that were outliers for high-risk admissions identified recurring causes: inadequate assessment and management of deteriorating patients in the ward, underdeveloped ICU outreach services, late referral to ICU, a shortage of available ICU beds, and ICU admission policies that restricted admission until the patient required organ support.

The outlier Units proposed actions to address the issues identified, including: improved compliance with protocols for responses to increased Irish National Early Warning System (INEWS) scores, improvements to ICU outreach services, and increased ICU bed capacity. NOCA will continue to report these QIs in order to assess the impact of these interventions.

Four Units having outlier findings for high-risk admissions in 2023 (Table 7.4) is a decrease from nine Units having outlier findings in this QI category in 2022. This may have occurred by chance, or may reflect improved care of deteriorating patients in hospital wards and earlier referral to ICU.

Out-of-hours discharge to the ward (not delayed)

This QI is defined as the proportion of patients who were discharged from ICU to the ward between 22.00 and 06.59 without having been formally cleared for discharge by 18.00 the previous evening. If excessive numbers of patients leave the Unit in an unplanned manner, it is assumed that these are premature discharges due to a need to make a bed available for another patient who requires care in ICU. If patients are not fully ready to go to the ward, it is undesirable to discharge them to staff who do not know them and to wards with lower staffing levels at night. Table 7.5 provides a list of Units that were outliers for this QI during 2023.

TABLE 7.5: UNITS THAT WERE OUTLIERS FOR THE QUALITY INDICATOR 'OUT-OF-HOURS DISCHARGE TO THE WARD (NOT DELAYED)'

QI outlier	Unit
Out-of-hours discharge to the ward (not delayed)	Regional Hospital Mullingar ICU
Out-of-hours discharge to the ward (not delayed)	Wexford General Hospital ICU**
Out-of-hours discharge to the ward (not delayed)	Connolly Hospital ICU
Out-of-hours discharge to the ward (not delayed)	Letterkenny University Hospital ICU
Out-of-hours discharge to the ward (not delayed)	Tipperary University Hospital ICU
Out-of-hours discharge to the ward (not delayed)	University Hospital Kerry ICU*
Out-of-hours discharge to the ward (not delayed)	Cavan General Hospital ICU
Out-of-hours discharge to the ward (not delayed)	Mercy University Hospital Cork ICU
Out-of-hours discharge to the ward (not delayed)	Mayo University Hospital ICU
Out-of-hours discharge to the ward (not delayed)	Portiuncula University Hospital ICU
Out-of-hours discharge to the ward (not delayed)	Midland Regional Hospital Portlaoise ICU**

* No data for one quarter.
** No data for two quarters.

Reviews by Units that were outliers for this QI provided a list of commonly recurring reasons, including: inadequate numbers of ICU beds, requiring the discharge of patients who were not fully ready; unavailability of ward beds to accept discharges during normal working hours; and failure to document readiness for discharge before 6.00pm. A number of Units with outliers highlighted that many of these discharges were to areas that provided enhanced care compared with ordinary wards, e.g. a high-observation area or a Coronary Care Unit.

Actions proposed by outlier Units included earlier decision-making about discharges of patients, better documentation of decisions to approve patients for discharge, increased ICU bed capacity, and upgrading enhanced care areas to the level of a HDU. NOCA will continue to review the findings for this QI in order to assess the implementation and success of these interventions.

Unplanned readmission to ICU within 48 hours of discharge

This QI is defined by the proportion of patients discharged from ICU who were subsequently readmitted to the same ICU within 48 hours of discharge, unless this readmission had been planned at the time of discharge. If excessive numbers of patients need readmission, it suggests that patients have been prematurely discharged when they are not yet ready for ward care. The most likely reason for this is to make a bed available for another patient who requires care in ICU. If a patient is not yet ready for a lower level of care in the ward, they are likely to deteriorate and require readmission to ICU, which is linked to a worsened outcome. Table 7.6 provides a list of Units that were outliers for this QI during 2023.

Reviews by Units that were outliers for this QI identified a number of factors linked to unplanned readmissions: early discharge and discharge at night because of shortages of available ICU beds, shortfalls in care on the ward, a lack of outreach support from ICU for the wards, and lack of a HDU to discharge patients to.

The outlier Units proposed actions including the provision of adequate numbers of ICU beds in order to avoid premature discharges, improved ICU outreach services in order to support the care of patients in the ward, better compliance in the wards with protocols for the care of deteriorating patients, and increased provision of HDU beds.

TABLE 7.6: UNITS THAT WERE OUTLIERS FOR THE QUALITY INDICATOR 'UNPLANNED READMISSION TO ICU WITHIN 48 HOURS OF DISCHARGE'

QI outlier	Unit
Unplanned readmission to ICU within 48 hours of discharge	Letterkenny University Hospital ICU
Unplanned readmission to ICU within 48 hours of discharge	Sligo University Hospital ICU

Risk-adjusted mortality

No Units were an outlier for their risk-adjusted mortality rate in 2023.

Non-clinical transfers to another ICU

This QI refers to the transfer of patients from one Unit to a Unit in another hospital for reasons not related to clinical care of the patient. The usual reason is because an ICU bed is needed for another patient who is too sick to be transferred elsewhere. University Hospital Kerry ICU was the only outlier for this QI in 2023. As expected, the reason was unavailability of ICU beds for other patients who were too unwell to be transferred long distances to the nearest available ICU bed (in one case, this was as far as Our Lady of Lourdes Hospital Drogheda, which is about 350 kilometres from University Hospital Kerry).

TABLE 7.7: UNITS THAT WERE OUTLIERS FOR THE QUALITY INDICATOR 'NON-CLINICAL TRANSFERS TO ANOTHER INTENSIVE CARE UNIT'

QI outlier	Unit
Non-clinical transfers to another Unit	University Hospital Kerry ICU*

* No data for one quarter.

Unit-acquired bloodstream infection

This QI identifies Units with a higher-than-expected rate of positive bacterial cultures from blood. Some of these infections may be related to the quality of care in ICU if they are related to central venous catheters or to the lungs, but others may originate in the abdomen or another location that indicates that they are not directly related to quality of care. Nevertheless, this QI is useful as a way of screening for increased infection rates that may or may not require remedial action.

One Unit was an outlier for this QI in 2023. Review by the hospital drew attention to a number of bloodstream infections related to central venous catheters. This has led to the hospital reviewing its practice in relation to the insertion and care of central venous catheters, and implementing changes that should improve the quality of patient care.

TABLE 7.8: UNITS THAT WERE OUTLIERS FOR THE QUALITY INDICATOR 'UNIT-ACQUIRED BLOODSTREAM INFECTION'

QI outlier	Unit
Unit-acquired bloodstream infection	St Vincent's University Hospital ICU

Bed days of care post-delayed discharge

In order to make optimal use of expensive and scarce resources, it is important to be able to discharge patients who no longer need ICU care. This ensures the availability of ICU beds for critically ill patients awaiting admission, which is particularly important in busy Units with high bed occupancy levels.

Compared with other Units, St James's Hospital General ICU and Tallaght University Hospital ICU had a higher number of bed days occupied by patients who had been cleared for discharge both 8 hours earlier and 24 hours earlier. Review by these two hospitals noted that this metric reflected a lack of available ward beds for patients rather than reflecting the quality of care in ICU.

The reviews also noted that the hospitals experienced exceptional pressure on all hospital beds during the relevant period. Notably, St James's Hospital General ICU was also an outlier for the QI 'High-risk admissions from the ward' (i.e. it had a high number of patients who developed organ failure in four or more organ systems within 24 hours of ICU admission). This is generally considered to reflect delayed admission to ICU. St James's Hospital General ICU had a high number of patients occupying an ICU bed for longer than they required which is likely to have contributed to this finding.

Actions in response to these findings included meetings to discuss bed requirements and bed availability early each day and repeated during the day to optimise bed utilisation and work towards increasing overall hospital bed capacity in order to meet the needs of the clinical services provided.

NOCA realises that there is a constant dilemma for bed managers between whether to take a patient from ICU, from the Emergency Department or from the surgical waiting list whenever a ward bed becomes available. However, ICU discharges should be prioritised in order to have a minimum of one 'emergency bed' empty in each Unit whenever patients are fit for discharge. This was a recommendation in the *Irish National ICU Audit Annual Report 2022* (NOCA, 2024).

TABLE 7.9: UNITS THAT WERE OUTLIERS FOR THE QUALITY INDICATOR 'BED DAYS OF CARE POST-DELAYED DISCHARGE'

QI outlier	Unit
Bed days of care post-8-hour delay	St James's Hospital General ICU
Bed days of care post-8-hour delay	Tallaght University Hospital ICU*
Bed days of care post-24-hour delay	St James's Hospital General ICU
Bed days of care post-24-hour delay	Tallaght University Hospital ICU*

* No data for one quarter.

OUTLIER MANAGEMENT

The National ICU Audit Governance Committee reviewed all reports from hospitals in relation to outlier findings. The Committee accepted the findings of all these reviews during 2023 and has supported the actions proposed by the hospitals to improve the quality of care. The National ICU Audit Governance Committee conducts ongoing monitoring of the effects of hospital actions to deal with the issues raised by the INICUA findings.

NOCA believes that the process of highlighting outlier findings and hospital reviews of the underlying reasons, together with the provision of feedback to NOCA and national governance structures, has encouraged a culture of quality improvement across the Units that participate in the INICUA.

FINDINGS FROM CHAPTER 7

- Nationally, 33% of all admissions to ICU from the ward or Emergency Department in 2023 occurred within 1 hour of the decision to admit, and 87% occurred within 4 hours of the decision to admit. Three hospitals met the target of 50% of admissions occurring within 1 hour of the decision to admit, and 20 hospitals met the target of 80% of patients being admitted within 4 hours of the decision to admit.
- Nationally, 10% of all patients admitted from the ward developed organ failure in four or more organ systems within 24 hours of admission to ICU in 2023. St James's Hospital General ICU and St Vincent's University Hospital ICU were both outside the expected range for this QI. A subset of the patients who developed organ failure in four or more organ systems within 24 hours were patients with sepsis. Of patients admitted to ICU nationally with sepsis in 2023, 11% developed organ failure in four or more organ systems within 24 hours of admission. This finding was above the expected range when benchmarked against data from ICUs in the UK.
- Nationally, 3.7% of discharges from ICU to the ward in 2023 were unplanned and occurred between 22.00 and 06.59, compared with 1.9% in the UK. This suggests that patients were discharged without being fully ready in order to provide a bed for a patient who required ICU admission. Furthermore, patients who are discharged at night tend to go to a ward with lower staffing levels and more junior staff than discharges during the daytime, and these patients are not known to the ward staff. Eleven Units participating in the INICUA in 2023 had more than the expected number of unplanned discharges from ICU at night.
- Unplanned readmission of patients to ICU within 48 hours of discharge to the ward is a key metric for the quality of care of critically ill patients. The overall rate of unplanned readmission to ICU in the ROI in 2023 was 0.9%, which is within the expected range. Letterkenny University Hospital ICU and Sligo University Hospital ICU were outside the expected range for this QI, which may indicate premature discharge of patients from ICU due to a shortage of available ICU beds. All other Units participating in the INICUA were within the expected range for this metric in 2023.
- The mortality rate in ICUs nationally in 2023 was 14%, and a further 6% of patients died before leaving acute hospital. Thus, 80% of patients who were admitted to ICU/HDU in 2023 survived to leave hospital alive (versus 76% in both 2021 and 2022).
- The 20% hospital mortality rate of patients admitted to ICU nationally in 2023 was slightly lower than the mortality rate predicted by the ICNARC$_{H\text{-}2023}$ risk-prediction model, giving a ratio of observed to expected deaths (standardised mortality ratio - SMR) of 0.94.
- All individual Units participating in the INICUA in 2023 were within the expected range for risk-adjusted mortality rates. This important finding demonstrates consistently acceptable outcomes across Units of different sizes, patient characteristics and case mix.

- Risk-adjusted mortality was examined for both low-risk patients (those with a predicted risk of death of less than 20% on admission to ICU) and high-risk patients (those with a predicted risk of death greater than 20% on admission to ICU). Nationally, the mortality rate for low-risk patients in 2023 was below the expected range (SMR: 0.88). All Units had a mortality rate within the expected range for low-risk patients. For high-risk patients, the national SMR for 2023 was 0.95, and no Units deviated widely from the mean SMR value.

- NOCA compared risk-adjusted mortality in high-risk patients (those with greater than a 20% predicted mortality rate) between patients who were initially admitted to smaller Units (those with fewer than 200 Level 3 admissions annually) and those who were admitted to larger Units (those with 200 or more Level 3 admissions annually). The SMR for the aggregated data from the 15 smaller Units was 0.92 in 2023, compared with an SMR of 0.97 for the 14 larger Units. This provides encouraging data on the outcomes for patients who are initially admitted to smaller Units, showing equality of outcomes with patients who are admitted to larger Units. Many patients are transferred within the national network of ICUs in order to avail of specialist services in the larger Units, and this is a major factor in ensuring good outcomes for patients who are initially admitted to smaller Units.

- Rates of testing for MDROs were high in most Units in 2023. National rates of colonisation with MDROs at the time of admission to ICU were 2.1% for MRSA, 0.7% for CPE, but 10.2% for VRE. Testing for C difficile was only undertaken in symptomatic patients; the rate of colonisation in those tested was 4.9%. Rates of transmission of MDROs while in ICU were low for MRSA, *C. difficile* and CPE but higher for VRE at 2.6% (Table 7.1).

- Hospitals with outlier findings for QIs were asked to review the reasons for these findings and to propose a plan to address the issues involved. Common issues identified by hospitals included: a lack of resources for ICU outreach to support the care of patients in wards; failure to follow guidelines for the management of deteriorating patients on the ward; shortages of ICU beds leading to delayed admissions to ICU; early discharges from ICU; and shortages of ward beds to facilitate discharges from ICU.

- Proposals by hospitals to address these issues included better compliance with protocols for deteriorating patients, adequately resourcing ICU outreach teams, increasing the number of beds in ICUs and HDUs, and prioritising discharges from ICU when patients are declared fit for discharge.

CHAPTER 8
ORGAN DONATION

CONTENTS

CHAPTER 8: **ORGAN DONATION**

Most patients who are admitted to ICU survive to leave hospital (80% in 2023, Figure 7.6). Of those who unfortunately do not survive, some may have the potential to help other patients by donating their organs.

Death can be defined according to either circulatory or neurological criteria. Most deaths are defined by the absence of circulation (circulatory death). A smaller number of deaths are defined by neurological criteria, where patients have adequate circulatory function but no brainstem function (brain death).

Patients who have been diagnosed as 'dead by neurological criteria' or 'brain dead' make up the largest group of potential organ donors. Brain death is rare and is becoming even rarer with improvements in road safety and in the management of brain injury. Maximising the number of patients diagnosed with brain death who become organ donors is key to maximising the number of patients who receive life-saving organ transplantation.

In addition to the benefits for organ recipients, organ donation can bring significant benefits to the family of the donor in dealing with the loss of their loved one. ICUs should offer the option of organ donation as an integral part of end-of-life care. In order to drive improvements in this area, it is vitally important to audit clinical practice around death and the numbers of organ donors.

END OF LIFE AND ORGAN DONATION

Brain death was diagnosed in 108 of the patients audited in 2023 (5.4% of all those who died in ICU; Table 8.1 and Figure 8.1). This is similar to rates of patients diagnosed with brain death in 2022 (5.5%), 2021 (5.2%) and 2020 (6.5%) (Table 8.2). Sixty-four patients who were diagnosed with brain death became organ donors in 2023, which is a conversion rate of 59%. This is higher than the conversion rates seen during the COVID-19 pandemic (55% in 2022, 49% in 2021 and 50% in 2020).

Twenty-four patients became organ donors after circulatory death, representing 1.3% of all circulatory deaths (compared with 2.7% in the UK) (Table 8.1).

Organ Donation Transplant Ireland (2023) reported 71 donors after brain death and 24 donors after circulatory death nationally during 2023. The difference between the NOCA value and the ODTI value is explained by: (1) three donors in children's hospitals, (2) one donor in a private hospital, (3) two donors documented by ODTI who donated during 2023 but were admitted to ICU during 2022 and were included in the *Irish National ICU Audit Annual Report on 2022 data*, and (4) one donor included by ODTI but whose organs were not transplanted.

TABLE 8.1: BRAIN DEATH AND ORGAN DONATION IN THE REPUBLIC OF IRELAND AND THE UNITED KINGDOM

Brain death and organ donation	ROI	UK
Number of Unit deaths (percentage of all admissions)	1992 (13%)	(12%)
Number of patients diagnosed with brain death (percentage of Unit deaths)	108 (5.4%)	(6.2%)
Number of patients who donated organs after brain death (percentage of brain deaths)	64 (59%)	(48%)
Number of patients who donated organs after circulatory death (percentage of circulatory deaths)	24 (1.3%)	(2.7%)

Note: Numbers of patients not available for the UK data.

TABLE 8.2: TRENDS IN ORGAN DONATION, 2020–2023

Organ Donation Process	2020	2021	2022	2023
Number of deaths in ICU	1518	1991	1767	1992
Brain death as a percentage of all deaths	6.5%	5.2%	5.5%	5.4%
Rate of organ donation after brain death	50.0%	49%	55%	59%
Number of circulatory deaths	1420	1888	1669	1884
Rate of organ donation after circulatory death	0.4%	0.5%	0.7%	1.3%
Total number of deceased donors	55	60	65	88
Rate of organ donation as a percentage of all deaths	3.6%	3.0%	3.7%	4.4%

RATE OF DIAGNOSIS OF BRAIN DEATH

Any patient who is likely to fulfil the criteria for brain death should have this confirmed by the formal diagnostic process for establishing brain death (Dwyer *et al.,* 2020). This provides certainty to staff and family that the patient has died, allows a rapid end to futile care, maximises the potential for organ donation, and provides meaningful data on the potential for organ donation after brain death.

The rates of brain death will vary between Units because of variations in case mix: a neurocritical care Unit will have a high rate of patients diagnosed with brain death, whereas a cardiothoracic Unit will have a low rate of such deaths. Lower rates of patients diagnosed with brain death may also occur because of unfamiliarity with the procedure for brainstem testing, or because awareness of organ donation is not high. The percentage of deaths in each Unit that are diagnosed using neurological criteria to establish death (i.e. brain death) is shown in Figure 8.1.

The rate of diagnosis of death by neurological criteria in 2023 was highest in Beaumont Hospital (Richmond) Neurosurgical ICU (21%). Rates of patients diagnosed with brain death as a proportion of all deaths in other Units varied from 0% to 11% (Figure 8.1).

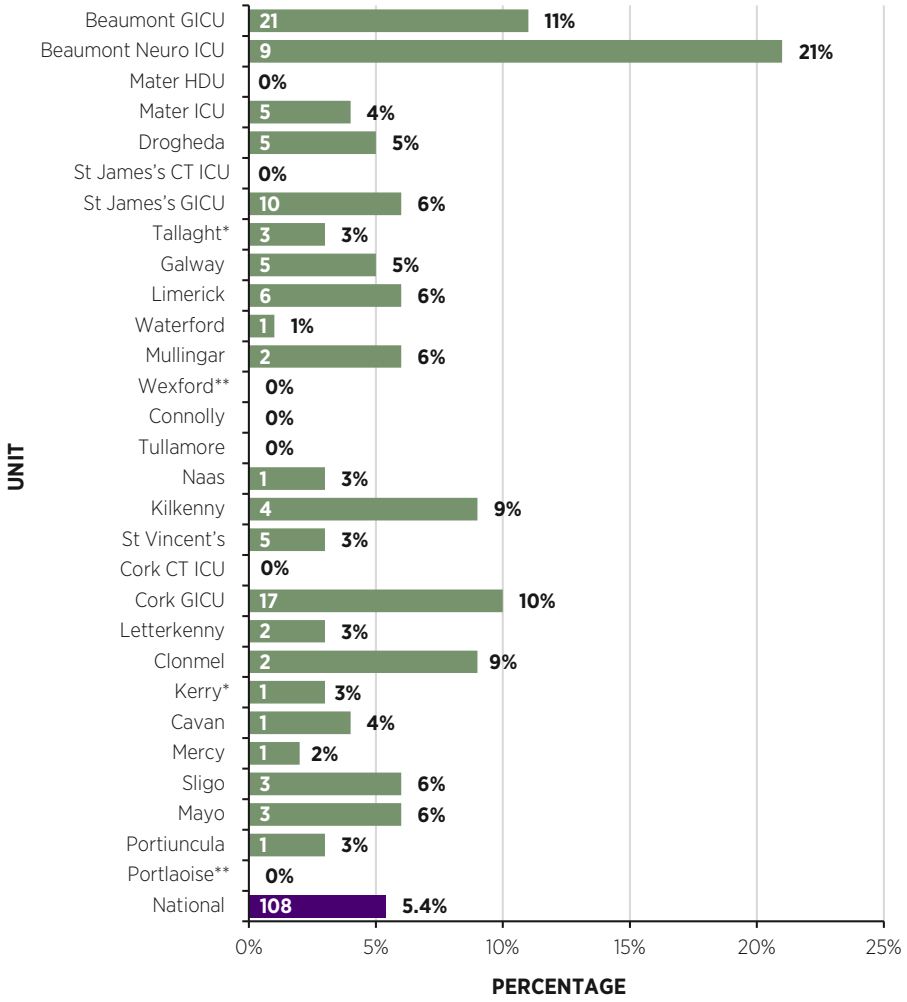


FIGURE 8.1: BRAIN DEATHS AS A PERCENTAGE OF ALL UNIT DEATHS AND NUMBERS OF PATIENTS DIAGNOSED WITH BRAIN DEATH IN EACH UNIT, 2023

* No data for one quarter.
** No data for two quarters.

PROGRESSION FROM BRAIN DEATH TO ORGAN DONATION

The numbers of patients who progressed from a diagnosis of brain death to organ donation in 2023 are shown in Figure 8.2. The assent rate by families when organ donation was requested was 75% (compared with 73% in 2022), which is high by international standards.

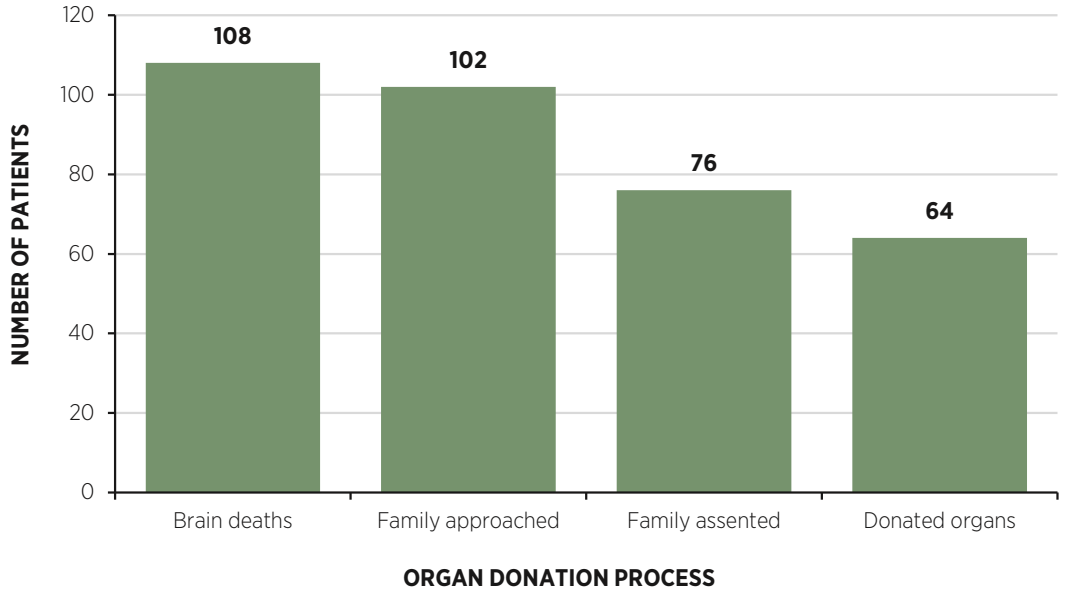


FIGURE 8.2: PROGRESSION OF PATIENTS FROM BRAIN DEATH TO ORGAN DONATION 2023

The reasons why patients who were diagnosed with brain death did not progress to organ donation are shown in Figure 8.3. The most common reason was families withholding assent to organ donation (25% refusal rate). The reasons for not approaching the families of potential organ donors or for not proceeding with organ donation despite assent from families are also included in Figure 8.3. The most common reason for not progressing to donation after assent was given was that the organs were considered unsuitable by the transplant teams (10 patients).

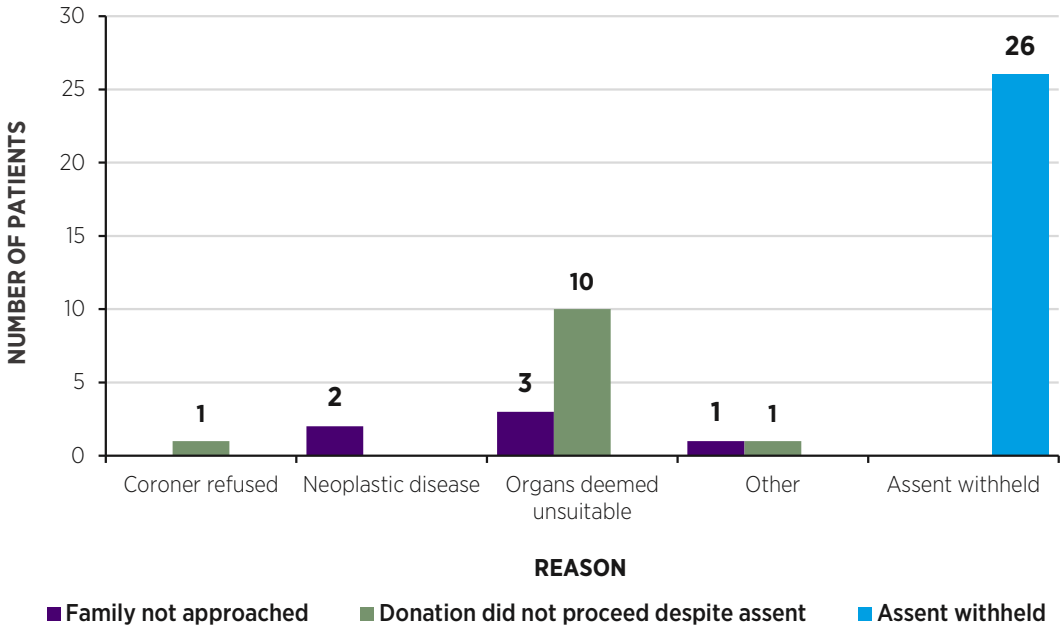


FIGURE 8.3: REASONS THAT PATIENTS WHO WERE DIAGNOSED WITH BRAIN DEATH DID NOT BECOME ORGAN DONORS 2023

Figure 8.4 shows data for each Unit that had three or more patients diagnosed with brain death in 2023. Percentages are shown for: (1) patients who progressed to organ donation; (2) patients whose family assented but did not proceed to organ donation; (3) patients whose family was not approached to seek assent; and (4) patients whose family withheld assent (Figure 8.4).

The percentage of patients diagnosed with brain death who progressed to organ donation varied between Units, from 20% in Mater Misericordiae University Hospital ICU to 100% in St Luke's General Hospital Carlow/Kilkenny ICU, with a national rate of 59% (Figure 8.4). This variability is partly due to the small numbers of patients in each Unit, but should be examined by local organ donation staff and by ODTI in Units with low rates of progression from brain death to organ donation.

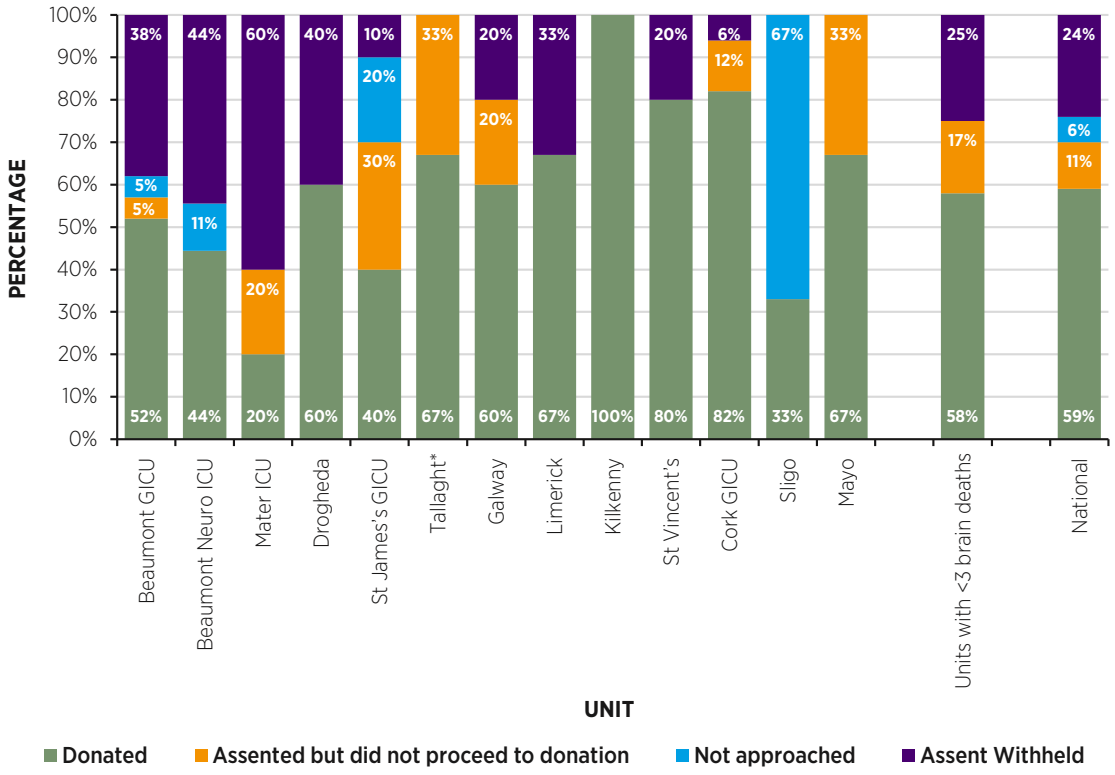


FIGURE 8.4: PERCENTAGE OF PATIENTS DIAGNOSED WITH BRAIN DEATH WHO DID AND DID NOT DONATE ORGANS, WITH REASONS FOR NOT DONATING, BY UNIT, 2023

Note: Only Units with three or more patients diagnosed with brain death are shown individually. Data from Units with fewer than three patients diagnosed with brain death are aggregated and displayed together.

* No data for one quarter.

It is considered good practice to refer all patients who are diagnosed with brain death to organ donation personnel for consideration as organ donors. There are few absolute contraindications to organ donation by patients diagnosed with brain death, and many patients who seem unsuitable as donors may still be considered in certain circumstances. ODTI and the national transplant teams can use their knowledge of current guidelines and of the patients awaiting transplantation to assess offers of organ donation in order to maximise all donation opportunities.

Data on rates of referral for organ donation by each Unit are shown in Figure 8.5. Nationally, 91% of patients diagnosed with brain death were referred to organ donation personnel for consideration for organ donation in 2023 (compared with 79% in 2022).

In some cases, potential organ donors were not referred because their families had already indicated that they would not assent to donation; this situation is not documented in this audit.

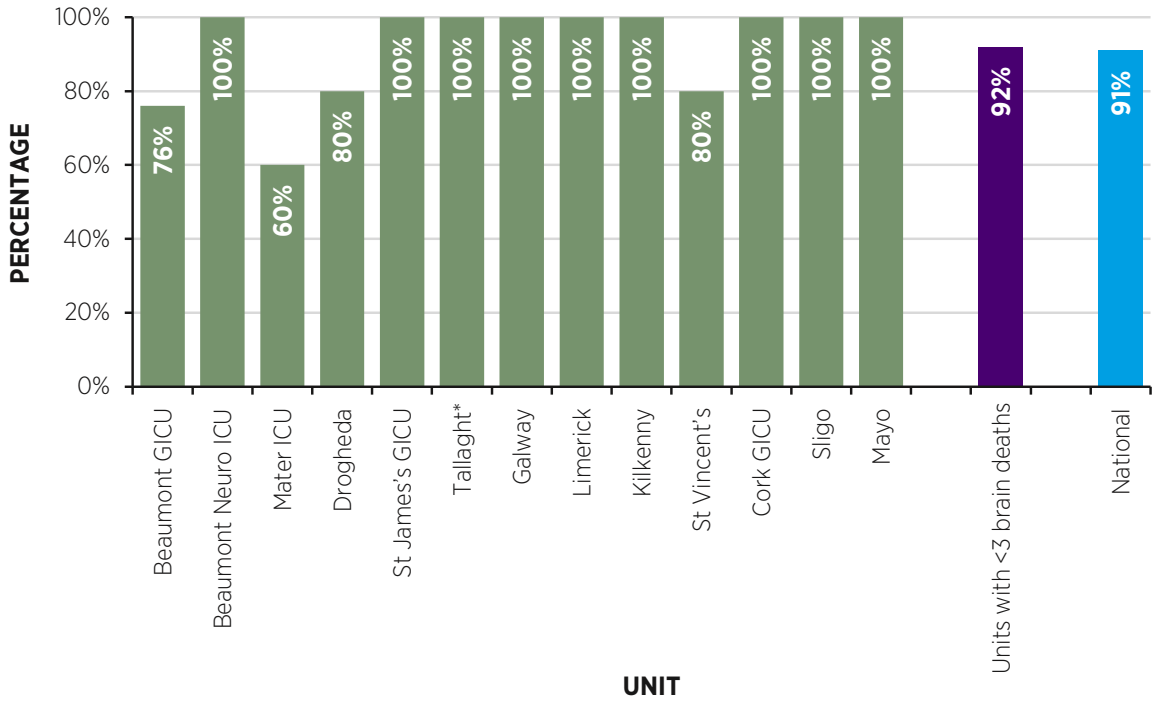


FIGURE 8.5: PERCENTAGE OF PATIENTS DIAGNOSED WITH BRAIN DEATH WHO WERE REFERRED TO ORGAN DONATION PERSONNEL, BY UNIT

Note: Only Units with three or more patients diagnosed with brain death are shown individually. Data from Units with fewer than three patients diagnosed with brain death are aggregated and displayed together.

* No data for one quarter.

ORGAN DONATION AFTER CIRCULATORY DEATH

The number of patients diagnosed with brain death has decreased in recent years, and it will become increasingly important to offer opportunities for donation after circulatory death (DCD) to families of potential donors. Almost without exception, only patients who die from a neurological condition are suitable for DCD, and only a small proportion of patients with neurological conditions are suitable to become organ donors. It is important, therefore, that all patients dying from a neurological condition are considered as potential organ donors, and all such patients should be referred to organ donation personnel for consideration. Detailed data on DCD are not included in this audit report for 2023 because of issues with data quality.

The numbers of organ donors from each hospital after brain death and after circulatory death are shown in Table 8.3.

TABLE 8.3: ORGAN DONORS AFTER BRAIN DEATH AND AFTER CIRCULATORY DEATH IN EACH HOSPITAL

UNIT	Donors after brain death	Donors after circulatory death
Beaumont Hospital	15	9
Cork University Hospital	14	2
St James's Hospital	4	5
University Hospital Limerick	4	2
St Luke's General Hospital, Carlow/Kilkenny	4	0
St Vincent's University Hospital	4	0
Our Lady of Lourdes Hospital Drogheda	3	1
University Hospital Galway	3	4
Hospitals with <3 donors in total	13	1
Total	**64**	**24**

FINDINGS FROM CHAPTER 8

- Deaths diagnosed using neurological criteria made up 5.4% of all ICU deaths in 2023.
- Rates of diagnosis of death by neurological criteria (brain death) in individual Units as a proportion of all ICU deaths ranged from 0% to 21% (this was in Beaumont Hospital (Richmond) Neurosurgical ICU).
- The rate of organ donation by patients diagnosed with brain death was 59% in 2023 (compared with 55% in 2022 and 49% in 2021).
- Rates of organ donation in Units with three or more patients diagnosed with brain death in 2023 ranged from 20% to 100%.
- The rate of assent by families when organ donation was requested was 75%. This is high by international standards.
- Ninety-one percent of patients who were diagnosed with brain death in 2023 were referred to organ donation personnel for consideration for organ donation (compared with 79% in 2022).
- The rate of organ donation after circulatory death was 1.3% in the ROI in 2023 (0.7% in 2022), compared with 2.7% in the UK.

CHAPTER 9

COVID-19 PATIENTS IN ICU

CONTENTS

CHAPTER 9: **COVID-19 PATIENTS IN ICU**

The data presented in this chapter come from both the INICUA and the ICU Bed Information System (ICU-BIS). The number of patients with COVID-19 documented by the ICU-BIS was greater than that recorded by the INICUA because the ICU-BIS includes all patients with a positive test for COVID-19 before or during their ICU stay, whereas the INICUA includes only patients with COVID-19 listed as a primary or secondary diagnosis at the time of ICU admission. In addition, the ICU-BIS includes data from a large HDU that is not included in the INICUA, and there were no quarterly gaps in the ICU-BIS data.

NUMBER OF PATIENTS WITH COVID-19 ADMITTED TO ICU (ICU-BIS DATA ONLY)

The number of admissions of patients with COVID-19 to ICU during 2023 was considerably lower than the number in 2022. The ICU-BIS documented 534 admissions of patients with COVID-19 in 2023, compared with 1,100 in 2022 and 1,766 in 2021. The weekly number of admissions fluctuated, with peaks and troughs throughout the year (Figure 9.1). The highest numbers of admissions were in January and August, and the lowest numbers were in June and July.

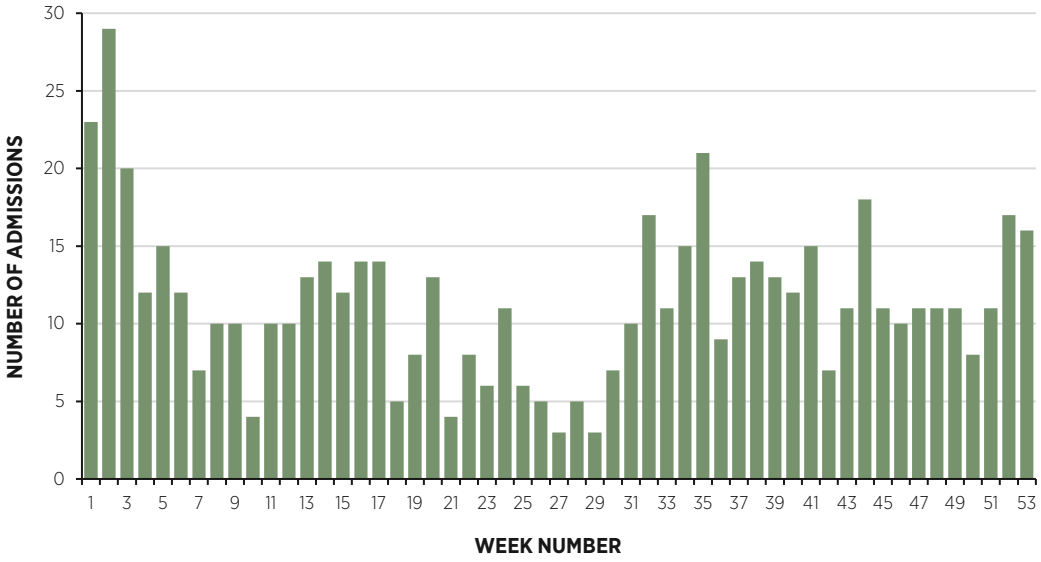


FIGURE 9.1: WEEKLY ADMISSIONS TO INTENSIVE CARE UNITS OF NEW PATIENTS WITH A CONFIRMED DIAGNOSIS OF COVID-19 (JANUARY–DECEMBER 2023)

Source: ICU-BIS

EPIDEMIOLOGY AND MORTALITY (INICUA DATA ONLY)

In 2023, the INICUA documented 309 ICU admissions of 297 patients with a diagnosis of COVID-19 (there were 12 readmissions). This accounted for 2% of all patients who were admitted to Units participating in the INICUA in 2023, a decrease from 6% in 2022 and 15% in 2021. Patients with COVID-19 occupied 5% of all bed days in Units in 2023, compared with 12% in 2022 and 29% in 2021.

Patient characteristics are described in Tables 9.1 and 9.2 and compared with previous years. Data for 2020 are presented separately for Q1-2 and for Q3-4 to show differences between these periods. Patients who were admitted to ICU with COVID-19 in 2023 had more risk factors than in previous years: they were older; they had higher illness severity scores; a higher proportion of patients had very severe comorbidities; and fewer were living fully independently before admission. The percentage of patients with COVID-19 requiring invasive ventilation was lower than in previous years. The median partial pressure of oxygen/fraction of inspired oxygen (PaO_2/FiO_2) ratio was greater in 2023 compared with previous years, suggesting that COVID-19 was not the main reason for these patients' admission to ICU, but rather was incidental to their admission for another reason.

Eighty-one patients with COVID-19 died before leaving ICU; this represents an ICU mortality rate of 27%, compared with 30% in 2022 and 33% in 2021 (Table 9.3). A total of 110 patients with COVID-19 died before discharge from acute hospital, which represents a hospital mortality rate of 37% (compared with 38% in 2022 and 36% in 2021). This compares to the hospital mortality rate for the overall ICU patient population of 20%.

TABLE 9.1: CHARACTERISTICS OF PATIENTS ADMITTED TO ICU WITH COVID-19 IN THE REPUBLIC OF IRELAND (2020–2023) AND THE UNITED KINGDOM (2023)

Patient characteristics	ROI 2020 Q1-2 (n=434)	ROI 2020 Q3–4 (n=268)	ROI 2021 (n=1671)	ROI 2022 (n=615)	ROI 2023 (n=297)	UK 2023 (n=2985)
Mean age (in years)	59	63	58	62	67	63
Females (%)	31%	34%	39%	39%	35%	41%
Patients with a body mass index (BMI) >40 (%)	10%	13%	12%	6%	6%	6%
Currently or recently pregnant patients (%)	0.5%	1.1%	4.2%	1.6%	0.3%	0.7%
Patients living fully independently before hospital admission (%)	91%	88%	88%	73%	59%	67%
Patients with very severe comorbidities (%)	10%	12%	15%	37%	31%	26%

TABLE 9.2: ILLNESS SEVERITY ON ICU ADMISSION OF PATIENTS ADMITTED WITH COVID-19 IN THE REPUBLIC OF IRELAND (2020–2023) AND THE UNITED KINGDOM (2023)

Measures of illness severity	ROI 2020 Q1-2 (n=434)	ROI 2020 Q3–4 (n=268)	ROI 2021 (n=1671)	ROI 2022 (n=615)	ROI 2023 (n=297)	UK 2023 (n=2985)
Invasive ventilation within 24 hours (%)	58%	38%	37%	36%	31%	34%
Median PaO_2/FiO_2 ratio (in kilopascals (kPa))	17	14	13	21	22	24
Mean APACHE II score	16	16	15	18	19	17

TABLE 9.3: OUTCOMES FOR PATIENTS ADMITTED TO ICU WITH COVID-19 IN THE REPUBLIC OF IRELAND (2020–2023) AND THE UNITED KINGDOM (2023)

Patient outcomes	ROI 2020 Q1-2 (n=434)	ROI 2020 Q3–4 (n=268)	ROI 2021 (n=1671)	ROI 2022 (n=615)	ROI 2023 (n=297)	UK 2023 (n=2982)
Patients who survived to ICU discharge (%)	83%	65%	67%	70%	73%	74%
Median number of days in ICU, survivors/non-survivors	14/16	8/15	9/15	7/9	6/7	5/5
Patients who underwent invasive ventilation (ARS) (%)	71%	58%	58%	51%	43%	43%
Duration of invasive ventilation, in days (median, interquartile range (IQR))	12 (7–22)	12 (5–22)	12 (6–23)	8 (3–16)	7 (3–13)	5 (2–11)
Patients who received advanced cardiovascular system (CVS) support (%)	19%	22%	19%	22%	23%	20%
Patients who received renal support (%)	23%	15%	15%	17%	18%	16%

NOCA compared data on patients with COVID-19 who received advanced respiratory support (ARS, invasive ventilation) in ICU in the ROI and the UK, as a need for ARS indicates a greater degree of illness severity. The proportion of patients who received ARS in Units in the ROI was 43% in 2023, compared with 51% in 2022 and 58% in 2021.

Tables 9.4 and 9.5 show prognostic indicators that predict a worse outcome for patients in the ROI than for patients in the UK based on factors such as age, comorbidities, PaO_2/FiO_2 ratios (a measure of acute respiratory failure) and APACHE II scores. In line with these data, the mortality rate for patients in the ROI who received ARS was 43%, compared with 38% in the UK.

TABLE 9.4: CHARACTERISTICS OF PATIENTS ADMITTED TO ICU WITH COVID-19 WHO RECEIVED ADVANCED RESPIRATORY SUPPORT IN THE REPUBLIC OF IRELAND (2020–2023) AND THE UNITED KINGDOM (2023)

Patient characteristics	ROI 2020 Q1-2 (n=307)	ROI 2020 Q3–4 (n=155)	ROI 2021 (n=969)	ROI 2022 (n=316)	ROI 2023 (n=129)	UK 2023 (n=1281)
Mean age (in years)	59	65	59	62	65	61
Median age (in years)	60	68	61	65	68	63
Males (%)	70%	70%	62%	64%	69%	62%
Patients with a BMI >40 (%)	11%	11%	12%	7%	5%	6%
Currently or recently pregnant patients (%)	0.7%	0.6%	3.4%	0.3%	0.0%	0.3%
Patients living fully independently before hospital admission (%)	91%	92%	90%	77%	71%	73%
Patients with very severe comorbidities (%)	9%	10%	14%	34%	30%	24%

TABLE 9.5: ILLNESS SEVERITY ON ADMISSION TO ICU OF PATIENTS WITH COVID-19 WHO RECEIVED ADVANCED RESPIRATORY SUPPORT IN THE REPUBLIC OF IRELAND (2020–2023) AND THE UNITED KINGDOM (2023)

Measures of illness severity	ROI 2020 Q1–2 (n=307)	ROI 2020 Q3–4 (n=155)	ROI 2021 (n=969)	ROI 2022 (n=316)	ROI 2023 (n=129)	UK 2023 (n=1281)
Mean/median number of days in hospital before ICU admission	7/1	8/3	7/3	10/3	7/1	6/1
Median PaO_2/FiO_2 ratio (in kPa)	15	13	12	18	17	23
Mean APACHE II score	16	18	16	20	21	18

TABLE 9.6: OUTCOMES FOR PATIENTS ADMITTED TO ICU WITH COVID-19 WHO RECEIVED ADVANCED RESPIRATORY SUPPORT IN THE REPUBLIC OF IRELAND (2020–2023) AND THE UNITED KINGDOM (2023)

Patient outcomes	ROI 2020 Q1–2 (n=307)	ROI 2020 Q3–4 (n=155)	ROI 2021 (n=969)	ROI 2022 (n=316)	ROI 2023 (n=129)	UK 2023 (n=1281)
Patients who survived to ICU discharge (%)	78%	49%	51%	53%	57%	62%
Median number of days of ICU care for survivors/non-survivors	19/18	22/16	25/17	18/10	16/9	10/7
Patients who received advanced CVS support (%)	27%	37%	31%	40%	42%	41%
Patients who received dialysis (%)	31%	24%	25%	25%	28%	24%

RISK-ADJUSTED 28-DAY IN-HOSPITAL MORTALITY RATE FOR PATIENTS WITH COVID-19 (INICUA DATA)

Because of the multiple factors that contribute to the risk of death with COVID-19, the 43% crude mortality rate in patients who received advanced respiratory support (i.e. invasive ventilation) does not assess the quality of care provided. The Intensive Care National Audit and Research Centre (ICNARC) has developed a risk-prediction model for acute hospital mortality using data from patients admitted between 1 January and 31 December 2021. Using this model, the following section benchmarks risk-adjusted in-hospital mortality outcomes for patients in the ROI in 2023 against UK data for 2023.

STANDARDISED MORTALITY RATIOS

ICNARC has reported the standardised mortality ratio (SMR) for patients admitted to individual Units during 2023 (Figure 9.2 and Table 9.7). The reported SMR relates to the Unit to which patients were first admitted, even if those patients were subsequently transferred elsewhere. Transfers to a Unit from another ICU are not included when calculating the SMR for the receiving Unit. The SMRs for all Units were within the expected range in 2023 (i.e. ±2 standard deviations (SDs) from the mean) (Figure 9.2). The overall national SMR for patients with COVID-19 who were admitted to ICU in the ROI in 2023 was 0.78.

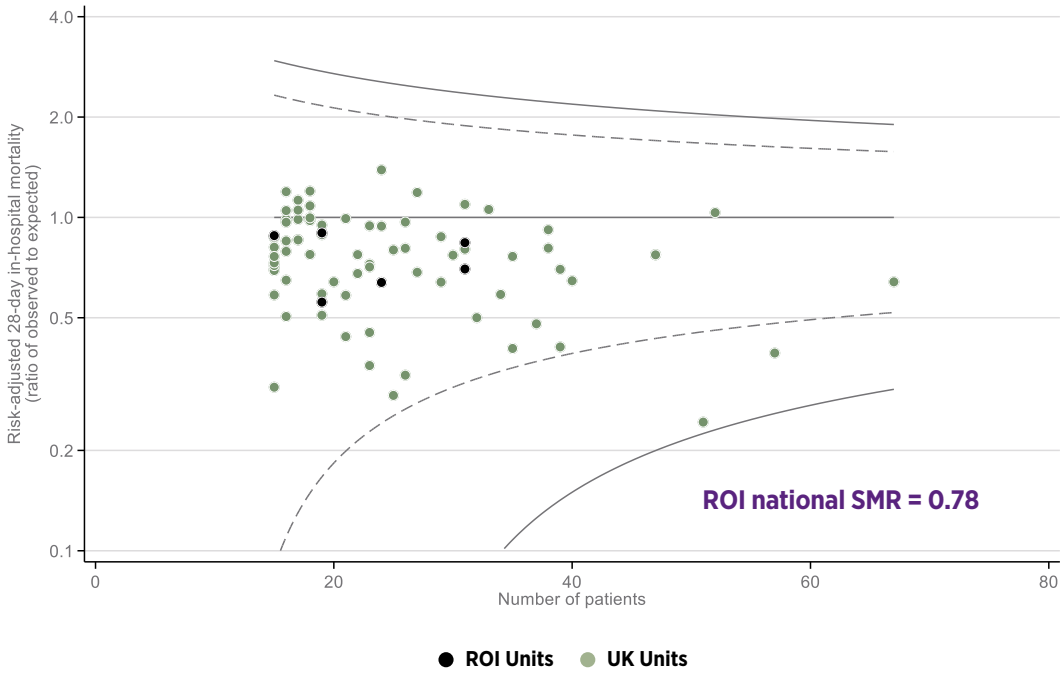


FIGURE 9.2: INDIVIDUAL UNITS' STANDARDISED MORTALITY RATIOS FOR PATIENTS ADMITTED WITH COVID-19, 2023

Note: The funnel plot shows data from 6 ROI Units and 74 UK Units, each with at least 15 eligible patients.

Source: INICUA (ROI) and ICNARC (UK) data

Table 9.7 shows the numbers of patients with COVID-19 whose first admission was to each included Unit, as well as the SMR for each Unit. The SMR for aggregated data for patients who were initially admitted to the 15 smaller Units (those with fewer than 200 Level 3 admissions per annum; Figure 5.5) was 0.77. The SMR for aggregated data for patients initially admitted to the 14 larger Units (those with 200 or more Level 3 admissions per annum; Figure 5.5) was 0.78.

TABLE 9.7: NUMBERS AND STANDARDISED MORTALITY RATIOS OF PATIENTS WITH COVID-19 IN 2023

Hospital	Number of patients	SMR
Beaumont Hospital†	20	0.90
Mater Misericordiae University Hospital†	37	0.70
University Hospital Galway	19	0.56
St Luke's General Hospital Carlow/Kilkenny	31	0.70
St Vincent's University Hospital	15	0.88
Cork University Hospital†	32	0.83
Hospitals with <15 eligible patients§	141	0.80
Total	295	0.78

Note: There were no admissions of patients with COVID-19 to Tipperary University Hospital ICU.

† The numbers for Beaumont Hospital General ICU and for Beaumont Hospital (Richmond) Neurosurgical ICU have been combined, as the neurosurgical ICU had fewer than 15 eligible patients. Similarly, the numbers for Mater Misericordiae University Hospital ICU and Mater Misericordiae University Hospital HDU have been combined, as the ICU had fewer than 15 patients. The numbers for Cork University Hospital Cardiothoracic ICU and Cork University Hospital General ICU have been combined, as the cardiothoracic ICU had fewer than 15 eligible patients.

§ Our Lady of Lourdes Hospital Drogheda ICU, St James's Hospital Cardiothoracic ICU, St James's Hospital General ICU, Tallaght University Hospital ICU, University Hospital Limerick ICU, University Hospital Waterford ICU, Regional Hospital Mullingar ICU, Wexford General Hospital ICU, Connolly Hospital ICU, Midland Regional Hospital Tullamore ICU, Naas General Hospital ICU, Letterkenny University Hospital ICU, University Hospital Kerry ICU, Cavan General Hospital ICU, Mercy University Hospital Cork ICU, Sligo University Hospital ICU, Mayo University Hospital ICU, Portiuncula University Hospital ICU, and Midland Regional Hospital Portlaoise ICU all had fewer than 15 eligible patients in 2023. The numbers for these 19 Units have been aggregated to calculate an SMR value.

FINDINGS FROM CHAPTER 9

- A total of 297 patients were admitted to Units participating in the INICUA with COVID-19 as their primary or secondary diagnosis during 2023. Patients with COVID-19 occupied 5% of all ICU bed days in 2023, compared with 12% in 2022 and 29% in 2021.
- Demographic data for patients with COVID-19 in the ROI were comparable to those for patients in the UK in 2023.
- The ICU mortality rate for patients with COVID-19 admitted to Units participating in the INICUA in 2023 was 27%, and the hospital mortality rate for patients with COVID-19 was 37%. This compares to a hospital mortality rate of 20% for the overall ICU patient population.
- The SMR for patients with COVID-19 admitted to ICU in the ROI in 2023 was 0.78 (i.e., only 78% of the predicted number of deaths occurred).
- Only six hospitals participating in the INICUA in 2023 had enough patients with COVID-19 for the calculation of individual SMRs. All these hospitals had an SMR value within the expected range, indicating that the quality of care provided in these hospitals was acceptable.
- The SMR for patients with COVID-19 who were initially admitted to smaller Units (those with fewer than 200 Level 3 admissions per annum) in 2023 was 0.77, compared with an SMR for patients who were initially admitted to larger Units (those with 200 or more Level 3 admissions per annum) of 0.78. This suggests that outcomes for patients, as assessed by risk-adjusted mortality rates, were not adversely impacted by the patients being initially admitted to a smaller Unit rather than a larger one.

CHAPTER 10
INTERHOSPITAL TRANSFERS OF CRITICALLY ILL PATIENTS

CONTENTS

CHAPTER 10: INTERHOSPITAL TRANSFERS OF CRITICALLY ILL PATIENTS

Transfers of critically ill patients between hospitals are an integral part of all modern healthcare systems. Patients may be transferred for specialist medical or surgical care, in order to receive a more complex level of critical care, or because of a shortage of available ICU beds in the referring hospital. Comprehensive data on transfers of critically ill patients are needed in order to plan ICU services, to define requirements for critical care transport, and to identify shortfalls in the existing service.

The INICUA encompassed all the Units that provided Level 3 critical care in hospitals funded by the Health Service Executive in 2023 (apart from Our Lady's Hospital Navan ICU, that provided just 0.16% of bed days nationally during which patients received invasive ventilation). There are small gaps in the data because four Units did not submit data for the full year in 2023. Nevertheless, this report captures almost all critical care transfers by analysing data on all patients who were transferred to or admitted from an ICU in another hospital. The analysis provides comprehensive data on the number and complexity of transfers and the resources required for interhospital transfers of critically ill patients.

Transfers of critically ill patients between hospitals fall into three categories: (1) transfers directly from one ICU to another ICU; (2) transfers from a non-ICU location (ward, Emergency Department (ED), operating theatre (OT), etc.) in the referring hospital directly to ICU in the receiving hospital; and (3) transfers to a non-ward location (ED, OT, etc.) in the receiving hospital before admission to ICU.

Patients in these transfer groups are considered to have been critically ill, and aggregated data on patients from these three cohorts are a useful representation of critical care transfers.

The INICUA documented 878 critically ill patients who were transferred between hospitals in 2023 (Table 10.1). This number includes transfers for more specialist care, transfers because of a shortage of available ICU beds, and transfers for repatriation.

As the data from four Units were incomplete, we have extrapolated from the existing data for those Units in order to estimate activity over the full year. Extrapolating data in this manner provides an estimated total of 895 critical care transfers. This compares to estimated totals of 836 transfers in 2022 and 913 in 2021.

The Mobile Intensive Care Ambulance Service (MICAS) of the National Ambulance Service undertook 356 transfers of critically ill patients in 2023 (MICAS Activity Report 2023), leaving the remaining 539 transfers to be undertaken by ICU or anaesthesia staff in the referring hospitals.

TABLE 10.1: NUMBER OF CRITICALLY ILL PATIENTS TRANSFERRED TO A UNIT IN ANOTHER HOSPITAL, 2021–2023

	Documented transfers in, 2021	Documented transfers in, 2022 (extrapolated transfers)	Documented transfers in, 2023 (extrapolated transfers)
Patients transferred directly from ICU to ICU	486	373 (430)	471 (486)
Patients transferred from a non-ICU location (ward, ED, OT, etc.) in the referring hospital directly to ICU in the receiving hospital	333	281 (308)	305 (307)
Patients initially transferred to a non-ward location (ED, OT, etc.) in the receiving hospital before their admission to ICU	94	90 (98)	102 (102)
Total interhospital critical care transfers	**913**	**744 (836)**	**878 (895)**

Characteristics of the 878 critically ill patients who were transferred to ICU in 2023 are shown in Table 10.2. The common conditions associated with transfer were trauma (23% of patients), sepsis (29%) and surgery (11%). Sixty-seven percent of patients received Level 3 care in the first 24 hours after admission to the receiving ICU.

Forty-four percent of admissions to ICU after transfer from another hospital occurred between 10.00pm and 8.00am (i.e. outside normal daytime working hours), and 25% of admissions occurred at weekends or on bank holidays. This means that ICU or anaesthesia staff undertaking the transfer were away from their base hospital, often for prolonged periods. This has significant implications for the provision of safe care in the referring hospital.

TABLE 10.2: CHARACTERISTICS OF CRITICALLY ILL PATIENTS TRANSFERRED TO ICU FROM ANOTHER HOSPITAL, 2021–2023

	Transfers in, 2021 (n=913)	Transfers in, 2022 (n=744)	Transfers in, 2023 (n=878)
Median age, in years (IQR)	58 (44–69)	60 (43–71)	61 (44–71)
Males	60%	59%	62%
Median BMI, in kg/m^2	27	26	26
Number of transfers following trauma (%)	155 (17%)	160 (22%)	203 (23%)
Number of transfers following traumatic brain injury (%)	73 (8%)	90 (12%)	110 (13%)
Number of transfers from another hospital going to OT in receiving hospital before ICU admission (%)	92 (10%)	95 (13%)	96 (11%)
Number of patients with acute kidney injury on Day 1 in receiving Unit (%)	451 (49%)	362 (49%)	436 (50%)
Number of patients with sepsis (%)	358 (39%)	233 (31%)	257 (29%)
Number of patients who received Level 3 care on Day 1 in receiving Unit (%)	660 (72%)	532 (72%)	591 (67%)
Number of patients admitted to ICU at night (20:00-07:59) after transfer from another hospital (%)	398 (44%)	328 (44%)	388 (44%)
Number of patients transferred at weekends/bank holidays (%)	237 (26%)	213 (29%)	220 (25%)

The patients who were transferred in 2023 were relatively sick, with a mean APACHE II score of 16 and a mean predicted hospital mortality rate of 27% (Table 10.3). The mean Unit length of stay (LOS) in 2023 was 10.6 days (SD: 16.2 days), compared with the overall mean LOS for all ICU admissions of 5.6 days (INICUA data). The SD of 16.2 days indicates wide variability in LOS values and indicates that there were a number of patients whose LOS was considerably longer than the mean of 10.6 days.

TABLE 10.3: ILLNESS SEVERITY AND OUTCOMES OF CRITICALLY ILL PATIENTS TRANSFERRED TO A UNIT IN ANOTHER HOSPITAL, 2021–2023

	Transfers in, 2021	Transfers in, 2022	Transfers in, 2023
Mean APACHE II score (SD)	15 (7)	16 (7)	16 (7)
Mean predicted hospital mortality rate* (%)	24%	29%	27%
Mean Unit LOS, in days (SD)	10 (15)	10 (16)	11 (16)
Hospital mortality rate (%)	26%	26%	24%

* Statistics computed using the ICNARC$_{H\text{-}2023}$ model.

Figure 10.1 shows the number of patients who were admitted to each Unit after transfer from another hospital without initial admission to a ward in the receiving hospital. The hospitals receiving the greatest numbers of transfers to ICU were Beaumont Hospital (n=167), Cork University Hospital (n=140), and Mater Misericordiae University Hospital (n=124).

"I called an ambulance and was unconscious when it arrived. And so began 10 weeks where I journeyed through three hospitals and three ICUs." *- Olga Barry*

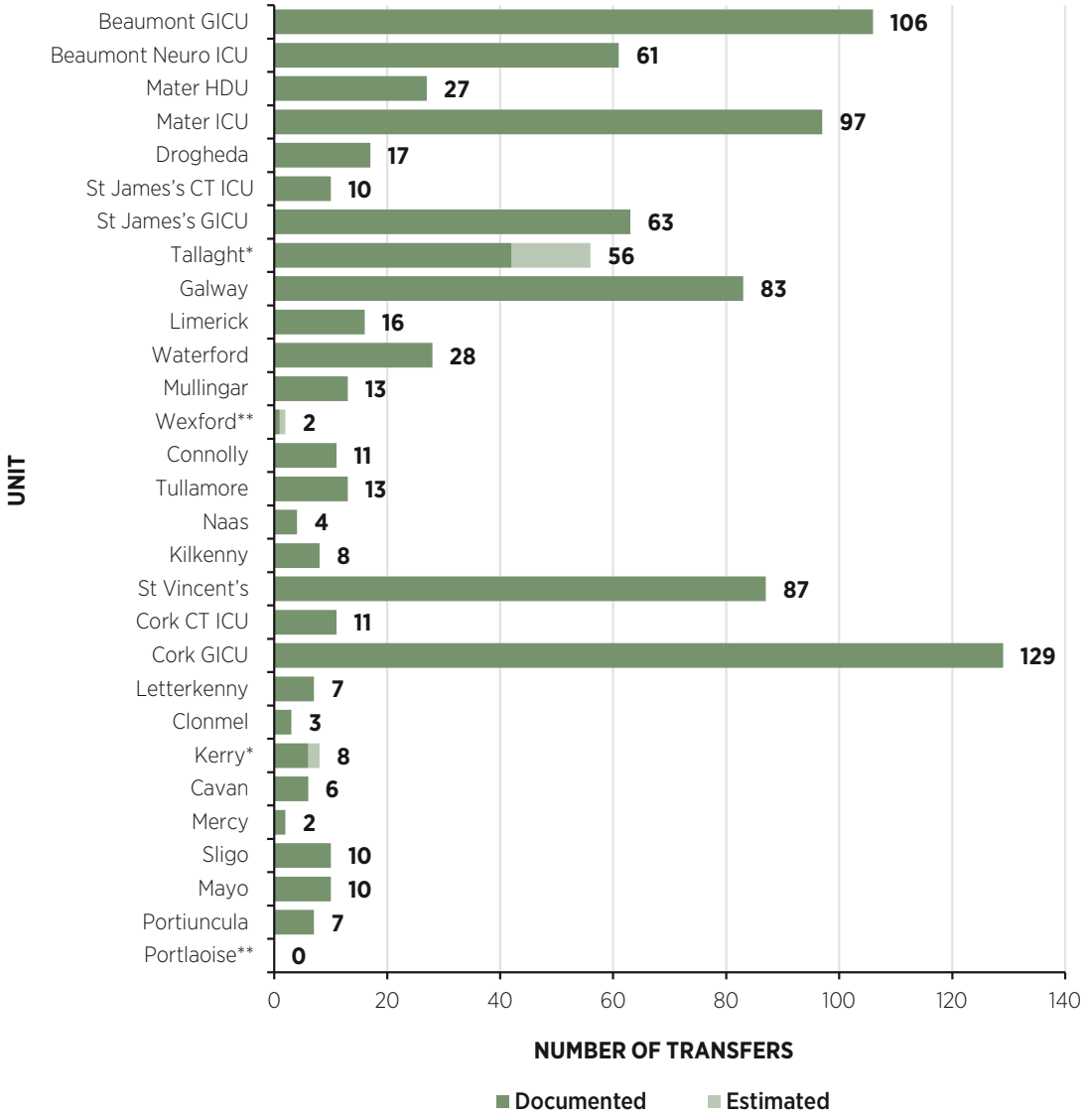


FIGURE 10.1: TRANSFERS TO EACH UNIT FROM ANOTHER HOSPITAL

Note: The total number of documented and estimated transfers was 895.

* No data for one quarter.
** No data for two quarters.

Figure 10.2 shows the number of transfers to each Unit directly from another ICU. This is a subset of the patients in Figure 10.1. The hospitals that received the greatest numbers of direct ICU-to-ICU transfers were Beaumont Hospital (n=83), Mater Misericordiae University Hospital (n=79), and University Hospital Galway (n=67).

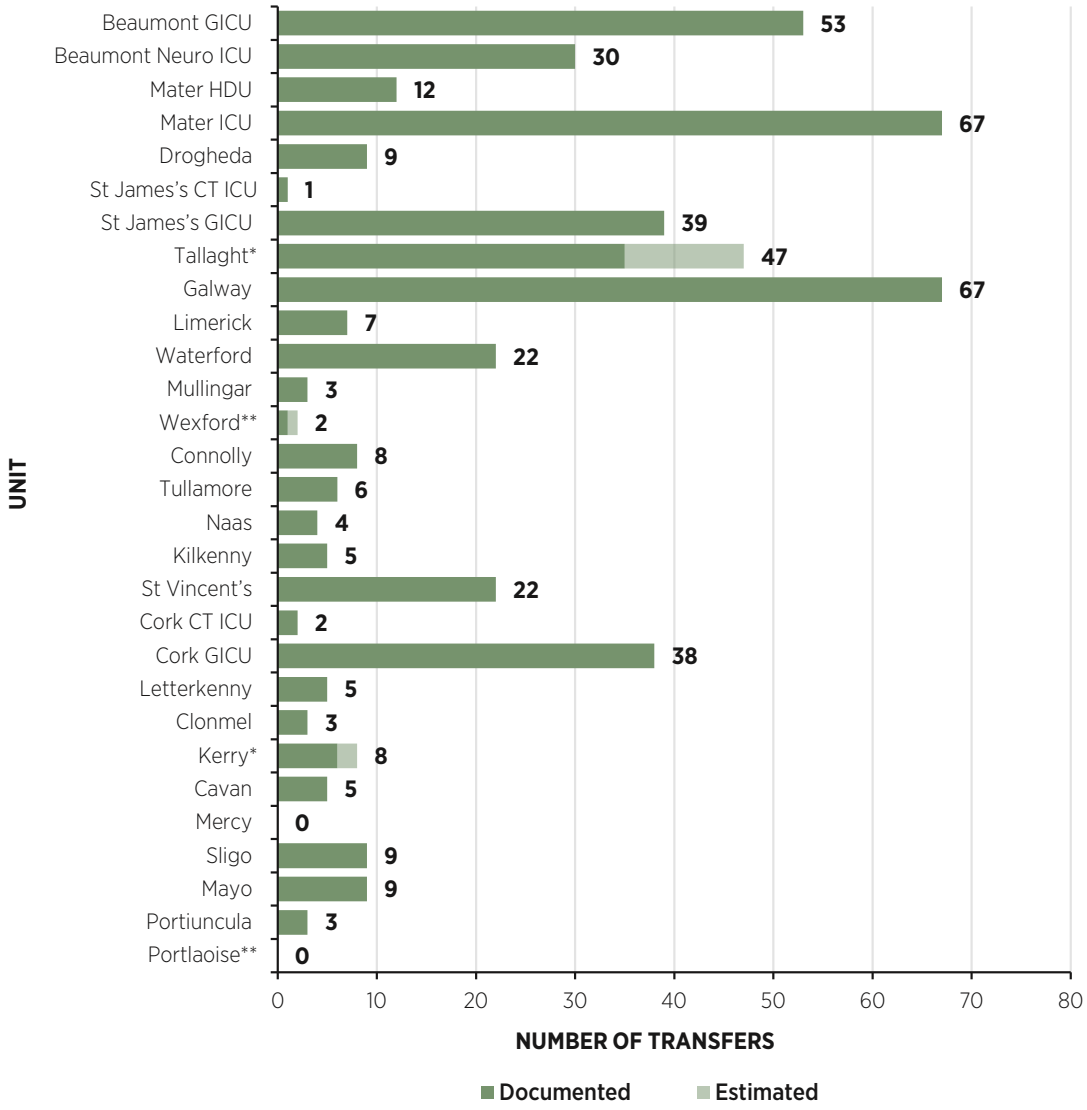


FIGURE 10.2: TRANSFERS TO EACH UNIT DIRECTLY FROM ANOTHER ICU

Note: The total number of documented and estimated transfers was 486.

* No data for one quarter.
** No data for two quarters.

Figure 10.3 shows the proportions of all Unit admissions that were transferred directly from another ICU. The highest percentages of admissions to a Unit directly from another ICU were to Beaumont Hospital (Richmond) Neurosurgical ICU, Beaumont Hospital General ICU, Mater Misericordiae University Hospital ICU, University Hospital Galway ICU, Cork University Hospital General ICU, and Tallaght University Hospital ICU.

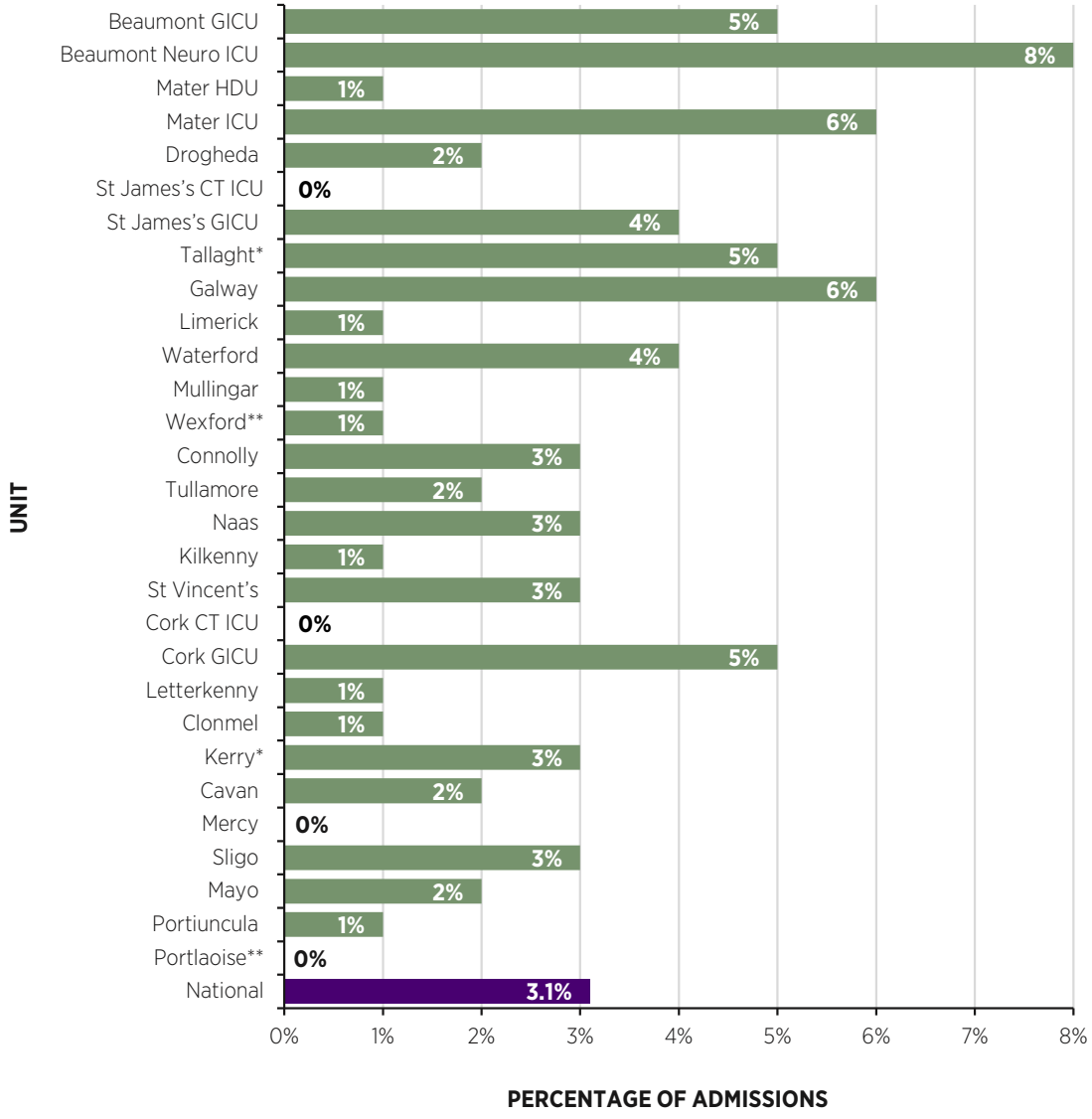


FIGURE 10.3: TRANSFERS TO EACH UNIT DIRECTLY FROM ANOTHER ICU, AS A PERCENTAGE OF ALL UNIT ADMISSIONS

* No data for one quarter.
** No data for two quarters.

Critical care transfers out were defined as patients transferred directly from one ICU to another ICU. The difference between the numbers transferred in and the numbers transferred out is primarily explained by 67 transfers from adult ICUs to paediatric ICUs.

The total number of transfers out from one Unit to another ICU (including 31 estimated transfers from Units without complete data) was 576 (Figure 10.4). The largest numbers of transfers out to another ICU were from Mayo University Hospital ICU (n=46), Portiuncula University Hospital ICU (n=43), University Hospital Galway ICU (n=40), and Beaumont Hospital General ICU (n=38).

Twenty-three percent of transfers out of ICU directly to another ICU began at night (between 20:00 and 07:59), while 44% of critical care transfers in arrived at night. This reflects the journey time between departure from the referring Unit and arrival at the receiving Unit, or indicates that patients went to the OT or ED in the receiving hospital before admission to ICU.

Twenty-three percent of transfers out to another ICU occurred at weekends or bank holidays.

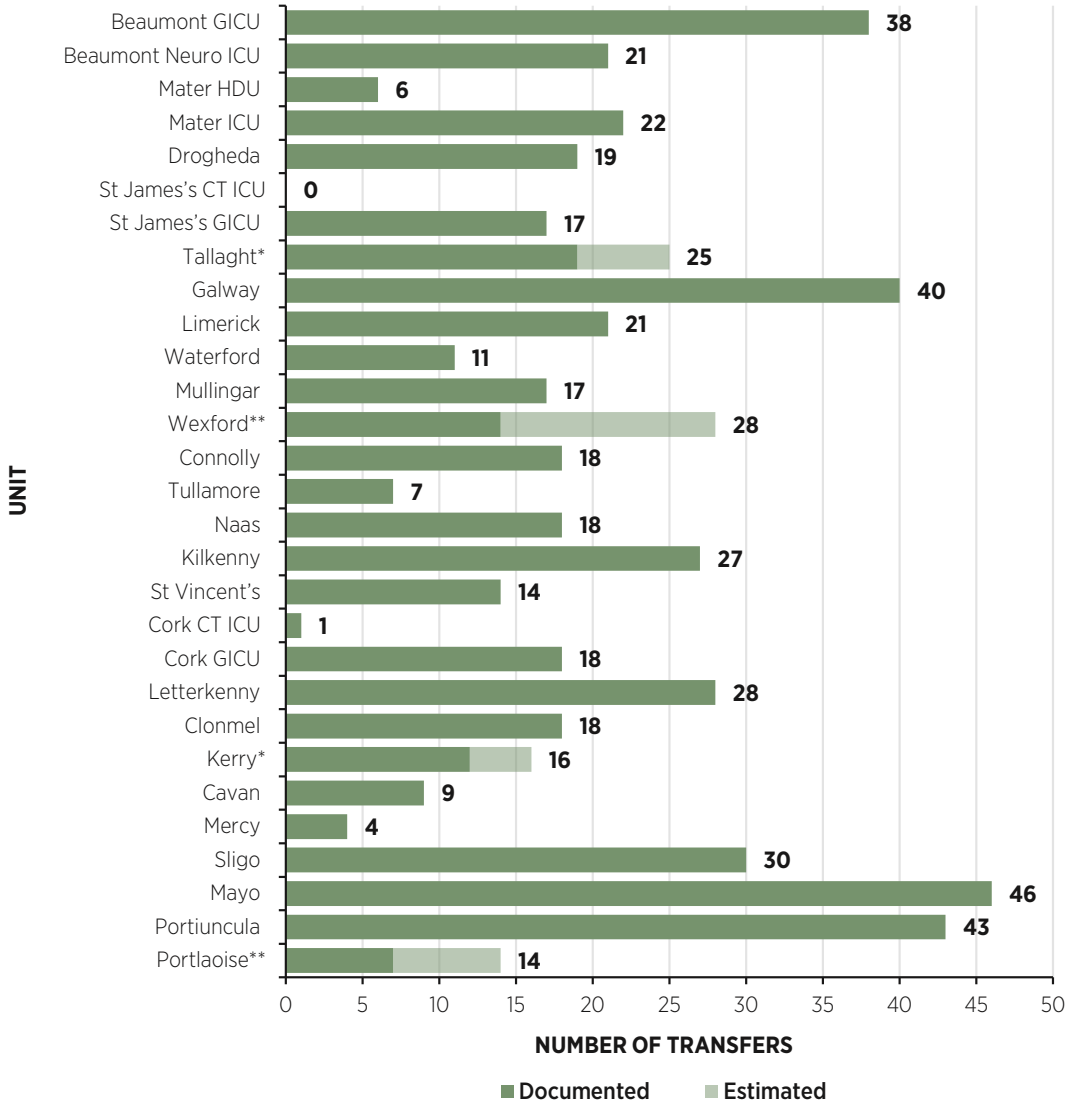


FIGURE 10.4: TRANSFERS FROM EACH UNIT DIRECTLY TO ANOTHER ICU

Note: The total number of documented and estimated transfers was 576.

* No data for one quarter.
** No data for two quarters.

Transfers out directly to another ICU as a percentage of all Unit survivors are shown in Figure 10.5. The Units with the highest percentages of transfers out directly to another ICU in 2023 were Naas General Hospital ICU, Wexford General Hospital ICU, Mayo University Hospital ICU, and Portiuncula University Hospital ICU.

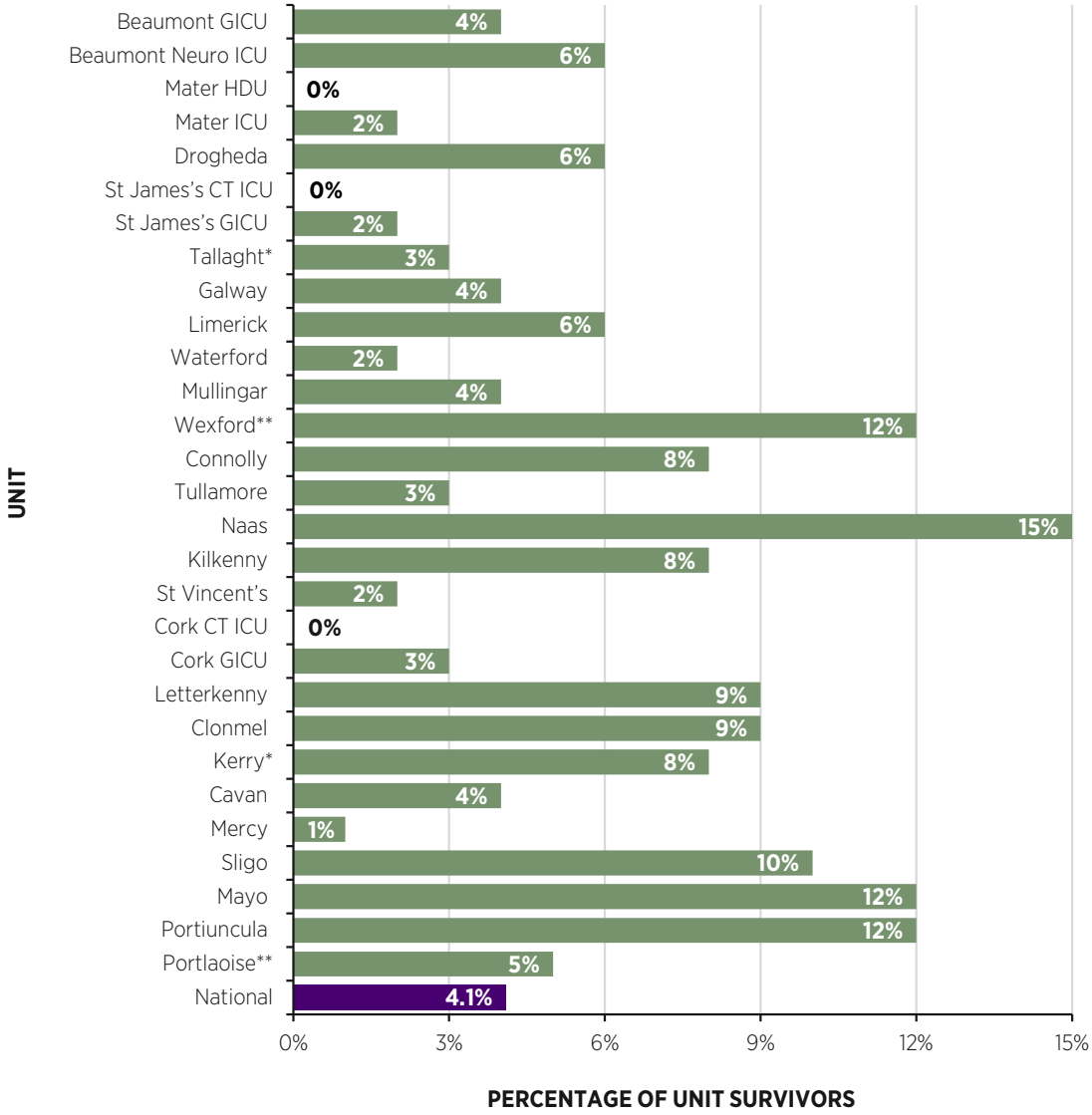


FIGURE 10.5: TRANSFERS FROM EACH UNIT DIRECTLY TO ANOTHER UNIT, AS A PERCENTAGE OF ALL UNIT SURVIVORS

* No data for one quarter.
** No data for two quarters.

The numbers of transfers out to another ICU, by referring specialty, are shown in Figure 10.6. The specialties that transferred out the largest numbers of critically ill patients in 2023 were general medicine, general surgery, respiratory medicine and paediatrics.

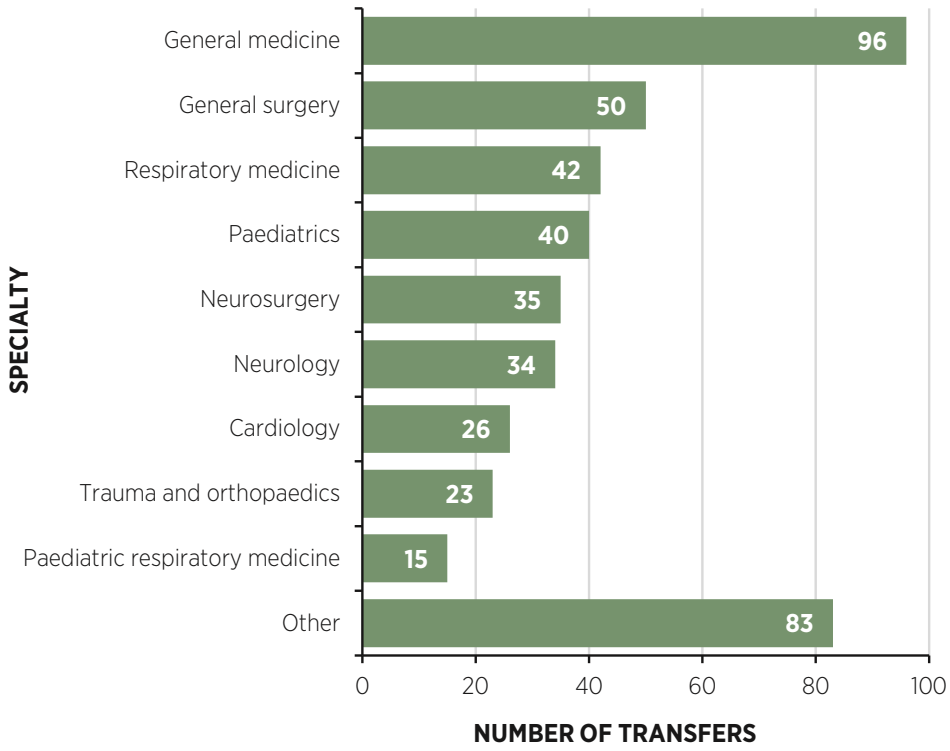


FIGURE 10.6: PATIENTS TRANSFERRED OUT TO ANOTHER ICU FROM EACH SPECIALTY

Note: n=444; data were not available for 23% of transfers out.

"On the first anniversary of my leaving the hospital, I sent a card to the ICU in Hospital 2 to say that I was still grateful." *- Olga Barry*

FINDINGS FROM CHAPTER 10

- The INICUA estimated that 895 critically ill patients were transferred from one hospital to ICU in another hospital in 2023.
- Forty-four percent of transfers occurred at night (i.e. between 20:00 and 07:59), and 25% occurred at weekends or on bank holidays. This has significant implications for the provision of safe care in the referring hospital, as the on-call ICU doctor will have been absent from the Unit during these transfers, often for prolonged periods.
- Beaumont Hospital received the largest number of interhospital transfers into ICU in 2023 (n=167).
- The Units with the highest percentages of transfers out directly to another ICU in 2023 were Naas General Hospital ICU, Wexford General Hospital ICU, Mayo University Hospital ICU, and Portiuncula University Hospital ICU.
- The specialties with the largest numbers of patients transferred from one ICU to another ICU in 2023 were general medicine, general surgery, respiratory medicine and paediatrics.

CHAPTER 11
QUALITY IMPROVEMENT

CONTENTS

CHAPTER 11: **QUALITY IMPROVEMENT**

The purpose of this chapter is to highlight quality improvement initiatives based on data derived from the INICUA, and to identify and promote potential areas for quality improvement in the future.

Clinical audit is one of a range of quality improvement methodologies that can deliver improved processes and outcomes for patients (Healthcare Quality Improvement Partnership, 2020). Clinical audit provides data in order to identify possible deficiencies in the quality of care and to monitor the effect of remedial measures. It also identifies instances of good practice, providing validation for staff and offering a model for others to copy.

Good quality data are essential to gain support for quality improvement initiatives from all stakeholders, from the local clinical team to hospital management and national policy-makers. The data presented throughout this chapter illustrate trends in our formal quality indicators (QIs) and other metrics over time and highlight areas of improvement since the first ICU Audit Annual Report on 2017 data.

IMPLEMENTATION OF IRISH NATIONAL ICU AUDIT (INICUA)

When national ICU Audit (INICUA) was initiated in 2015, data were collected by only four adult ICUs in Ireland. By 2023, however, due to the commitment and hard work of the NOCA team and the ICU Audit Coordinators, INICUA documented activity from 29 Units in 25 hospitals, which undertook all but 0.2% of all Level 3 ICU activity in hospitals funded by the Health Service Executive (HSE) during 2023 (Figure 11.1).

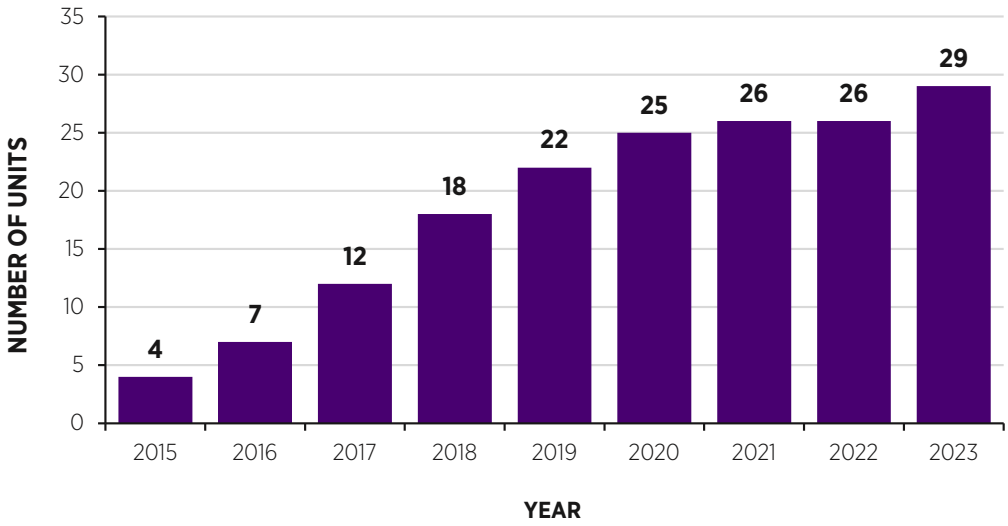


FIGURE 11.1: NUMBER OF ICUS INCLUDED IN THE IRISH NATIONAL ICU AUDIT, 2015–2023

Figure 11.2 shows the number of admissions to ICUs documented by the INICUA each year from 2017 to 2023.

Some Units had to omit data for one or two quarters during 2023. This was a result of inadequate ICU Audit Coordinator staffing. The recommended staffing level is 1 ICU Audit Coordinator for every 10 ICU beds. Gaps in data coverage reduce the validity of the findings and make comparisons of activity data between Units difficult.

Throughout this report, we have dealt with these gaps in data by extrapolating from the available data to provide estimated values for the entire 12-month period for the affected Units. The shortfall between documented patient numbers and the actual total numbers of patients admitted (as estimated by extrapolation) in 2022 and 2023 is indicated by the paler shading in the bar graph in Figure 11.2. There was a major improvement in 2023 in the completeness of data collection; additional estimated numbers of admissions decreased from 21% of the total numbers for 2022 to 4% of the total for 2023.

This improvement in the documentation of ICU activity leads to more accurate data and greater validity for the INICUA findings.

Using extrapolated data as described, the INICUA achieved 99.8% coverage of Level 3 ICU activity nationally in 2023, compared with 58% coverage in 2017.

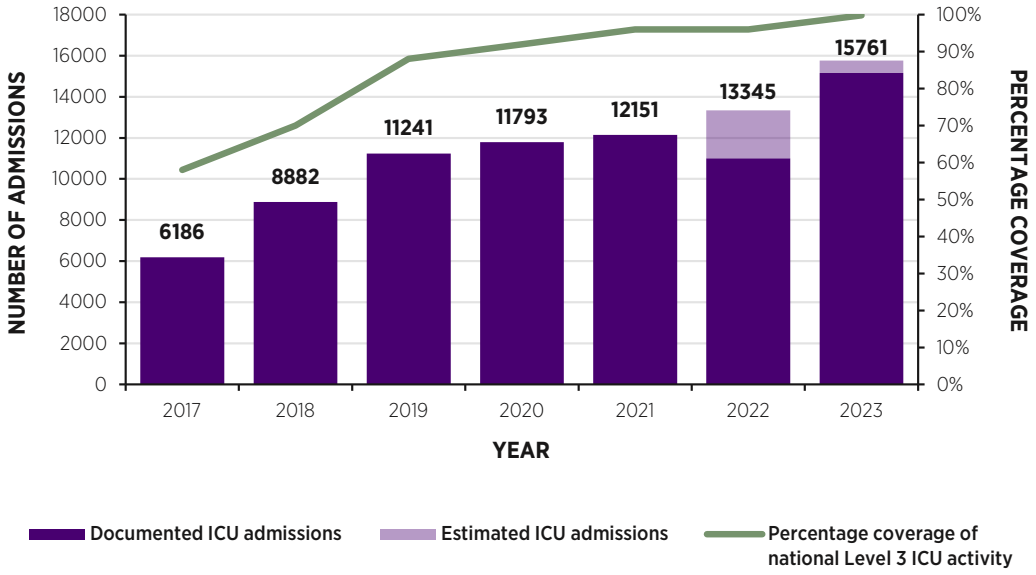


FIGURE 11.2: ADMISSIONS TO ICU AUDITED BY THE IRISH NATIONAL ICU AUDIT AND PERCENTAGE COVERAGE OF LEVEL 3 ACTIVITY IN UNITS, 2017–2023

MORTALITY

Risk-adjusted mortality rates can be evaluated by calculating the SMR[5] (the ratio of observed to predicted deaths) using the ICNARC$_{H\text{-}2023}$ risk-prediction model. The national SMR increased to 1.16 in 2021 (Figure 11.3). We hypothesised that the SMR increased because the risk-prediction model underestimated the risk of mortality in patients with COVID-19, who commonly had only single-organ failure at the time of admission to ICU. Following recalibration of the ICNARC$_{H\text{-}2023}$ risk-prediction model and with fewer patients with COVID-19 admitted to ICU in 2022 and 2023, the national SMR has returned to pre-pandemic values. In 2023, the SMR was 0.94 (i.e. the number of observed deaths was slightly less than the number of expected deaths).

The overall national SMR is a blunt measure that could conceal issues in individual Units. In 2023, all Units were within the expected ranges for the risk-adjusted mortality metrics. These data are an important reassurance that the quality of care for patients who are admitted to all Units in Ireland reaches a consistent and acceptable standard.

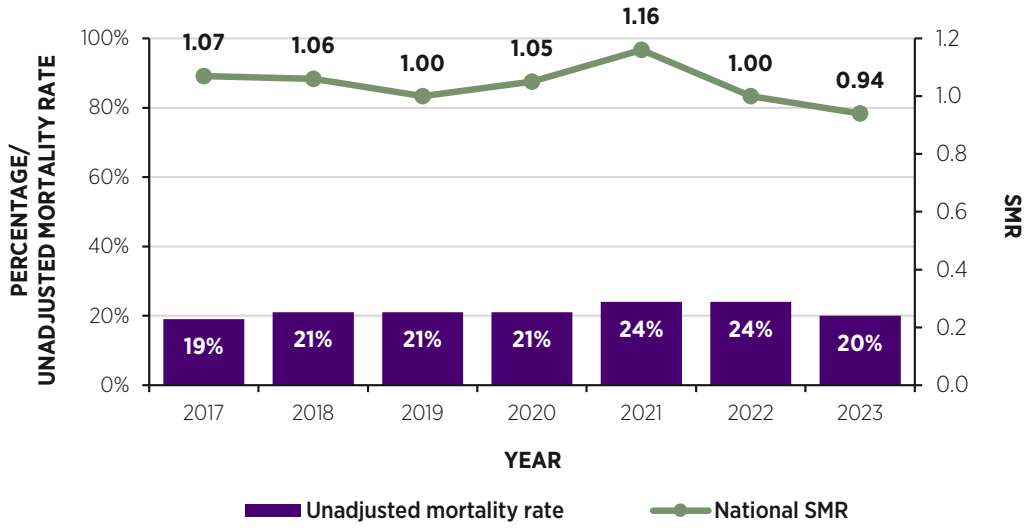


FIGURE 11.3: OBSERVED (UNADJUSTED) MORTALITY RATE AND STANDARDISED MORTALITY RATIO, 2017–2023

[5] For an explanation of SMR, refer to the Acute hospital mortality section in Chapter 7.

TIMELINESS OF ADMISSION TO ICU

Prompt admission to ICU improves outcomes for critically ill patients. The HSE has defined two key performance indicators (KPIs) as targets for timeliness of admission to ICU from locations other than OT or another hospital:

1. Fifty percent of patients should be admitted within 1 hour of the decision to admit.
2. Eighty percent of patients should be admitted within 4 hours of the decision to admit.

In 2023, 3 out of 24 of the hospitals participating in the INICUA (13%) achieved the KPI target of 50% of patients being admitted to ICU within 1 hour of the decision to admit, which was an improvement compared with previous years. Twenty out of those 24 hospitals (83%) achieved the target of admitting 80% of patients to ICU within 4 hours of the decision to admit (Figure 11.4).

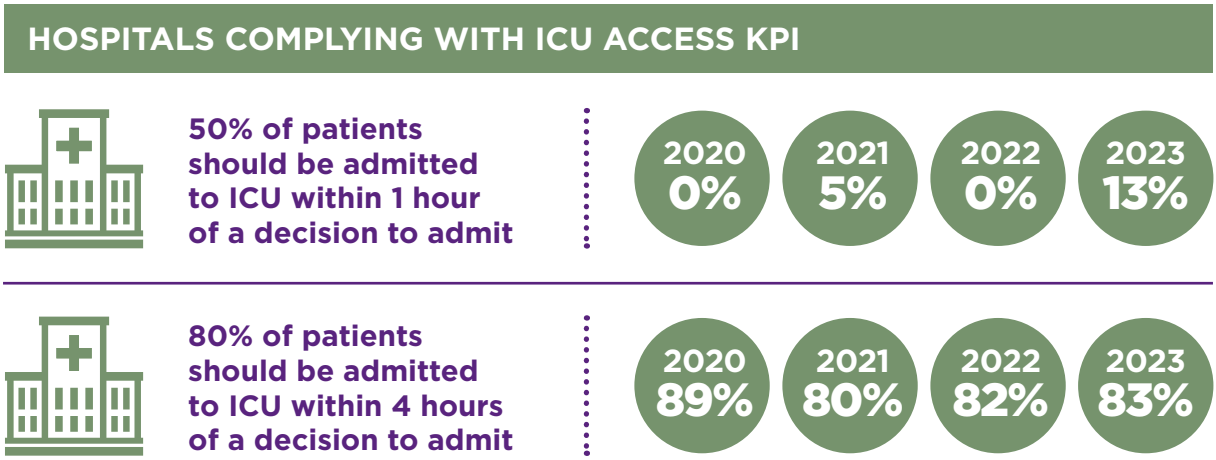


FIGURE 11.4: PERCENTAGE OF HOSPITALS ADMITTING (i) 50% OF PATIENTS TO ICU WITHIN 1 HOUR AND (ii) 80% OF PATIENTS WITHIN 4 HOURS OF THE DECISION TO ADMIT, 2020–2023

Thirty-three percent of all patients were admitted to ICU within 1 hour and 87% within 4 hours of the decision to admit in 2023 (Figure 11.5). Comparing the 2023 and 2022 data suggests a marginal improvement in the timeliness of ICU admission in 2023.

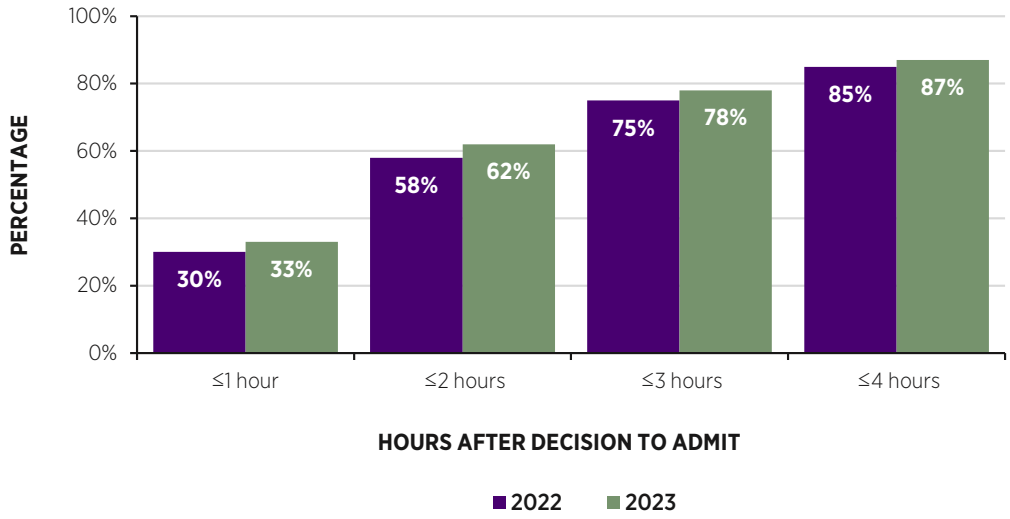


FIGURE 11.5: CUMULATIVE PERCENTAGES OF PATIENTS ADMITTED TO UNITS FOLLOWING THE DECISION TO ADMIT, AS A PERCENTAGE OF ALL ADMISSIONS FROM A WARD OR EMERGENCY DEPARTMENT[6]

Values like the mean number of hours before admission to ICU can obscure the situation of individual patients. Figure 11.6 shows that some individual patients waited prolonged periods (more than 24 hours) for an ICU bed in 2023.

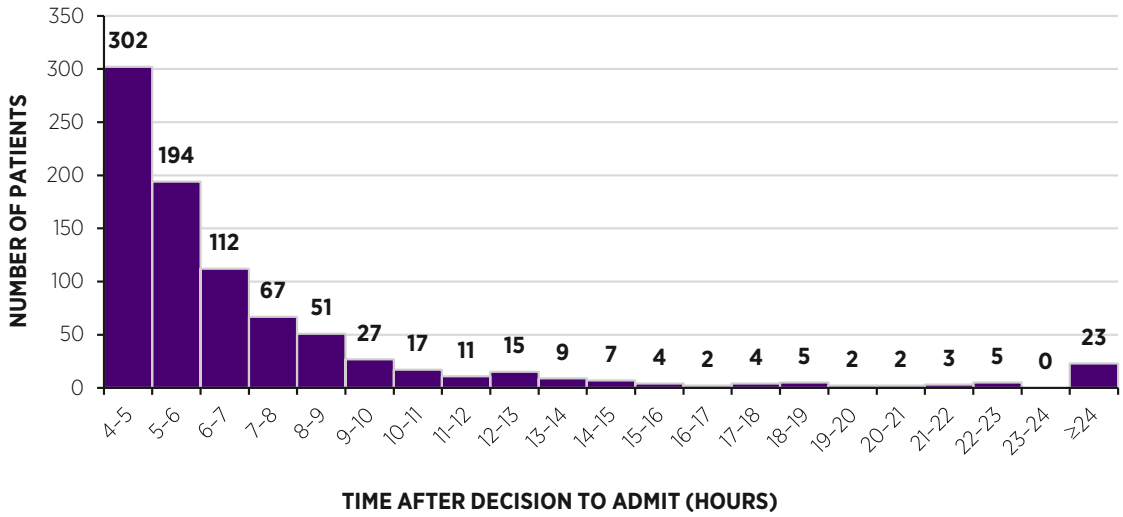


FIGURE 11.6: PATIENTS WHOSE ADMISSION TO ICU WAS DELAYED MORE THAN 4 HOURS, 2023 (n=862)

[6] These data refer only to patients whose time of decision to admit was recorded.

SURVEY OF HOSPITAL PRACTICE REGARDING MANAGEMENT OF ICU BEDS

In January 2025 NOCA circulated a survey to ICU Clinical Leads for each Unit regarding hospital practice in the management of ICU beds. Although only 10 Clinical Leads responded, the responses provide insights into the difficulties encountered in managing ICU beds (Table 11.1).

RESPONSES FROM THE ICU CLINICAL LEADS INCLUDE THE FOLLOWING COMMENTS:

"Bed managers cite clearance of ED as their priority."

"Bed limitations on the ward result in patients being left in ICU until [the] ICU bed is needed."

"[There is] often nowhere for patients to step down to; [there needs] to be Level 1 [care] before discharge."

"Despite reassurances to the contrary, ICU discharges are not a priority with bed management."

"Please highlight this issue. Vacant beds are kept in hospitals for hip fractures and acute myocardial infarction but not for ICU patients. We have highlighted this issue repeatedly at local level."

TABLE 11.1: HOSPITAL ICU CLINICAL LEADS' RESPONSES TO A QUESTIONNAIRE FOR THE IRISH NATIONAL INTENSIVE CARE UNIT AUDIT, JANUARY 2025

Question	Yes
Does the ICU Consultant have the power to decide on suitability for discharge from ICU?	100%
Is there a hospital policy to prioritise discharges from ICU (where clinically appropriate) in order to keep an 'emergency bed' available for urgent ICU admissions?	50%
Do bed managers in your hospital follow this policy?	20%
Is it routine to have an 'emergency bed' made available in ICU whenever there are patients suitable for discharge?	30%
Is it routine for patients who have been cleared for discharge to remain in ICU until their bed is required for a new admission?	90%

IN-HOSPITAL CARDIOPULMONARY RESUSCITATION BEFORE ICU ADMISSION

If a patient deteriorates in hospital to the point of requiring cardiopulmonary resuscitation (CPR), this commonly indicates that appropriate treatment was delayed, either because the patient's deterioration was not noticed or because admission to ICU was delayed (Findlay *et al.*, 2012). Patients who require CPR before ICU admission have a poor prognosis; thus, rates of CPR before ICU admission are an important predictor of patient outcomes and also give an insight into patient care on the ward. In some cases, both CPR and ICU admission may have been inappropriate in patients with advanced disease who were unlikely to benefit from these interventions; this QI is useful in identifying Units where this has occurred.

Despite strenuous efforts nationally to improve care in the wards (e.g. outreach programmes, Irish National Early Warning System (INEWS) scores, the Deteriorating Patient Improvement Programme), national rates of CPR in the 24 hours prior to ICU admission had not improved prior to 2023 (Figure 11.7). In 2023, the national rate of patients requiring CPR in the 24 hours prior to ICU admission was 2.8%, which was a significant decrease from 3.5% in 2022 (Figure 11.7).

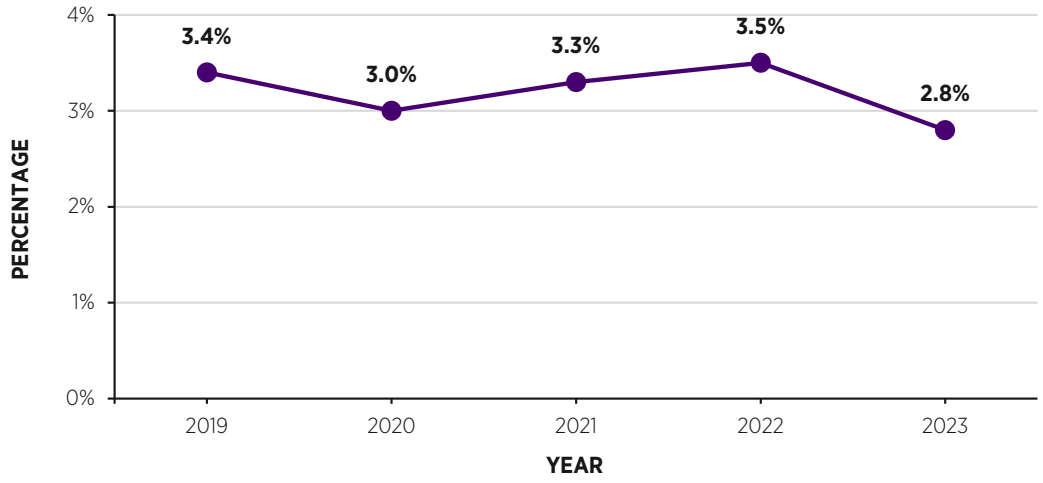


FIGURE 11.7: PERCENTAGE OF ALL UNIT ADMISSIONS THAT FOLLOWED IN-HOSPITAL CPR, 2019–2023

The Critical Care Programme and the HSE have sponsored and resourced the development of ICU Outreach services in many hospitals over the last 4 years. Data on staffing levels of advanced nurse practitioners in individual hospitals are shown in Table 11.2. It is possible that the small improvement in rates of CPR in the 24 hours before ICU admission is related to these developments.

TABLE 11.2: NUMBERS OF ADVANCED NURSE PRACTITIONERS FOR ICU OUTREACH PER HOSPITAL

Hospital	Number of ANPs	Year when ICU outreach service recommended
Tallaght University Hospital	4	2012
University Hospital Galway	7	2014
Mater Misericordiae University Hospital	7	2020
St James's Hospital	8	2020
University Hospital Limerick	4	2020
Beaumont Hospital	5	2021
Our Lady of Lourdes Hospital Drogheda	4	2021
St Vincent's University Hospital	4	2022
Letterkenny University Hospital	2	2022
Connolly Hospital	2	2022
University Hospital Kerry	2	2022
Cavan General Hospital	2	2022
Cork University Hospital	3	2023
University Hospital Waterford	2	2023
Total	56	

Source: Director of Nursing Project Lead Critical Care Services Access & Integration, 19 January 2025

TRENDS IN ORGAN DONATION

The INICUA collects extensive data on organ donation. Figure 8.5 and Table 8.2 show trends in referral rates of potential organ donors and in rates of organ donation as recorded by the INICUA.

A key element in maximising rates of organ donation is the referral of all potential donors to organ donation personnel. This helps ensure that all suitable patients and families are offered the opportunity to consider organ donation and also provides valuable data on missed opportunities for organ donation. A significant improvement was seen in the percentage of patients diagnosed with brain death who were referred to organ donation personnel nationally, from 79% in 2022 to 91% in 2023 (Figure 11.8).

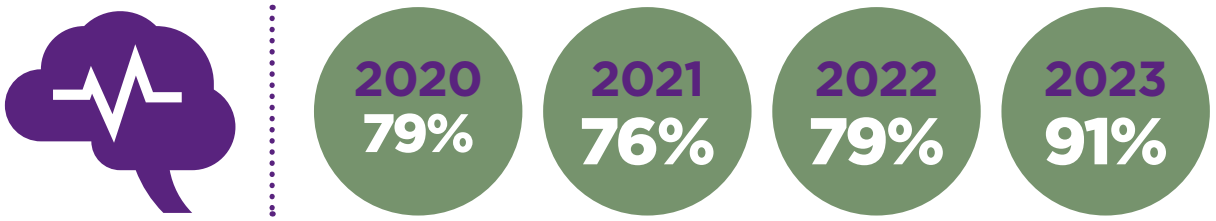


FIGURE 11.8: PERCENTAGE OF PATIENTS DIAGNOSED WITH BRAIN DEATH WHO WERE REFERRED TO ORGAN DONATION PERSONNEL, 2020–2023

In 2022, NOCA published the results of a feasibility study for an audit of organ donation practices in Ireland. Following this, Organ Donation Transplant Ireland (ODTI) commissioned NOCA to develop an Irish Potential Donor Audit (IPDA) for Irish hospitals, which commenced in May 2022, with a pilot study commencing in six hospitals in November 2022.

The quality improvement aim of the IPDA is to ensure that every person who is approaching death in ICU or ED has the possibility to become an organ donor (where this is appropriate). The final report from the IPDA development project recommended the implementation of the IPDA in all acute hospitals with an ICU and/or ED. As the opportunities for organ donation are so few, it is important that every site with potential organ donors is audited and every opportunity for organ donation maximised. HSE secured funding to continue auditing the six pilot sites included in the IPDA development project report, and to support the implementation of the IPDA nationwide.

The number of organ donors decreased during the COVID-19 pandemic (2020–2021). These lower numbers were associated with decreased diagnoses of brain death as a percentage of all deaths (Figure 11.9) and a decreased rate of progression from brain death to organ donation (Figure 11.10). The reasons for this are presumably related to lower rates of traumatic deaths and decreases in all healthcare activity, including organ transplantation, due to lockdown measures and decreased ICU bed availability. Rates of patients being diagnosed with brain death have remained unchanged in 2022 and 2023, but encouragingly, the progression rate from brain death to organ donation has increased.

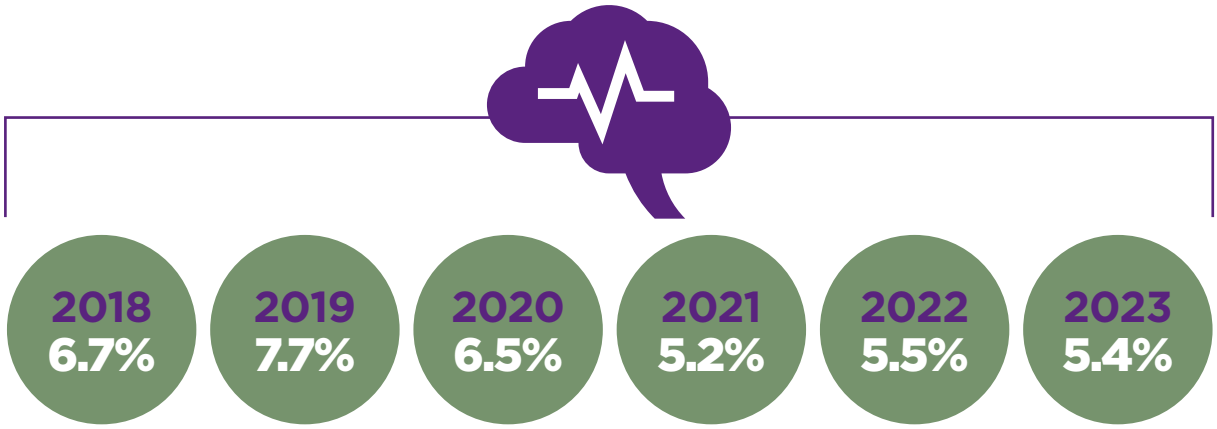


FIGURE 11.9: DEATHS DIAGNOSED BY NEUROLOGICAL CRITERIA (BRAIN DEATHS), AS A PERCENTAGE OF ALL DEATHS IN ICUS, 2018–2023

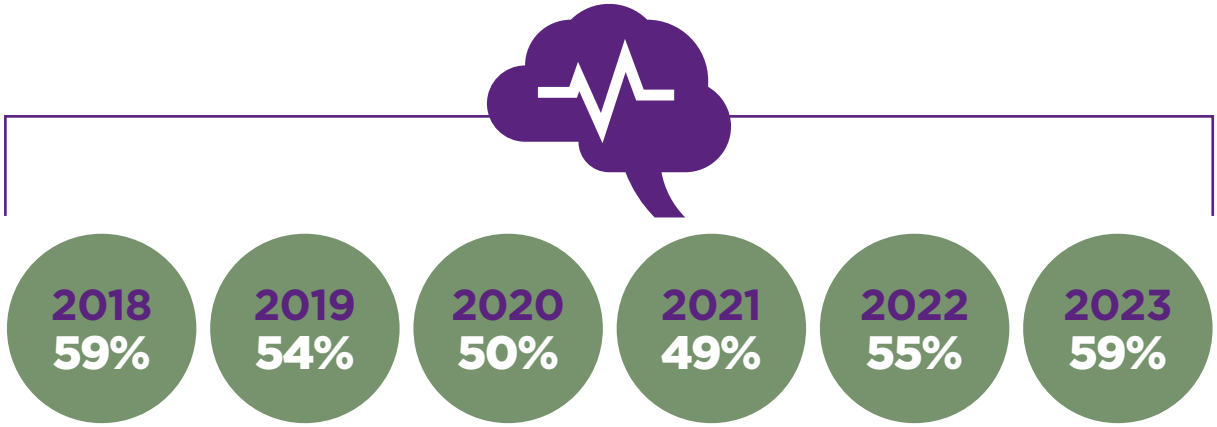


FIGURE 11.10: PERCENTAGE OF PATIENTS DIAGNOSED WITH BRAIN DEATH WHO PROGRESSED TO ORGAN DONATION, 2018–2023

Deceased patients who do not have death diagnosed by neurological criteria have death determined by circulatory criteria (i.e. the cessation of cardiac and circulatory function). Internationally, the ongoing lack of donors after brain death to meet organ transplantation needs has led to an increasing reliance on donation after circulatory death (DCD). In line with this trend, an increased percentage of patients diagnosed with circulatory death became organ donors in 2023 (Figure 11.11).

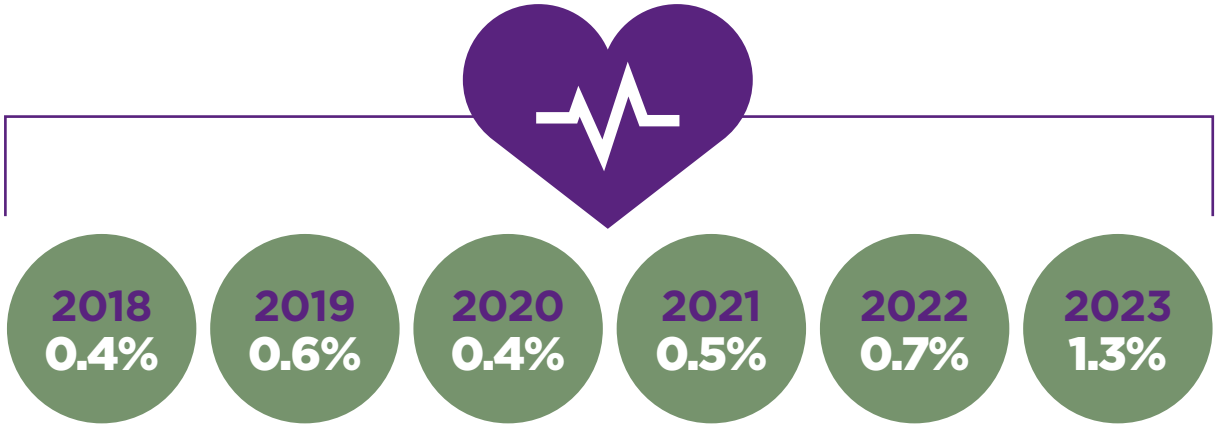


FIGURE 11.11: PERCENTAGE OF PATIENTS DIAGNOSED WITH CIRCULATORY DEATH WHO PROGRESSED TO ORGAN DONATION, 2018–2023

The increased rate of DCD in 2023 led to an overall increase in organ donors as a percentage of all deceased patients, from 3.7% in 2022 to 4.4% in 2023 (Figure 11.12).

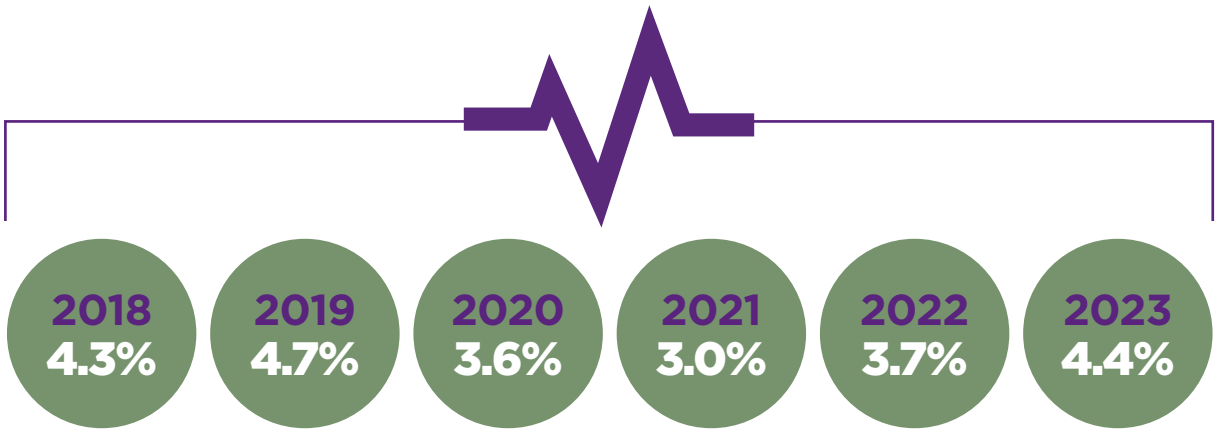


FIGURE 11.12: PATIENTS WHO PROGRESSED TO ORGAN DONATION, AS A PERCENTAGE OF ALL DEATHS, 2018–2023

QIs: OUTLIER UNITS

A number of metrics for activities and outcomes in ICU are considered to reflect the quality of care provided (see Chapter 7). If the value of one of these QIs for a Unit lies outside the expected range for that metric, the Unit is considered an outlier for the corresponding QI. This is a signal of a potential issue with the quality of care being provided for critically ill patients. NOCA has a standardised response process where it asks the hospital to review the findings and suggest appropriate actions to address the issues identified. The National ICU Audit Governance Committee reviews a summary of the hospital's response in order to ensure that any significant issues have been addressed.

In every INICUA annual report to date, there have been a small number of outlier QIs; the hospitals concerned have reviewed these findings and put action plans in place to address the issues identified.

In earlier INICUA annual reports, a small number of outlier QIs have been noted, the hospitals responded to them, and NOCA reviewed the responses. But the number of outlier QIs increased markedly to 25 in 2022 and remained around this level in 2023 (23 outlier QIs) (Figure 11.13).

The most frequent outlier QI was 'Out-of-hours discharge to the ward (not delayed)' (Figure 11.13). Both this QI and a number of the other outlier QIs relate to shortages of ICU beds rather than to the quality of clinical care in the Unit (see Chapter 7 for a fuller discussion). Reassuringly, there were no outlier QIs related to patient mortality rates in 2023 (Figure 11.13).

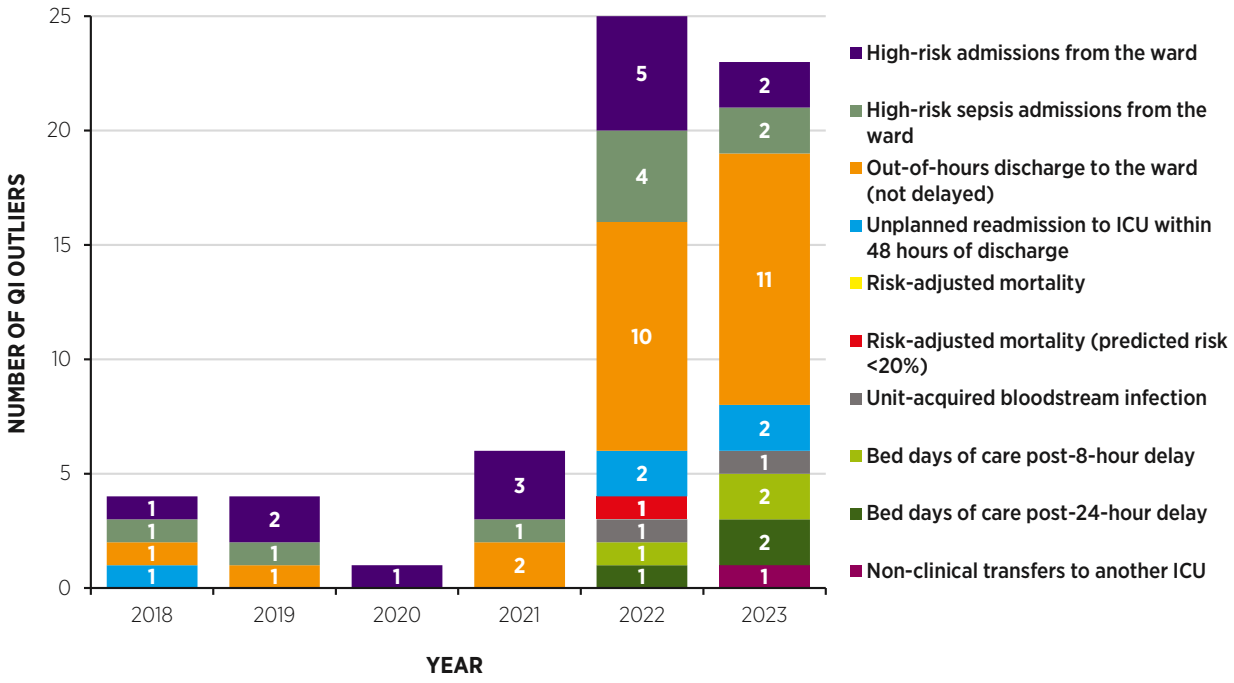


FIGURE 11.13: NUMBERS AND CATEGORIES OF OUTLIER FINDINGS FOR QUALITY INDICATORS, 2018–2023

IDENTIFICATION OF GOOD PRACTICE

A key aim of clinical audit is to identify areas for improvement and to promote actions to improve the quality of care when necessary. It is also important to identify instances of good practice in order to acknowledge high-quality care when it arises and to learn lessons that can be applied nationally.

In order to begin to identify instances of good quality care, Figures 11.14 and 11.15 show the best-performing Units for each of the standard QIs we review in each quarterly report. The figure shows the mean value for all Irish Units, and the values for the best-performing Unit in a Model 4 hospital and the best-performing Unit in a Model 3 hospital.

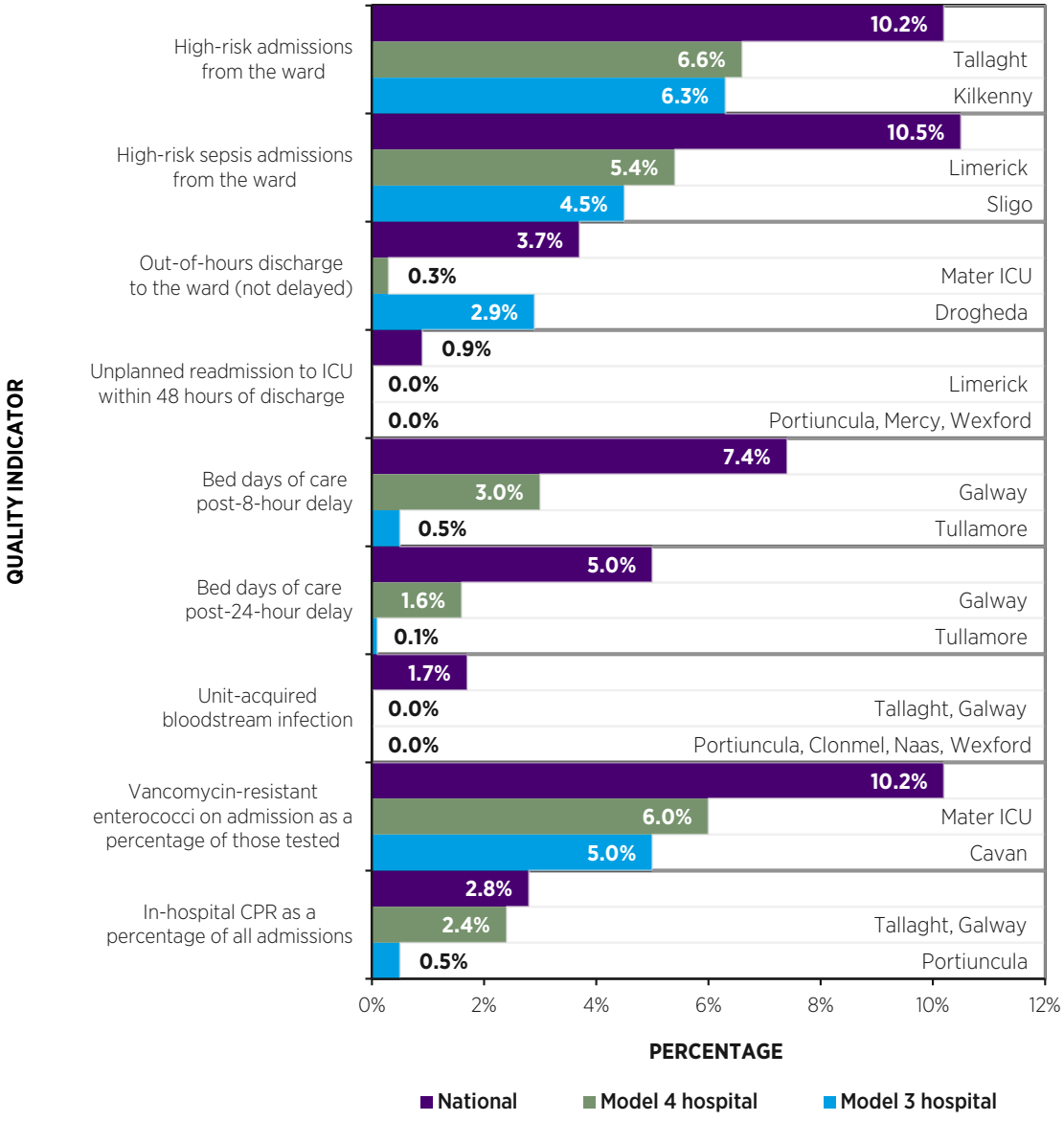


FIGURE 11.14: QUALITY INDICATORS: MEAN NATIONAL VALUE, VALUE FOR BEST-PERFORMING UNIT IN A MODEL 4 HOSPITAL, AND VALUE FOR BEST-PERFORMING UNIT IN A MODEL 3 HOSPITAL, 2023

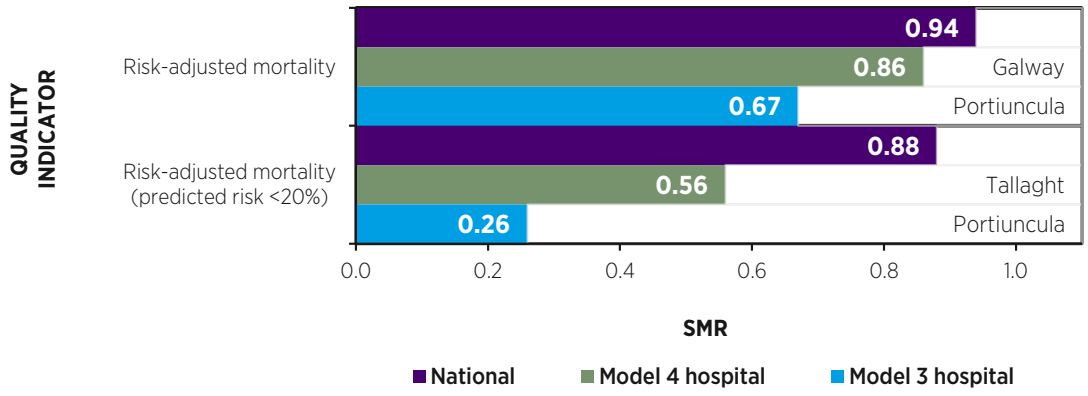


FIGURE 11.15: OVERALL NATIONAL SMR, LOWEST SMR IN A MODEL 4 HOSPITAL, AND LOWEST SMR IN A MODEL 3 HOSPITAL, 2023

ONGOING QUALITY IMPROVEMENT EDUCATION PROVIDED TO INICUA AUDIT COORDINATORS IN 2023–2024

In June 2024, all INICUA Audit Coordinators successfully completed a six-month quality improvement education programme, outlined in the *Irish National ICU Audit Annual Report on 2022 data*. The programme was delivered by the HSE National Quality and Patient Safety Directorate team, in collaboration with the NOCA Quality Improvement team. Its primary aim was to support the development of quality improvement plans in response to INICUA-identified statistical outliers.

NOCA conducted a follow-up organisational survey to assess the knowledge and learning outcomes of the INICUA Audit Coordinators after they completed the quality improvement programme. The results were positive, with 100% of respondents confirming that the training met their expectations. Additionally, 84% of participants reported that the course was practical and easy to apply in their roles.

On 16 October 2024, NOCA organised a workshop for INICUA Audit Coordinators at the Royal College of Surgeons in Ireland (RCSI) in Dublin (further details are provided in Chapter 12). During the workshop, ICU Audit Coordinators shared their experiences of implementing quality improvement projects that were initiated locally in response to INICUA QI outlier findings in their hospitals. These projects illustrated the pathway of a quality improvement project (Figure 11.16), using the knowledge and quality improvement tools gained from the programme.

FIGURE 11.16: THE SIX STEPS FOR IMPLEMENTING A QUALITY IMPROVEMENT PROJECT

Source: HSE, Quality and Improvement Guide and Toolkit (2024)

USING A QUALITY IMPROVEMENT APPROACH TO MANAGE QI OUTLIERS IN TWO HOSPITALS

Two acute hospitals with QI outliers in the 2023 INICUA data offered to review and manage the outlier findings using a quality improvement approach. The hospitals were Tallaght University Hospital and Regional Hospital Mullingar.

The NOCA team working with INICUA Audit Manager Mary O'Dwyer Baggot included Dr Fionnola Kelly, Marina Cronin and Dr Dervla Hogan, HSE National Quality and Patient Safety Directorate.

The project team held workshops to explore the relevant QI outliers using recognised domains for assessing healthcare quality. Healthcare should be effective, safe, people-centred, timely, equitable, and efficient (Institute of Medicine (US) Committee on Quality of Health Care in America, 2001), as well as being integrated (World Health Organization, n.d.) and sustainable (McGeoch *et al.* (2023).

While reviewing the QI outliers, teams learned together, co-producing and testing ideas for change. The project was supported by hospital clinicians and managers, staff in both Units, and the INICUA teams in both hospitals.

The conclusion of this project at Tallaght University Hospital was a presentation to hospital staff on 4 December 2024. This presentation included the findings and results of the collaborative work examining delayed ICU discharges from the Tallaght University Hospital ICU.

This project highlighted the true impact of delays in discharge from ICU for patients and for staff working to provide an efficient service for those patients, as well as the financial costs to Tallaght University Hospital itself.

This project also illustrated the integration of quality improvement into national clinical audit findings.

SUMMARY OF QUALITY IMPROVEMENTS IN CHAPTER 11

- The INICUA's coverage of ICU activity has increased to almost 100%, and the data collected provide a comprehensive overview of the activity and quality of care in the national network for ICUs. Gaps in the data from Units participating in the INICUA decreased from 21% of the total numbers of admissions in 2022 to 4% in 2023 (both values estimated).
- Despite strenuous efforts to improve measures of the quality of care provided in ICUs, overall national performance in many QIs remains unchanged (e.g. delayed access to ICU and night-time discharges to the ward). However, there were marginal improvements in the time between a decision to admit and the actual time of admission to ICU in 2023.
- Reassuringly, a key outcome measure (the risk-adjusted mortality rate) improved in 2023 compared with 2022, and no Units were outliers for risk-adjusted mortality rates. The percentage of patients who required CPR in the 24 hours before admission to ICU decreased in 2023 compared with 2022, which suggests better care in the wards.
- The proportion of potential organ donors who were referred to organ donation personnel increased in 2023 compared with 2022, and there was also a marginal increase in the percentage of patients diagnosed with brain death who progressed to organ donation compared with 2022. However, with the decreasing numbers of patients being diagnosed with brain death, this did not translate into more organ donors in 2023. An encouraging finding was an almost doubling in the rate of organ donation after circulatory death, from 0.7% of circulatory deaths in 2022 to 1.3% in 2023.
- The number of QI outlier findings in 2023 was similar to that in 2022, but remained considerably higher than in earlier years of the INICUA. This may reflect the ongoing pressures on ICU beds and on hospital beds generally.
- Two Units with QI outliers participated in a detailed process to review and address the issues underlying the outlier findings, using a quality improvement approach.
- In a survey of hospital ICU Clinical Leads for the INICUA, 9 of the 10 respondents noted that it was routine in their Units for patients to remain in ICU until their bed was needed for another patient.
- Ongoing quality improvement education was provided to INICUA Audit Coordinators throughout 2023 and 2024, and NOCA conducted a follow-up organisational survey in order to assess their knowledge and learning outcomes. The results were positive, with 100% of respondents confirming that the training met their expectations. Additionally, 84% of participants reported that the course was practical and easy to apply in their roles.

CHAPTER 12
AUDIT UPDATE

CONTENTS

CHAPTER 12: **AUDIT UPDATE**

NOCA published the Irish National ICU Audit Annual Report on 2022 data in May 2024, but that report did not include any new recommendations.

This is an update on progress to date on the recommendations from the *Irish National ICU Audit Annual Report 2021* (NOCA, 2023).

RECOMMENDATION 1

Continue the ongoing HSE programme to expand ICU capacity in line with the Critical Care strategic plan.

UPDATE

NOCA welcomes the progress made in expanding ICU capacity.

HSE UPDATE

Update provided by Specialist Acute Services, Access & Integration, HSE on 2 January 2025.

Delivering additional adult critical care bed capacity: Phase 1 (2020 to date)
A significant investment of €82 million during Phase 1 of the implementation of the *Critical Care Strategic Plan* (National Clinical Programme for Critical Care, HSE 2020) has enabled an increase in the number of critical care beds from 258 in March 2020 to 340 at the end of December 2024. The HSE expect to complete Phase 1 of the implementation by the end of 2025 with the delivery of the final 12 ICU beds (6 in St Vincent's University Hospital and 6 in Mater Misericordiae University Hospital).

Phase 2 of *Critical Care Strategic Plan* (National Clinical Programme for Critical Care, HSE 2020)**: 106 additional critical care beds**
Phase 2 of the *Critical Care Strategic Plan* commits to the development of new-build capacity at 5 prioritised sites in order to support the delivery of an additional 106 beds. Developments are subject to completion of the necessary capital strategic assessments and preliminary business cases under the *Public Spending Code (Public Spending Code, 2012)*. The developments in Phase 2 at the prioritised sites at Beaumont Hospital, Mater Misericordiae University Hospital, St Vincent's University Hospital, Cork University Hospital, and St James's Hospital will provide for the required additional beds, as well as the replacement of existing substandard critical care accommodation. Due to the complexities of delivering new-build capacity on busy operational hospital sites, enabling and site preparation works will be required. All five capital projects are progressing through the capital build processes.

RECOMMENDATION 2

Develop and implement a national policy that each Unit should keep one staffed ICU bed empty to be available for immediate admission of critically ill patients, if this can be achieved by discharge of a patient who has been declared clinically ready for discharge.

UPDATE

A survey of ICU Clinical Leads in each hospital participating in the INICUA, indicated that while 50% of hospitals have a policy of prioritising discharges of patients from ICU, patients are commonly only discharged when an ICU bed is needed.

There is no update available from the HSE at the time of publication of this report. NOCA will engage again with the new Regional Executive Officers (REOs) to advance this recommendation in individual regions.

Last update provided by the HSE, May 2024
Response "Acute Operations would not sanction this recommendation and notes that alternative enablers to improve safe and timely patient flow through the ICU would be a preference".

RECOMMENDATION 3

Develop the Critical Care Retrieval Service of the National Ambulance Service to provide a 24-hour, 7-day transport service for inter-hospital transfers of critically ill patients.

UPDATE

Update provided by the Director of the National Ambulance Service Critical Care Retrieval Services (NAS-CCRS), May 2025

The National Ambulance Service Critical Care & Retrieval Service (NAS-CCRS) is committed to the development of 24/7-365 Adult and Paediatric retrieval services to parallel that already established for the Neonatal Service. Unfortunately, progress stalled in recent years because of difficulty in both the recruitment of suitable clinicians, and challenges around implementing and processing the posts allocated to us under the National Service Plan 2025.

The next 6 months will see publication of operational review of NAS CCRS structures and a parallel clinical review of the Model of Care for NAS-CCRS. This will be followed by stakeholder engagement.

In practical terms, it remains the goal of the NAS to have the IPATS paediatric retrieval team running 24/7 by the opening of the New Children's Hospital. For adult MICAS services, daytime service stabilisation will be the initial priority as we build to a comprehensive the Model of Care for 24/7-365 adult retrieval.

RECOMMENDATION 4

Adequately staff ICU audit by providing one whole-time equivalent (WTE) ICU audit coordinator for every 10 Unit beds audited.

UPDATE

NOCA continues to recommend INICUA staffing of 1 whole-time equivalent ICU Audit Coordinator for every 10 Unit beds. This allows for the timely and complete collection of data. Units without this staffing level have had gaps in data collection, some of which are discussed in this report.

HSE UPDATE

No update from the HSE was available at the time of publication of this report. NOCA will engage with the new REOs to advance this recommendation.

RECOMMENDATION 5

Continue the development of the National ICU Audit database at NOCA to allow wider reporting of data nationally.

UPDATE

Technical and information governance work is under way to support the provision of the INICUA database. The national database will consolidate data from the 29 individual INICUA databases.

A national database will support the provision of dashboards documenting up-to-date metrics regarding activity and the quality of care provided in participating Units.

Reporting from the national database will allow NOCA to provide a greater range of national reports. It will facilitate replies to requests for service evaluation, planning, and improvement to the healthcare system.

A national database will allow a wide range of healthcare research projects with useful lessons for the entire health service.

NOCA UPDATE

NOCA anticipates that the national database will be operational by quarter 4 of 2025.

UPDATE ON CONSIDERATION AND LEARNING POINT FROM THE *IRISH NATIONAL ICU AUDIT ANNUAL REPORT 2021*

NOCA is committed to including the patient voice at the centre of national clinical audit, thereby providing a broader picture of quality and safety, and of the patient experience of healthcare. From previous INICUA reports that incorporated patient stories, we identified a gap in psychological support for ICU patients and their families.

NOCA introduced a learning point in the *Irish National ICU Audit Annual Report 2021* (NOCA, 2023) using the learning from patient stories. Learning points can highlight key lessons for practice that have been revealed by the INICUA, and these lessons can have a positive impact on outcomes and service delivery.

In 2024, NOCA had undertaken to review the psychological services available in Ireland to ICU patients and their families.

The original plan was to develop this project, which was supported by two practising clinical psychologists, ICU clinicians, ICU nurse leads, ICU Audit Coordinators and relevant stakeholders from hospitals across Ireland participating in the INICUA. However, following a preliminary meeting with a consultation group, NOCA discovered that similar work had already been completed. As a result, the direction of the project changed. After further consultation with relevant stakeholders, including the Health and Social Care Professions (HSCP) Lead for Critical Care and the Critical Care Programme (CCP), it was determined that:

- Best practice reviews in psychological support for ICU patients and their families were already available (in the United Kingdom (UK)).
- Psychologists are part of the HSCP clinical group. In 2022, a National HSCP Lead for Critical Care was appointed by Acute Operations in the HSE in order to oversee the development of a workforce plan for HSCP and pharmacy, which was to include psychology in critical care. Aine Kelly, Clinical Specialist Dietitian in Critical Care at Tallaght University Hospital, held this position until December 2024, when funding for the post ended. The HSCP and pharmacy in critical care conducted a comprehensive national workforce survey and findings and recommendations were published.
- The national HSCP Lead for Critical Care made report recommendations available to the CCP. This report, *HSCP and Pharmacy in Critical Care: A Workforce Survey of the Irish Public System*, was published in 2024 (Kelly, 2024).
- These recommendations have been accepted by the Joint Faculty of Intensive Care Medicine of Ireland (JFICMI) and have been included in the *National Standards for Adult Critical Care Services, 2019* (last updated November 2024).
- The working group which included Health and Social Care Professions (HSCP) Lead for Critical Care, the Critical Care Programme (CCP) and NOCA agreed that the CCP was in the best position to progress this project following the national HSCP Lead for Critical Care's report.
- The CCP submitted a business case to HSE Clinical Design and Innovation in November 2024 to reactivate the post of HSCP Lead for Critical Care in order to continue this work.
- The HSCP Lead for Critical Care should provide metrics to measure compliance to the HSCP Lead for Critical Care recommendations would be a next step.
- The INICUA would assess these metrics with a view to adding them to its dataset for data collection in the future

An update will be provided in the INICUA report on 2024 data.

ICU AUDIT COORDINATORS' WORKSHOP, OCTOBER 2024

In collaboration with the Intensive Care National Audit and Research Centre (ICNARC), NOCA held a workshop for INICUA Audit Coordinators on 16 October 2024 at the RCSI in Dublin. Many ICU Audit Coordinators from around the country attended in person, while others participated via Microsoft Teams alongside some hospital ICU Clinical Leads.

Our workshop had a full agenda aimed at empowering the ICU Audit Coordinators in reviewing their Quarterly Quality Reports (QQRs). The learning objectives focused on enhancing their skills and confidence to effectively manage and utilise QQRs for quality improvement projects.

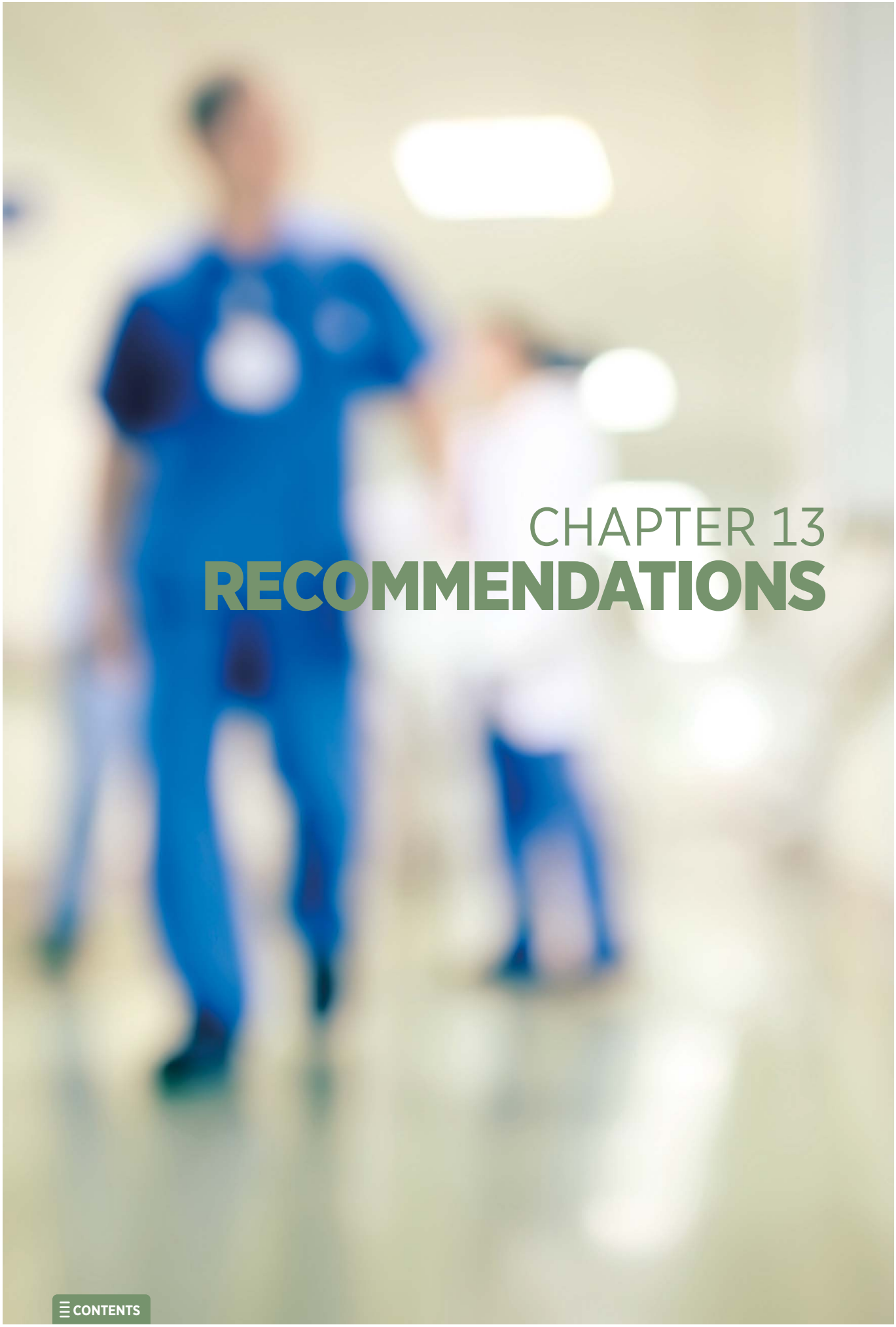
Andrew Fleming and Georgina Bolton from ICNARC travelled from the UK to deliver the training during the morning session, focusing on the new QQR layout, QIs, and analysis. The session concluded with Professor Rory Dwyer presenting some of the 2023 data that are included in this audit report. Following a question-and-answer segment, attendees happily took the opportunity to reconnect over lunch.

NOCA ICU Audit Managers began the afternoon session with presentations on local governance structures and NOCA's process for monitoring outliers. This was followed by a presentation from Marina Cronin, NOCA's Head of Quality and Development, on patient safety and clinical audit. Participants were also reminded of key takeaways from the quality improvement educational programme, specifically focusing on the methodologies used in quality improvement projects.

Next, our ICU Audit Coordinators presented their experiences with quality improvement projects initiated locally in response to INICUA statistical outliers in their hospitals. The afternoon session wrapped up with brief presentations on future development plans from several speakers: Andrew Fleming from ICNARC; Brid Moran, NOCA's Information Manager, discussing individual health identifier numbers; Fionnuala Treanor, INICUA and ICU Bed Information System (ICU-BIS) Audit Manager, presenting on the national database project and the ICU-BIS; and Maria Messit, Irish Potential Donor Audit (IPDA) Manager, who spoke about the IPDA.

The workshop was a great success, marked by high levels of active participation and discussion throughout the day. Feedback was overwhelmingly positive, emphasising the value of bringing all ICU Audit Coordinators together. The INICUA managers organise these in-person workshops twice a year, supplemented by monthly support and educational meetings on Microsoft Teams.

Picture taken on the day of the workshop shows ICU Audit Managers; ICU Audit Coordinators; Professor Rory Dwyer (INICUA Clinical Lead); Andrew Fleming and Georgina Bolton (Intensive Care National Audit and Research Centre (ICNARC)).



CHAPTER 13
RECOMMENDATIONS

CONTENTS

CHAPTER 13: **RECOMMENDATIONS**

RECOMMENDATION 1

Continue the ongoing HSE programme to expand ICU capacity in line with the HSE critical care strategic plan (National Clinical Programme for Critical Care, HSE 2020).

Such capacity planning should include expansion of both Level 2 (HDU) and Level 3 (ICU) beds in order to enhance the efficiency and safety of both admissions to and discharges from appropriate levels of care; the exact configuration of both can be informed by hospital case mix, supported by INICUA annual reports.

Rationale
1. The overall national ICU bed occupancy rate in 2023 was 96% of total staffed beds, with higher figures in some of the larger Units (ICU-BIS data, Table 6.1). This is higher than the 85% bed occupancy rate recommended by the JFICMI, (JFICMI and Intensive Care Society of Ireland (ICSI), 2024)".).
2. Metrics of illness severity show that patients are sicker on admission to ICU in the Republic of Ireland (ROI) than in the UK (Figures 5.1–5.4). Patients need to be more seriously ill to be admitted to ICU in the ROI, especially in the larger hospitals, which suggests that patients would benefit from earlier admission to ICU and that wards would not have to care for these sicker patients.
3. High bed occupancy rates mean that a bed is not always immediately available for critically ill patients, leading to delays in admission to ICU (Figure 7.1).
4. The Department of Health (DOH) identified a major shortfall in critical care bed capacity in its *Health Service Capacity Review 2018* (DOH, 2018).
What action should be taken?
1. Identify the Units with the greatest need for additional critical care bed capacity using the data on bed occupancy, delays in admission to ICU, and complexity of care from this report.
2. Allocate additional funding in order to increase the number of critical care beds in these Units.
3. Identify measures to address the difficulties in the recruitment and retention of specialist ICU staff in order to ensure that all funded beds are open and operational.
Who will benefit from this action/recommendation?
1. Patients will benefit from earlier admission to ICU in the course of a critical illness leading to a shorter stay in ICU, lower mortality and, ultimately, reduced costs (Cardoso *et al*., 2011; Chalfin *et al*., 2007; Young *et al*., 2003).
2. Ordinary ward staff will not have the burden of caring for critically ill patients, leaving them free to provide better care to other patients.
3. Patients will be able to stay in ICU or HDU until they are ready for discharge, thereby reducing the number of early discharges and out-of-hours discharges.
4. Units will operate within their capacity, thus improving the care provided to all patients in the Unit.
5. Staff will experience lower levels of stress and burnout, improving staff retention.

Who is responsible for implementing this action/recommendation?
HSE REOs will work with the DOH to seek the necessary investment from the Government for the implementation of the Strategic Plan for Critical Care (National Clinical Programme for Critical Care, HSE, 2020)
When should this be implemented?
This recommendation should be implemented as soon as possible in order to correct the existing deficit in ICU/HDU beds.
Realistically, implementation is likely to be gradual due to funding limitations and the existing difficulty in recruiting specialist critical care staff. However, commitment to a programme of continual expansion of critical care beds is needed in order to correct the existing deficit and to meet future increased needs.
Evidence base for recommendation
1. The average number of ICU beds open daily in 2024 was 6.1 ICU beds per 100,000 population. This is considerably less than ICU bed numbers in most Organisation for Economic Co-operation and Development (OECD) member states (OECD, 2021).
2. The DOH *Health Service Capacity Review 2018* recommended an increase to 430 ICU beds by 2031 (DOH, 2018). More recently, the HSE *Critical Care Strategic Plan* (National Clinical Programme for Critical Care, HSE, 2020) proposed an increase to 458 beds by 2029 (HSE National Service Plan, 2024).
3. Delayed admission to ICU increases mortality: (Cardoso, L.T.Q., Grion, C.M., Matsuo, T., Anami, E.H., Kauss, I.A., Seko, L. and Bonametti, A.M. (2011) Impact of delayed admission to intensive care units on mortality of critically ill patients: a cohort study. *Critical Care,* 15(1), R28; Chalfin, D.B., Trzeciak, S., Likourezos, A., Baumann, B.M. and Dellinger, R.P. for the DELAY-ED study group (2007) Impact of delayed transfer of critically ill patients from the emergency department to the intensive care unit. *Critical Care Medicine,* 35(6), pp. 1477-1483; Young, M.P., Gooder, V.J., McBride, K., James, B. and Fisher, E.S. (2003) Inpatient transfers to the intensive care unit: Delays are associated with increased mortality and morbidity. *Journal of General Internal Medicine*, 18(2), pp. 77-83).

RECOMMENDATION 2

Implement a national policy that each Unit should keep one staffed ICU bed empty for urgent admissions, whenever it is possible to achieve this by discharging a patient who is clinically ready for discharge.

Rationale
1. Discharging patients when they are fit for discharge would make their ICU beds available for the rapid admission of critically ill patients. At present, new admissions often have a prolonged wait (4–5 hours) while existing ICU patients are being discharged.
2. The HSE's key performance indicator (KPI) for timely admission to ICU (50% of patients admitted to ICU within 1 hour of the decision to admit) was achieved in only three hospitals participating in the INICUA in 2023 (Figure 7.1).
3. Caring for a critically ill patient on a ward while they are waiting for an ICU bed causes complete disruption of the ward's normal activities, as it requires most of the ward staff to be involved in direct patient care, equipment sourcing, and communicating with different teams and the patient's family.
4. In 2023, patients in the ROI waited an average of 2.3 hours for ICU admission, compared with 1.7 hours in the UK. These average values do not reflect the very prolonged delays in admission for some patients (Figures 11.5 and 11.6).
5. The HSE KPI for timely admission to ICU does not incorporate patients being admitted from the OT. Patients are commonly held up in Theatre Recovery waiting for an ICU bed; these delays are very disruptive to the smooth running of theatres.
6. In 2023, 7.4% of available bed days (8,018 bed days) in ICU were occupied by patients who had been cleared for discharge for more than 8 hours (Figure 6.5).
7. Data from the ICU-BIS showed that 15% of available beds in 2023 were occupied by patients who had been cleared for discharge, an increase from 14% in 2022 and 10% in 2021 (Figure 6.8).
8. Discharging patients from ICU when they no longer require this level of care would reduce the stress on ICU staff of trying to find ward beds for patients in order to facilitate urgent admissions. This is a major stressor for nursing and medical staff, contributing to burnout and staff turnover.
9. Discharging patients as soon as they are cleared for discharge would reduce discharges from ICU at night, which increase risks for patients.
10. The ICU is a stressful environment for patients who are well enough for discharge, with constant noise and activity. Delayed discharge from ICU is not in their interest.
11. A quality improvement project in St James's Hospital ICU that included the introduction of a policy of keeping an emergency bed available in ICU was associated with improvements in QIs relating to ICU bed availability (O'Hagon, n.d.).
12. Increased numbers of ICU beds will not contribute to patient care if these beds are occupied by patients who do not need to be there while patients who would benefit remain in the ward.

What action should be taken?
1. Acute hospitals should work to optimise their bed capacity by focusing on timely patient flow through the ICU.
2. All hospitals should prioritise a policy of keeping an ICU bed empty for urgent admissions whenever possible, and should achieve this by discharging patients who are clinically ready for discharge.
Who will benefit from this action/recommendation?
1. Patients who require urgent admission to ICU.
2. All patients already in ICU.
3. ICU staff, who will waste less time organising urgent discharges in order to create a vacant ICU bed.
Who is responsible for implementing this action/recommendation?
HSE REOs should implement this as a national policy.
When should this be implemented?
This recommendation should be implemented immediately.
Evidence base for recommendation
1. Delayed admission to ICU worsens patient outcomes (Cardoso *et al.*, 2011; Chalfin *et al.*, 2007; Young *et al.*, 2003). The only way to ensure rapid admission to ICU is to keep an ICU bed vacant and available for urgent admissions at all times.
2. Having ward beds available during the daytime for patients who have been cleared for discharge would prevent night-time discharges (Priestap and Martin, 2006).
3. Implementing a policy of keeping an emergency bed available in ICU when possible led to fewer delays in admission to ICU. The St James's Hospital quality improvement project 2022 (O'Hagon, n.d.) (https://a.storyblok.com/f/265949/x/d3591a4e95/sjh-noca-kpi-access-times-poster-pdf.pdf).
4. A 2024 survey of ICU Clinical Leads indicated that while 50% of hospitals had a policy of prioritising discharges from ICU, discharges mostly occurred only when an ICU bed was needed. Nine of the 10 ICU Clinical Leads who responded to the survey noted that it was routine in their Units for patients to remain in ICU until their bed was needed for another patient.

RECOMMENDATION 3

Continue the implementation of measures to improve the care of critically ill patients outside ICU, including 24-hour provision of outreach services from ICU, uniform documentation of Irish National Early Warning System (INEWS) scores, and compliance with protocols for the escalation of care for deteriorating patients.

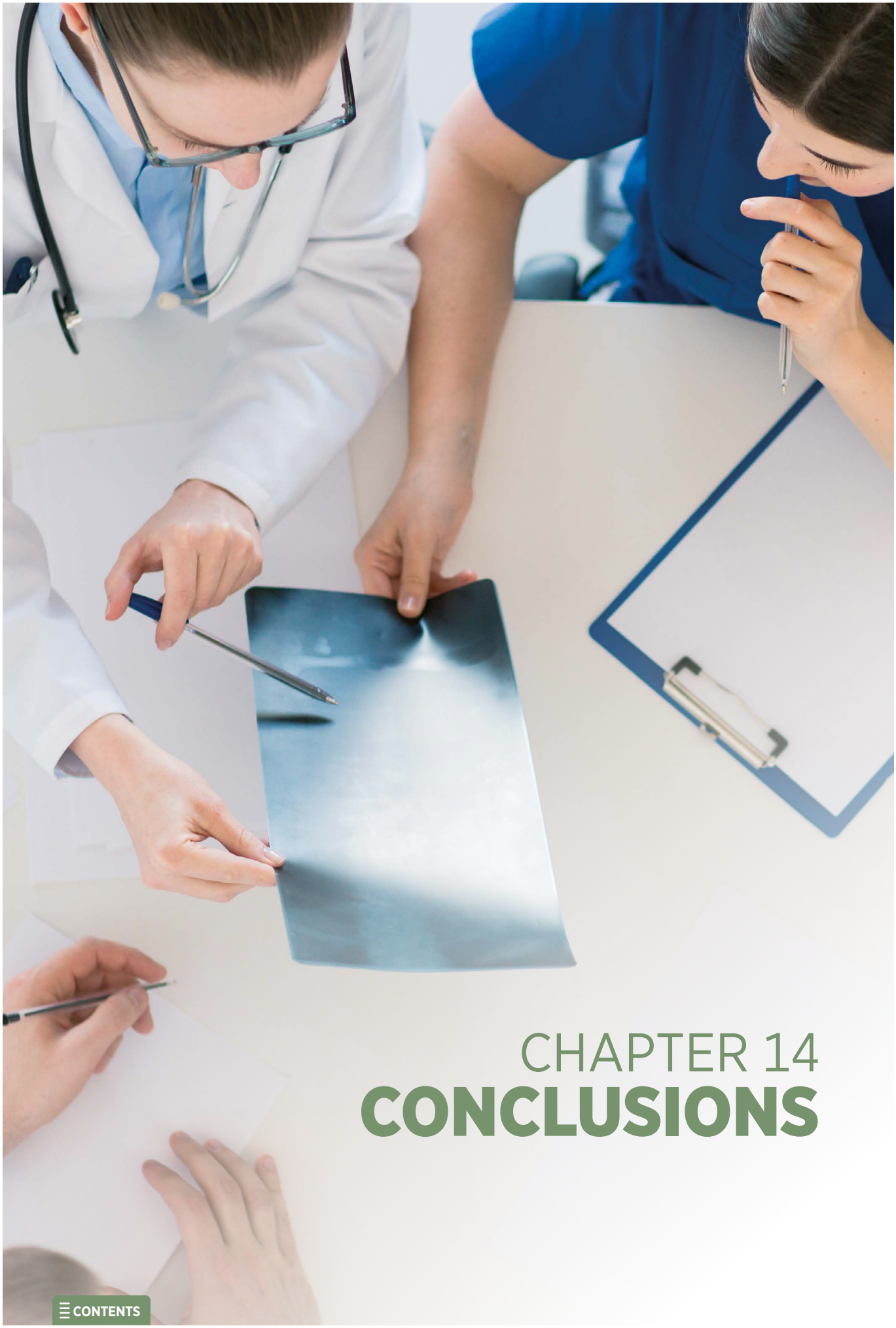
Rationale
1. Delayed ICU admissions are common (refer to the in-hospital CPR, HSE KPIs for timely admission to ICU, and high-risk admission graphs in Figures 4.6, 7.1, 11.5 and 11.6). This means that critically ill patients who should be cared for in ICU are on a hospital ward.
2. Failure to detect and treat deteriorating patients in the ward can lead to avoidable morbidity and mortality. Sepsis associated with dysfunction in four or more organ systems indicates severe illness and has a high mortality rate (Figures 7.3A and 7.3B).
3. Multiple indicators of delayed admission to ICU show higher rates in the ROI than in the UK, including multi-organ failure within 24 hours of ICU admission (Figures 7.2A and 7.2B), ICU discharges out of hours (Figures 7.4A and 7.4B), high INEWS scores on ICU admission (Figure 6.9), and acute kidney injury on admission to ICU (Figure 4.4). These issues are occurring due to both the failure to detect deterioration in patients in the ward and shortages of ICU beds. Providing better support for staff in the wards will help address both of these issues.
4. The provision of an ICU outreach service would improve the care of critically ill patients in the ward. Currently, we rely on indirect measures of the quality of care of sicker patients in hospital wards, as provided by national ICU audit. The provision of an outreach service would improve the documentation of unmet need in the care of critically ill patients in the ward.
What action should be taken?
1. Continue the national implementation of ICU outreach services in hospital wards.
2. Promote the use of the INEWS to detect patients who are deteriorating clinically in wards.
3. Develop a uniform national dataset for outreach services to support the comprehensive audit of the care provided to critically ill patients in hospital wards.
Who will benefit from this action/recommendation?
1. Deteriorating patients who become critically ill in hospital wards.
2. Ward staff, who will benefit from more skilled support and extra staff capacity in caring for critically ill patients in hospital wards.
Who is responsible for implementing this action/recommendation?
HSE REOs supported by the HSE Deteriorating Patient Improvement Programme. https://www2.healthservice.hse.ie/organisation/qps-improvement/deteriorating-patient-improvement-programme/
When should this be implemented?
This recommendation should continue to be implemented as part of the roll-out of ICU outreach services.

Evidence base for recommendation
1. Delayed admission to ICU for acutely ill patients worsens outcomes (Harris *et al*., 2018; NOCA, *Deteriorating Patient Audit Feasibility Study*. Dublin: National Office of Clinical Audit, 2021; DOH (2020) *Irish National Early Warning System (INEWS) V2 (NCEC National Clinical Guideline No. 1)*. Dublin: Department of Health. Available from: https://www.gov.ie/en/collection/cc5faa-national-early-warning-score-news/).
2. After the introduction of an ICU outreach service, University Hospital Galway documented a 75% reduction in unplanned readmissions to ICU (University Hospital Galway Annual ICU Audit Reports 2014–19; Hession, C.A. and Meaney, T. (2022) Ward nurses' experiences and perceptions of the critical care outreach service: A qualitative study undertaken in a large teaching hospital in the West of Ireland. *Nursing in Critical Care*, 27(1), pp. 19-26)),

RECOMMENDATION 4

Complete the development of the INICUA database at NOCA in order to allow full utilisation of the data being collected.

Rationale
1. The INICUA dataset contains both the ICNARC dataset and additional NOCA data items that considerably broaden the range of information collected, particularly in relation to activity in ICUs in the ROI. Furthermore, there are gaps in the ICNARC dataset in key areas because in the UK, these data are collected by other programmes (e.g. obstetric patients in ICU, organ donation). Currently, we cannot provide national reports on the non-ICNARC data items, meaning that these important data are not being analysed and reported.
2. While we have access to the ICNARC dataset, we are currently limited to the analyses provided by ICNARC. Enabling NOCA analysis of the ICNARC dataset will allow a broader range of analyses.
3. Having access to the complete INICUA database will enable reports to provide more detailed insights into the activity and quality of care in ICU (e.g. regarding bloodstream infection). This will enable NOCA to answer specific queries, including those related to the development of critical care services.
4. The INICUA has now collected comprehensive data on a large number of patients passing through ICU. This is a valuable resource for answering research questions relating to the epidemiology of critical illness, outcomes, resource utilisation and service evaluation. Development of a national database is required in order to enable access to these data.
What action should be taken?
Continue the development of the INICUA database at NOCA in order to allow wider reporting of data nationally.
Who will benefit from this action/recommendation?
1. Patients will benefit from the availability of detailed and complex analysis of the large database that will now be available.
2. Clinicians will have access to bespoke reports on issues of importance to them.
3. Hospital management will have access to timely data on hospital activity, which will guide decision-making.
4. Researchers will have access to a large database of data on the most high-risk patients in the healthcare system.
Who is responsible for implementing this action/recommendation?
NOCA is responsible for this.
When should this be implemented?
This recommendation should be implemented as quickly as resources allow.
Evidence base for recommendation
NOCA receives regular requests from both researchers and stakeholders in the health service for new analyses of the large database that has now built up. These requests demonstrate the need for the INICUA database.



CHAPTER 14
CONCLUSIONS

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CHAPTER 14: **CONCLUSIONS**

Critically ill patients in the ROI are cared for in a network of 29 ICUs in 25 HSE-funded acute hospitals across the country. The numbers of ICU beds per 100,000 population are low by international standards, and many Units are under severe pressure to cope with the needs of acutely ill patients who require complex levels of care. There has been a 30% increase in the number of ICU beds nationally since 2020, and this expansion is planned to continue.

Bed occupancy levels are high, which means that patients have to be seriously ill in order to be admitted to ICU, and there is evidence that admission to ICU is often delayed because no ICU bed is available. A key finding was that the mean predicted risk of death in 2023 for patients admitted to ICU in the ROI was 8.6%, compared with 5.6% for patients admitted to ICU in the UK. Higher predicted mortality rates indicate that patients had to be sicker to be admitted to ICU in the ROI. This means that patients who are critically ill are being cared for in the ward; available data indicate that these patients would have a lower risk of death if they were cared for in ICU earlier in their illness.

The demands on ICU beds are likely to increase as the population ages and as improving therapies in ICU mean that more patients are likely to benefit from such care.

The national network of ICUs operates effectively to ensure that beds and appropriate care are made available when needed, even if this requires transfer to another hospital for an available bed or for specialist care.

Our outcome data suggest that the overall quality of care nationally is equivalent to international comparators. Our data also suggest that outcomes after admission to ICU are similar across all participating hospitals, with the proviso that this is achieved through a high rate of transfers from smaller to larger Units in major hospitals for more specialised care. However, the data also indicate that patients who would benefit from ICU care are being admitted later than is desirable, and this is likely to affect their chances of survival.

NOCA monitors a number of QIs for care in ICU. If a Unit is identified as an outlier for one of these QIs, NOCA initiates a process for the hospital to review the factors contributing to this finding and propose a plan to address the issues identified. To date, most of the QI outliers have related to a lack of ICU bed capacity, and the review process has been helpful for hospitals to become aware of issues and work to improve the care provided.

It is noteworthy how similar the findings in the INICUA reports are from year to year, with the exception of the peak years of the COVID-19 pandemic. Our findings from 2023 indicate a return to the patterns and activity seen before the pandemic.

The INICUA continues to provide assurance that the availability of ICU beds and the quality of care are being maintained in our ICUs nationally.

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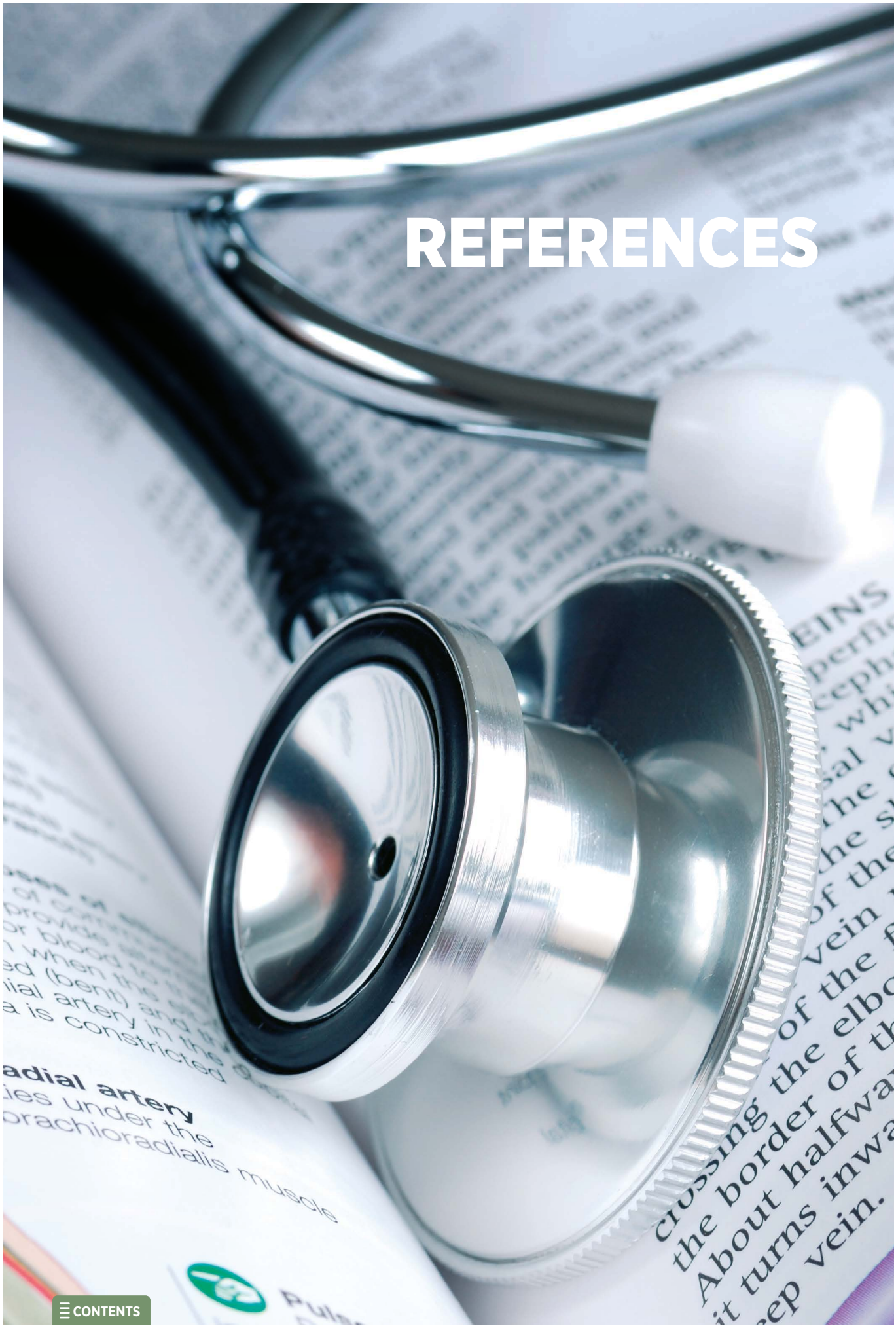

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APPENDIX 4:
NATIONAL ICU AUDIT GOVERNANCE COMMITTEE MEMBERSHIP

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