NATIONAL SEPSIS REPORT 2022

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

December 2023

National Sepsis Outcome Report 2022

Dear Colleagues,

This is the eighth 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 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 2022. 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 2022 has increased when compared to the 2021 data (21.8% vs 20.3%). Over the same period the number of documented cases of sepsis has also increased by approximately 10% (14,742 vs 13,319). The crude mortality rate for septic shock has decreased from 45% to 42.5%. It appears that the COVID-19 pandemic may be a major determinant of the changes in epidemiology of sepsis in recent years.

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 (Q.I.) programme. Each hospital's sepsis Q.I. 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.

It is now time to expand the programme of work on Sepsis to adapt to changing health service structures and new models of care under Sláintecare. Key to this expansion is the transfer of the Sepsis and Deteriorating Patient Programmes into NQPSD. These programmes have significant potential for alignment to achieve synergies in mutual patient safety outcomes and improved efficiencies for healthcare staff.

Due for publication in early 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. Also increasing public awareness of the signs and symptoms of sepsis and developing GP guidelines and early warning systems which help identify and treat sepsis at the earliest opportunity.

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 national centre for clinical audit, 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,

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Dr. Orla Healy,

National Clinical Director - Quality and Patient Safety Directorate

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Executive Summary 2022

Key findings

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

Total number of cases sepsis and septic shock, 2022	**14,742**
Crude mortality rate, 2022	**21.8%**

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

Number of cases of Sepsis & Septic Shock	**13,712**
In-hospital crude mortality rate: Sepsis & Septic Shock	**23.3%**
Average length of stay	**22.8 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	**28.3%**
Medical (DRG) sepsis-associated hospital crude mortality rate	**22.2%**

Key comparators with 2021 (adult non-maternity cohort)

- There was a 10.1% increase in documented cases of Sepsis and Septic Shock with a 8.1% relative increase in associated in-hospital crude mortality.
- There was a 7.4% increase in average length of stay.

Sepsis (excluding septic shock): There were 12,150 cases documented in 2022, a 7.9% increase when compared with 2021 (n=11,265), with an in-hospital crude mortality rate of 20.8%, representing a 9.1% increase in crude mortality over 2021 (19.1%). 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 1,562 cases documented in 2022, a 33.1% increase when compared with 2021 (n=1,190), with an in-hospital crude mortality rate of 42.5%, representing a 5.4% relative decrease in crude mortality rate when compared with 2021 (n=45.0%). This also benchmarks well internationally: global 42%[4].

Key Recommendations

1	Support a public sepsis awareness campaign to facilitate education of the general public on sepsis recognition.
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 mechanism in place to provide reassurance that this has been completed.
3	Continue to support education 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 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 2022

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, the 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.

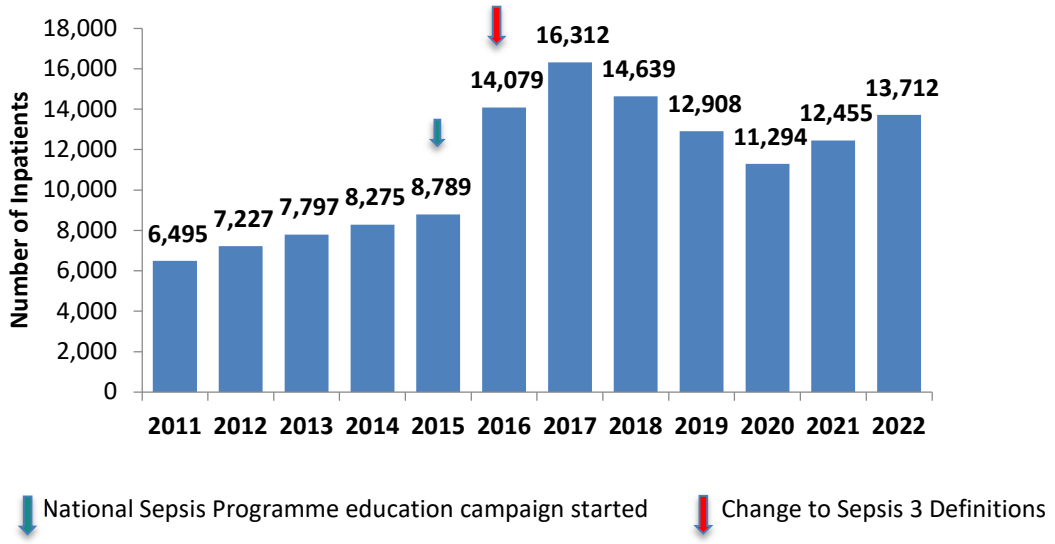
The data presented in this report are based on inpatients in publicly funded acute hospitals with the diagnosis of sepsis coded on the HIPE system. Causality cannot be inferred, as sepsis may be one of many diagnoses that complicated the patients' admission. Thus, mortality rates reported are sepsis-associated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

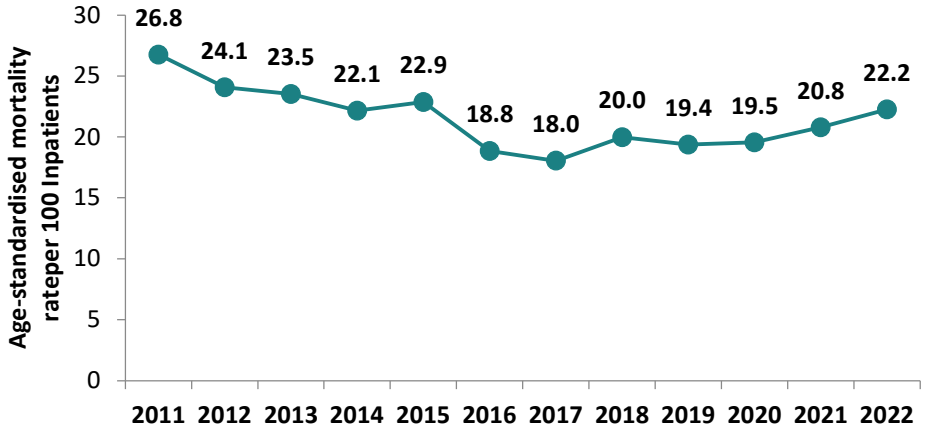
Figure 1: The number of adult patients with a diagnosis of Sepsis & Septic Shock, 2011-2022 (excludes paediatric & maternity).



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 2011-2022



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 2022 (includes paediatrics and maternity).

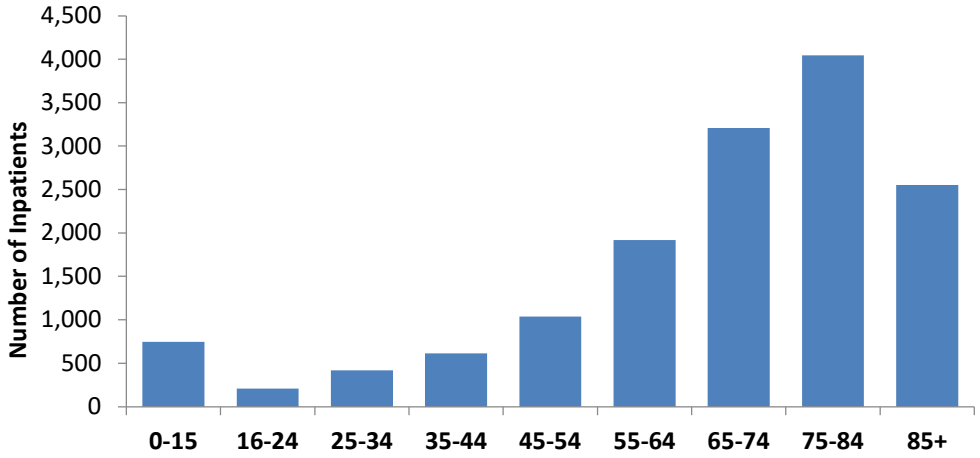
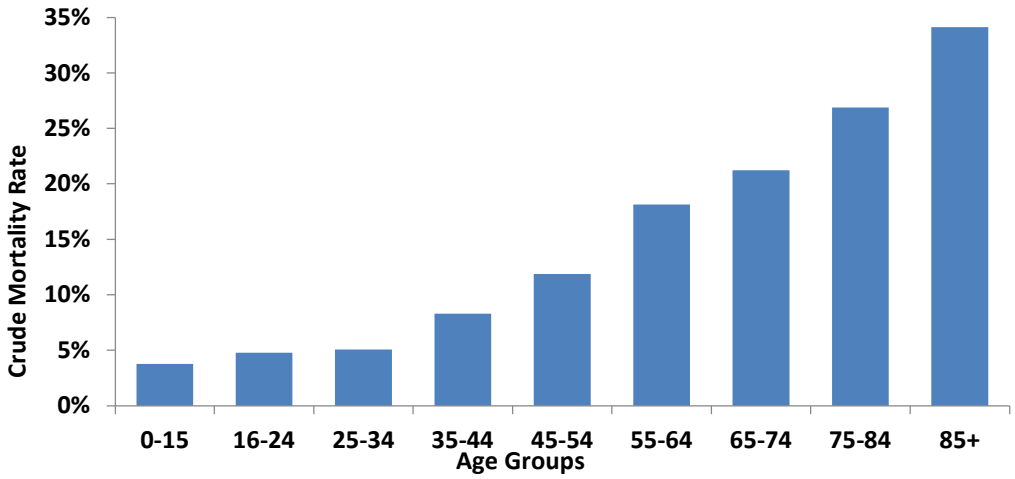


Figure 4: In-hospital crude mortality rate for patients with a diagnosis of sepsis by age group 2022.



In 2022, 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 2022.

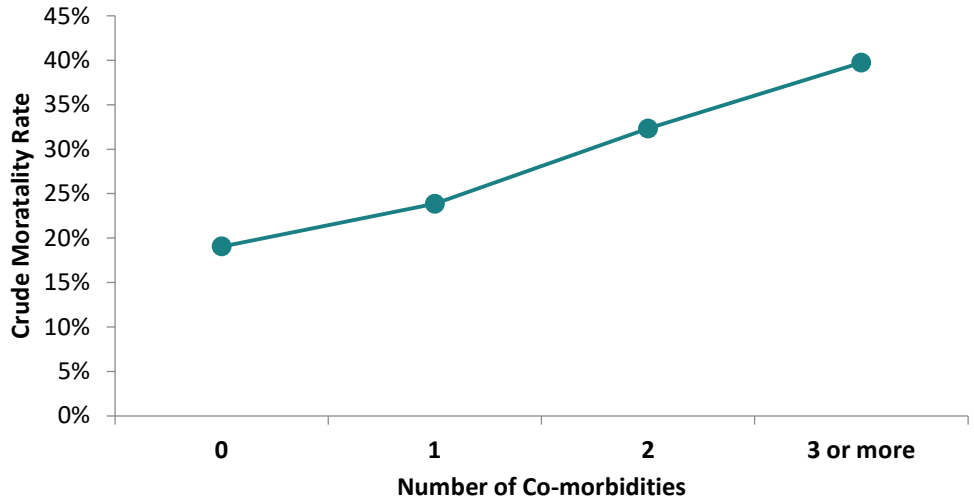


Table 1 summarises the effect of co-morbidities on sepsis incidence and mortality.

Table 1: Inpatients with a diagnosis of sepsis and selected co-morbidities; Number of cases and crude mortality rates 2022.

Co-morbidity	Number of cases	Crude Mortality Rate
Chronic Liver Disease	479	45.9%
Chronic Obstructive Pulmonary Disease	1,198	36.0%
Mental & Behavioural Disorders due to Alcohol	539	33.6%
Chronic Kidney Disease	1,730	31.2%
Cancer	2,931	24.7%
Diabetes	3,329	24.1%

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 2022 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 28.3% vs 22.2%.

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 develop deterioration due to infection and who have one or more co-morbidities including those >75years of age, or those with identified chronic conditions such or who have had recent surgery.

Sepsis-associated mortality, 2011-2022

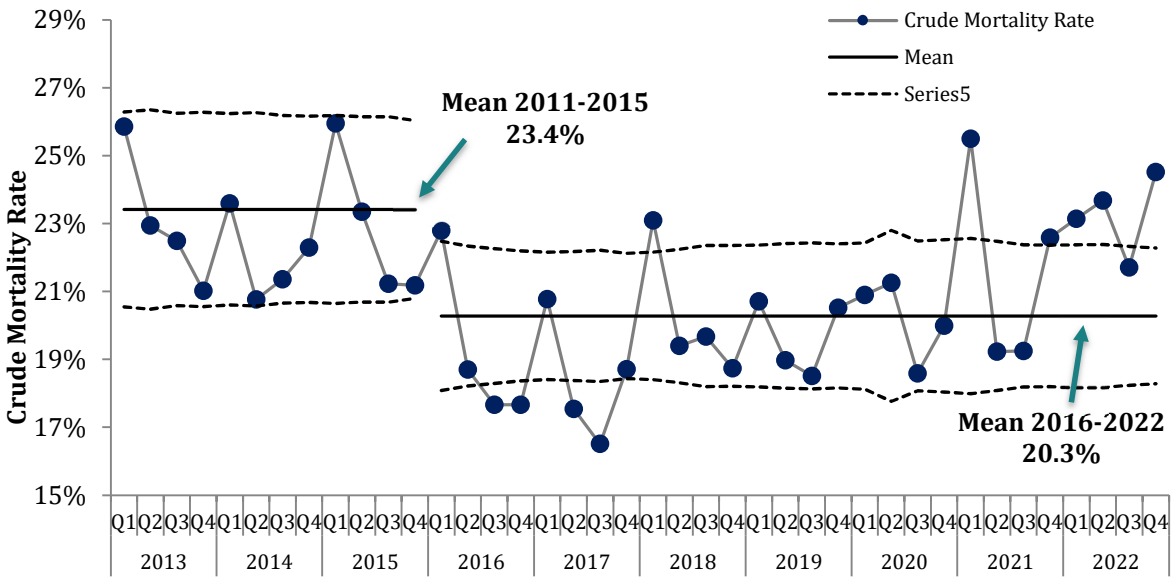
Age-adjusted mortality rates control for the effects of differences in age distributions and allow for comparisons of mortality rates across years with different age distributions. (Table 2). However, both age and co-morbidities are strongly associated with higher mortality from sepsis in Ireland and 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 2011-2022.

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

* 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, 2011 – 2022.



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 2022 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 19.8% 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 2020-2022

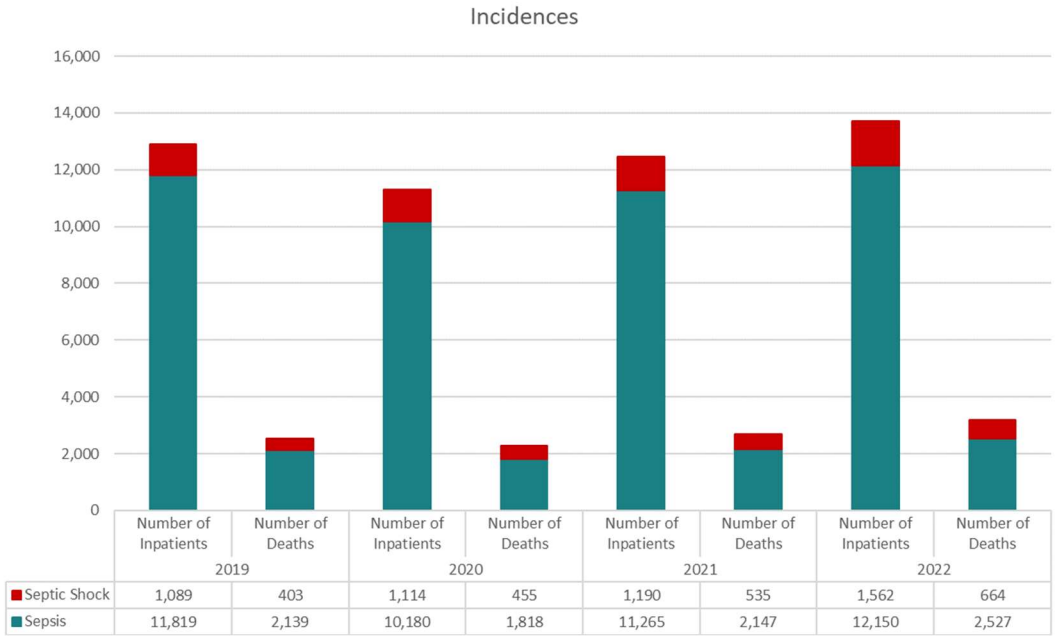
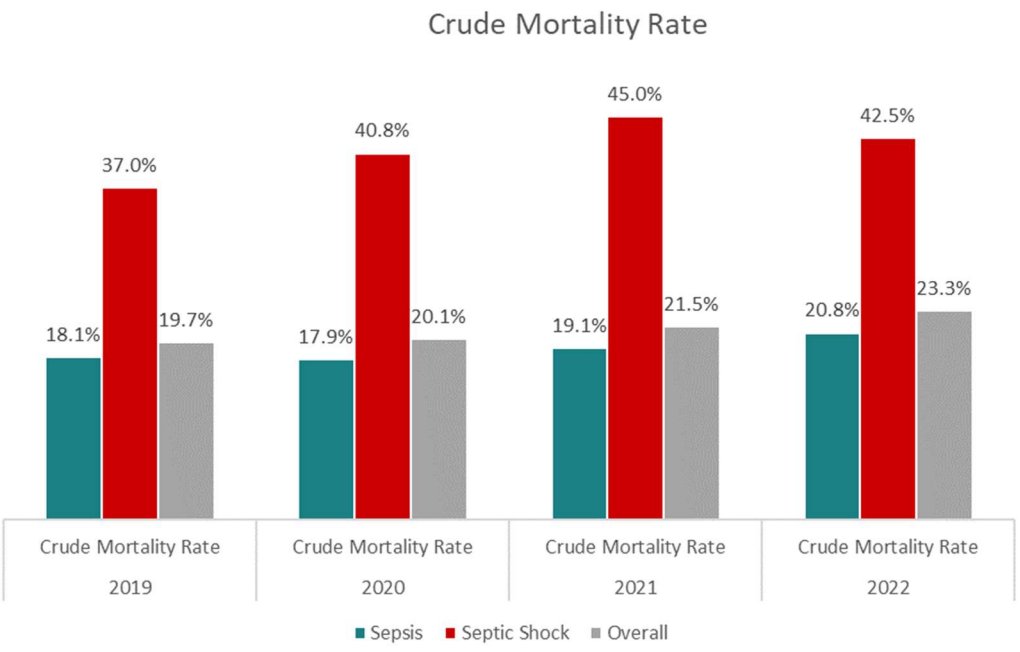


Figure 8: Adult inpatients (non-maternity) with a diagnosis of sepsis or septic shock, incidences and crude mortality rate 2020-2022.



Specialties:

Maternity

In 2022, there were 283 pregnancy-related cases of sepsis, with no associated deaths. (Table 3).

Table 3: Maternal sepsis-associated incidence and crude mortality rates, 2011-2022

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%

Paediatrics

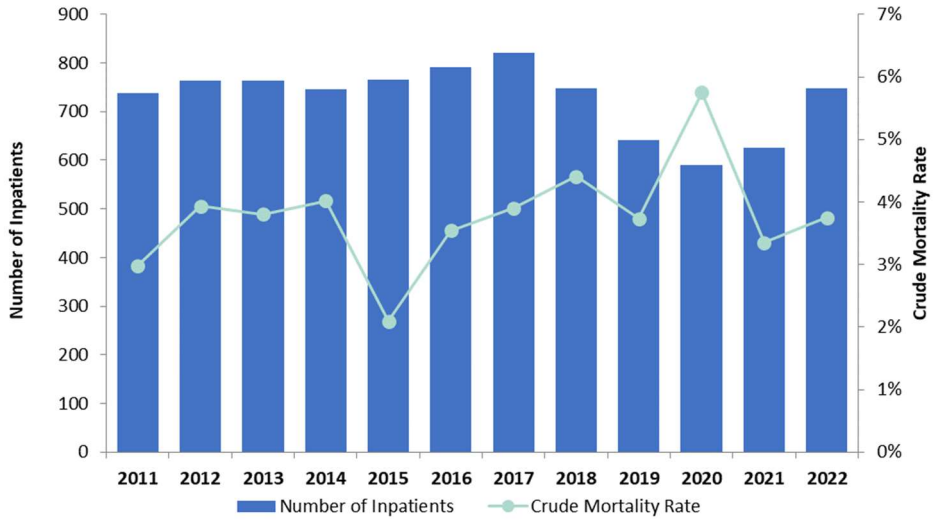
The majority of paediatric morbidity and mortality occurs in the under ones when the immune system is still immature (Table 4).

Table 4: Paediatric sepsis-associated incidence and crude mortality rates, by age group 2019 - 2022

Age Group	Number of Inpatients	Number of Deaths	Crude Mortality Rate
Under 1 Year of age	2026	84	4.1%
1-9 Years	389	12	3.1%
10-15 Years	191	11	5.8%
Total	**2,606**	**107**	**4.1%**

We had previously anticipated that the number of documented cases of paediatric sepsis would increase in 2022 in conjunction with the implementation of the Surviving Sepsis Campaign International Guidelines in paediatric settings in Ireland (Figure 9). In 2022 we also noted an increase in invasive Group A Streptococcal (iGAS) sepsis cases which was mirrored internationally.

Figure 9: Paediatric sepsis-associated incidence and crude mortality rates, 2011- 2022.



Medicine and Surgery

In 2022, adult sepsis inpatients with a medical Diagnostic Related Group (DRG) accounted for 83% of all adult inpatients with sepsis (excluding maternity) while those with a surgical DRG accounted for 17%. 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, 2022.

Surgical / Medical DRG	Number of Inpatients	Number of Bed Days	Average Length of Stay	Crude Mortality Rate
Surgical	2,317	109,412	47.2	28.3%
Medical	11,395	203,144	17.8	22.2%
Total	**13,712**	**312,556**	**22.8**	**23.3%**

* '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 47.2 days which is triple that of medical patients (17.8 days (Table 5)). To put this in context, Table 6 below identifies the AvLOS for sepsis, infection, and all other diagnoses for surgical patients.

Surgical patients with a sepsis diagnosis have more than double the length of stay than those with an infection diagnosis (n=21.7 days) and nearly 10 times the length of stay of those with any other diagnosis (n=4.9 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.

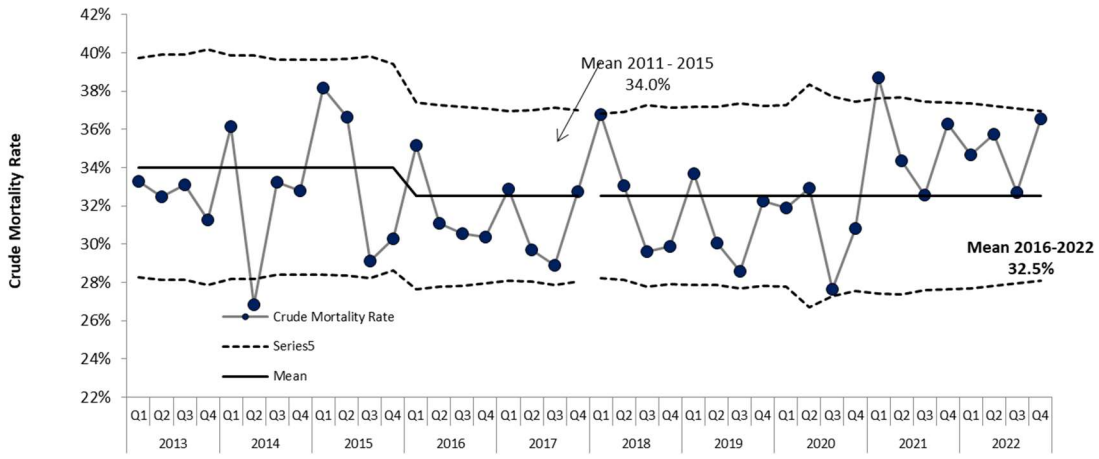
Table 6: Adult inpatient with a diagnosis of sepsis vs diagnosis of infection or all other diagnoses, 2022.

Diagnosis	No. of pts.	AvLOS
Sepsis	2,317	47.2
Infection	13,188	21.7
All other Diagnoses	72,044	4.9
Total	87,549	8.6

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 2016-2022 this dropped to 32.5% 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, 2011 – 2022.



In 2022, 27.1% 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).

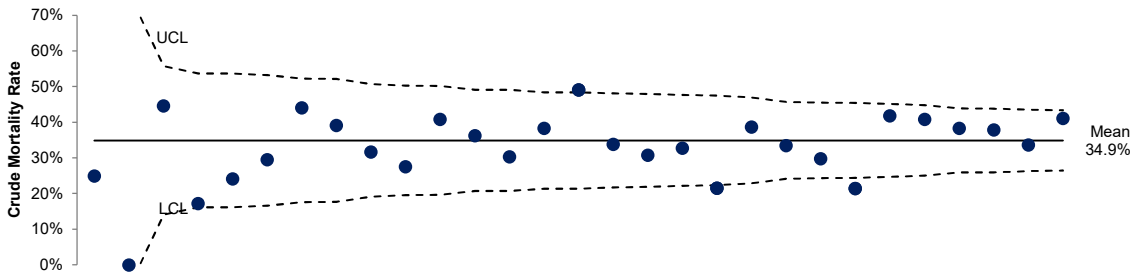
Table 7: Admission and crude mortality rates for adult inpatients (non-maternity) admitted to a critical care area with a diagnosis of sepsis or septic shock, 2022

	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	3,718	34.9%	9,994	18.9%

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. The majority, 74.6%, are managed on a general ward and in 2022 these patients had a mortality rate of 18.9% which is significant when compared with other time dependant medical emergencies such as acute myocardial infarction 6.9% 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, 2022.



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, 2022

Diagnosis	Number of Inpatients	Number of Bed Days	Average Length of Stay (Days)
Sepsis	13,712	312,556	22.8
Infection	118,986	1,511,297	12.7
All Other Diagnoses	305,358	1,473,170	4.8
Total	**438,056**	**3,297,023**	**7.5**

Table 9: Healthcare outcomes – Sepsis vs infection and all other diagnoses, 2022

Diagnosis	Number of Inpatients	% Total inpatients	Number of deaths	% Total deaths	Crude mortality rate
Sepsis	13,712	3.1%	3,191	25.4%	23.3%
Infection	118,986	27.1%	5,548	44.2%	4.7%
All Other Diagnoses	305,358	70%	3,821	30.4%	1.3%
Total	438,056		**12,560**		**2.9%**

Key findings:

Sepsis patients account for only 3.1% of the total in-patient population but have almost 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 2022 (27.1% vs 22.6%) (Figure 12).

Figure 12: Crude mortality rate for adult inpatients with a diagnosis of infection or sepsis and with/without COVID-19, 2022

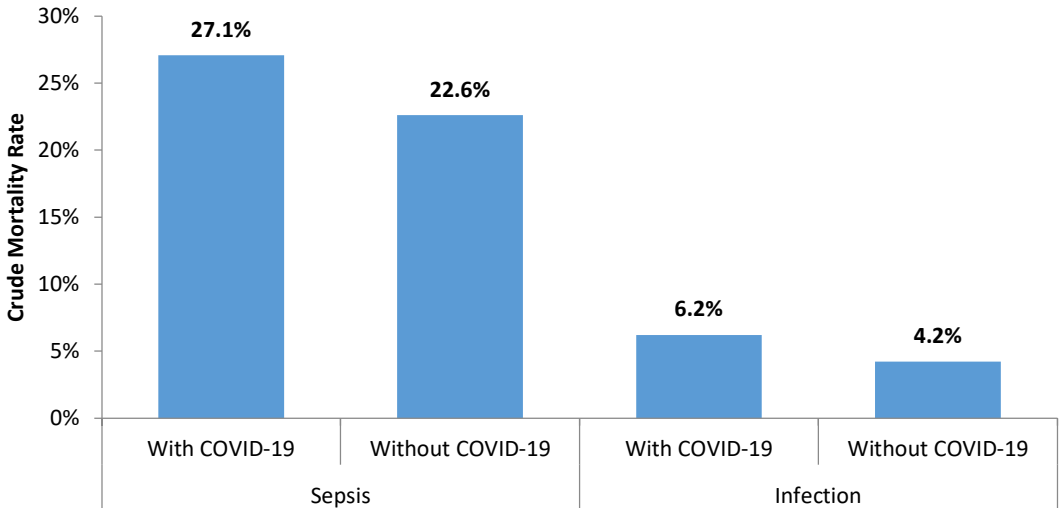


Table 10: Inpatients with a diagnosis of sepsis and with/without COVID-19, by age group 2022, (adult non maternity patients only).

	Sepsis with COVID-19		Sepsis without COVID-19		Total	
Age Group	Number of Inpatients	Crude Mortality Rate	Number of Inpatients	Crude Mortality Rate	Number of Inpatients	Crude Mortality Rate
16-44 Years	102	10.8%	854	8.3%	956	8.6%
45-64 Years	363	21.8%	2,592	15.1%	2,955	15.9%
65-84 Years	1,100	27.5%	6,151	23.8%	7,251	24.4%
85+ Years	447	34.0%	2,103	34.1%	2,550	34.1%
Total	**2,012**	**27.1%**	**11,700**	**22.6%**	**13,712**	**23.3%**

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 2022 (43.7% vs 27.1%), possibly indicating the decreasing severity of disease as the coronavirus continues to evolve.

Table 11: Inpatients admitted to/not admitted to critical care with a diagnosis of sepsis and with/without COVID-19, 2022.

		Sepsis with COVID-19	Sepsis without COVID-19	Total
Admitted to Critical Care	**Number of Cases**	635	3,083	3,718
	Average Length of Stay in Days	59.0	28.2	33.4
	Crude Mortality Rate	31.8%	35.6%	34.9%
Not Admitted to Critical Care	**Number of Cases**	**1,377**	**8,617**	**9,994**
	Average Length of Stay in Days	37.6	15.8	18.8
	Crude Mortality Rate	24.9%	18.0%	18.9%
Total	**Number of Cases**	**2,012**	**11,700**	**13,712**
	Average Length of Stay in Days	44.3	19.1	22.8
	Crude Mortality Rate	27.1%	22.6%	23.3%
Percentage Admitted to Critical Care		46.5%	31.6%	26.4%

The numbers of patients admitted to the critical care unit with sepsis and COVID-19 increased in 2022 compared to 2021 (635 vs 465) and these accounted for 46.5% of all cases of sepsis with COVID-19 (Table 11). However, there was a decrease in mortality for this cohort when compared with 2021 (31.8% vs 50.8%). 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 2022, EARS-Net data were received from 35 of 36 microbiology laboratories in Ireland with an estimated 97.5 % coverage of the Irish population. In 2022, 6635 isolates of all eight EARS-Net pathogens were reported, which is 6% higher than in 2021 (n=6262) but slightly lower than in 2019 (n=6665). When comparing only the 35 laboratories that consistently reported over the latest five-year period (2018-2022), the numbers reported in 2022 were 4% higher than in 2019.

Six pathogens saw an increase in the numbers of cases reported when data from 2022 was compared to 2019 (+38 % for *E. faecium*, +22% for *E. faecalis*, +21% for *Acinetobacter* spp., +12 % for *P. aeruginosa*, +5% for both *S. aureus* and +1% for *E. coli*), while two pathogens saw a decrease (*K. pneumoniae*, - 9%; and *S. pneumoniae*, -19%). Across the EU/EEA, however, the overall number of all pathogens reported between 2021 and 2022 increased for *S. pneumoniae* (+71.2%) and decreased for *Acinetobacter* spp. (-29.0%). The numbers of *P. aeruginosa, E. coli, S. aureus, K. pneumoniae, E. faecium* and *E. faecalis* infections remained relatively stable between 2021 and 2022.

In Ireland, most of the key AMR indicators showed no significant trend over the latest five year period (2018-2022) with the following exceptions:

1. **Meticillin-Resistant *S. aureus* (MRSA):** The proportion of MRSA decreased slightly from 12.4% in 2018 to 10.6% in 2022, its lowest level since surveillance began in 1999. In fact, MRSA has been decreasing steadily since 2006, when it peaked at almost 42%. 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 VREfm decreased from 40.2% in 2018 to 27.7% in 2022. The lowest level to date was in 2021 with 27.5%. By contrast, 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 Europe.
3. **Third-Generation Cephalosporin Resistant *E. coli*:** The proportion of 3rd generation cephalosporin resistance among invasive *E. coli* infections has been consistently decreasing in the last five years from 12.9 % in 2018 to 9.7 % in 2022.
4. **Fluoroquinolone Resistant *K. pneumoniae*:** Fluoroquinolone resistance in K. *pneumoniae* infections halved in the last five years in Ireland. The proportion of resistant isolates was 18.0 % in 2018 and it decreased to 9.9 % in 2022.

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 almost 1 in 3 *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 2.6% CRA in 2022, the EU/EEA weighted mean was 36.3%. 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, CRE in Ireland is still very low (1.6%) compared to levels seen in Southern Europe, especially among K. pneumoniae, with proportions exceeding 25% in Bulgaria, Cyprus, Greece and Romania. In 2022, 2.6% of Acinetobacter spp. isolates were reported as resistant in Ireland, the situation here contrasts greatly with what is seen in Southern and Eastern Europe, where CRA has increased to critical levels exceeding 60% in over one-third of EU/EEA countries. 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 assocated with colonisation and infection (both invasive and non-invasive) re-commenced in 2022. Data were received from all but two of the 36 laboratories in Ireland. Of the 861 isolates reported, 88% were associated with colonisation, 10% with non-invasive infection and 2% with invasive infection (this breakdown is similar to that for last reported data from 2018). Comparing only the labs that reported data for both 2018 and 2022, the number of CPEs has increased by 60%. The majority of CPE reported in both years had OXA-48-like enzymes, accounting for 74% in 2018 and 73% in 2022. The composition of the remaining isolates has changed over the past 5 years, with a decrease in KPC (from 15% to 8%) and increases in both NDM (from 5% to 9%) and VIM (from 4% to 7%). This highlights the value and importance of conducting this surveillance.

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 2022, 2,216 cases of CDI were notified to public health. Of these, 1,829 (83%) were classified as new cases, 149 (7%) as recurrent and 238 (11%) as unknown case type. The national crude incidence rate for new and recurrent CDI per 100,000 population was 39.7, higher than that reported in 2021 (32.8; also, higher than 37.2, the annual mean for 2016-2020). As in previous years, the majority of CDI was reported in patients aged ≥65 years (66%).

Healthcare-associated (HCA) CDI accounted for the origin of 58% (n=993) of all cases, equating to a national incidence rate for new and recurrent HCA-CDI, that originated within the participating hospital, of 2.3 per 10,000 bed days used (BDU), which was higher than that of 2021 (2.1); and lower of the annual mean for 2016-2020 (2.4).

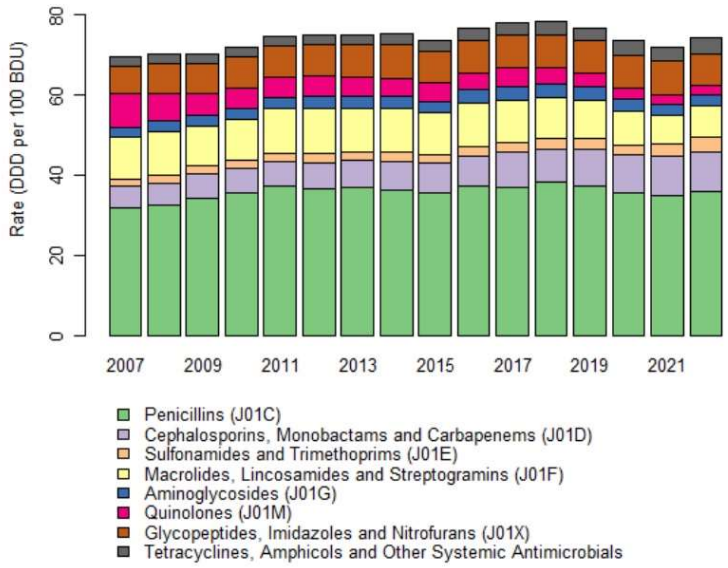
Antimicrobial consumption:

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 prescriibing (Acute hospitals):

- The provisional median rate of systemic antibacterial consumption in 43 public acute hospitals in Ireland for 2022, as expressed in Defined Daily Doses per 100 bed days used (DDD/100BDU) was 67.9, a decrease on the figure of 70.1 in 2021.
- The overall national consumption (mean) increased from 72.1 DDDs/100BDU in 2021 to 72.9 DDD/100BDU in 2022. This rate of antimicrobial consumption is mid-range in comparison with other European countries.
- Carbapenem consumption decreased slightly from 2021, going from 2.3 DDDs/100BDUs to 2.2 DDDs/100BDUs. Consumption of fluoroquinolones, second and third-generation cephalosporin consumption has remained stable. Overall consumption of penicillins increased slightly between 2021 and 2022, however the increase was significant for combinations of penicillins with enzyme inhibitors, with 22.2 DDD/100BDU in 2021 to 23.5 DDD/100BDU in 2022.

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



Quality of antimicrobial prescribing (Acute hospitals):

The following data is from the 2022 national antimicrobial point prevalance survey (PPS). For further information, please see https://www.hse.ie/eng/services/list/2/gp/antibiotic-prescribing/hospital-related-guidelines/national-antimicrobial-pps-2022-in-acute-hospitals-summary-report.pdf

The 2022 national antimicrobial PPS included 53 hospitals, the highest number of participating hospitals to date (2021: 52, 2020: 48, 2019: 45), and 10,463 patients were reviewed (2021: 10,388, 2020: 8458, 2019: 8916); 9,132 were patients in public hospitals and 1,331 were patients in private hospitals.

In total, 3884 patients received at least one antibiotic which equates to an overall prevalence of 37% (2021: 38%, 2020: 39%, 2019: 38%). The median prevalence of antimicrobial use by hospital was 39%, remaining largely unchanged over the last number of years (2021: 39%, 2020: 40%, 2019: 40%).

Fifty-three per cent of antimicrobials were prescribed for community infection (2021: 52%, 2020: 54%, 2019: 55%) and 23% for healthcare associated infection (2021: 25%, 2020: 24%, 2019: 25%). In thirty-three percent of therapies prescribed for surgical antibiotic prophylaxis the duration extended beyond 24 hours. Pneumonia, intra-abdominal and skin/soft tissue infections were the most common body sites with infection for which antimicrobials were prescribed: 26%, 15% and 12% respectively (2021: 26%, 14% and 12%).

The **WHO AWaRe classification** is a tool to evaluate and monitor antimicrobial use and support appropriate antimicrobial use.

- 'Access' antibiotics are mostly first-line and second-line therapies that offer the best therapeutic value, while minimising the potential for AMR,
- 'Watch' antibiotics have higher AMR potential and should be prioritised in stewardship and monitoring efforts. 'Watch' antibiotics include most of the

highest priority agents in the WHO Critically Important Antimicrobials for Human Medicine.

- 'Reserve' antibiotics include antibiotics of last resort and should be saved for treatment of confirmed or suspected infections due to multidrug-resistant organisms.

In the 2022 PPS, of the prescribed antibiotics, 48% were 'Access' category, 49% 'Watch' category and 3% 'Reserve' category. Eighty-six per cent of antimicrobial prescriptions were considered to be of appropriate duration at the time of the PPS (2021:84%, 2020: 89%). An increasing trend in the proportion of prescriptions with a planned review or duration documented was observed (2022: 53%, 2021: 47%, 2020: 45%, 2019: 42%). The percentage of antimicrobials where choice was in line with local guideline or clinical microbiology/infectious diseases approved remained stable at 85% (2021: 84%, 2020: 85%, 2019: 84%)

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 greater integrated approach to sepsis, deteriorating patient and clinical handover 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 June 2022. The Sepsis Steering Committee is currently being re-established and will develop and progress the Action on Sepsis: Five Year Strategy (2024 – 2029).

Having reviewed international best practice, the NQPSD and the NSP have identified the priority areas for inclusion in the Action on Sepsis: Five Year Strategy (2024 – 2029) for the HSE. The provision of identified programme resources is an essential requirement to delivery on this plan, as well as consultation, input, and support for implementation from key stakeholders.

The Action on Sepsis: Five Year Strategy (2024 – 2029) will build on and enhance the existing priorities and work of the programme. The Strategy will include preventative measures, awareness of recognition, standardised management, and follow up and management of those that survive sepsis, as they suffer significant morbidity, and are at increased risk of recurrence of sepsis.

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 programme.
- Group Sepsis ADONs:
    - Provide support to local sepsis 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.

Sepsis associated crude mortality rates for 2022 per Hospital Group are presented in table 12.

Table 12: Hospital Group crude mortality rate for sepsis & septic shock, 2019-2021 Adult inpatients only, excluding maternity and paediatrics

Hospital Group	2020	2021	2022
Dublin Midlands	21.5%	22.2%	23.6%
Ireland East	18.9%	22.5%	23%
RCSI	19.8%	19.9%	22.5%
SAOLTA	20.4%	20.8%	25%
South SouthWest	20.3%	22.4%	22.7%
University of Limerick	22.5%	18.7%	23.6%
National	**20.1%**	**21.50%**	**23.3%**

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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
Lorna Quigley	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	National Clinical Lead, National Sepsis Programme
Lorna Quigley	National Sepsis Programme Manager
Prof. Garry Courtney	National Clinical Lead Acute Medicine
Prof Debbie McNamara	National Clinical Programme for Surgery
TBC	National Clinical Programme for Surgery
TBC	National Clinical Lead Obstetrics and Gynaecology
Dr. Karen Power	National Clinical Programme for Obs & Gynae
Dr. Michael Power	National Clinical Lead Critical Care
Dr. Omar Tujjar	National Clinical Lead Anaesthesia
Dr. Gerry McCarthy	National Clinical Lead Emergency Medicine
Fiona McDaid	Emergency Medicine Programme
Dr. Diarmuid O'Shea	National Clinical Programme for Older Persons
Siobhan Horkin	National Clinical Programme for Paediatrics and Neonates
Dr. Marie Keogan	National Clinical Lead – Pathology
TBC	Hospital Group CDONM representative
TBC	NCHD representative
Dr Michael O'Connor	NCAGL Acute Hospitals Division
Dr. Geraldine Shaw	ONMSD

Deirdre Murphy/ Jacqui Curley	Health Pricing Office
Declan McKeown	Health Intelligence Unit
Dr David O'Hanlon	Primary Care
Blathnaid Connolly	Deteriorating Patient Programme
Barbara Egan	Patient representative
Linda Dillon	Patient Advocacy Group
TBC	Pre-Hospital Emergency Care Council
Ms Anne McCabe	NASCCRS (National Ambulance Service and critical care and retrieval services)
TBC	AMRIC representative
Gethin White	Library Services DSH
Tony McNamara	Hospital CEO/GM representative
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 2022

Member	Title
Dr. Michael Dwyer	National Clinical Lead, National Sepsis Programme
Lorna Quigley	Programme Manager National Sepsis Programme
Sue Markey	Group Sepsis ADON RCSI Hospital Group
Karen D Holden	Group Sepsis ADON Dublin Midlands Hospital Group
Celine Conroy	Group Sepsis ADON Ireland East Hospital Group
Denise McCarthy / Sinead Horgan	Group Sepsis ADON South/South West Hospital Group
Ronan O'Cathasaigh	Group Sepsis ADON Saolta Hospital Group
Yvonne Young / Anne Calitz	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