NATIONAL SEPSIS REPORT 2023

RECOGNISE SEPSIS • ENHANCE SURVIVAL •

An Stiúrthóireacht um Ardchaighdeáin agus Sábháilteacht Othar
Oifig an Phríomhoifigigh Cliniciúil

National Quality and Patient Safety Directorate
Office of the Chief Clinical Officer

August 2024

National Sepsis Outcome Report 2023

Dear Colleagues,

This is the ninth National Sepsis Outcome Report describing the burden of sepsis on our patients and the healthcare system. Understanding the pattern of sepsis incidence in Ireland is essential to inform the Sepsis Programme about the characteristics of individuals who are at increased risk both of developing sepsis and of dying from sepsis. This allows us to have heightened vigilance for sepsis amongst these individuals. Sepsis does not discriminate. It can happen to anybody irrespective of their age. However, it is much more common in the extremes of age and in individuals with co-morbidities.

The most effective way to reduce mortality from sepsis is by prevention. Preventative measures are those measures to stay healthy and prevent infection. These include good sanitation, personal hygiene, healthy eating, exercising moderately, breast feeding, avoiding unnecessary antibiotics and vaccination for vaccine preventable infections.

The next most effective way to combat sepsis is through early recognition and treatment.

Six processes must occur to give a person the best opportunity to survive:

i) The unwell person, their family or carer must be aware of the signs and symptoms of sepsis and the need to seek urgent medical review.
ii) Early recognition of the signs and symptoms of sepsis by healthcare staff at point of presentation or deterioration.
iii) Timely escalation to medical review to ensure that a thorough history and examination is carried out to identify infection as the likely (or suspected cause) of the patient being unwell and either detecting new onset organ dysfunction consequent to that infection or identifying that the person is in a group that puts them at an increased risk of developing and indeed dying from sepsis.
iv) The person with sepsis is treated with the Sepsis 6 bundle, which includes blood tests being sent to assess organ function.
v) Healthcare staff must review the person's response to initial therapy and amend the treatment plan accordingly.
vi) Adequate critical care capacity is available to accommodate those patients who fail to respond to treatment and require critical care.

This report outlines the status of sepsis in Ireland based on data extracted from the Hospital Inpatient Enquiry (HIPE) dataset for 2023. All datasets have limitations and are dependent on

methodologies used to identify and extract data. The strengths in this report include the education of the acute healthcare sector and the coders in a standardised approach to assessment and documentation of sepsis and using a consistent dataset.

This report shows that the associated in-hospital mortality rate for sepsis in 2023 has decreased when compared to the 2022 data (19.3% vs 21.8%). Over the same period the number of documented cases of sepsis has increased by approximately 7% (15,722 vs 14,742). The crude mortality rate for septic shock has decreased from 42.5% to 38%.

The outcomes in this report are the result of the hard work and dedication of the staff caring for sick people in our acute healthcare sector and recognition must be given to the improvements that they have achieved through their willingness to engage in this quality improvement (QI) programme. Each hospital's sepsis QI project was coordinated by their Sepsis or Deteriorating Patient Committees. Credit also to the Group Sepsis Assistant Directors of Nursing who provided awareness, education, and audit reports to feedback to the Hospitals, Hospital Groups and to inform national data so that the ongoing education efforts could be strengthened.

We would like to thank Florina Rizoaica, National Quality and Patient Safety Directorate, for providing the statistical analysis, without whom this report would not be possible.

Finally, we wish to thank the members of the report subcommittee (Appendix 1) including the Healthcare Pricing Office, the Office of Coding, who manage the HIPE system. The National Sepsis Programme is overseen by the National Sepsis Steering Committee (Appendix 2) and effected through the National Sepsis Team (Appendix 3). The diagnostic codes used for this analysis are outlined in Appendix 4.

Go raibh mile maith agat,

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Chair, National Sepsis Steering Committee

Dear Colleagues,

The establishment of the National Clinical Programme for Sepsis in 2014 led to many achievements, including the development of the National Clinical Effectiveness Committee (NCEC) National Clinical Guideline No. 6 on Sepsis Management, 2014 and the revised National Clinical Guideline No. 26 - Sepsis Management for Adults (including maternity), 2021, national awareness campaigns, educational initiatives, and ongoing audits in acute hospitals. These efforts aim to standardise sepsis management, reduce mortality rates, and enhance patient care and safety across Ireland and have yielded significant results.

These achievements would not have been possible without the dedicated team of professionals who work as part of the Sepsis Programme, including the current and former Clinical Leads, the Sepsis Directors and Assistant Directors of Nursing in each hospital group and the present and former programme managers.

The HSE Patient Safety Strategy (2019-2024) calls for embedding patient safety into everything we do. Commitment 4 of the Strategy outlines 13 Common Causes of Harm. These are high-impact patient safety risks and, if tackled effectively, can improve safety in healthcare organisations. Two prominent examples include reducing and managing sepsis and recognising and responding to clinically deteriorating patients.

Due for publication in 2024, the Action on Sepsis: Five Year Strategy (2024 – 2029) is comprehensive and grounded in Irish data and international best practice. The Strategy will tackle the challenges of sepsis management and prevention. It will build on the current sepsis programme of work and will expand its focus into community settings, including supporting the uptake of vaccinations and public health measures that can reduce the incidence of sepsis.

The ‘Could it be sepsis?’ campaign, which launched in March 2024, is the first HSE mass media campaign for sepsis. It was developed following quantitative and qualitative market research and engagement with key stakeholders and experts by experience including patients & their families.

Paid search, radio, digital audio, paid social media, PR, leaflets and posters carried the message ‘Sepsis can hide behind any infection. Don’t miss the signs.’ The advertising and information encouraged the public to know the signs and symptoms of sepsis and never be afraid to ask ‘Could it be sepsis?’

Visitors to the HSE.ie sepsis content increased by 100% for the duration of the campaign and there was significant national media coverage of the launch, with key statistics from the market research peaking the interest of journalists.

The performance of the campaign was promising. A research evaluation showed that people were significantly more likely to be familiar with the signs of sepsis if they were exposed to the campaign. A third of people recalled seeing or hearing the campaign. The radio advert, in particular, showed strong potential to encourage people to consider sepsis if they were to experience symptoms.

In September 2024, the HSE & the Irish College of General Practitioners (ICGP) will launch an Adult Sepsis: General Practice Update for GPs on identifying and managing Sepsis in Adults in the primary care setting. This guide aims to promote sepsis awareness in primary care and to

promote vaccination as an essential part of sepsis prevention. This document will assist GPs in the detection, assessment, and early management of suspected sepsis

The 8th Sepsis Summit will take place in Dublin Castle on 3rd September 2024. The theme for this year's sepsis summit is: 'Early Treatment Saves Lives'. There will be national and international experts and family advocates amongst those presenting at the Summit. Public awareness champions/groups such as the Irish Sepsis Foundation and 'Lil Red's Legacy Sepsis Awareness Campaign have been invited to the event & survivors of Sepsis will be asked to speak at the summit.

Retrospective audits against the National Clinical Guideline for Sepsis are undertaken in Adult, Maternity & Paediatric inpatient services annually. Key learnings from the audits are used to improve care in the early recognition and management of sepsis. The audit findings have been consistent since 2018 and identify key areas for improvement particularly around the use of the Sepsis tools. The Sepsis programme team has worked with the National Centre for Clinical Audit (NCCA) to improve the audit tool used. This will be ready for implementation in Q3 2024. Analysis including recommendation on areas for improvement will be shared with acute hospitals before the end of 2024.

This National Report provides us with important data on the incidence of sepsis in our acute hospitals, over the next two years we plan, in partnership with the NCCA, to develop a national clinical audit on the incidence of deteriorating patients and sepsis in the acute hospitals. This audit will expand on the findings in this report and include, regional variations, more detail on the experience of patients and the journey of the deteriorating patients including those with sepsis. This data is needed to help us identify and treat clinical deterioration and sepsis as early as possible so that the risk of critical care admission and death from sepsis is avoided or reduced.

In presenting this report we extend our sympathy to the families and friends of those who have lost their lives to sepsis.

Best wishes,

Dr. Orla Healy,

National Clinical Director - Quality and Patient Safety Directorate

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Key findings

The following figures include adult, maternity, and paediatric patients.

Total number of cases sepsis and septic shock, 2023	**15,722**
Crude mortality rate, 2023	**19.3%**

The following relate to the adult, non-maternity patient.

Number of cases of Sepsis & Septic Shock	**14,535**
In-hospital crude mortality rate: Sepsis & Septic Shock	**20.6%**
Average length of stay	**22.2 days**

Specialty based data:

Paediatric sepsis-associated hospital crude mortality rate	**3.7%**
Maternal sepsis-associated hospital crude mortality rate	**0%**
Surgical (DRG) sepsis-associated hospital crude mortality rate	**24.4%**
Medical (DRG) sepsis-associated hospital crude mortality rate	**19.9%**

Key comparators with 2022 (adult non-maternity cohort)

- There was a 6% increase in documented cases of Sepsis and Septic Shock with an 11.5% relative decrease in associated in-hospital crude mortality.
- There was a 2.7% decrease in average length of stay.

Sepsis (excluding septic shock): There were 12,620 cases documented in 2023, a 3.9% increase when compared with 2022 (n=12,150), with an in-hospital crude mortality rate of 18%, representing a 13.7% relative decrease in crude mortality over 2022 (20.8%). International comparators for sepsis mortality include the UK at 20.3%[1], USA at 25%[2], Australia at 19.7%[3] and globally at 27%[4].

Septic Shock: There were 1,915 cases documented in 2023, a 22.6% increase when compared with 2022 (n=1,562), with an in-hospital crude mortality rate of 38%, representing a 10.6% relative decrease in crude mortality rate when compared with 2022 (n=42.5%). This also benchmarks well internationally: global 42%[4].

Key Recommendations

1	Support the ongoing public sepsis awareness campaign to facilitate education of the general public on sepsis recognition at times of heightened risk.
2	Sepsis eLearning to remain mandatory for all relevant Healthcare Professionals and should be refreshed on a 3 yearly basis. Each hospital should have a governance and monitoring system in place to confirm compliance with sepsis training.
3	Continue to support education, multidisciplinary training and blended learning including simulation on sepsis recognition and integration of sepsis treatment pathways across primary and secondary care.
4	Continue to support the implementation of the Surviving Sepsis Campaign International Guidelines for the Management of Septic Shock and Sepsis-Associated Organ Dysfunction in Children (SSCGC 2020) and National Clinical Guideline Number 26 across the acute hospital service.
5	Development of a sepsis mortality prediction model and scoring system to compare age and co-morbidity adjusted hospital sepsis-associated mortality rates nationally and internationally.
6	Continued support for the sepsis quality improvement programme at a national level and for the acute hospital sepsis/deteriorating patient committees.
7	Continued education of clinicians and HIPE coders in the Sepsis-3 definition with emphasis on the importance of documentation of Sepsis/Septic Shock, infection and associated organ dysfunction.
8	Continued alignment of the national sepsis programme with national antimicrobial stewardship and antimicrobial resistance prevention programmes.

National Sepsis Report 2023

An overview of the burden of sepsis-associated mortality and healthcare usage as captured by the Hospital In-Patient Enquiry database (HIPE).

Hospital in-patient enquiry (HIPE) dataset

The data captured in this dataset is dependent on the documentation in the patients' medical notes and its' subsequent coding. An external, independent body reviewed the quality of coding in 2016 and the subsequent report is available at www.hpo.ie.

The National Sepsis Programme has developed clinical decision support tools (Sepsis Forms) that facilitates diagnosis and correct risk stratification, from which coders can code, providing a medical professional has signed the form.

Population studied

ICD–10–AM Diagnosis codes were used to identify patients with sepsis (Appendix 4a) and infection (Appendix 4b). These codes were interrogated in patients aged 16 years and over in the acute hospital sector. Maternity patients with sepsis are subject to analysis and reporting by Maternal Death Enquiry Ireland (National Perinatal Epidemiology Centre). Therefore, we present limited mortality data for this cohort.

Limitations

Administrative databases are limited to what is documented in the patients' case notes (The Coding Process, Appendix 4). To severity-adjust for limited benchmarking the surrogate of 'patients with a diagnosis of sepsis and critical care admission' was used. Critical care requirement was identified by admission to Coronary Care Unit (CCU), High Dependency Unit (HDU) or Intensive Care Unit (ICU), or the presence of an Intensive Care Consultant code recorded in the HIPE record. The advantage is that it includes critically ill patients where there was 'an intention to treat', and some limited comparison with critical care databases can be done. The disadvantages are that it assumes that there is always a critical care bed available, and it fails to consider that patients admitted to critical care are a heterogeneous group varying from requiring modest respiratory or cardiovascular support with a lower mortality predictive score to multi-organ failure and a high score. This current analysis provides age-adjusted mortality rates and provides an insight into the burden of sepsis in our healthcare system. Both age and co-morbidities are strongly associated with higher mortality from sepsis. Based on the current analysis, the requirement to develop and validate a sepsis mortality prediction model for the HIPE database remains and has been highlighted again in key recommendations.

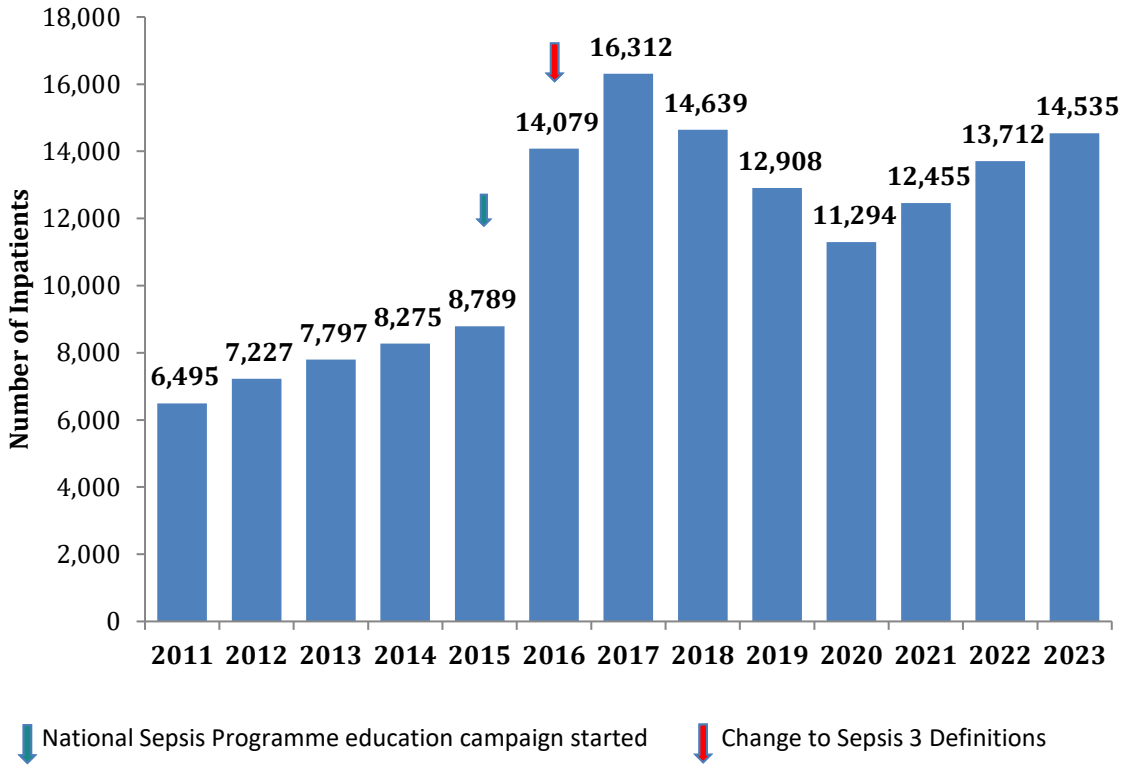
The data presented in this report are based on inpatients in publicly funded acute hospitals with the diagnosis of sepsis coded on the HIPE system. Causality cannot be inferred, as sepsis may be one of many diagnoses that complicated the patients' admission. Thus, mortality rates reported are sepsis-associated and include both direct and indirect deaths due to sepsis.

Other limitations include:

- Not all Irish hospitals participate in submitting data to HIPE.
- Patients who attend the Emergency Department are not captured by HIPE unless they are admitted to a ward.
- Patients who attend an outpatient clinic are not captured.

The Epidemiology of Sepsis in Ireland

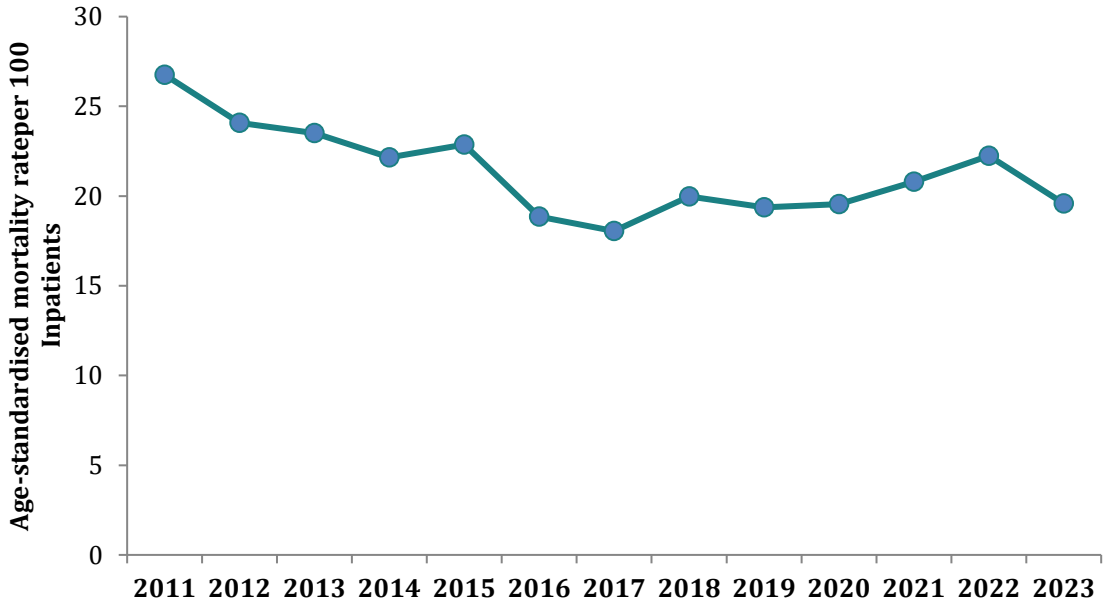
Figure 1: The number of adult patients with a diagnosis of Sepsis & Septic Shock, 2011-2023 (excludes paediatric & maternity).



Between 2011 and 2015 documented cases of sepsis were increasing by approximately 8% per annum. In 2015, there was a nationwide education campaign as part of the implementation programme of the 2014 National Clinical Guideline. This was associated with a 60% increase in the recognition and documentation of sepsis cases (Figure 1).

Sepsis-3 definitions which were published in 2016 identify a cohort of patients with a higher acuity than previously documented as sepsis. It is reasonable to expect a lower number of cases in this cohort with a higher mortality (Figures 1 & 2).

Figure 2: Age-standardised hospital mortality rate for adult inpatients with a diagnosis of Sepsis 2011-2023



High risk cohort

Risk stratification and prognosis in sepsis is important because high-risk patients may benefit from earlier clinical interventions, whereas low-risk patients may benefit from not undergoing unnecessary procedures[5]. Chronic comorbid conditions that alter immune function and increase the risk of sepsis include chronic renal failure, diabetes mellitus, alcohol abuse, neutropenia and cumulative comorbidities are associated with greater acute organ dysfunction[6].

Figure 3: The number of inpatients with a diagnosis of sepsis by age group 2023 (includes paediatrics and maternity).

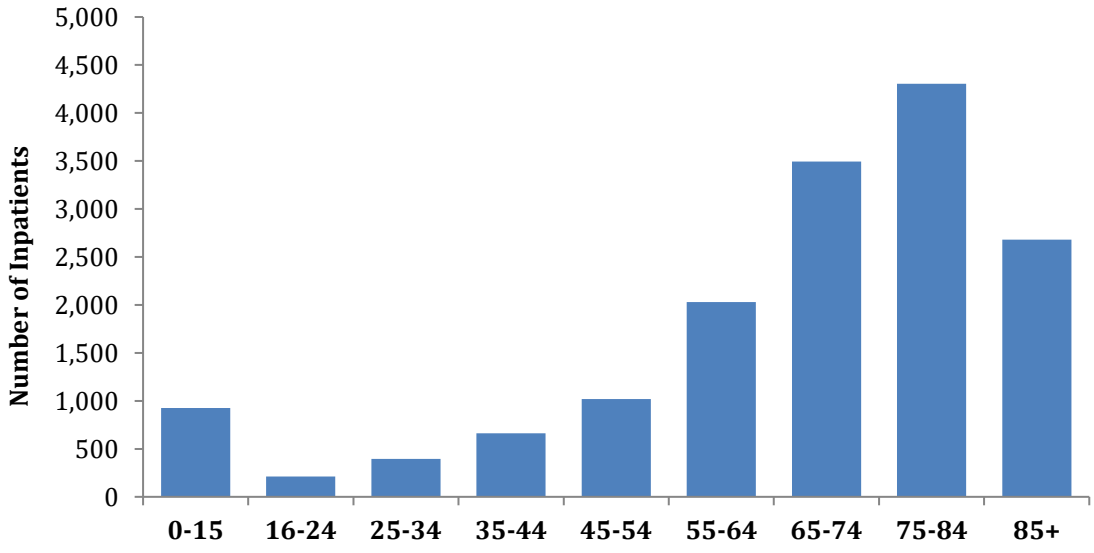
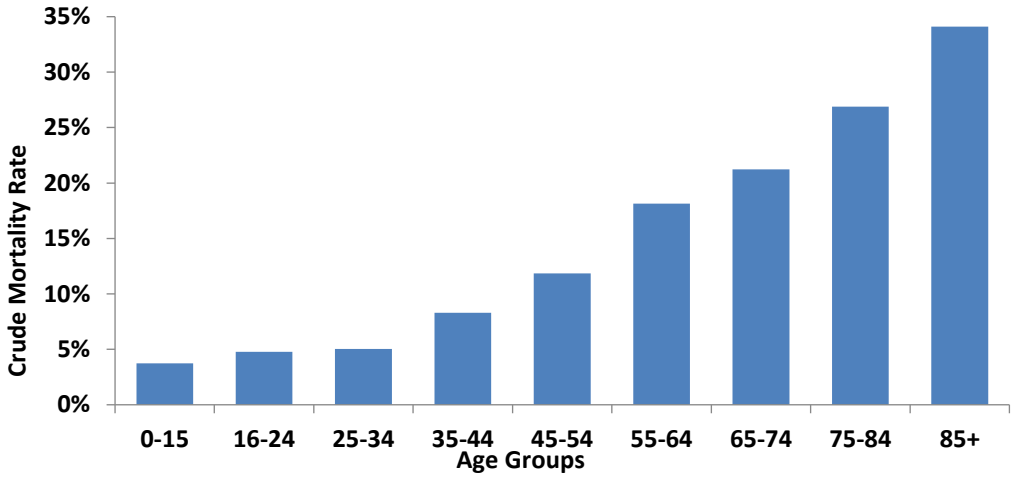


Figure 4: In-hospital crude mortality rate for patients with a diagnosis of sepsis by age group 2023.



In 2023, as in previous years, sepsis incidence increases with age in adults (Figure 3). With a crude mortality rate of over 25%, a person aged over 75 years is considered at very high risk for sepsis mortality (Figures 3 & 4).

With ageing, co-morbidities are accumulated, and the immune system gradually deteriorates leading to increases in both sepsis incidence and mortality (Figure 5).

Figure 5: The in-hospital crude mortality rate for adult inpatients with a diagnosis of sepsis and selected co-morbidities 2023

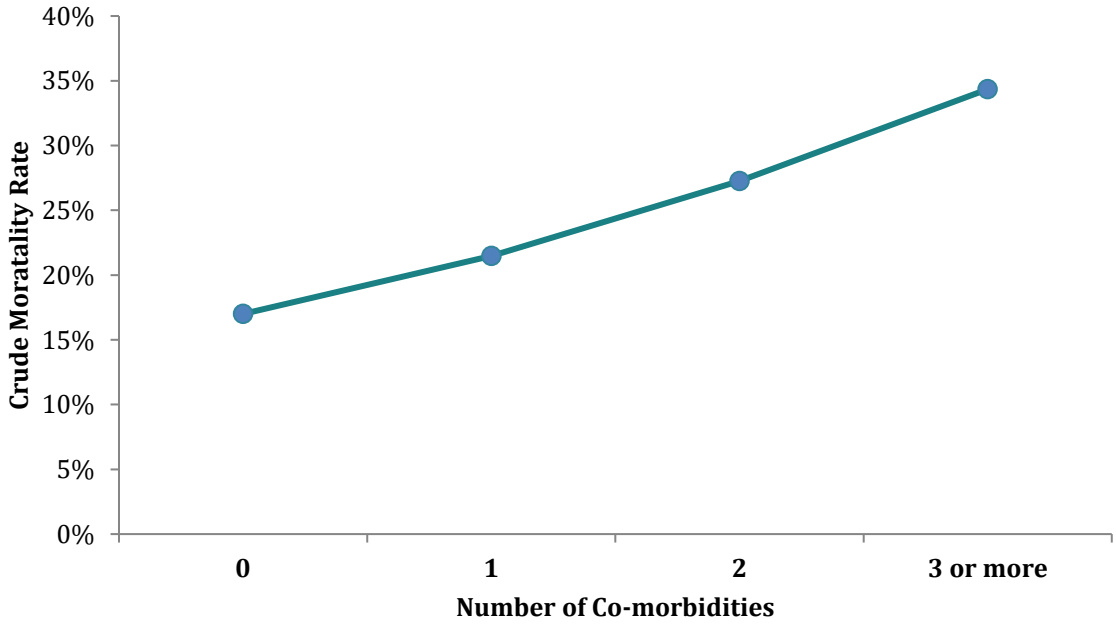


Table 1 summarises the effect of co-morbidities on sepsis incidence and mortality.

Table 1: Inpatients with a diagnosis of sepsis and selected co-morbidities; Number of cases and crude mortality rates 2023

Co-morbidity	Number of cases	Crude Mortality Rate
Chronic Liver Disease	473	39.1%
Chronic Kidney Disease	1,783	28.3%
Chronic Obstructive Pulmonary Disease	1,331	27.2%
Mental & Behavioural Disorders due to Alcohol	529	25.1%
Cancer	3,122	22.5%
Diabetes	3,590	22.3%

Note: Cases with more than one of the co-morbidities above are included in each of the relevant co-morbidity groups. This excludes paediatrics and maternity.

Effect of Recent Surgery on sepsis mortality.

The 2023 HIPE data identified that sepsis patients with a surgical diagnosis related group (DRG) continue to have a higher mortality than those with a medical DRG 24.4% vs 19.9%.

Previous reports identified that the difference in mortality between the medical and surgical cohorts is not due to issues related to recognition and management, but rather inherent in the circumstances of the patient, the immunosuppressant effect of surgery and the different microorganisms and sites of infection that affect these patients. This data is widely replicated in other jurisdictions. Given this higher mortality risk, extra vigilance should be given to surgical patients who develop signs of infection. For this reason, recent surgery is also considered to place patients in a high-risk group. The more co-morbidities the higher the mortality risk (Figure 5). Therefore, extra vigilance should be given to patients who deteriorate due to infection and who have one or more co-morbidities, including age >75years, or those with identified chronic conditions such as those listed above or those who have had recent surgery.

Sepsis-associated mortality, 2011-2023

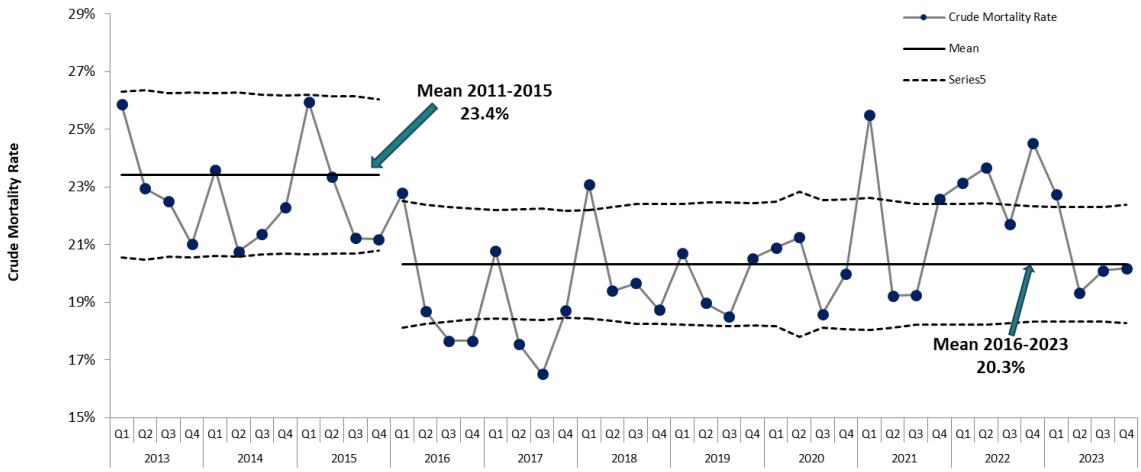
Age-adjusted mortality rates control for the effects of differences in age distributions and allow for comparisons of mortality rates across years with different age distributions. (Table 2). However, both age and co-morbidities are strongly associated with higher mortality from sepsis in Ireland and the National Sepsis Programme recommend the development of a sepsis mortality prediction model and scoring system to enable the comparison of age and co-morbidity adjusted hospital sepsis-associated mortality rates nationally and internationally.

Table 2: Adult inpatients (non-maternity) with a diagnosis of sepsis, crude and age standardised mortality rates 2011-2023.

Year	Number of Inpatients with a Diagnosis of Sepsis	Number of Deaths among Inpatients with a Diagnosis of Sepsis	Crude Mortality Rate per 100 Inpatients	Age-standardised Mortality Rate per 100 Inpatients*
2011	6,495	1,686	26.0	26.8
2012	7,227	1,720	23.8	24.1
2013	7,797	1,799	23.1	23.5
2014	8,275	1,821	22.0	22.2
2015	8,789	2,010	22.9	22.9
2016	14,079	2,676	19.0	18.8
2017	16,312	3,004	18.4	18.1
2018	14,639	2,979	20.3	20.0
2019	12,908	2,542	19.7	19.4
2020	11,294	2,273	20.1	19.6
2021	12, 455	2, 682	21.5	20.8
2022	13,712	3,191	23.3	22.2
2023	14,535	2,994	20.6	19.6

* Data have been age-standardised using a standard population based on the numbers of inpatients with a diagnosis of sepsis in 2015

Figure 6: Quarterly rates of in-hospital mortality for adult patients with a diagnosis of Sepsis, quarterly data, 2013 – 2023



Seasonal variation

Peaks in mortality occur in the winter season corresponding with the higher incidence of respiratory tract infections, a number of which are vaccine preventable. This report clearly demonstrates the vulnerability of the older patient and those with co-morbidities to sepsis. It is recommended that this cohort avail of recommended vaccination as prevention is always better than cure. However, cure is not always possible even with the very best management.

Quarterly rates of in-hospital mortality for inpatients with a diagnosis of sepsis from 2013 to 2023 were analysed using statistical process control (SPC) methods (Figure 6). The use of SPC methods allows us to see whether the changes we made resulted in improvements and allow us to distinguish between variation that may have happened by chance alone and variation that indicates a real improvement in mortality rates.

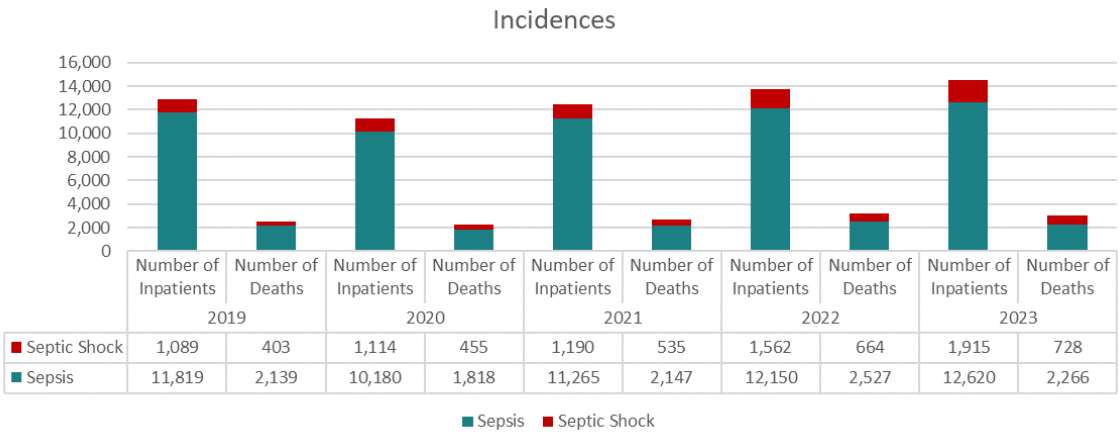
The mean in-hospital crude mortality rate for inpatients with a diagnosis of sepsis from 2013-2015 showed an average of 23.4%. Using control limits based on SPC methods it was expected during this period that the quarterly mortality rate would vary from around 20 to 26% by chance alone. Since 2016, the quarterly mortality rate has averaged 20.3% and has been below the previous average of 23.4%, indicating an improvement in mortality rates that is not explained by chance alone.

The control limits in the SPC chart have been re-calculated to reflect this reduction. We can now expect that this improvement will be sustained, and the average mortality rate will remain around 20% (with some variation due to seasonal effects).

Septic shock.

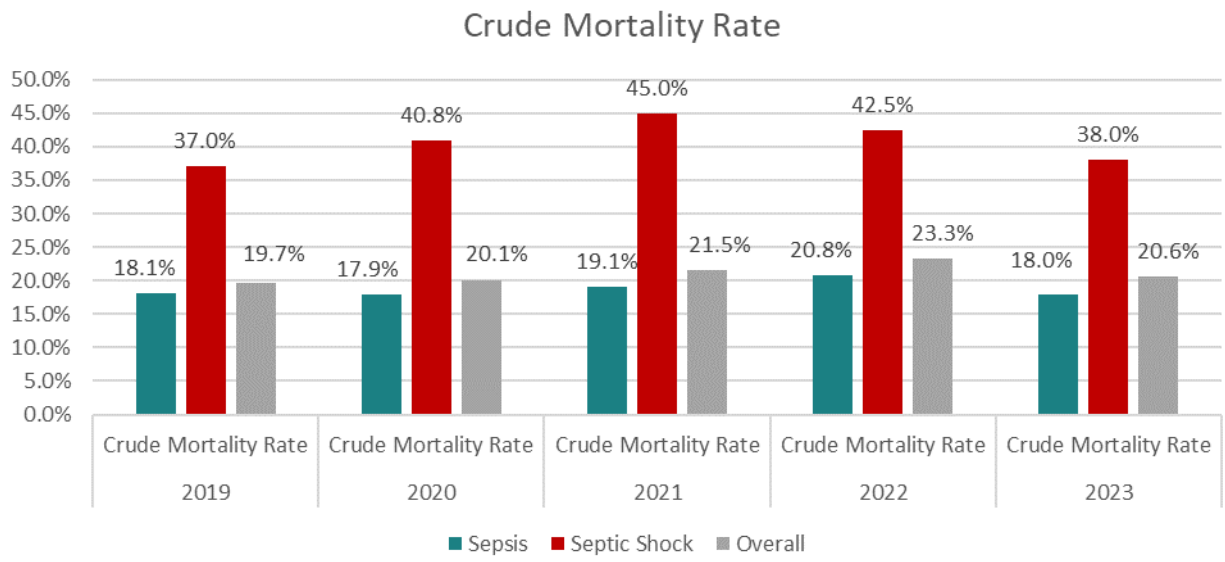
Septic shock is considered a sub-group of sepsis, where patients experience more severe disease characterised by hypotension necessitating vasopressor administration. This sub-group of patients, while lower in incidence, consistently experience worse outcomes (Figures 7 & 8).

Figure 7: Adult inpatients (non-maternity) with a diagnosis of sepsis or septic shock, Incidences 2019-2023



	2019		2020		2021		2022		2023	
	Number of Inpatients	Number of Deaths	Number of Inpatients	Number of Deaths	Number of Inpatients	Number of Deaths	Number of Inpatients	Number of Deaths	Number of Inpatients	Number of Deaths
Septic Shock	1,089	403	1,114	455	1,190	535	1,562	664	1,915	728
Sepsis	11,819	2,139	10,180	1,818	11,265	2,147	12,150	2,527	12,620	2,266

Figure 8: Adult inpatients (non-maternity) with a diagnosis of sepsis or septic shock, crude mortality rate 2019-2023



Specialties:
Maternity

In 2023, there were 260 pregnancy-related cases of sepsis, with no associated deaths. (Table 3).

Table 3: Maternal sepsis-associated incidence and crude mortality rates, 2011-2023

Year	Pregnancy Related Cases with a Diagnosis of Sepsis	
	Number of Inpatients	Crude Mortality Rate
2011	190	1.6%
2012	192	0.5%
2013	271	0.0%
2014	282	0.0%
2015	306	0.3%
2016	402	0.0%
2017	473	0.2%
2018	420	0.5%
2019	380	0.0%
2020	257	0.0%
2021	238	0.0%
2022	283	0.0%
2023	260	0.0%

Paediatrics

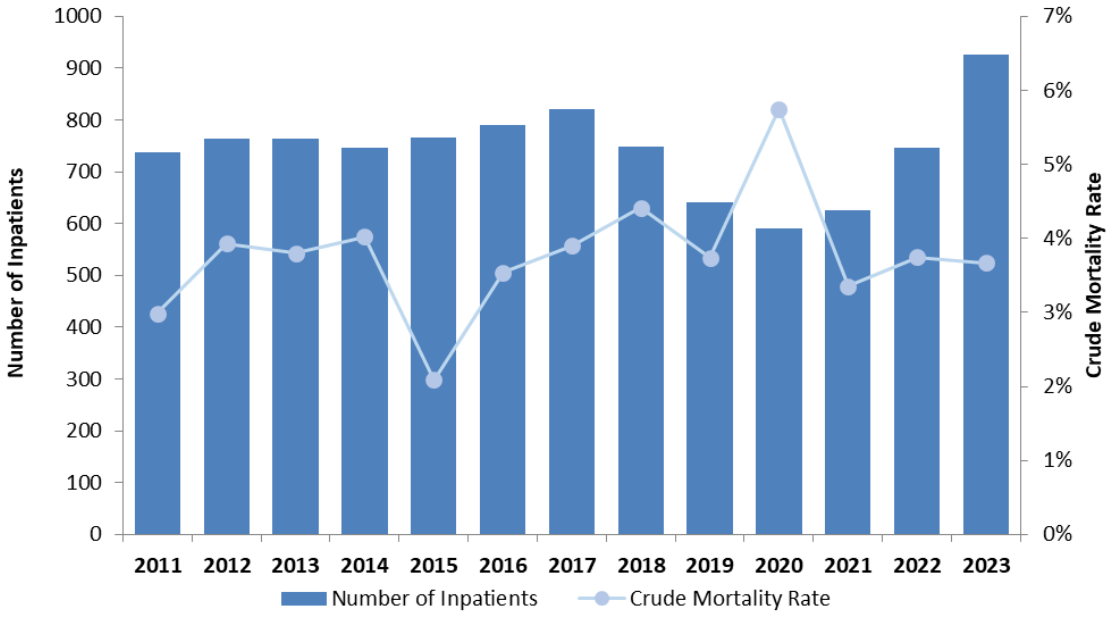
The majority of paediatric morbidity and mortality occurs in the under ones when the immune system is still immature (Table 4).

Table 4: Paediatric sepsis-associated incidence and crude mortality rates, by age group 2020 - 2023

Age Group	Number of Inpatients	Number of Deaths	Crude Mortality Rate
Under 1 Year of age	2,229	94	4.2%
1-9 Years	452	11	2.4%
10-15 Years	210	12	5.7%
Total	**2,891**	**117**	**4.0%**

The Surviving Sepsis Campaign International Guidelines for paediatric settings was introduced in Ireland in 2021 and as anticipated the number of documented cases of paediatric sepsis has increased since implementation began in 2022 (Figure 9).

Figure 9: Paediatric sepsis-associated incidence and crude mortality rates, 2011- 2023



Between October 2022 and August 2023, Ireland experienced an unusual upsurge in invasive Group A Streptococcus (iGAS) disease, particularly in children aged under 18 years.

In the years prior to the COVID-19 pandemic, children accounted for approximately 25% of all iGAS cases. Since the 2022-2023 upsurge, the proportion that are children rose to 41% during 2023

Medicine and Surgery

In 2023, adult sepsis inpatients with a medical Diagnostic Related Group (DRG) accounted for 84% of all adult inpatients with sepsis (excluding maternity) while those with a surgical DRG accounted for 16%. However, as seen in previous years, adult sepsis inpatients with a surgical DRG spent over twice as long in hospital and had a higher mortality rate than their medical counterparts (Table 5).

Table 5: Adult inpatient with a diagnosis of sepsis by Surgical/Medical Diagnostic Related Group, 2023

Surgical / Medical DRG	Number of Inpatients	Number of Bed Days	Average Length of Stay	Crude Mortality Rate
Surgical	2,317	107,467	46.4	24.4%
Medical	12,218	214,884	17.6	19.9%
Total	**14,535**	**322,351**	**22.2**	**20.6%**

* 'Surgical' refers to inpatients with a surgical Diagnosis Related Group (DRG) which is assigned if there is at least one significant surgical procedure carried out in an operating room during that episode of care. 'Medical' refers to inpatients with a medical DRG which is assigned if there are no significant surgical procedures during that episode of care. The 'Medical' group above also includes a small number of patients with a DRG classified as 'Other', that is they had a non-surgical operating room procedure.

The average length of stay (AvLOS) for surgical patients with sepsis is 46.4 days which is triple that of medical patients (17.6 days (Table 5)). To put this in context, Table 6 below identifies the AvLOS for sepsis, infection, and all other diagnoses for surgical patients.

AvLOS for surgical patients with a sepsis diagnosis is just over double that of those with an infection diagnosis (46.4 vs 22.1 days) and nearly 10 times the length of stay of those with any other diagnosis (n=5.0 days). The opportunity to shorten this by earlier recognition and treatment will not only improve patient outcomes but free up bed days for patients on waiting lists.

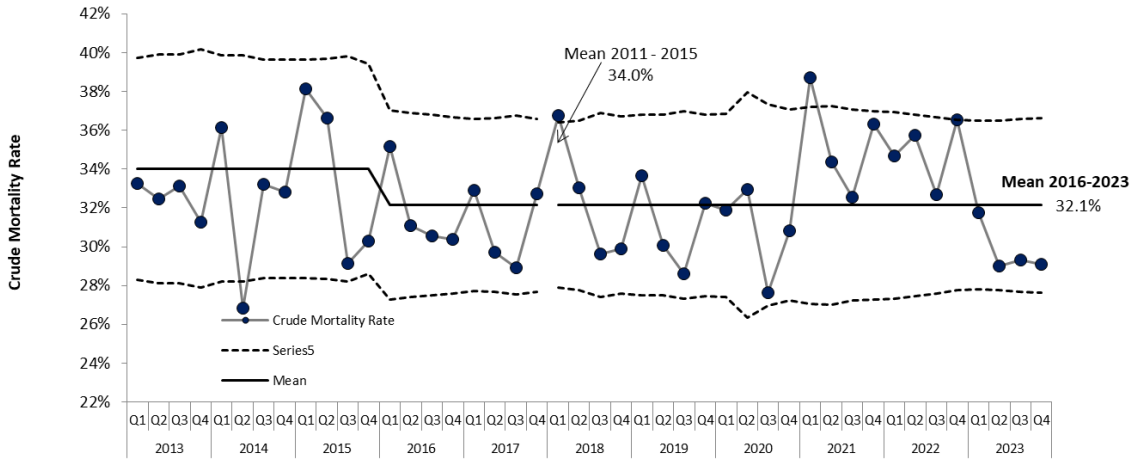
Table 6: Adult Surgical inpatient with a diagnosis of sepsis vs diagnosis of infection or all other diagnoses, 2023.

Diagnosis	No. of pts.	AvLOS
Sepsis	2,317	46.4
Infection	13,270	22.1
All other Diagnoses	79,683	5.0
Total	95,270	8.4

Critical Care

The mean in-hospital crude mortality rate for inpatients with a diagnosis of sepsis or septic shock admitted to critical care from 2011-2016 showed an average of 34% (Figure 10). For the period 2016-2023 this dropped to 32.1% representing an improvement since the inception of the national clinical programme for sepsis.

Figure 10: Statistical process control chart of hospital mortality for adult inpatients with a diagnosis of sepsis and admitted to a critical care area, quarterly data, 2013 – 2023.



In 2023, 27.7% of sepsis patients were admitted to a critical care bed and the mortality rate was nearly twice that of those managed on the ward (Table 7).

Table 7: Admission and crude mortality rates for adult inpatients (non-maternity) admitted to a critical care area with a diagnosis of sepsis or septic shock, 2023

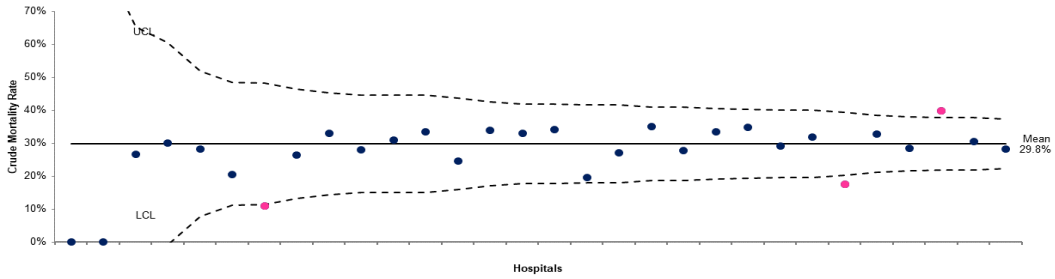
	Admitted to Critical Care		Not Admitted to Critical Care	
	Total Number of cases	Crude mortality rate	Total Number of cases	Crude mortality rate
Sepsis + Septic Shock	4,027	29.8%	10,508	17.1%

The Centres for Disease Control and Prevention (CDC) report that 80% of all sepsis cases arise in the community and therefore present to the emergency department. In 2023 the majority, 72.3%, were managed on a general ward and these patients had a mortality rate of 17.1% which is significant when compared with other time dependant medical emergencies such as acute myocardial infarction 4.8% and ischaemic stroke 6.8% (NAHM,

2021). Capacity in the critical care area remains the limiting factor for admission. Admission to critical care when required, as well as appropriate management on admission, will give the patient the best opportunity to survive.

In the absence of age and co-morbidity adjustment, which would allow each hospital sepsis-associated mortality to be published, the funnel plot (Figure 11) depicts the crude in- hospital mortality in patients with a diagnosis of sepsis or septic shock and who were admitted into a critical care area in hospitals who had more than 40 of such cases. It is the aim of the National Sepsis Programme to be able to produce an age and comorbidity adjusted funnel plot for all acute hospitals that manage sepsis patients into the future. This would assure people that their hospital achieves similar outcome goals as others in the state and if a hospital has outlier status, it will facilitate further investigation as to the reasons why and enable timely intervention to correct that status and associated outcomes.

Figure 11: Inpatient crude mortality rate for adult inpatients with a diagnosis of sepsis or septic shock and admitted to critical care area, by hospital, 2023.



Healthcare usage

It is of interest to compare sepsis cases with those coded as infection and all other diagnosis as it demonstrates the clear difference in these disease processes in terms of healthcare usage i.e. bed days used and average length of stay (Table 8) and outcome (Table 9).

This provides a clear rationale to investigate the patient with infection for evidence of organ dysfunction, not just so they can be HIPE coded correctly but also so they can get the urgent time-dependent therapy that is associated with improved patient outcomes. Additionally, early input from senior decision makers is essential to direct appropriate treatment and escalation plans which include source control, critical care management and other complex needs.

Table 8: Healthcare usage and outcomes– Sepsis vs infection and all other diagnoses, 2023

Diagnosis	Number of Inpatients	Number of Bed Days	Average Length of Stay (Days)
Sepsis	14,535	322,351	22.2
Infection	124,585	1,564,017	12.6

All Other Diagnoses (Dx)	341,028	1,647,776	4.8
Total	**480,148**	**3,534,144**	**7.4**

Table 9: Healthcare outcomes – Sepsis vs infection and all other diagnoses, 2023

Diagnosis	Number of Inpatients	% Total inpatients	Number of deaths	% Total deaths	Crude mortality rate
Sepsis	14,535	3.0%	2,994	24.3%	20.6%
Infection	124,585	25.9%	5,402	43.8%	4.3%
All Other Dx	341,028	71%	3,933	31.9%	1.2%
Total	480,148		**12,329**		**2.6%**

Key findings:

Sepsis patients account for only 3% of the total in-patient population but have more than a 4-fold higher mortality rate compared to patients coded with infection and a 2-fold average higher length of stay.

COVID-19

The COVID-19 pandemic presents a unique situation whereby a very large number of patients globally manifest a largely homogenous disease process displaying signs predominantly of respiratory sepsis from a viral origin.

The crude mortality rate for patients with both sepsis and COVID-19 was higher than that of those without COVID-19 in 2023 (25.3% vs 20.1%) (Figure 12).

Figure 12: Crude mortality rate for adult inpatients with a diagnosis of infection or sepsis and with/without COVID-19, 2023

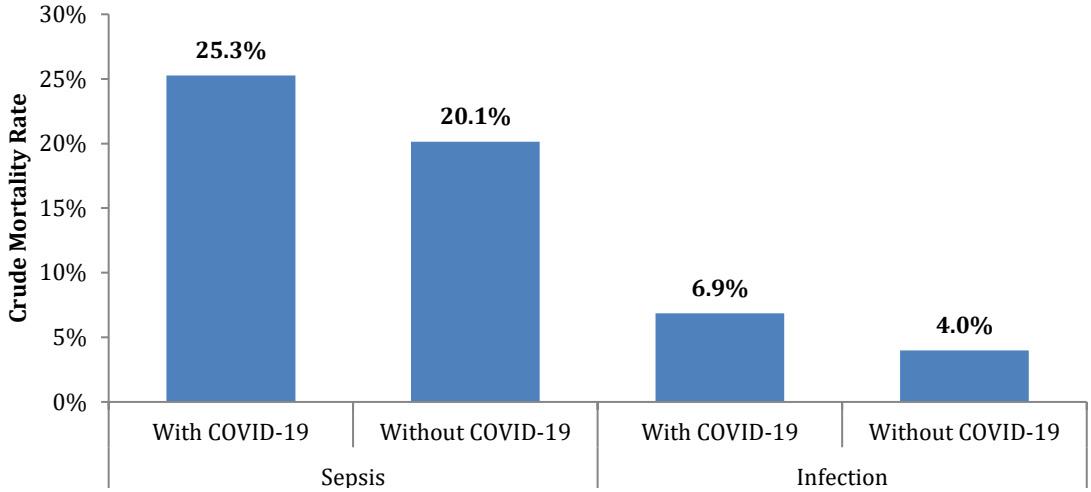


Table 10: Inpatients with a diagnosis of sepsis and with/without COVID-19, by age group 2023, (adult non maternity patients only)

Age Group	Sepsis with COVID-19		Sepsis without COVID-19		Total	
	Number of Inpatients	Crude Mortality Rate	Number of Inpatients	Crude Mortality Rate	Number of Inpatients	Crude Mortality Rate
16-44 Years	42	14.3%	972	6.7%	1,014	7.0%
45-64 Years	222	17.6%	2,821	12.2%	3,043	12.6%
65-84 Years	748	25.8%	7,050	21.1%	7,798	21.6%
85+ Years	294	31.3%	2,386	32.1%	2,680	32.1%
Total	**1,306**	**25.3%**	**13,229**	**20.1%**	**14,535**	**20.6%**

Crude mortality rate was consistently higher for sepsis cases with COVID-19 in patients under 85 years old in comparison to patients with sepsis from other causes (Table 10). It is notable that there has been a significant decrease in the mortality rate for Sepsis with Covid-19 from 2021 to 2023 (43.7% vs 25.3%), possibly indicating the decreasing severity of disease as the coronavirus continues to evolve.

		Sepsis with COVID-19	Sepsis without COVID-19	Total
Admitted to Critical Care	**Number of Cases**	**436**	**3,591**	**4,027**
	AvLOS (Days)	63.5	28.6	32.4
	CMR	31.7%	29.6%	29.8%
	Number of Cases	**870**	**9,638**	**10,508**

Not Admitted to Critical Care	AvLOS (Days)	37.2	16.6	18.3
	CMR	22.1%	16.6%	17.1%
Total	**Number of Cases**	**1,306**	**13,229**	**14,535**
	AvLOS (Days)	45.9	19.8	22.2
	CMR	25.3%	20.1%	20.6%
Percentage Admitted to Critical Care		**46.5%**	**33.4%**	**27.1%**

Table 11: Inpatients admitted to/not admitted to critical care with a diagnosis of sepsis and with/without COVID-19, Incidence, AvLOS and CMR 2023

The numbers of patients admitted to the critical care unit with sepsis and COVID-19 decreased in 2023 compared to 2022 (436 vs 635) and these accounted for 33.4% of all cases of sepsis with COVID-19 (Table 11). Crude mortality for this cohort remained virtually unchanged when compared with 2022 (31.7% vs 31.8%). We would urge caution in the interpretation of these results though, as an internal audit by the National Sepsis Programme revealed that a high proportion of patients with COVID-19 were not coded as having sepsis despite fulfilling criteria.

Balancing measures

The following data is from the Health Protection Surveillance Centre (HPSC). Further details are available at www.hpsc.ie

Multi-drug resistant organisms:

On-going surveillance is key to monitoring the emergence, spread and control of antimicrobial resistance (AMR). Since 1999, AMR surveillance in Ireland, as part of the European Antimicrobial Resistance Surveillance Network (EARS-Net), has been undertaken for a number of important pathogens that cause invasive infections, in particular bloodstream infections (BSIs).

In 2023, 33 of 36 microbiology laboratories in Ireland submitted data on invasive infections for 8 key EARS-Net pathogens (*Escherichia coli, Klebsiella pneumoniae, Pseudomonas aeruginosa, Acinetobacter species, Streptococcus pneumoniae, Staphylococcus aureus, Enterococcus faecalis* and *Enterococcus faecium*).The estimated population coverage by EARS-Net Ireland in 2023 was approximately 96%.

Data were received on 7,641 isolates in 2023 compared with 7,130 in 2022. Of these, 6,961 were EARS-Net pathogens and the rest were invasive Group A Streptococcus, Group B Streptococcus and Candida species isolates.

For most pathogens, there was an increase in the number of cases reported in 2023 compared to 2022, with the biggest increases seen for Group A streptococcus (coinciding with the upsurge in iGAS infections at the end of 2022 and continued in 2023), *K. pneumoniae* and *S. pneumoniae* whereas *P. aeruginosa, Acinetobacter* spp. and Group B streptococcus infections decreased in 2023.

In Ireland, most of the key AMR indicators showed no significant trend over the latest five year period (2019-2023) with the following exceptions:

1. **Meticillin-Resistant *S. aureus* (MRSA):** In 2023, the proportion of methicillin-resistant *S. aureus* (%MRSA) decreased to 9.7%. This is the lowest recorded level to date. However, the MRSA incidence rate slightly increased to 0.032 per 1,000 Patient Days from 0.031 per 1,000 Patient Days in 2022. The %MRSA is also decreasing throughout EARS-Net countries (with a significant 5-year trend) with an EU/EEA weighted mean of 15.2% in 2022. The highest proportions are seen in Southern Europe.
2. **Vancomycin-Resistant *E. faecium* (VREfm):** The proportion of vancomycin-resistance among *E. faecium* (VREfm) decreased to 21.4% in 2023. This is also the lowest recorded level to date. Overall, the 5-year trend indicates that the %VREfm is decreasing. However, VSEfm and overall *E. faecium* incidence increased between 2022 and 2023. By contrast, the %VREfm is increasing across Europe (with a significant 5-year trend) with an EU/EEA weighted mean of 17.6% in 2022. Despite the decreasing trend here, Ireland still has one of the highest proportions in Europe, along with countries in Eastern and Southern Europe.

Despite decreasing trends for both MRSA and VRE, both of these AMR indicators remain problematic in Irish healthcare settings, accounting for approx. 1 in 10 *S. aureus* and just over 1 in 5 *E. faecium* invasive infections, respectively.

Carbapenem resistant organisms:

Resistance to carbapenems is one of the biggest AMR challenges facing the healthcare systems in Ireland and worldwide. Carbapenem resistance in the Enterobacterales (CRE), (which include *E. coli* and *K. pneumoniae*), and *Acinetobacter* spp. (CRA) is most commonly via the production of carbapenemase enzymes, e.g. KPCs, NDMs and OXA-type; hence, the terms carbapenemase-producing Enterobacterales (CPE) and carbapenem-producing Acinetobacter (CPA).

CRA is a major problem in most Eastern and Southern European countries. While Ireland reported 0% CRA in 2023 (a decrease from 2.5 % in 2022), the EU/EEA weighted mean was 36.3% in 2022. Ten countries reported CRA proportions in excess of 60% (decrease from 12 countries in 2021). Carbapenem resistance among Acinetobacter spp. (especially A. baumannii) has been listed as one of the top priorities by the WHO for research and development of novel therapeutic agents.

Among invasive isolates of *E. coli* and *K. pneumonaie* reported to EARS-Net, carbapenem resistance in Ireland is still very low (0.1% and 1.5% respectively) compared to levels seen in Southern Europe, especially among K. pneumoniae, with proportions exceeding 25% in Bulgaria, Cyprus, Greece and Romania. Implementation of antimicrobial stewardship and infection prevention and control strategies are required in order to prevent the emergence and spread of such highly resistant strains in Ireland.

National surveillance of all new CPE, including cases associated with colonisation and infection (both invasive and non-invasive) re-commenced in 2022. The annual surveillance report on CPE in Ireland in 2023 is currently being produced, so the 2023 data is provisional and subject to change. Data were received from all but five of the 36 laboratories in Ireland in 2023. Of the 1060 isolates reported, 89% were associated with colonisation, 9% with non-invasive infection and 2% with invasive infection (this breakdown is similar to previous years). In line with 2022 data, the majority of CPE reported in 2023 had OXA-48-like enzymes (73%). The composition of the remaining isolates included KPC (10% compared to 8% in 2022), NDM (11% compared to 9% in 2022) and VIM (3% compared to 7% in 2022).

Implementation of antimicrobial stewardship and infection prevention and control strategies are required in order to prevent the emergence and spread of such highly resistant strains in Ireland.

Clostridioides difficile infection (CDI):

Clostridioides difficile are bacteria normally found in the large intestine and are the primary cause of antibiotic-associated diarrhoea. Antimicrobials drive CDI pathogenesis by disruption of the gut microbiome. This gives *C. difficile* a selective advantage, thereby increasing the risk of CDI. Antimicrobial stewardship and infection prevention and control are important CDI preventative measures.

In 2023, 2,256 cases of CDI were notified to public health. Of these, 1,807 (80%) were classified as new cases, 189 (8%) as recurrent and 260 (12%) as unknown case type. The national crude incidence rate for new and recurrent CDI per 100,000 population was 39.6, similar to that reported in 2022 (39.7; higher than 36.6, the annual mean for 2017-2021). As in previous years, the majority of CDI was reported in patients aged ≥65 years (64*%).*

Healthcare-associated (HCA) CDI accounted for the origin of 57% (n=1194) of all cases, equating to a national incidence rate for new and recurrent HCA-CDI, that originated within the participating hospital, of 2.0 per 10,000 bed days used (BDU), which was slightly higher than that of 2022 (1.9); and higher of the annual mean for 2017-2021 (2.3).

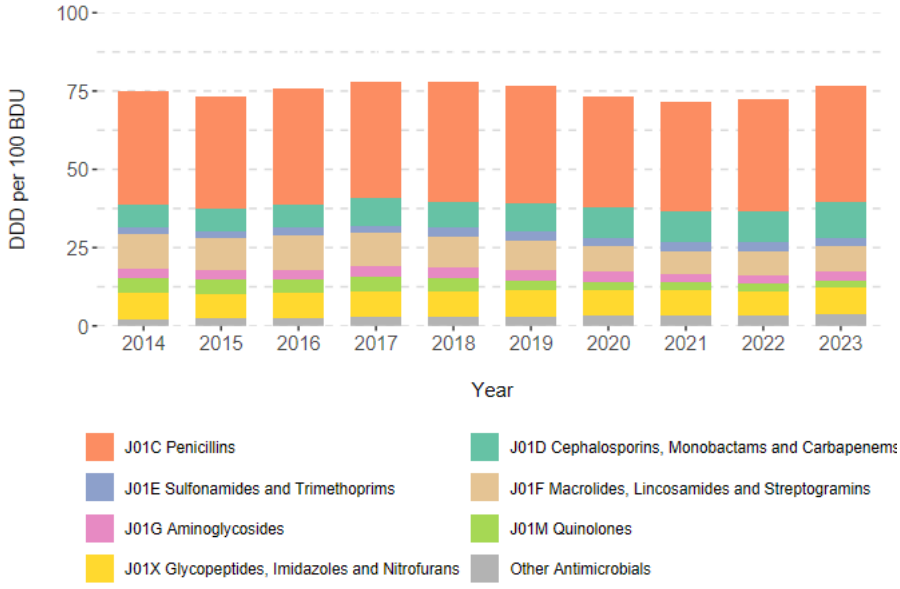
Antimicrobial consumption:

Antimicrobial prescribing is a key part of sepsis management. However, high rates of antimicrobial consumption increases AMR. Surveillance of both the quantity and the quality of antimicrobial use is therefore crucial, as AMR challenges the treatment of sepsis by reducing the number of effective antimicrobials to treat the condition.

Quantity of antimicrobial prescribing (Acute hospitals):

- The median rate of antimicrobial consumption in 42 participating acute hospitals in Ireland in 2023 was 71.8 defined daily doses (DDD) per 100 bed days used (BDU), ranging from 20.9 to 109.2 DDD per 100 BDU. This represents a slight increase from 68.1 DDD per 100 BDU in 2022.
- Similarly, the mean consumption also increased, rising from 72.6 DDD per 100 BDU in 2022 to 76.8 DDD per 100 BDU in 2023. This rate of antimicrobial consumption is mid-range in comparison with other European countries.
- There was a slight increase in the consumption of penicillins, other beta-lactams, macrolides, glycopeptides, imidazoles, and nitrofurans. In contrast, a slight decrease was observed in the consumption of sulfonamides and trimethoprim.
- Carbapenem consumption remained relatively stable over the last three years, recorded at 2.4 DDD per 100 BDU in 2023. Conversely, the consumption of second and third-generation cephalosporins has been increasing steadily over the past five years.

Figure: Annual national hospital antibacterial consumption rate in DDD per 100 BDU by pharmacological subgroup (ATC level 3).



National Clinical Programme for Sepsis (NSP) Governance and future planning

In 2023, governance for the NSP transferred from Acute Operations to the National Quality and Patient Safety Directorate (NQPSD). It is planned to have a greater integrated approach to sepsis and the deteriorating patient programmes ensuring that sepsis remains a key patient safety improvement priority, as identified in the HSE's Patient Safety Strategy 2019-2024[9].

The NSP (Working Group) currently meets monthly, and membership includes the Clinical Lead, Programme Manager and Sepsis HG ADONs.

The National Sepsis Steering Committee provides oversight and guidance for the work of the NSP to support the Programme in achieving its overall aims and objectives. The Steering Committee is scheduled to meet quarterly; however, these meetings were paused during the COVID-19 pandemic. The last meeting was held in July 2024.

Five Year Strategic Plan:

The Action on Sepsis: Five Year Strategy is with stakeholders for engagement & feedback. The strategy outlines a five-year strategic programme of work from 2024 to 2029. This comprehensive strategy, grounded in Irish data and international best practices, is structured to tackle the challenges of sepsis management and prevention.

The current draft strategy sets out a range of HSE actions aligned to the six priority areas:

1. Governance
2. Preventing Avoidable Cases of Sepsis
3. Increasing Awareness of Sepsis amongst the Public and Health Professionals
4. Improving Identification and Treatment across the Patient Care Pathway
5. Improving Support and Care for Sepsis Survivors
6. Research for Sepsis

Revision of the National Clinical Guidelines:

The Society of Critical Care Medicine: Surviving Sepsis Campaign have updated their international guidelines. This information provides important evidence and recommendations on the prescribing protocols for antibiotics and fluids in sepsis management. The Sepsis programme have committed to adapting the sepsis tools used in acute hospitals to reflect these recommendations, this work will be completed in 2024.

Health Regions :

A key priority of the Action on Sepsis: Five Year Strategy is to ensure that the changing structures of the Health Services are reflected in the delivery of its objectives. Part of the new structures will be the National Quality & Patient Safety Unit (NQPSU) reporting directly to the Chief Clinical Officer.

Hospital Groups

Robust structures have been put in place to support and monitor implementation of National Clinical Guideline No. 26 – Sepsis Management (NCG) and the Surviving Sepsis Campaign International Guidelines for the Management of Septic Shock and Sepsis-Associated Organ Dysfunction in Children (SSCGC 2020) in the acute hospital setting, including:

- Sepsis is a standing item on HCAI/AMR Group Oversight Committees which meet quarterly and are chaired by Hospital Group CEOs.
- All Groups have either made sepsis eLearning mandatory for all relevant HCWs or are planning to do so with the launch of the updated Sepsis eLearning programmes.
- Group Sepsis ADONs:
    - Provide support to local sepsis and DPIP committees including adult, maternity, and paediatrics.
    - Undertake process audits (adult, maternity & paediatrics) to measure compliance at hospital level with the NCG and provide feedback on audit results to Local and HG Leadership.
    - Provide information and updates as relevant.

All hospitals held sepsis awareness events for World Sepsis Day - 13th September and throughout the month of September (Sepsis Awareness Month). These events included: sepsis simulations; information stands for staff, patients, and visitors; virtual and in person presentations; staff quizzes; poster displays and ward-based education. Many Irish hospitals are featured on the annual World Sepsis Day global event poster. https://static1.squarespace.com/static/597f001fb3db2bde61e79d4a/t/657c2795b725750ef586d809/1702635431851/2023_WSD_Event_Poster.pdf

Sepsis associated crude mortality rates for 2023 per Hospital Group are presented in table 12.

Table 12: Hospital Group crude mortality rate for sepsis & septic shock, 2021-2023 Adult inpatients only, excluding maternity and paediatrics

Hospital Group	2021	2022	2023
Dublin Midlands	22.2%	23.6%	21%
Ireland East	22.5%	23%	21.3%
RCSI	19.9%	22.5%	19.7%
SAOLTA	20.8%	25%	23.7%
South SouthWest	22.4%	22.7%	18.9%
University of Limerick	18.7%	23.6%	19.1%
National	**21.50%**	**23.3%**	**20.6%**

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Appendix 1: The National Sepsis Report Subcommittee

Member	Title
Dr. Michael O'Dwyer	National Clinical Lead, National Sepsis Programme
Florina Rizoaica	QPS Intelligence, National Office of Quality & Patient Safety
Bláthnaid Connolly	Programme Manager, National Sepsis Programme
Celine Conroy	Ireland East Hospital Group
Prof Fidelma Fitzpatrick	Chair Sepsis Steering Committee

Appendix 2: National Sepsis Steering Committee

Name	Job title and affiliation
Prof Fidelma Fitzpatrick	Consultant Microbiologist, Chair Sepsis Steering Committee
Dr Michael O'Dwyer	Clinical Lead, National Sepsis Programme
Blathnaid Connolly	Programme Manager, National Sepsis Programme
Prof. Garry Courtney	National Clinical Lead Acute Medicine
Mr Ken Mealy	National Clinical Programme for Surgery
Ciara Hughes	National Clinical Programme for Surgery
Dr. Fiona Healy	National Clinical Lead Critical Care
Dr. Gerry McCarthy	National Clinical Lead Emergency Medicine
Fiona McDaid	Emergency Medicine Programme
Dr. Graham Hughes	National Clinical Programme for Older Persons
Dr Ciara Martin	National Clinical Advisor & Group Lead, Children and Young Persons Programme
Dr John Fitzsimons	QI/NQPSD
Dr Maureen Flynn	ONMSD
Mary Bedding	DPIP
Dr Orla Healy	NQPSD
Dr Cliona Murphy	NHWIP
Angela Dunne	NHWIP
Majella Daly	National Centre for Clinical Audit
Dr Diarmuid Quinlan	ICGP
Dr Andrea Fitzgerald	ICGP/NCP Sepsis Paediatric Lead
Dr Ellen Hayes	ICGP/NCP Sepsis Adult Lead
Celine Conroy	Hospital Group CDONM representative

Dr Bryony Treston	NCHD representative
Dr Karen McCarthy	NCHD representative
Jacqui Curley / Marie Glynn	Health Pricing Office
Barbara Egan	Patient representative
Linda Dillon	Patient Advocacy Group
Brendan Cawley	Pre-Hospital Emergency Care Council
Ms Anne McCabe	NASCCRS (National Ambulance Service and critical care and retrieval services)
Dr Eimear Brannigan	AMRIC
Susan Keane	Group Sepsis ADON - Ireland East Hospital Group
Karen D Holden	Group Sepsis ADON - Dublin Midlands Hospital Group
Sue Markey	Group Sepsis ADON - RCSI Hospitals
Yvonne Young	Group Sepsis ADON - UL Hospitals Group
Nuala Clarke	Group Sepsis ADON Children's Health Ireland
Ronán O'Cathasaigh	Group Sepsis ADON - Saolta University Health Care Group
Denise Mc Carthy	Group Sepsis ADON - South / Southwest Hospital Group

Appendix 3: The National Sepsis Programme Team 2023

Member	Title
Dr. Michael Dwyer	National Clinical Lead, National Sepsis Programme
Bláthnaid Connolly	Programme Manager, National Sepsis Programme
Sue Markey	Group Sepsis ADON RCSI Hospital Group
Karen D Holden	Group Sepsis ADON Dublin Midlands Hospital Group
Susan Keane	Group Sepsis ADON Ireland East Hospital Group
Denise McCarthy	Group Sepsis ADON South/South West Hospital Group
Ronan O'Cathasaigh	Group Sepsis ADON Saolta Hospital Group
Yvonne Young	Group Sepsis ADON UL Hospitals Group
Nuala Clarke	Group Sepsis ADON Children's Health Ireland

Appendix 4: The Coding Process

The source document for coding in Ireland for HIPE is the medical record or chart. The clinical coder uses the entire chart to extract the conditions and procedures to provide a complete record of the patient and their health care encounter. The clinical coder, the person who translates medical terminology into alphanumeric code, performs an essential function in providing quality, accurate, and uniform medical information and greatly contributes to the continuous growth of medical knowledge. In addition to the discharge summary or letter, additional documentation referenced for coding a case include nursing notes, consultation reports, progress notes, operative reports, pre- and post-operative reports, pathology reports and more recently the sepsis screening form.

The classification used is ICD-10-AM/ACHI/ACS 10th Edition (International Classification of Diseases, 10th Revision, Australian Modification/ Australian Classification of Health Interventions/Australian Coding Standards). The Australian Coding Standards have to be adhered to by clinical coders in their work. These are complemented by the Irish Coding Standards (ICS). The ICS are developed to complement the Australian Coding Standards (ACS) and are revised regularly to reflect changing clinical practice.

ACS 0010 General Abstraction Guidelines states that coders cannot infer diagnoses from laboratory results and that "The listing of diagnoses on the front sheet and/or the discharge summary of the clinical record is the responsibility of the clinician". It further states, "Unless a clinician can indicate that a test result is significant and/or indicates the relationship between an unclear test result and a condition, such test results should not be coded".

All HIPE data are keyed in at the hospital using the HIPE Portal data entry system that runs an extensive number of validations edit checks to ensure the quality of the data. Other data quality activities and data quality tools are in use at local and national HPO level.

Appendix 4a: ICD-10-AM Diagnosis Codes for Sepsis

Sepsis (based on Sepsis-3 definition)

ICD-10-AM Diagnosis Codes	Description
A40	Streptococcal sepsis
A41	Other sepsis
A02.1	Salmonella sepsis
A22.7	Anthrax sepsis
A26.7	Erysipelothrix sepsis
A32.7	Listerial sepsis
A42.7	Actinomycotic sepsis
B37.7	Candidal sepsis
T81.42	Sepsis following a procedure[1]
R65.1	Systemic inflammatory response syndrome [SIRS] of infectious origin with acute organ failure / Severe Sepsis

1. ICD-10-AM 8th Edition code, no corresponding 10th Edition Code.

Septic Shock

ICD-10-AM Diagnosis Codes	Description
R57.2	Septic Shock

NOTE:

Data are based on inpatients grouped into two mutually exclusive categories:

(i) Inpatients with any diagnosis (principal or secondary) of septic shock

(ii) Inpatients with any diagnosis (principal or secondary) of sepsis (including severe sepsis), excluding cases with any diagnosis of septic shock as these are already captured in the septic shock category.

Appendix 4b: ICD-10-AM Diagnosis Codes for Infections

ICD-10-AM Codes	Description
A00 - B99[1]	Certain Infectious & Parasitic Diseases
G00 - G07	Meningitis, Encephalitis, Intracranial and intraspinal abscess and granuloma
J00 - J06	Acute upper respiratory infections
J09 - J18	Influenza and pneumonia
J20 - J22	Other acute lower respiratory infections
J36	Peritonsillar abscess
J44.0	Chronic obstructive pulmonary disease with acute lower respiratory infection
K35.0[2]	Acute appendicitis with generalised peritonitis
K35.2[3]	Acute appendicitis with generalised peritonitis
K35.3[3]	Acute appendicitis with localised peritonitis
K57.0, K57.2, K57.4, K57.8	Diverticular disease of intestine with perforation and abscess
K61	Abscess of anal and rectal regions
K65	Peritonitis
L00–L08	Infections of the skin and subcutaneous tissue
M00–M03	Infectious arthropathies
M86	Osteomyelitis
N10 - N12	Acute, chronic & not specified tubulo-interstitial nephritis
N13.6	Pyonephrosis
N39.0	Urinary tract infection, site not specified
N45	Orchitis and epididymitis
R65.0	Systemic inflammatory response syndrome [SIRS] of infectious origin without acute organ failure
T80.2	Infections following infusion, transfusion and therapeutic injection
T81.4	
T81.41[3]	Wound infection following a procedure

T82.6	Infection and inflammatory reaction due to cardiac valve prosthesis
T82.7	Infection and inflammatory reaction due to other cardiac andvascular devices, implants and grafts
T83.5	Infection and inflammatory reaction due to prosthetic device, implant and graft in urinary system
T83.6	Infection and inflammatory reaction due to prosthetic device, implant and graft in genital tract
T84.5	Infection and inflammatory reaction due to internal joint prosthesis
T84.6	Infection and inflammatory reaction due to internal fixation device [any site]
T84.7	Infection and inflammatory reaction due to other internal orthopaedic prosthetic devices, implants and grafts
T85.7	Infection and inflammatory reaction due to other internal prosthetic devices, implants and grafts
T89.02	Open wound with infection
U07.1	Emergency use of U07.1 (COVID-19, virus identified)
U07.2	Emergency use of U07.2 (COVID-19, virus not identified)

[1.] Excluding diagnosis codes already included in the list of sepsis codes, i.e. A40, A41, A02.1, A22.7, A26.7, A32.7, A42.7, B37.7.

[2.] ICD-10-AM 6th Edition code.

[3.] ICD-10-AM 8th Edition code.

Appendix 4c: Pregnancy related exclusions

Admission type = 6 (Maternity) or Any diagnosis (principal or additional) of O00 – O99 (Pregnancy, Childbirth and the Puerperium) or Any diagnosis of

- Z32 Pregnancy examination and test
- Z33 Pregnant state, incidental
- Z34 Supervision of normal pregnancy
- Z35 Supervision of high-risk pregnancy
- Z36 Antenatal screening
- Z37 Outcome of delivery
- Z39 Postpartum care and examination
- Z64.0 Problems related to unwanted pregnancy
- Z64.1 Problems related to multiparity