NATIONAL SEPSIS REPORT 2018

Feidhmeannacht na Seirbhíse Sláinte
Health Service Executive

Clinical Design and Innovation

October 2019

NATIONAL SEPSIS OUTCOME REPORT 2018

Dear Colleagues,

The purpose of this report is to describe the burden of sepsis, in terms of the number of cases and the associated mortality, to our healthcare system. Whilst sepsis occurs in all age groups and all sectors of society, it most commonly occurs in the extremes of age and in individuals with co-morbidities. This report shows the pattern of sepsis incidence in Ireland and informs us on 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 and provides evidence to support the use of preventative strategies, such as vaccination, in these at risk people.

The most effective way to reduce mortality from sepsis is by prevention, good sanitation, personal hygiene, eating healthily and exercising moderately, breast feeding, getting vaccinations for vaccine preventable infections and avoiding unnecessary antibiotics.

The next most effective way is early recognition and treatment. This is not simple. Sepsis evolves over time and the pattern of evolution is extremely variable as it depends on the patient's general health status, their genetic response to infection and the characteristics of the infecting microbe. Thus, the patient's characteristics (e.g. age, co-morbidities, medications) represent only one aspect of the pattern, the genetic response and the microbe characteristics (e.g. virulence, lethality) have to be inferred by the degree of physiological derangement on presentation and the clinical course of the illness.

Four processes have to occur to give the patient the best opportunity to survive:

i) Recognition at point of presentation or deterioration (e.g. Triage, NEWS and/or clinical judgment)
ii) Escalation to a medical review if the patient's symptoms or presentation suggest infection as the likely or suspected cause of patient deterioration
iii) Following medical review the patient is treated with the Sepsis 6, which includes blood tests being sent to assess organ function
iv) Review the patient's response to initial therapy with the results of further clinical examination, and the available tests and investigations and amend the treatment plan accordingly

This report outlines the status of sepsis in Ireland in 2018 based on data extracted from the Hospital Inpatient Enquiry (HIPE) dataset. Much has been made of the limitations of administrative or claims based datasets when compared to electronic health record (EHR) data, fortunately a plan for the introduction of a National EHR is currently being evaluated. All datasets have limitations and are dependent on methodologies used to identify and extract datasets. 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.

We acknowledge the change in sepsis definition so that the systemic inflammatory response to infection without organ dysfunction (R65.0) is no longer included in the suite of sepsis diagnosis. For the purpose of trend data this diagnosis continues to be included however, for 2018 standalone data it is not and where this occurs, it is clearly documented. Our aim for 2019 data is that Systemic Inflammatory Response (SIRS) data will be excluded from the report.

The report also shows a 1.8 percentage point increase in mortality (17.6% in 2017 versus 19.4% in 2018), a relative increase of 10.1%. A possible explanation for this increase in mortality may be that in 2016, the Third International Consensus Definitions for Sepsis and Septic Shock were published by the Journal of the American Medical Association, and adopted by the Irish National Sepsis Programme in 2018. The new definition of sepsis defined it as 'life-threatening organ dysfunction caused by a dysregulated host response after infection. The impact of this adjustment is that less people will be coded as having sepsis than would have been under the previous definition. With the addition of organ dysfunction to the new definition, individuals coded under this new definition are invariably a higher acuity cohort with a higher expected mortality.

The outcomes in this report are the result of the hard work and dedication of the staff caring for sick people in our acute hospital 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 Committee, which in many included a dedicated Sepsis Nurse, who took on these additional responsibilities with no reward other than the improved care of their patients. Credit also to the Group Sepsis Assistant Directors of Nursing who provided awareness, education and painstaking audit to feedback to the Hospitals, Hospital Groups and to inform national data so that the ongoing education efforts could be strengthened.

Thanks also to the coders for their hard work and it is our intention to run further sepsis coding workshops in 2020. We would also like to thank the members of the audit subcommittee (Appendix 1) who include the Healthcare Pricing Office, the Office of Coding and indeed our statistician, Grainne Cosgrove from the National Quality Improvement Team, without whom this report would not be possible. Also, thank you to Ciara Hughes, Programme Manager, for her dedicated work that has positively impacted on the success of the programme. We would also like to thank Dr Vida Hamilton, Dr Fidelma Fitzpatrick and the team from the Health Protection Surveillance Centre for their contribution to this report. The National Sepsis Programme is overseen by the National Sepsis Steering Committee (Appendix 2) and effected through the National Sepsis Team (Appendix 3). The codes used for this analysis are outlined in Appendix 4.

Go raibh mile maith agat,

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THE MOST EFFECTIVE WAY TO REDUCE MORTALITY FROM SEPSIS IS BY PREVENTION, GOOD SANITATION, PERSONAL HYGIENE, EATING HEALTHILY AND EXERCISING MODERATELY, BREAST FEEDING, GETTING VACCINATIONS FOR VACCINE PREVENTABLE INFECTIONS AND AVOIDING UNNECESSARY ANTIBIOTICS.

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Key Findings

The following figures include adult, maternity and paediatric patients.

Number of cases of SIRS of infectious origin, sepsis, septic shock cases, 2018	16,578
Crude mortality rate, 2018	18.5%

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

Number of cases of SIRS of Infectious Origin, Sepsis, Septic shock	15,379
In-hospital mortality SIRS of Infectious Origin, Sepsis, Septic Shock	19.7%
Number of cases of Sepsis & Septic Shock	14,639
In-hospital mortality rate: Sepsis & Septic Shock	20.3%
Average length of stay	21.9 days

Specialty based data:

Paediatric sepsis-associated hospital mortality rate	4.5%
Maternal sepsis-associated hospital mortality rate	0.5%
Surgical DRG sepsis-associated hospital mortality rate	24.8%
Medical DRG sepsis-associated hospital mortality rate	19.4%

Key Comparators with 2017

Mortality: In the adult, non-maternity cohort, there was a relative increase of 10.1% in mortality, which equates to 1.8 percentage point increase (17.6% in 2017 versus 19.4% in 2018) when compared with 2017 data.

There was a 10.1% decrease in documented cases of SIRS of Infectious Origin, sepsis and septic Shock with an increase of 6.7% on average length of stay. The total number of deaths from sepsis decreased from 3,068 in 2017 to 3,028 in 2018.

Sepsis: There were 13,547 cases documented in 2018, an 11.7% decrease over 2017, with an in-hospital mortality of 18.6% representing a 9.4% increase in mortality.

Septic Shock: There were 1092 cases documented, 12.5% increase over 2017, with an in-hospital Crude mortality of 41.6%, representing a 3.2% increase in Crude mortality compared with 2017.

Change of definition and change in mortality

In 2016, the Third International Consensus Definitions for Sepsis and Septic Shock were published by the Journal of the American Medical Association*. The new definition defined sepsis as 'life-threatening organ dysfunction caused by a dysregulated host response to infection'.
This altered definition was adopted by the National Sepsis Programme and allows clinicians to focus appropriate care on the cohort of patients that need additional support and monitoring.

- The impact of this adjustment is that less people will be coded as having sepsis than would have been under the previous definition and therefore it might be expected that the number of cases detected may fall.

- With the addition of organ dysfunction to the new definition, individuals coded under this new definition are invariably a higher acuity cohort than those coded previously, and it may be expected that the mortality rate may increase.

The adoption of the new criteria are reflected in the 2018 figures. There has been a 10% increase in associated in-hospital mortality rate in adult, non-maternity cohort in comparison to 2017 data.

Despite the changes in both detection and mortality rates, it is important to note that the actual number of deaths from SIRS of infectious origin and sepsis dropped from 3,068 in 2017 to 3,028 in 2018.

*The Third International Consensus Definitions for Sepsis and Septic Shock (Sepsis-3)
Mervyn Singer et al. JAMA. 2016;315(8):801-810.

Key Recommendations

1	The 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.
2	Continued support for the sepsis quality improvement programme at a national level and for the hospital sepsis committees.
3	The development and implementation of the national paediatric sepsis guideline update.
4	Increased awareness and education about sepsis in primary and community care.
5	Increased awareness about sepsis amongst the general public.
6	Continued education of clinicians and HIPE coders in the new definition with emphasis on documentation of infection and associated organ dysfunction.

National Sepsis Report 2018

An Overview of the Burden of Sepsis-Associated Mortality and Healthcare Usage, 2011 - 2018, as captured by the Hospital In-Patient Enquiry database (HIPE).

HIPE dataset

The data captured in this dataset is dependent on the documentation in the patients' medical notes and its' coding. An external, independent body reviewed the quality of coding in 2015 and the subsequent report is available at www.hpo.ie.

The National Sepsis Programme provides clinical decision support tools, the sepsis forms (Appendix 5), that facilitate diagnosis and correct risk stratification and from which Coders can code, provided a medical professional signs the form.

Population studied

ICD–10–AM Diagnosis codes were used to identify patients with sepsis (appendix 4a) and infection (appendix 4b). In 2015, the 8th edition of ICD-10-AM was introduced and this includes new codes:

R57.2 Septic Shock
R65.0 Systemic inflammatory response syndrome (SIRS) of infectious origin without acute organ failure
R65.1 Systemic inflammatory response syndrome (SIRS) of infectious origin with acute organ failure (severe sepsis)

The inclusion of these new codes means the datasets analysed pre- and post-2015 are not identical and this needs to be taken into consideration when interpreting trends over the past 5 years.

Furthermore, in 2016, the latest definition of sepsis, Sepsis-3, excludes R65.0, SIRS of infectious origin without organ failure. For the purpose of trend analysis the same codes have been used as for the 2015 analysis. However, for the purposes of international benchmarking and in order to be Sepsis-3 compliant R65.0 has been excluded from the national sepsis-associated hospital mortality rate (20.3% in 2018).

These codes were interrogated in patients aged 16 + in the acute hospital sector. Maternity patients with sepsis, identified by maternity specific codes (appendix 4c), were excluded as they are subject to analysis and reporting by Maternal Death Enquiry Ireland.

Limitations

Administrative databases are limited to what is documented in the patients' case notes (The Coding Process, Appendix 4).

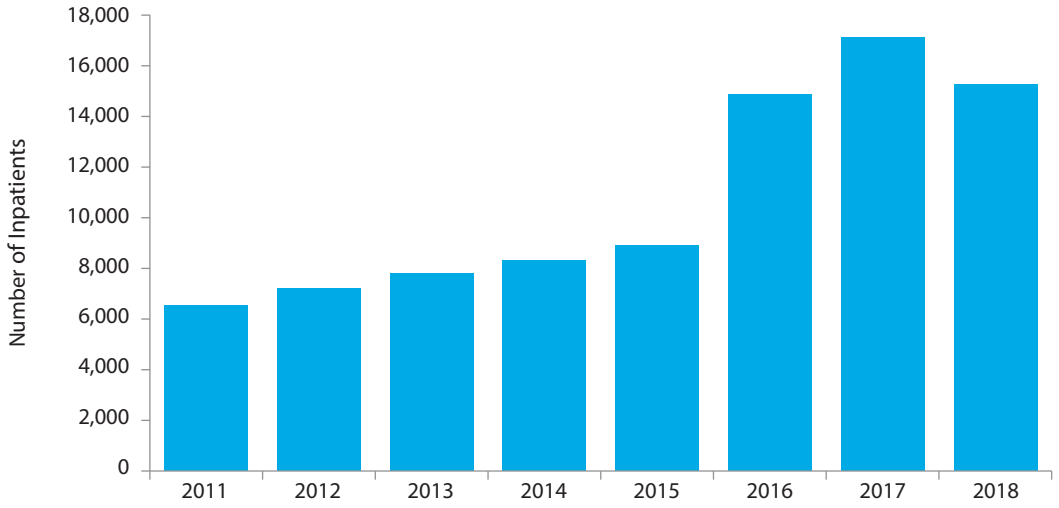
In order to severity-adjust for limited benchmarking, the surrogate of patients with a diagnosis of sepsis and critical care admission' was used. Critical care requirement was identified by admission to CCU, HDU, ICU or an Intensive Care Consultant code. The advantage is that it includes critically ill 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 take into account 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. Sex difference in sepsis incidence occurs but not in mortality. Based on the current analysis, the requirement to develop and validate a sepsis mortality prediction model and an associated mortality prediction score for the HIPE database is identified.

The data presented in this report are based on inpatients in publically 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.

The Epidemiology of Sepsis in Ireland

FIGURE 1: The number of adult patients with a diagnosis of SIRS of Infectious Origin, Sepsis & Septic Shock, 2011- 2018 (excludes maternity).



Between 2011 and 2015 sepsis cases were increasing by approximately 7% per annum. In 2015, there was a nationwide education campaign as part of the implementation programme of the 2014 National Clinical Guideline No.6: Sepsis Management. This resulted in a 67% increase in the recognition and documentation of sepsis cases. The effect of ongoing sepsis awareness education is reflected in the increase in cases documented between 2015 and 2018.

Co-morbidity data

In the process audits carried out in 2018, the average patient with sepsis was in their mid-seventies, and had 2 co-morbidities, again higher than the previous year (1.3). However, one explanation for this may be that one of the audit cohorts was patients admitted from a residential setting where the age profile is generally older and these patients also tend to have more comorbidities. The following figures outline the effects of age and co-morbidity on incidence and mortality.

FIGURE 2: The number of adult patients with a diagnosis of sepsis by age group, 2018 (excluding SIRS of infectious origin).

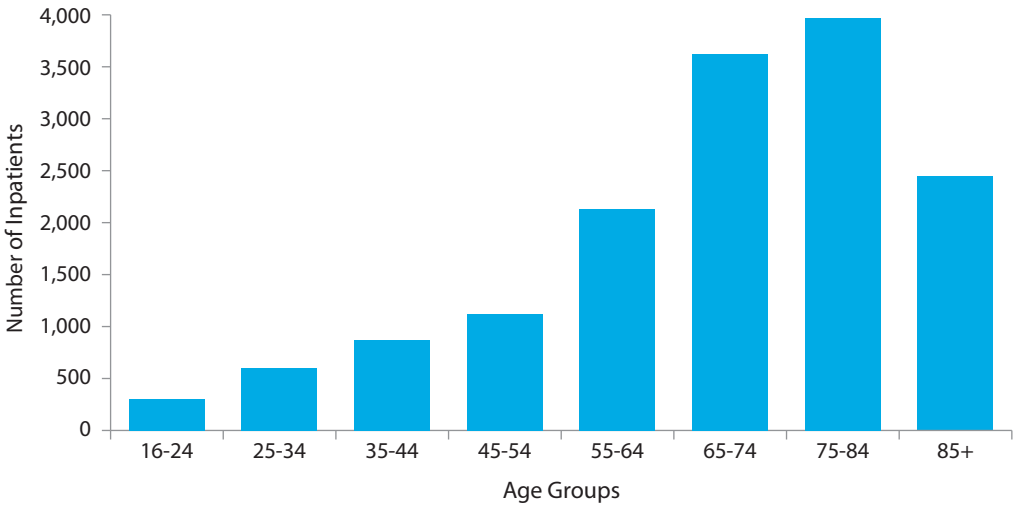
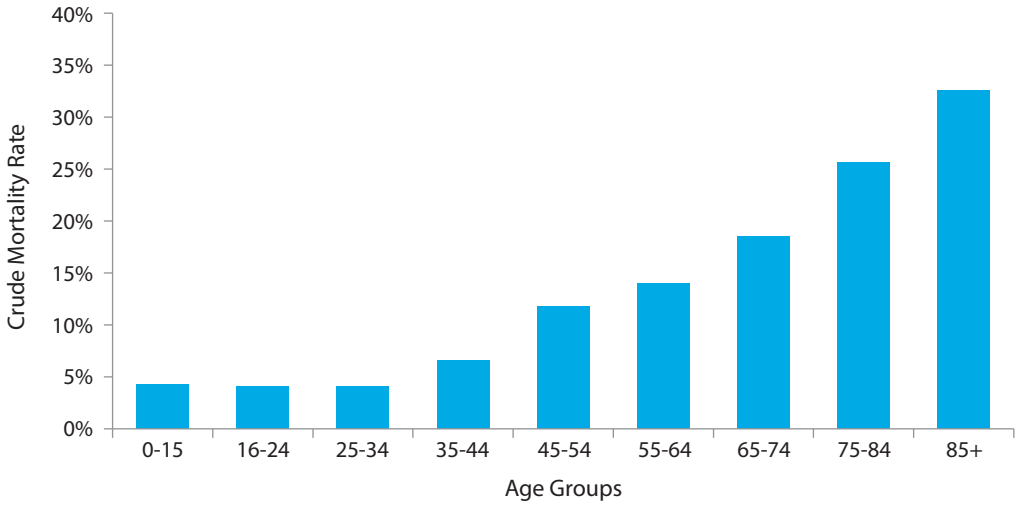


FIGURE 3: In-hospital mortality for inpatients with a diagnosis of sepsis by age groups, 2018 (excluding SIRS of infectious origin).



Whilst sepsis incidence increases with age in adults, mortality peaks at the extremes of age. The majority of paediatric morbidity and mortality occurs in the under ones when the immune system is immature and with aging co-morbidities are accumulated and the immune system gradually deteriorates leading to increases in both incidence and mortality.

TABLE 1: Inpatients with a diagnosis of sepsis and selected co-morbidities; number of cases and crude mortality rates, 2018.

Co-morbidity	Number of cases	Crude Mortality Rate %
Mental & Behavioural Disorders due to Alcohol	603	27.7%
Chronic Obstructive Pulmonary Disease	2,023	26.5%
Cancer	3,376	21.3%
Chronic Kidney Disease	2,130	28.6%
Chronic Liver Disease	507	41.6%
Diabetes	3,152	23.3%
HIV Disease	28	7.1%

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

FIGURE 4: In-hospital mortality rate for inpatients with a diagnosis of sepsis and selected co-morbidities, 2018

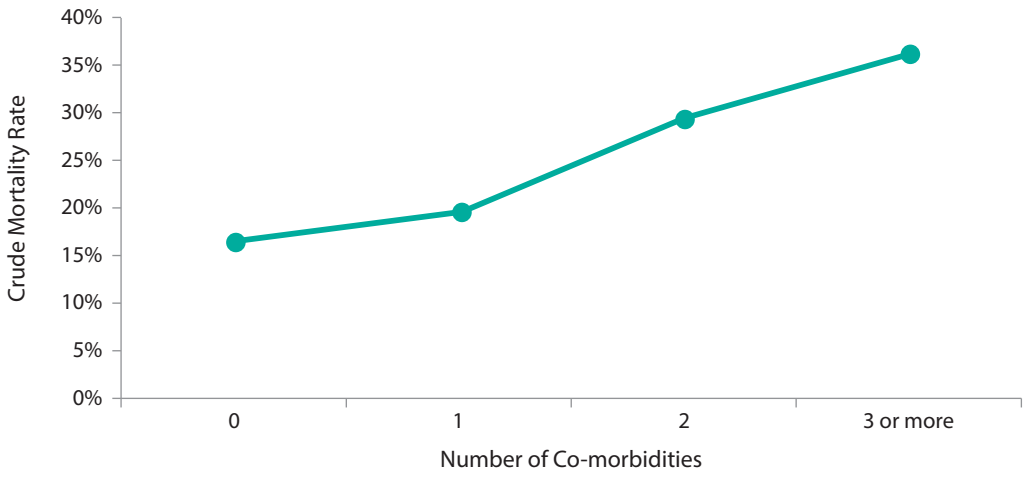


FIGURE 5: The number of adult males and females with a diagnosis of SIRS of Infectious Origin and Sepsis, 2011 – 2018.

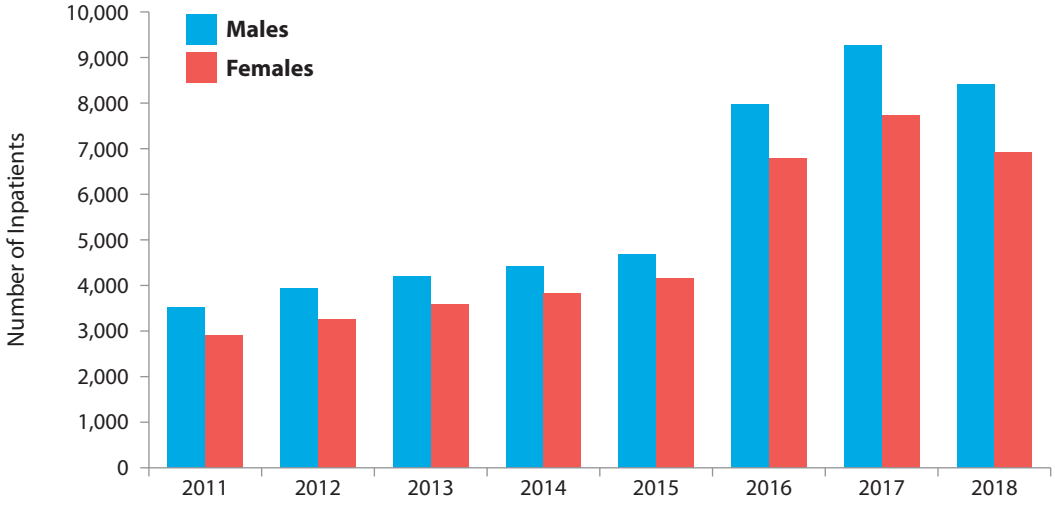
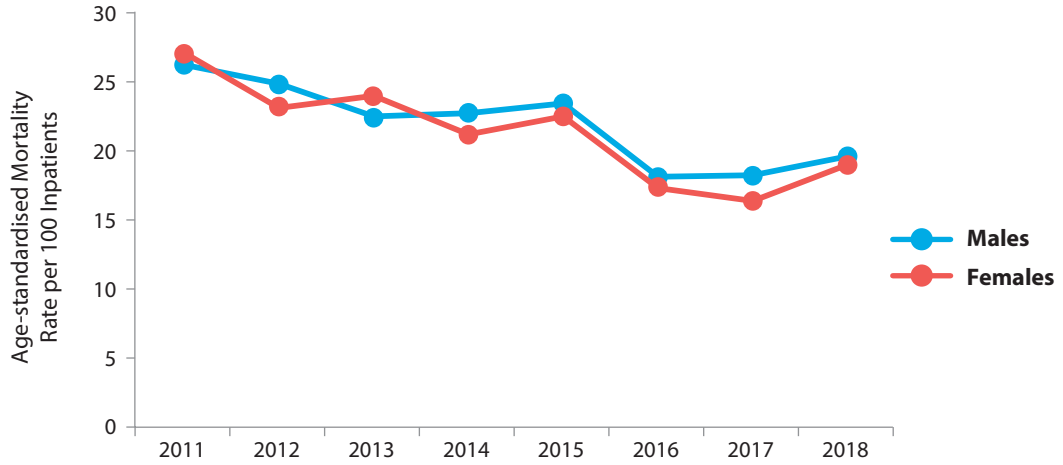
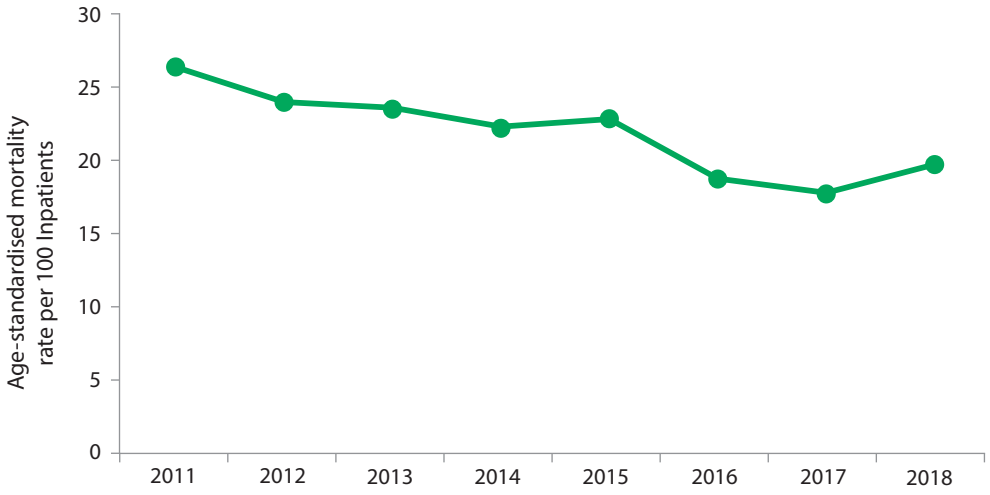


FIGURE 6: The age-standardised in-hospital mortality rates for adult males and females with a diagnosis of SIRS of Infectious Origin and Sepsis, 2011 – 2018.



Whilst sepsis is most common in the male gender there is no gender impact on mortality.

FIGURE 7: Age-standardised hospital mortality rate for adult inpatients with a diagnosis of SIRS of Infectious Origin and Sepsis, 2011 – 2018.



There was a slight increase in mortality in 2018. Our interpretation is that several factors may have contributed to this:

- Sepsis 3 definitions identify a cohort of patients with a higher acuity than previously documented as sepsis. It is reasonable to expect that this cohort will have a higher mortality.
- In the process audits carried out in 2018 we found a higher average age than in 2017 and higher average comorbidities. One cohort of patients were admitted from a residential care setting and as such are older and have more co-morbidities.
- Ireland had a particularly bad influenza season in 2018 with increased admissions to ICU and increased mortality.

This trend will be monitored over the coming years to determine if mortality is on an upward trend in Ireland or if the contributing factors have skewed the trend for 2018.

TABLE 2: Adult inpatients with a diagnosis of SIRS of Infectious Origin and Sepsis, crude and age-standardised mortality rates, 2011-2018.

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	22.1
2015	8,888	2,021	22.7	22.7
2016	14,804	2,735	18.5	18.3
2017	17,106	3,068	17.9	17.6
2018	15,379	3,028	19.7	19.4

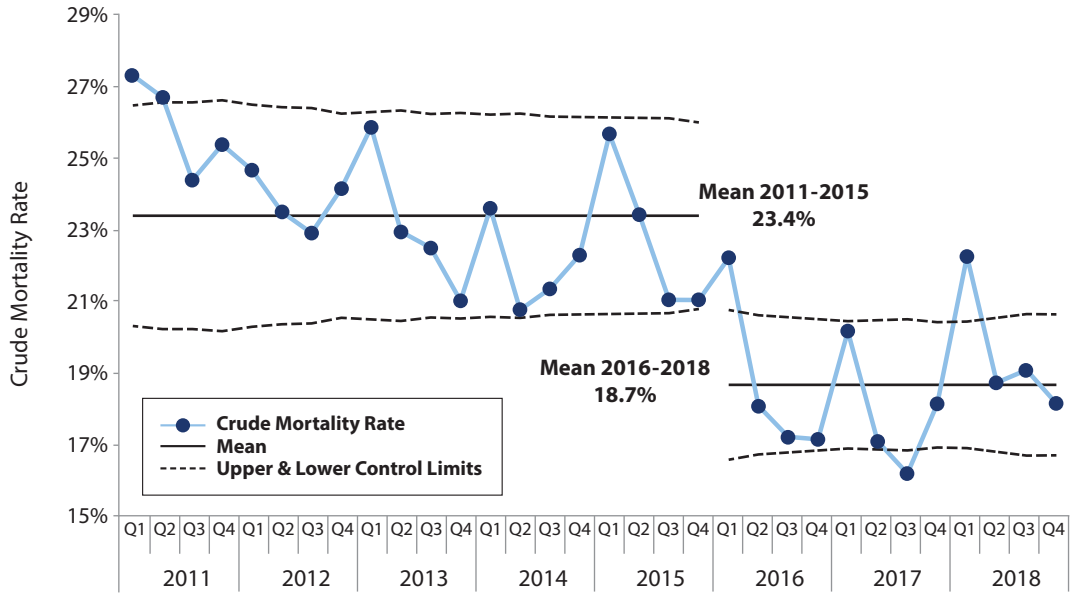
* Data have been age-standardised using a standard population based on the numbers of inpatients with a diagnosis of sepsis in 2015

KEY FINDING:

% CHANGE IN AGE-ADJUSTED MORTALITY SINCE 2017 ↑ 10.2%
% CHANGE IN AGE-ADJUSTED MORTALITY SINCE 2014 ↓ 12.2%
% CHANGE IN AGE-ADJUSTED MORTALITY SINCE 2011 ↓ 27.6%

Despite the changes in the both detection and mortality rates, it is important to note that the actual number of deaths from SIRS of infectious origin and sepsis dropped from 3,068 in 2017 to 3,028 in 2018.

FIGURE 8: Quarterly rates of in-hospital mortality for adult patients with a diagnosis of SIRS of Infectious Origin and Sepsis, quarterly data, 2011 – 2018.



Quarterly rates of in-hospital mortality for inpatients with a diagnosis of sepsis from 2011 to 2018 were analysed using statistical process control (SPC) methods. 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 2011- 2015 showed an average of 23.4%. For the period 2016-2018 this dropped to 18.7% representing a statistically significant improvement since the inception of the National Sepsis Programme.

The peak in our data for early 2018 indicates the impact that severe influenza can have on the incidence of sepsis and associated mortality. Analysis of the data indicated a spike in mortality in quarter 1 of 2018 for patients admitted to critical care. This highlights importance of awareness and vaccination.

It is not possible to distinguish what portion of improvement is due to improved recognition and what is due to improved management. Process audits on management are performed on each hospital to inform their in-house Q.I. project and group reports are included in this document.

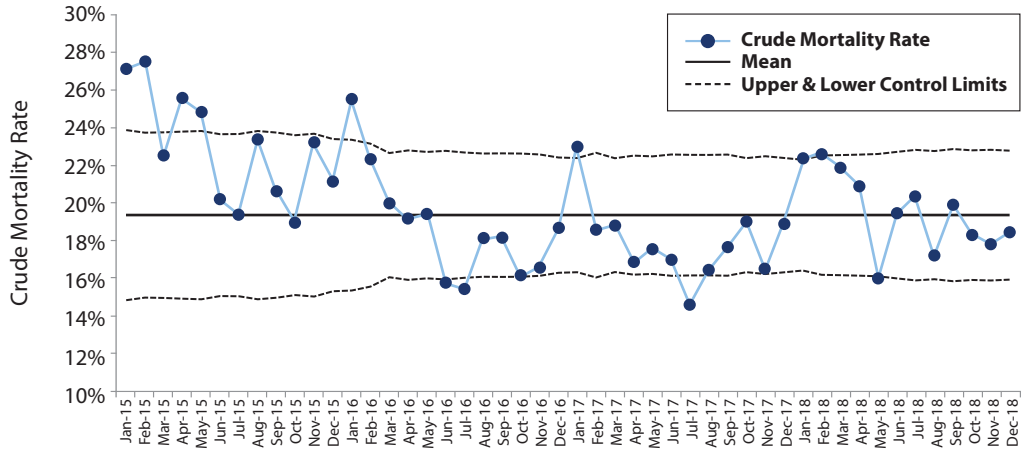
TABLE 3: Adult inpatients with a diagnosis of sepsis, 2016-2018

Diagnosis		2016			2017			2018		
		Number of Inpatients	Number of Deaths	Crude Mortality Rate	Number of Inpatients	Number of Deaths	Crude Mortality Rate	Number of Inpatients	Number of Deaths	Crude Mortality Rate
SIRS of Infectious Origin		725	59	8.1%	794	64	8.1%	740	49	6.6%
Sepsis-3	Sepsis	12,516	2,097	16.8%	14,763	2,439	16.5%	13,013	2,384	18.3%
	Severe Sepsis	643	198	30.8%	578	174	30.1%	534	141	26.4%
	Septic Shock	920	381	41.4%	971	391	40.3%	1,092	454	41.6%
	Total for Sepsis-3	14,079	2,676	19.0%	16,312	3,004	18.4%	14,639	2,979	20.3%
Total for SIRS of Infectious Origin + Sepsis-3		14,804	2,735	18.5%	17,106	3,068	17.9%	15,379	3,028	19.7%

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 and it is recommended that this cohort avail of vaccination as prevention is always better than cure and cure is not always possible even with the very best management.

FIGURE 9: In-hospital mortality for patients with a diagnosis of SIRS of Infectious Origin and Sepsis, monthly data, 2015 – 2018.



SPECIALTIES:

PAEDIATRICS AND MATERNITY

A paediatric sepsis form is under development to help support clinicians in the recognition and management of sepsis. It has undergone a phase 1 pilot and is currently being tested in the phase 2 pilot Q4, 2019. This form will contribute to the development of standalone guidance for the recognition and management of sepsis in paediatrics.

The maternity sepsis form has been rolled out nationally and the maternal electronic healthcare record is being updated to reflect the contents of the form.

TABLE 4: Paediatric and maternal sepsis-associated incidence and crude mortality rates, 2011-2018.

Year	Children aged 0-15 Years with a Diagnosis of Sepsis		Pregnancy Related Cases with a Diagnosis of Sepsis	
	Number of Inpatients	Crude Mortality Rate	Number of Inpatients	Crude Mortality Rate
2011	737	3.0%	190	1.6%
2012	763	3.9%	192	0.5%
2013	763	3.8%	271	0.0%
2014	746	4.0%	282	0.0%
2015	766	2.1%	308	0.3%
2016	802	3.5%	416	0.0%
2017	822	3.9%	483	0.2%
2018	757	4.5%	442	0.5%

MEDICINE AND SURGERY

The 2016 HIPE data identified that patients discharged with a surgical diagnosis related group (DRG) had a higher mortality and a longer length of stay than those in a medical DRG.

This was further explored by chart review audit in 2017 and 2018.

Medical audit - Medical DRG and coded for infection and acute organ dysfunction.

- 2017, 240 charts.
- 2018, 222 charts (exclusively from residential in-patient setting).

Surgical audit - Surgical DRG, operative intervention, infection code and acute organ dysfunction.

- 2017, 144 charts
- 2018, 203 charts

The results of this granular audit are outlined in Table 5.

TABLE 5: Granular process audit, all acute hospitals, performed by Hospital Group Sepsis ADONs, 2018.

	Medical		Surgical	
	2017	2018	2017	2018
Cases	240	222	144	203
Average age	78.9	80	72.66	70
Average Co-morbidities	1.36	2	1.28	2
Sepsis documented	50%	92%	58%	57%
Cultures before 1st dose antimicrobials	72%	92%	56%	90%
Antimicrobials within 1 hour of infection diagnosis	58%	55%	60%	56%
Antimicrobials as per guideline	85%	93%	81%	87%
Lactate taken	68%	86%	72%	66%
Fluid bolus given when indicated	72%	80%	65%	60%

Discussion

The results of the process audits demonstrate that the medical patient is older. Both medical and surgical sepsis patients have similar co-morbidities. The rate of sepsis documentation was best in the surgical cohort in 2017 but has greatly improved in the medical cohort in 2018. In terms of treatment with antimicrobials there was little difference between the 2 cohorts and for fluid resuscitation medical cohort performed best. There was a marked improvement in measurement of lactates for medical patients. Thus it can be inferred that the difference in mortality between the medical and surgical cohorts (19.4% vs 24.8%) (Table 6) 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.

TABLE 6: Adult inpatients with a diagnosis of sepsis, by Surgical* / Medical Diagnosis Related Group, 2018

Surgical / Medical DRG*	Number of Inpatients	Number of Bed Days	Average Length of Stay	Crude Mortality Rate
Surgical	2,634	122,255	46.4	24.8%
Medical	12,005	205,638	17.1	19.4%
Total	**14,639**	**327,893**	**22.4**	**20.3%**

* '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 for surgical patients with sepsis is 46.4 days. The opportunity to shorten this by earlier recognition and treatment will not only improve patient outcome but also free up bed days for patients on waiting lists.

TABLE 7: Healthcare usage in Sepsis vs. Infection vs. all other diagnoses, 2018

Diagnosis	Medical			Surgical		
	Number of Inpatients	Number of Bed Days	Average Length of Stay	Number of Inpatients	Number of Bed Days	Average Length of Stay
Sepsis	12,005	205,638	17.1	2,634	122,255	46.4
Infection	102,301	1,050,662	10.3	12,802	261,636	20.4
All Other Diagnoses	245,950	1,155,081	4.7	80,624	392,708	4.9
Total	**360,256**	**2,411,381**	**6.7**	**96,060**	**776,599**	**8.1**

CRITICAL CARE

FIGURE 10: Age-standardised in-hospital mortality rates for adult patients with a diagnosis of sepsis and admitted to a critical care area, 2011 – 2018.

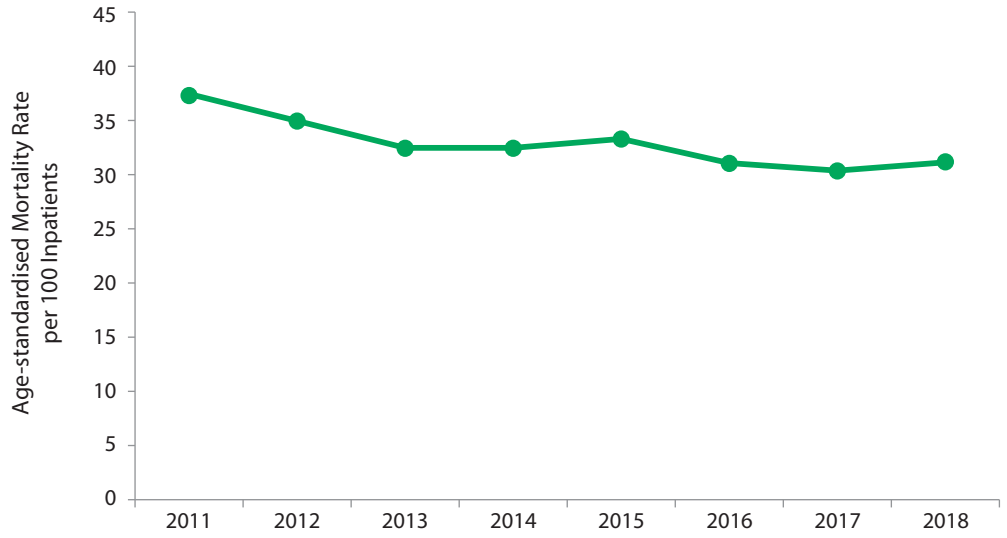
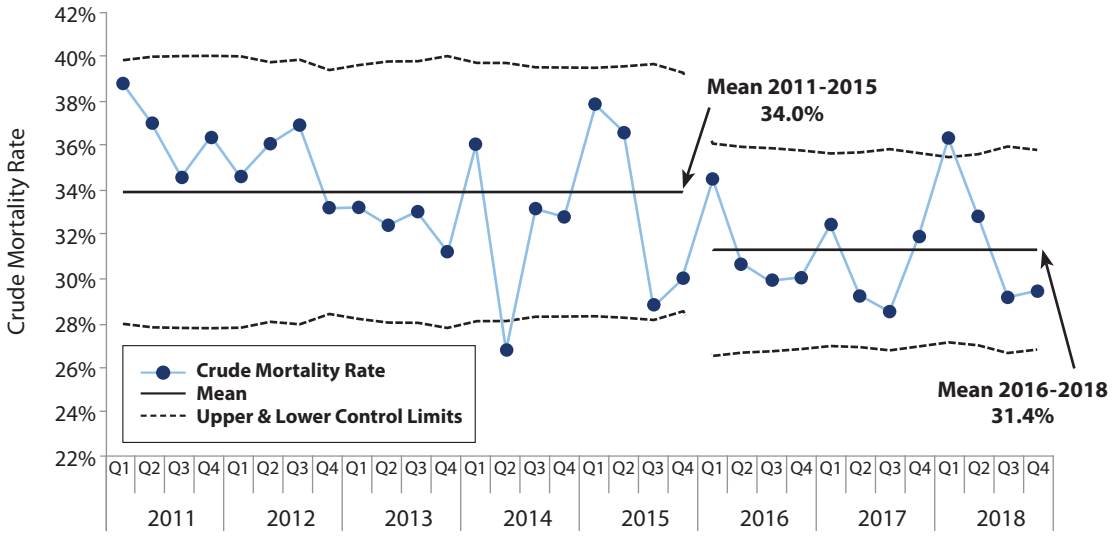


TABLE 8: Number of adult inpatients, bed days and average length of stay by admission to critical care, 2011-2018.

Year	Admitted to Critical Care			Not Admitted to Critical Care			Total			% of Inpatients with a Diagnosis of Sepsis Admitted to Critical Care
	Number of Inpatients	Number of Bed Days	Average Length of Stay	Number of Inpatients	Number of Bed Days	Average Length of Stay	Number of Inpatients	Number of Bed Days	Average Length of Stay	
2011	2,185	86,568	39.6	4,310	99,695	23.1	6,495	186,263	28.7	33.6%
2012	2,362	88,810	37.6	4,865	104,380	21.5	7,227	193,190	26.7	32.7%
2013	2,315	85,678	37.0	5,482	117,352	21.4	7,797	203,030	26.0	29.7%
2014	2,469	83,441	33.8	5,806	115,420	19.9	8,275	198,861	24.0	29.8%
2015	2,575	92,704	36.0	6,313	127,547	20.2	8,888	220,251	24.8	29.0%
2016	3,635	120,927	33.3	11,169	183,187	16.4	14,804	304,114	20.5	24.6%
2017	3,992	134,433	33.7	13,114	216,580	16.5	17,106	351,013	20.5	23.3%
2018	4,002	136,831	34.2	11,377	199,904	17.6	15,379	336,735	21.9	26.0%

FIGURE 11: 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 – 2018.

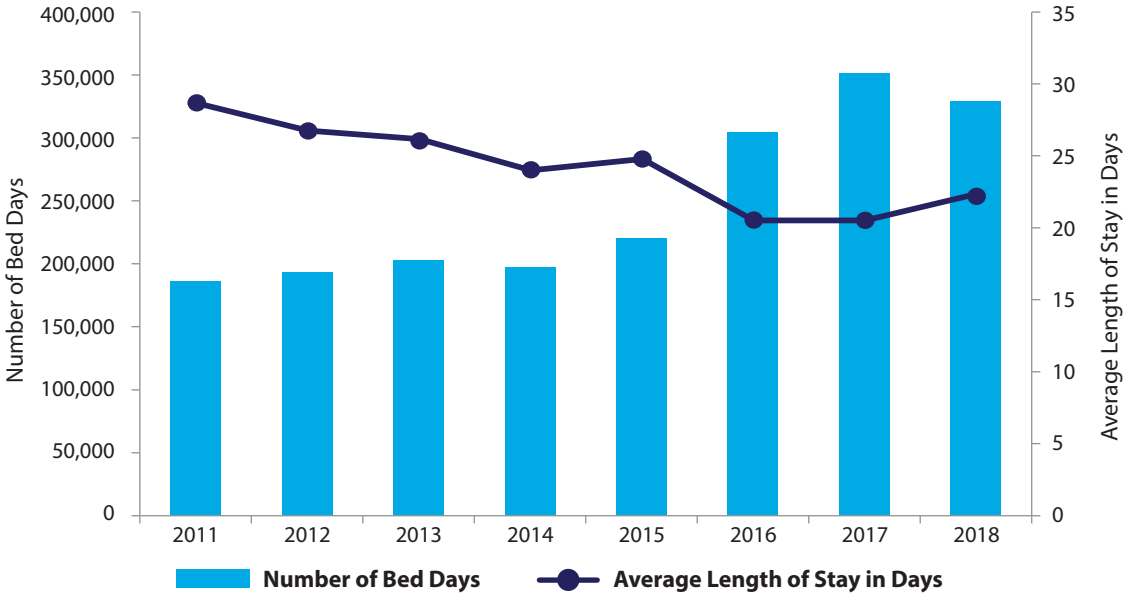


SUMMARY OF THE CHANGES IN INPATIENTS WITH SEPSIS ADMITTED TO CRITICAL CARE, 2011 – 2018.

% CHANGE MORTALITY 2011 – 2018 ↓ 14.4%

In 2018, 26% of sepsis patients were admitted to a critical care bed and the average length of stay (aLOS) is twice as long in these patients compared to those not admitted and their mortality is also twice that of those managed on the ward. This provides reassurance that critically ill patients are being appropriately escalated to critical care.

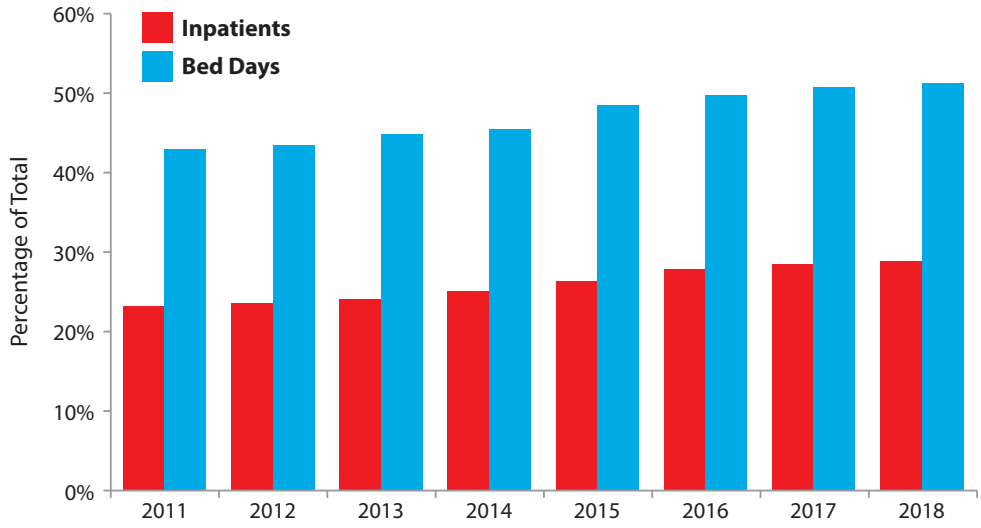
FIGURE 12: The number of bed days and average length of stay for adult inpatients with a diagnosis of Sepsis, 2011 – 2018.



SUMMARY CHANGES 2011 – 2018:

CHANGE IN THE NUMBER OF DOCUMENTED CASES	↑ 137%
CHANGE IN THE NUMBER OF BED DAYS USED	↑ 81%
CHANGE IN THE ALOS	↓ 24%

FIGURE 13: Adult inpatients with a diagnosis of sepsis or infection: the number of inpatients & bed days as a percentage of total inpatients & bed days, 2011 – 2018.



Sepsis-associated crude hospital mortality, 2018

TABLE 9: Incidence of and crude mortality rates for SIRS of infectious origin, sepsis, severe sepsis and septic shock, in adult inpatients, 2018

	Number of Cases	Crude Mortality Rate
SIRS of Infectious Origin	740	6.6%
Sepsis	13,013	18.3%
Severe Sepsis	534	26.4%
Septic Shock	1,092	41.6%
Total	**15,379**	**19.7%**

TABLE 10: Admission and crude mortality rates for inpatients admitted to a critical care area with a diagnosis of SIRS, sepsis, severe sepsis or septic shock, 2018

	Total Number of Cases	Number of cases admitted to critical care	Proportion of cases admitted to critical care	Crude Mortality Rate of cases admitted to critical care
SIRS of Infectious Origin	740	79	10.7%	16.5%
Sepsis	13,013	2,864	22.0%	30.3%
Severe Sepsis	534	186	34.8%	32.8%
Septic Shock	1,092	873	79.9%	40.0%
Total	**15,379**	**4,002**	**26.0%**	**32.2%**

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 of these cases, 76.7%, are managed on a general ward and these patients have the alarming mortality rate of 14%. Capacity in critical care is the limiting factor for admission and increasing capacity and critical care admission of sepsis cases, not just for the most physiologically deranged, will give them the best opportunity to survive.

FIGURE 14: The number of adult patients with a diagnosis of sepsis, excluding septic shock, who were not admitted to a critical care area, by age group, 2018.

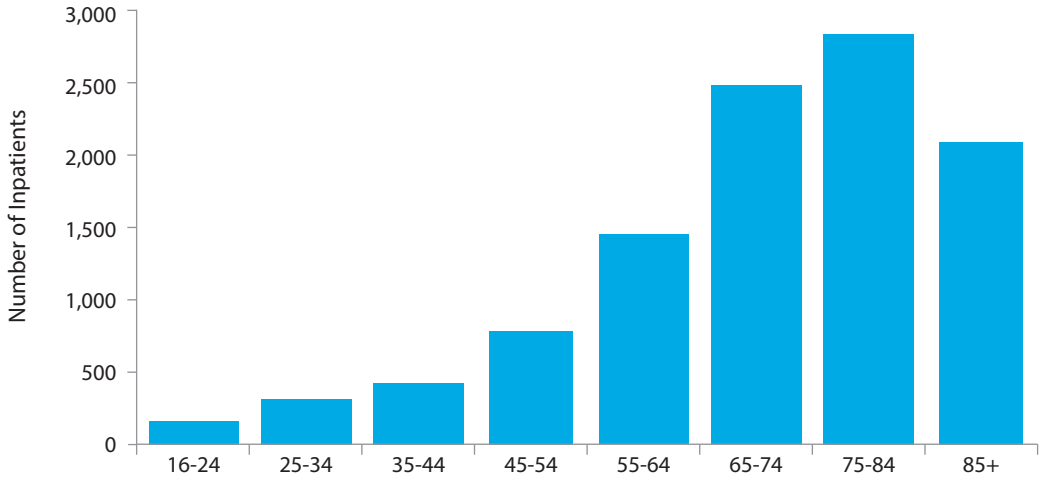


FIGURE 15: The in-hospital mortality for adult inpatients with a diagnosis of sepsis, excluding septic shock, who were not admitted to a critical care area, by age groups, 2018.

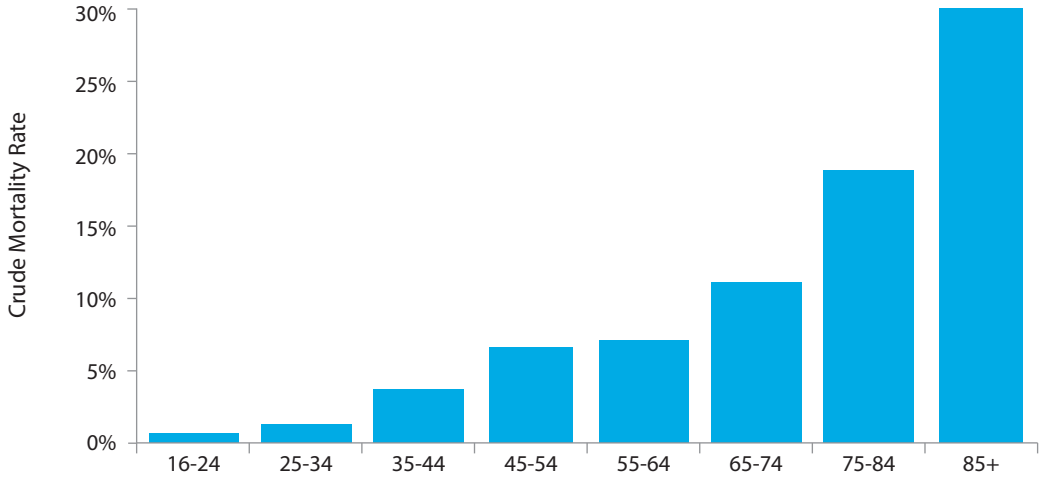


FIGURE 16: The number of adult inpatients with a diagnosis of sepsis or septic shock admitted to a critical care area by age groups, 2018.

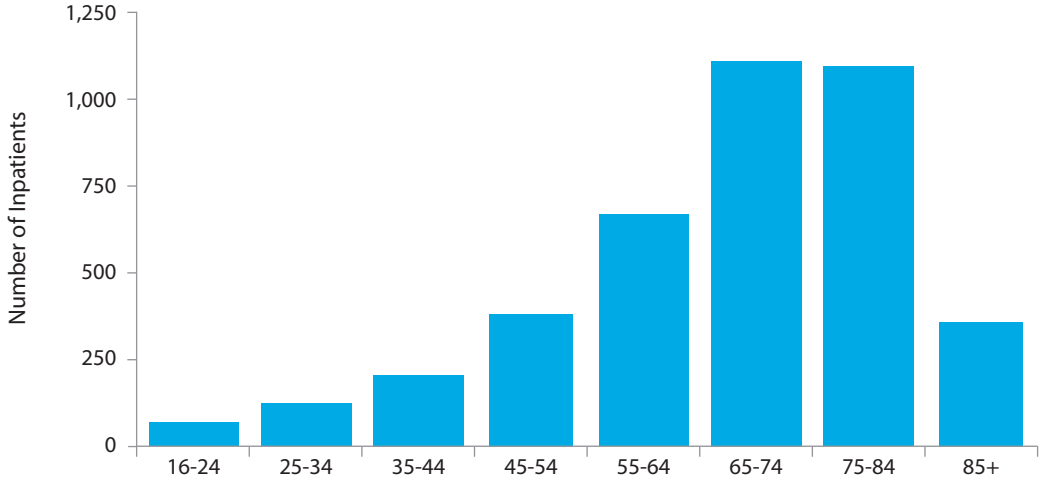
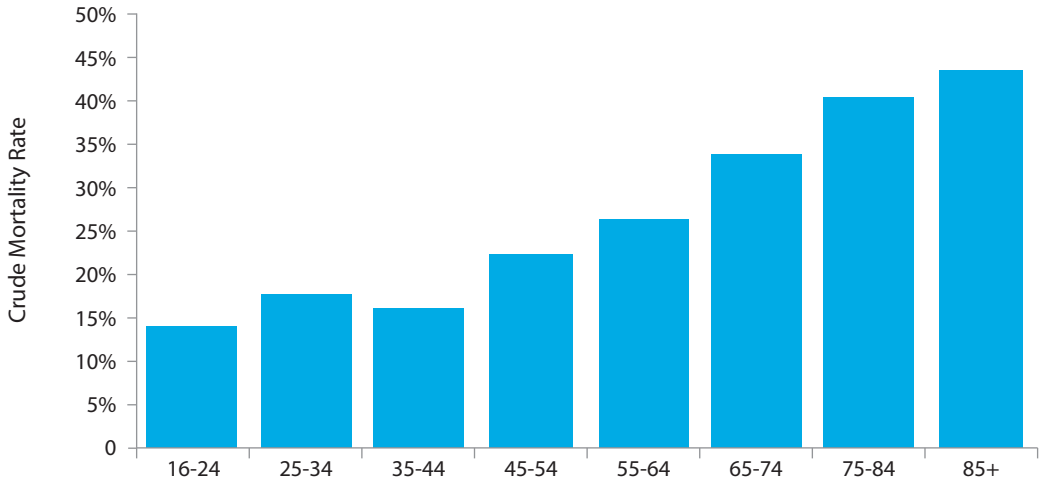
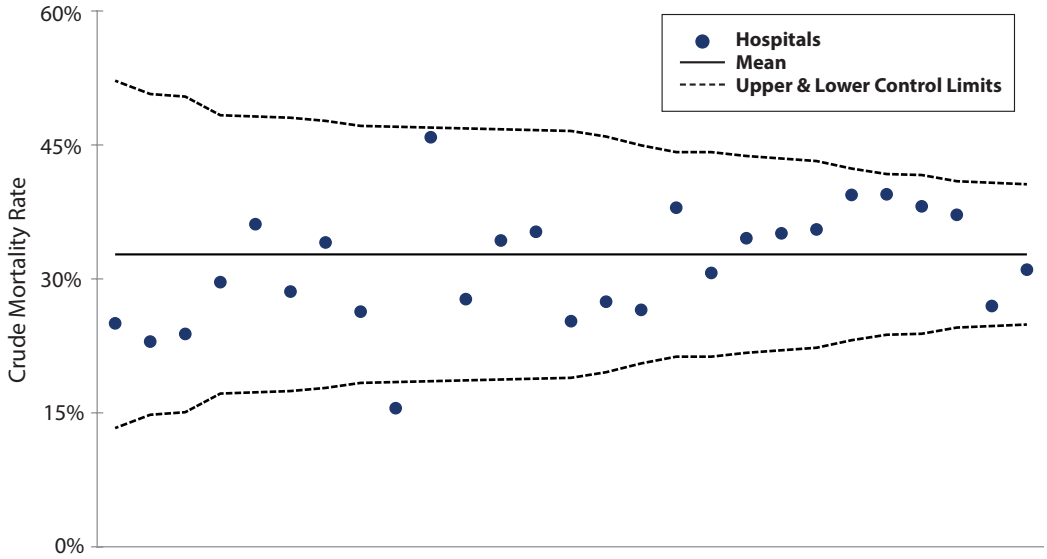


FIGURE 17: In-hospital mortality rate for adult inpatients with a diagnosis of Sepsis or Septic Shock, who were admitted to a critical care area, by age groups, 2018.



In the absence of age and co-morbidity adjustment, which would allow hospital sepsis-associated mortality to be published, the funnel plot, (figure 18) depicts the age-adjusted hospital mortality in patients with a diagnosis of sepsis and who were admitted into a critical care area in hospitals who had 50 or more of such cases. The funnel plot shows that the mortality rates for all hospitals were within the expected range of variation, with the exception of one hospital which had a lower mortality rate than expected by chance alone. It is the hope of the National Sepsis Programme to be able to produce such a plot for all acute hospitals that manage sepsis patients, into the future. This would assure the public that their hospital achieves similar outcome goals as others in the state and if a hospital has outlier status, it would enable intervention to correct that status and associated outcomes.

FIGURE 18: In-patient crude mortality rate for adult inpatients with a diagnosis of sepsis and admitted to a critical care area, by hospital, 2018.



It is of interest to compare sepsis cases with those coded as infection as it demonstrates the clear difference in these disease processes in terms of average length of stay and outcome. This is a clear driver to investigate the patient with infection for evidence of organ dysfunction, not just so they can be labelled correctly but also so they can get the urgent time-dependent therapy that is associated with improved outcome and so they can have early input from senior decision makers to drive that therapy forward in terms of source control, critical care management and other complex needs.

KEY FINDINGS:

SEPSIS PATIENTS HAVE A 5.2-FOLD HIGHER MORTALITY OVER PATIENTS CODED WITH INFECTION AND A 2-FOLD HIGHER AVERAGE LENGTH OF STAY.

TABLE 11: Inpatients & deaths with a diagnosis of sepsis or infection, 2018

Diagnosis	Number of inpatients	% of total inpatients	Number of deaths	% of total deaths	Crude mortality rate
Sepsis	14,639	3.2%	2,979	27.0%	20.3%
Infection	115,103	25.2%	4,491	40.7%	3.9%
All other diagnoses	326,574	71.6%	3,557	32.3%	1.1%
Total	**456,316**	**100%**	**11,027**	**100%**	**2.4%**

TABLE 12: Comparison between inpatients discharged with an infection vs. a sepsis code and all other diagnoses, 2018.

Diagnosis	Number of Inpatients	Number of Bed Days	Average Length of Stay
Sepsis	14,639	327,893	22.4
Infection	115,103	1,312,298	11.4
All other diagnoses	326,574	1,547,789	4.7
Total	**456,316**	**3,187,980**	**7.0**

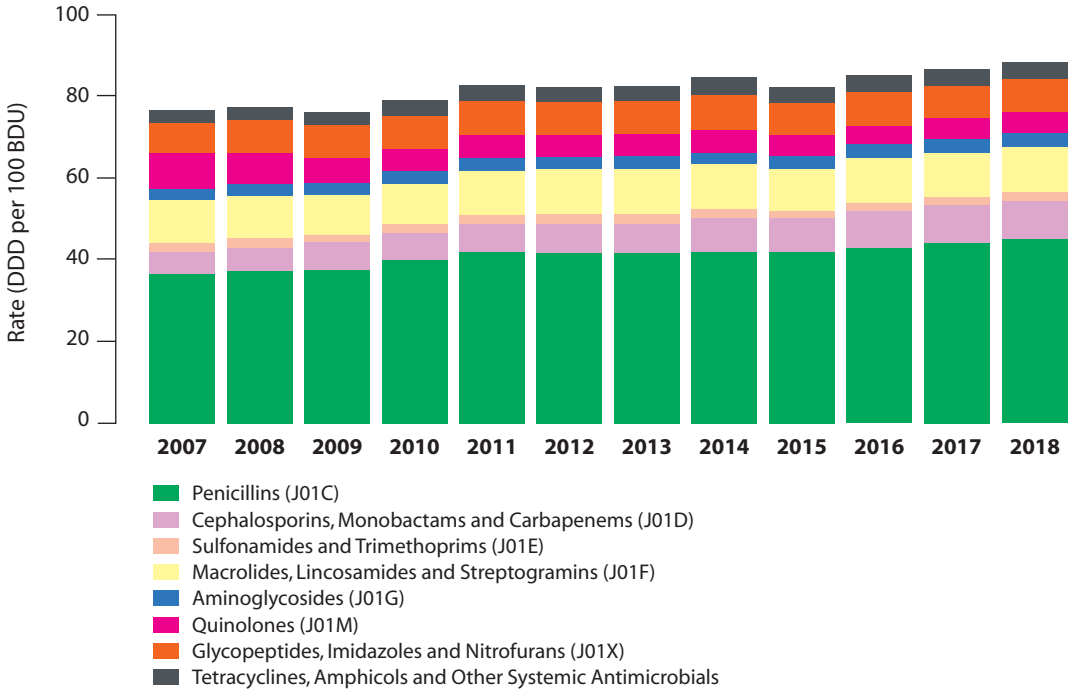
Balancing measures

Hospital antimicrobial consumption

The following data is from the Hospital Antimicrobial Consumption Surveillance report published by the Health Protection Surveillance Centre (HPSC). Further details are available at www.hpsc.ie

The median rate of antimicrobial consumption in 42 public acute hospitals in Ireland for 2018 was 88.4 defined daily doses per 100 bed days used (DDD/100BDU; range = 30.3 - 113.4), a slight increase from 2017 (86.3 DDD/100BDU). This rate of antimicrobial consumption is mid-high range in comparison with other European countries. Carbapenem consumption continued to decrease, having peaked in 2014 while consumption of fluoroquinolones also decreased in 2018. However, third-generation cephalosporin and monobactam (aztreonam) consumption increased. Use of penicillin in combination with a beta-lactamase inhibitor (such as co-amoxiclav) remained at high levels and increased in 2018.

FIGURE 19: Hospital antimicrobial consumption by class, 2007-2018 (defined daily doses per 100 bed days used)



Multidrug resistant organisms

The following data has been extracted from the HPSC Surveillance Report available at: www.hpsc.ie

Escherichia coli: Multidrug resistance remains a significant problem in this pathogen which is the most frequent cause of urinary tract infection and a common pathogen in intra-abdominal infection. In 2018 of 3,239 patients with invasive E. coli infection (bloodstream and/or CSF)), 368 (11.6%) were caused by extended-spectrum β-lactamase (ESBL)-producing E. coli and 201 (6.2%) patients had multi-drug resistant (MDR) E. coli (displaying resistance to three or more antimicrobial classes). There were four reported cases of carbapenemase- producing E. coli invasive infection in 2018.

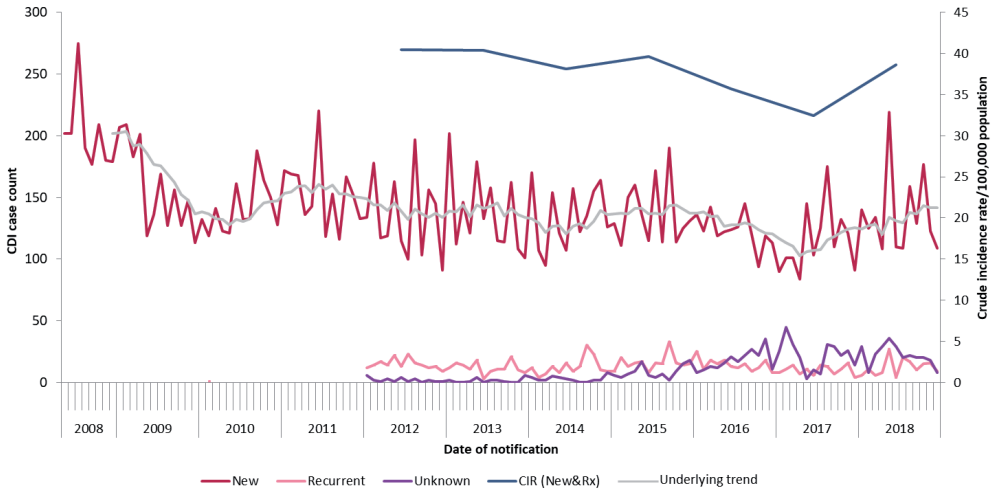
Klebsiella pneumoniae: There was an increase in MDR-K. pneumoniae invasive infections in 2018 (40/483 patients, 8.3%) in comparison to 6.1% in 2017. There were four reported cases of carbapenemase-producing K. pneumoniaelinvasive infections in 2018

Staphylococcus aureus: There was an increase in S aureus BSI in 2018 (n=1,188) however there were reductions in both the proportion (12.4%) and rate (0.035 cases per 1,000 bed days used (BDU)) of S. aureus BSI that were meticillin resistant (i.e. MRSA.).

Enterococcus faecium: The proportion of E. faecium BSI that were vancomycin resistant (i.e., VRE) remained high at 40.2% though reduced from 45.9% in 2015. Ireland still has one of the highest proportions in Europe of VRE causing BSI.

Clostridioides difficile infection (CDI). The national crude incidence rate for new and recurrent CDI per 100,000 population was higher than that reported in 2017 (38.6 versus 32.4). The majority of CDI was reported in patients aged ≥65 years (65%). The vast majority of notified cases of CDI were also reported to the voluntary enhanced CDI surveillance scheme (n=2,030) by 56 participating hospitals. Healthcare-associated (HCA) CDI accounted for the origin of 60% (n=1,218) of all cases, equating to a national incidence rate for new and recurrent HCA CDI combined, that originated within the participating hospital, of 2.4 per 10,000 bed days used (BDU), slightly higher than that of 2017 (2.2) . Further information is available in the 2018 Clostridioides difficile infection (CDI) report published by HPSC. Available from www.hpsc.ie

FIGURE 20: Number of CDI notifications by month and case type 2008-2018



Maternal Sepsis Summary

Lead ADON/M Dr Karn Cliffe

"Maternal sepsis is a life-threatening condition defined as organ dysfunction resulting from infection during pregnancy, childbirth, post-abortion, or post-partum period (WHO 2016)".

In order to monitor continued improvements in the management of sepsis in the maternity population, process audits were carried out at the beginning of 2019. The audits focused on screening, recognition and management of sepsis. The audit criteria were all maternity patients in 2018 with infection and organ dysfunction, or diagnosis of sepsis/septic shock as identified by HIPE.

In 2018, there were 61,016 (CSO, 2018) births in Ireland. There were 9,253 in-patient admissions with a diagnosis of infection and 442 inpatient admissions with a diagnosis of sepsis (Hospital Inpatient Enquiry HIPE, 2018).

Of the healthcare records audited 25% were women in the antenatal period, 13.2% intrapartum and 60.3% postnatal. The mean and median length of stay was 6.6 days and 5.3 days respectively, with 23.8% requiring either high dependency care or critical care.

SCREENING

Considering the initial trigger 83% of women had an early warning score as per the Irish Maternity Early Warning System; 75% had a systemic inflammatory response (SIRS), 44.1% triggered consideration for screening based on clinical judgment, with 0.7% meeting the criteria for being at risk of neutropenia.

With regards to SIRS; 71.3% of women had a temperature of < 36°C or ≥ 38°C, 31.6% had a respiratory rate of ≥ 20 breaths per minute and 71.3% of women had a tachycardia of >100bpm. The fetal heart rate was >160 beats per minute in 12.5% of cases

RISK FACTORS

The most frequently identified risk factor in this cohort of women was prolonged rupture of membranes 12.3% compared to the least frequently documented risk factor of 1.5% for cerclage. Retained products account for 4.6%. The most frequent non-pregnancy related risk factor was recent surgery 32.3% followed by age >35yrs - 18.4% and symptoms of infection in the last week 10.7%, with the least frequent documented immunocompromised of 4.6%. There were no women in this audit with a chronic renal, liver or heart failure condition.

TREATMENT WITH THE SEPSIS 6+ 1

Of the women included in the audit 93.3% were indicated to receive the Sepsis 6+1 based on sustained SIRS (76.1%), apparent organ dysfunction (16.4%) and risk of neutropenia (0.7%).

Overall 88.4% of women received antimicrobials within one hour. However, when the maternity sepsis form was used 94.4% of women received antimicrobials which shows a 7% increase when the form is used.

78.6% of antimicrobials were administered in line with local antimicrobial guidelines/consultation with a microbiologist. Lactate levels were taken 89% of the time. Of these 28.4% of women had a lactate > 2mmol/l. 77.4% of women with a lactate > 2mmol/l had lactate levels repeated. 89.1% of women had blood cultures taken prior to administration of antimicrobials, and 76.6% of women had urinary output

assessment.

DIAGNOSIS

Considering the new maternal sepsis definition: Maternal sepsis is a life-threatening condition defined as organ dysfunction resulting from infection during pregnancy, childbirth, post-abortion or postpartum period (WHO 2016). 71.9% of women had SIRS of infectious origin, 15.7% had sepsis, 0.8% had septic shock. 11.6% of women were treated for pyrexia in labour.

Of the cases audited 29.8% were documented as sepsis, however only 15.7% of cases met the criteria for sepsis i.e. infection causing organ dysfunction. This shows a slight over documentation of sepsis. It is important that sepsis is only diagnosed where infection has caused organ dysfunction. Documentation informs HIPE, therefore HIPE coders can only code what is documented. Correct documentation ensures correct statistics.

SEPSIS FORM

Of all the women included in the audit 62.7% had a form used to guide screening, and 67.8% of these forms were signed. There was a 7% increase in women who received antimicrobials within one hour of decision to give the Sepsis 6+1, which shows more timely treatment when the form is used. Using the sepsis form will also aid accurate diagnosis of sepsis with resultant accurate statistics.

Paediatric Sepsis

Lead ADON Celine Conroy

A paediatric sepsis clinical decision support tool was developed and is currently being piloted to ensure end user involvement in the final version.

STAGE 1: COMPLETED

The National Sepsis Programme together with the National Clinical Programme for Paediatrics and the Paediatric Clinical Advisory Group (CAG) established a design group with paediatric medical and nursing expertise, to develop a clinical decision support tool to support early recognition and timely treatment of paediatric sepsis patients. Following an information/education workshop in the RCPI, attended by representatives from the 16 paediatric hospitals/units, the Paediatric Sepsis Form was piloted with feedback received from 9 of the 16 hospitals/units.

STAGE 2: IN PROGRESS

To oversee stage 2, a governance group was established by the Children's Hospital Group and the National Sepsis Programme. This group was tasked with reviewing the feedback received at stage 1, re-designing and re-piloting the Paediatric Sepsis Form. The re-pilot is currently in progress and feedback is due by end December 2019. Amendments will be made based on the feedback prior to National roll out.

GP Sepsis Project:

Lead ADON Catherine (Kay) O'Mahony

While the National Clinical Effectiveness Committee has published National Clinical Guidelines on Sepsis Management adapted for specific patient groups (e.g. paediatric, maternity) and hospital settings (e.g. ED, in-patients), pathways of care for identification and management of adult patients with sepsis in other healthcare settings (e.g. pre-hospital care, community) remain to be developed. Furthermore, there is no mechanism to record sepsis in the community.

The South/South West Hospital Group (SSWHG) has been granted permission from the National Sepsis Programme to develop this initiative. The SSWHG has convened a Steering Group to oversee the implementation and evaluation of a pilot sepsis pathway specifically for General Practice nationally, with a local focus on out-of-hours care in the South West (SW) and South East (SE) of the country. An initial assessment of GPs' knowledge of and attitudes to sepsis, general variables used to assess infection as well as exposure to training will be carried out prior to conducting education sessions nationally in the coming months and implementation of a draft Primary Care Sepsis GP tool thereafter.

RCSI Hospital Group

Work continues in RCSI Hospitals to implement the work of the National Sepsis Programme, in particular embedding the Sepsis-3 definition of sepsis, (adopted in every hospital), as well as continuing to promote early recognition and treatment of patients with sepsis. Locally implementation is overseen by Sepsis/Deteriorating Patient Governance Committees (or similar) in collaboration with the Sepsis ADON. Each hospital continues to have a Lead Clinician and Lead Nurse/Midwife with responsibility for sepsis implementation. In addition, every hospital is now using either hard or electronic versions of the Sepsis-3 Sepsis Form to guide the identification, management and diagnosis of high risk/suspected sepsis cases in adult and maternity settings.

RCSI Hospitals participated in three national audits undertaken in 2018; baseline maternity, surgical and medical/residential. The baseline maternity audit in Q1 2018 demonstrated a high level of compliance not only with the elements of the Sepsis 6 (+1) one hour bundle, but also with the use of the Sepsis Form with 82% cases having a Sepsis Form used. Although there was huge variability in the content recorded on the forms, 79% could be used for HIPE coding purposes. 88% cases received antimicrobials within the recommended 60 minutes and there was evidence of good compliance with antimicrobial guidelines, blood cultures, initial lactate testing and IV fluid administration which all scored over 75%. The medical audit in Q3 demonstrated an older cohort of patients (average 79yrs Vs 70yrs in surgical audit) with multiple comorbidities associated with a higher risk of mortality from sepsis, but a shorter average length of stay (11 days Vs 40 days in Q2 surgical audit). In general there was greater compliance with Sepsis 6 and use of the Sepsis Form (36% Vs 8%) in the Q3 medical audit, where all of the patients were treated in ED, than the Q2 surgical audit where most patients were treated in the wards. However, many of the elements of Sepsis 6 administration exceeded the aggregated national audit results; especially in the Q3 medical audit; e.g. blood cultures, antimicrobials within 60 minutes, lactate testing and IV fluid administration. In the Q3 medical audit 95% of the patients had new onset organ dysfunction prior to Sepsis 6 administration, this was reduced to 62% post Sepsis 6 (35% reduction). Overall audit results demonstrated greater compliance when the Sepsis Form was used.

Throughout 2018 there have been a number of Sepsis QI Initiatives/Projects within the HG to increase awareness among staff, patients and the general public and to promote best practice. Some of these initiatives include; Sepsis 6 initiatives e.g. 'Spot the Dot' (Connolly Hospital) & Sepsis Drawers/Stars in OLOLH and Beaumont. Sepsis Mortality & Morbidity (M&M) Meetings in Connolly Hospital. Multiple education sessions in all hospital sites using a variety of different methods to educate staff and HSELand Sepsis eLearning remains mandatory for all medical and nursing staff. Cavan General and OLOLH participated in the first paediatric sepsis form pilot and will participate in the second national pilot in Q4 2019. World Sepsis Day was celebrated in a number of RCSI Hospitals including; Beaumont Hospital, Cavan General, Connolly Hospital, Louth County, OLOLH and St Josephs. Each event raised awareness among staff and the general public and used novel ideas to get staff involved included 'Sepsis socks', wear pink, quizzes, lectures, patient experiences and information stands. In addition, there were several sepsis stands in a number of hospitals throughout the year to increase awareness particularly in relation to; the new definition, those at risk, the signs and symptoms of sepsis and use of the Sepsis Forms. Beaumont Hospital won the QI Award at the 5th Sepsis Summit for 'Best Improvement & Recognition of Sepsis Cases'.

It must be remembered that the new Sepsis-3 definition represents a cohort of patients who are sicker than those that were classified as sepsis previously. With this in mind, excluding paediatrics and maternity, sepsis-associated crude mortality rate in RCSI Hospitals in 2018 was 20.1%, which is 14.8% higher than figures in 2017, but compares to national crude mortality rate of 20.3%. As this figure is not age or comorbidity adjusted it cannot be used to compare with other Hospital Groups or jurisdictions.

South/ South West Hospital Group

In 2018, 9 of the 10 hospitals in the SSWHG implemented the Sepsis-3 definitions. This definition encapsulates a sicker cohort of inpatients with sepsis and septic shock. Excluding maternity and paediatric cases, the sepsis-associated hospital crude mortality rate in the SSWHG for 2018 was 20.7% which was marginally higher than the national rate of 20.3% and an increase from the crude mortality rate of 16.6% in 2017(a 25% increase). This increase is in keeping with the 10.3% national upward trend in inpatient crude mortality for sepsis. Of note, as this data is not age or co-morbidity adjusted it cannot be used to compare with other Hospital Groups or jurisdictions.

Three national sepsis compliance audits that included a baseline maternal sepsis audit, a surgical sepsis audit and a residential patient/medical sepsis audit were completed across the ten hospitals in the SSWHG in 2018.

The maternal sepsis form, incorporating the Sepsis-3 definitions, has been implemented in the four maternity hospitals in the SSWHG – Cork University Maternity Hospital, University Hospital Kerry, South Tipperary General Hospital and University Hospital Waterford. The first maternity audit was carried out in Q1 of 2018 and this audit will form the baseline for future maternity sepsis audits. 71% of the women included in the audit had antimicrobials administered within the 1 hour target, with 73% of the women receiving antimicrobials that were prescribed as per local guidelines.

Improvements in a number of key areas were noticeable from the 2018 Q2 Surgical Sepsis audit to the Q3 Medical/Residential Care Sepsis Audit: the number of patients who had blood cultures taken prior to the first dose of antimicrobials increased from 54% in the surgical audit to 82% in the medical audit, the number of patients who had lactates taken increased from 57% to 69% and there was a concomitant increase in the use of the sepsis form from 39% in Q2 to 51% in Q3.

All ten hospitals in the SSWHG continued to have regular meetings of their Sepsis Committees in 2018. The group sepsis ADON attended the hospital committee meetings regularly, giving feedback on the sepsis process audits and updating the hospitals on national sepsis initiatives.

For sepsis awareness month 2018 all of the SSWHG hospitals held a range of activities throughout the month of September that aimed to increase awareness of sepsis both for hospital staff and members of the public. These activities included quiz's and poetry competitions as well as information and awareness stands for staff and public. Sepsis information leaflets were made available at vantage points throughout the hospitals.

All of the SSWHG hospitals continued to promote sepsis education and all members of clinical staff were encouraged to complete the Sepsis eLearning module on HSELand. Some of the hospitals complemented the e-learning by delivering face to face sepsis education sessions at induction days for new staff. To further increase the awareness of sepsis, the group Sepsis ADON presented on sepsis to the undergraduate nursing students in University College Cork.

UL Hospital Group

Three national sepsis compliance audits that included a baseline maternal sepsis audit, a surgical sepsis audit and a residential patient/medical sepsis audit were completed in all 6 hospitals in ULHG in 2018. From a random sample, 131 patient charts were audited of which 77 patients fulfilled the inclusion criteria.

The maternal sepsis form, incorporating the Sepsis-3 definitions, has been fully implemented after its pilot in 2017 in University Maternity Hospital Limerick (UMHL). A baseline maternal sepsis audit was carried out in quarter 1 of 2018 with very reassuring results. 70% of women in the audit had a sepsis form used to screen for sepsis, all but one of the forms were signed but only 20% of forms used were fully completed. 90% of the women who triggered a sepsis screen had risk factors and the average length of stay was 6.2 days. 100% of women had antimicrobials administered within the 1-hour target, 90% of which were prescribed as per local guidelines. 90% had blood cultures taken pre administration of antimicrobials. 100% had lactates taken and 100% had lactates repeated when the initial level was >2mmols/L. In regard to the two surgical and residential/medical sepsis audits, the results were stronger in the latter audit. The average age of the 67 patients in both audits was 83.3 years and 100% of these patients had 1 or more co-morbidity associated with high mortality in sepsis. Combined results showed limited sepsis form usage (59.7%) and correct documentation of sepsis in 65.6% of cases. 76% of patients audited received 1st dose antimicrobials within the first hour of diagnosis, 83.5% of antimicrobials were prescribed as per local guidelines. 67.1% had lactates taken and 100% of initial lactates >2mmols/L were repeated. 98.5% had blood cultures taken pre administration of antimicrobials. A fluid bolus was indicated in 43.2% of patients and 72.4% of these patients received same. The sepsis form was added to the microguide app to prompt its use.

In 2018, all 6 hospitals fully implemented the Sepsis-3 definitions. This definition reflects a sicker cohort of inpatients with sepsis and septic shock. Excluding maternity and paediatric cases, the sepsis-associated hospital crude mortality rate in ULHG for 2018 is 22.8%, which is an 10.6% increase from 2017. This increase mirrors the 10.1% national increase in inpatient crude mortality for sepsis. Of note, as this data is not age or co-morbidity adjusted it cannot be used to compare with other Hospital Groups or jurisdictions.

Supported by the group sepsis committee a very successful 2018 World Sepsis Day Campaign took place across ULHG to raise awareness for sepsis. It included a press release, local radio interviews, WSD Quiz for staff, ULHG Twitter campaign, an information and awareness stand for staff and public. Sepsis information leaflets were made available at public information points and added to loop infomercials on the hospital screens. ULHG was successful in having images from ULHG WSD included in the WSD International poster. Three posters and two presentations from ULHG were presented at the 5th National sepsis summit in Dublin Castle. There, ULHG was awarded the "Best compliance" award.

The paediatric unit and paediatric ED in UHL participated in phase 1 of the Paediatric sepsis form pilot in Q2 of 2018. Paediatric clinical and nursing leads were identified, education was rolled out and end user feedback was provided to inform the next phase of the pilot. Sepsis has been included in the 5-day Paediatric foundation course that runs twice a year in ULHG. A commitment was made to participate in phase 2 of the pilot in quarter 4 of 2019.

Sepsis education is now mandatory in ULHG for all clinical staff. Sepsis education continues across the hospital group and it has been incorporated into many foundation courses, study days, Infection Prevention & Control education blitz and pre and post grad modules. In July 2018, the ULHG Group ADON travelled to Wa in the upper west region of Ghana and delivered sepsis education to community and hospital-based healthcare workers as part of the Learning for Lives project.

Saolta University Health Care Group

Saolta University Health Care Group Group-wide implementation of the National Clinical Guideline No. 6, Sepsis Management is governed by the Saolta Group EWS & Sepsis Committee which includes Senior Medical, Nursing and Midwifery representation. The Committee works closely with individual hospitals to sustain the sepsis quality improvement initiatives that have been accomplished since publication of the National Clinical Guideline in 2014. The established Governance systems continued to support the implementation and monitoring of the Sepsis Management National Clinical Guideline No. 6 throughout the Saolta University Health Care Group in 2018. A review of the governance systems is planned in 2019 to incorporate international and national developments towards a Deteriorating Patient Recognition and Response Model incorporating Early Warning Systems including sepsis.

The Sepsis ADON attended local Sepsis Committee meetings regularly providing feedback on national developments and supporting local quality improvement projects.

The Sepsis Lead, Mr. Ronan OCathasaigh was seconded to a National Position within the DPIP (Deteriorating Patient Improvement Programme). He took up the position in January of 2019. A replacement was appointed in early 2019.

In 2018, Saolta fully implemented the Sepsis-3 definitions. This definition reflects a sicker cohort of inpatients with sepsis and septic shock. Excluding maternity and paediatric cases, the sepsis-associated crude mortality rate in Saolta is 20.1%, which is a 0.5% increase from 2017. Of note, as this data is not age or co-morbidity adjusted it cannot be used to compare with other Hospital Groups or jurisdictions.

Quality Improvement initiatives across the group include;
- Development of a Sepsis Folder on Q-Pulse
- Saolta EWS & Sepsis Newsletter
- Post-Intensive Care Clinic
- Ward Champions
- National Guideline Implementation and the effect on LOS, poster presentation.
- Post-Sepsis Syndrome leaflet development.

Saolta continues to participate nationally and has been involved with the following National Project's throughout 2018;
- Development of a Sepsis Infographic
- National Sepsis Awareness Campaign
- World Sepsis Day
- National Sepsis Summit
- National Sepsis Steering Committee
- Development of a Paediatric Sepsis Screening tool

Completion of the National Sepsis e-learning programme has been mandatory for all Saolta Medical, Nursing & Midwifery staff since 2016. Sepsis Education continued across disciplines using the national e-learning programme as the cornerstone with Saolta study days, departmental training and scenario-based bedside training also delivered to complement the E-Learning.

The Sepsis ADON conducted Sepsis blitzes, Grand Rounds, Induction programmes, Study Days and Departmental meetings in all hospitals to support the programme.
Three national sepsis compliance audits that included a baseline maternal sepsis audit, a surgical sepsis

audit and a residential patient/medical sepsis audit were completed in all 6 hospitals in Saolta University Health Care Group in 2018, opportunities for improvement identified to be addressed by individual hospitals. Trends in improvement opportunities include documentation of sepsis and use of the sepsis clinical decision support tools. Audit results were discussed with individual hospital Sepsis Committees and local action plans agreed and implemented.

Sepsis awareness month was marked in all Saolta hospitals with individual World Sepsis Day events and World Hand Hygiene Day was also marked with the support of Infection Prevention and Control colleagues.

Dublin Midland Hospital Group

In 2018, all 7 hospitals fully implemented the Sepsis-3 definitions. This definition reflects a sicker cohort of inpatients with sepsis and septic shock. Excluding maternity and paediatric cases, the sepsis-associated hospital crude mortality rate in DMHG for 2018 is 21.3%, (18.5% in 2017) which represents a 15.1% increase from 2017. This increase mirrors the 10.3% national increase in inpatient crude mortality for sepsis. Of note, as this data is not age or co-morbidity adjusted it cannot be used to compare with other Hospital Groups or jurisdictions.

Process audits were carried out on maternity, medical and surgical management of sepsis. Sepsis cases documented as sepsis, improved 15.12% and 1.85% in medical and surgical audits respectively. There was also an improvement in the administration of first dose antimicrobials by 7.43% and 4.07% in medical and surgical audits. Antimicrobials as per guideline improved by 4.47% in medical audits and remained unchanged at 92% for surgical audits. Lactates taken were down slightly. There was a slight decrease in fluid boluses for medical audits but remained unchanged at 100% in the surgical audits.

Antimicrobials were prescribed as per local guidelines 96.7% of the time. The Consultant Microbiologist was consulted in many cases especially pre-commencement of restricted antimicrobials.

There was evidence of escalation protocols for the deteriorating inpatient including the use of ISBAR communication tool stickers which were present in some patient notes.

Maternity audits

Both maternity units fully implemented the maternity sepsis form with noted improvements in key areas. There was an improvement with the delivery of the Sepsis 6. Blood cultures taken increased from 11.1% from the baseline audit to the compliance audit. Lactates 'taken' improved by 18.2%. Antimicrobials given within 1 hour of diagnosis and as per local remained unchanged at 100%. There were no sepsis forms used in the baseline line audit and a combined 68.75% in the compliance audit. By using the sepsis form patients received antimicrobials within one hour of diagnosis 89% of the time compared to 62.9% for the times when it was not used.

Sepsis Awareness/Education activities

Sepsis education is on-going with many hospitals doing sepsis awareness events for World Sepsis Day 2018, including Tallaght University Hospital, Midland Regional Hospital Portlaoise, Naas General Hospital and St. James Hospital. St. Luke's Hospital and other hospitals within the Group held sepsis/hand hygiene awareness events on World Hand Hygiene Day as the theme was sepsis prevention – 'It's in Your Hands, Prevent Sepsis'.

Quality Improvement initiatives

As part of the Flu Campaign the DMHG with Midland Regional Hospital Tullamore developed a video highlighting the dangers of flu and the ensuing complications including sepsis. The help of a patient advocate was employed, who recalled the devastating events which led to him spending 10 days in an induced coma with multi-organ failure with resultant long term weaknesses from his illness.

Funding was sought through the NMPDU to employ a research nurse to carry out research on the long term impact of sepsis with view to informing the need for dedicated multidisciplinary follow-up care. This initiative commenced July this year and work is currently on-going to secure ethical approval to commence recruitment in the five acute hospitals. The main aim is to identify the long-term impacts of sepsis on patients within an Irish regional context. A secondary aim is to identify any service gaps to inform service provision needs for sepsis survivors.

Tallaght University Hospital with Dr. Stan Rojack (lyrics and music composition) released the TUH Sepsis Song. The Meath Foundation, towards the end of the year, funded the development of an education video.

Ireland East Hospital Group

The Ireland East Hospital Group (IEHG) is the largest Group with eleven hospitals. All 11 hospitals have adopted the updated definition of sepsis (Sepsis-3).

Excluding maternity and paediatric cases, the sepsis-associated hospital crude mortality rate in IEHG for 2018 is 19.5%, (18% in 2017) which represents a 8.3% increase from 2017. This compares favourably with the National sepsis-associated hospital crude mortality rate of 20.4% and associated 10% increase in associated in-hospital mortality rate from 2017. These figures are not age or co-morbidity adjusted and, therefore, are not comparable with other groups.

Sepsis is a key patient safety issue and IEGH has robust structures in place to support and monitor implementation of National Clinical Guideline No. 6 – Sepsis Management, including:

- Sepsis is a standing item on HCAI/AMR Group Oversight Committee – meets quarterly and chaired by the Group CEO
- IEHG has made sepsis eLearning mandatory for all relevant HCWs in the group
- Group Sepsis ADON provides support to local committees, undertakes process audits to measure compliance at hospital level with the NCG, provides information and updates as relevant and provides feedback on audit results to Local and HG Leadership
- Our 11 hospitals have sepsis committees in place that meet regularly to oversee implementation of National Clinical Guideline No. 6-Sepsis Management (NCG). The committees have a nominated medical and nursing lead who co-ordinate and monitor implementation in their hospital, provide education and updates and implement action plans following recommendations in process audit reports. Progress is reported back through locally agreed forums to Hospital Leadership Teams. The committees have wide representation from key stakeholders including: Medical; Surgical; Paediatrics (as appropriate); Obstetrics (as appropriate); Nursing: General; Paediatrics (as appropriate); Midwifery; Microbiology; Laboratory; Pharmacy.

Local committees are dedicated to quality improvement in terms of sepsis recognition and timely treatment as evidenced by the following innovative initiatives: Journal Club talks; CNM 2 meetings incorporate sepsis awareness; Sepsis is included in ward meetings e.g. safety pauses, clinical handover and ward rounds; Sepsis trolley's in Emergency Departments and Wards; Sepsis box/folder on each ward; Intermittent schedule of Information sessions for all clinical staff; monitoring staff completion of HSE land eLearning; Information sessions for Medical staff at their lunchtime meetings twice yearly; Input at Medical Induction regarding Sepsis identification and management; Providing ongoing education to medical and nursing staff on using the clinical decision support tools (Forms and Algorithms).

Sepsis awareness events occur throughout the year but there is particular emphasis on awareness for World Sepsis Day -13th Sept and for the month of September (Sepsis month). These events include: Information stand for Staff and Public; Classroom presentations; Information stand in the Staff Canteen; Staff quiz; Posters at Sepsis Summit and displayed locally; Education Sessions facilitated for students and staff throughout September.

The Group ADON for Sepsis will support the National Clinical Programme's public awareness campaign at this year's ploughing championships.

Appendix 1: The Sepsis Audit Subcommittee 2018

Member	Title
Vida Hamilton	National Sepsis Clinical Lead
Grainne Cosgrove	Senior Statistician, Measurement for Improvement Team, QID
Christina Doyle	Programme Manager National Sepsis Programme
Deirdre Murphy	Head of HIPE & NPRS, HPO
Jacqui Curley	Coding Manager, Healthcare Pricing Office
Marie Glynn	Head of Clinical Coding Education
Declan McKeown	Health Intelligence
Sinead Horgan	Group Sepsis ADON South/South West Hospital Group

Appendix 2: The Sepsis Steering Committee 2018

Member	Title
Fidelma Fitzpatrick	Consultant Microbiologist, Chair Sepsis Steering Committee
Vida Hamilton	National Sepsis Clinical Lead
Kevin Rooney	National Clinical Lead on Sepsis Healthcare Improvement Scotland
Christina Doyle	Programme Manager National Sepsis Programme
Garry Courtney	National Clinical Lead Acute Medicine Programme
Blathnaid Connolly	Programme Manager Acute Medicine Programme
Michael Turner	National Clinical Lead Obstetrics and Gynaecology
Michael Power	National Clinical Lead Critical Care
Frank Keane	National Clinical Lead Surgery
Jeremy Smith	National Clinical Lead Anaesthesia
Robert Cunney	National Clinical Lead – HCAI and AMR prevention & QID representation
Marie Keogan	National Clinical Lead Pathology
Cathal O'Broin	NCHD representation
Karen Power	Project Manager Obs and Gynae
Deirdre Murphy	Head of HIPE & NPRS, HPO
Declan McKeown	Health Intelligence representation
Diarmuid O'Shea	National Clinical Lead Older Person Programme
Siobhan Horkin	Programme Manager Paeds and Neonatal Programme
Linda Dillon	Patient Advocacy Representative
David Hanlon	National Clinical Lead Primary Care Lead
Colm Henry	National Clinical Advisory and Group Lead – Acute Hospital
Tony McNamara	CEO/Hospital Manager Representative
Jean Kelly	Group Director of Nursing and IADNAM representative
Brian Power	Pre-Hospital Emergency Care Council
Anne McCabe	National Ambulance Service- Critical Care Retrieval Services
Gerry McCarthy	National Clinical Lead Emergency Medicine
Fiona McDaid	Emergency Nursing Representative
Rachel Gilmore	Emergency Medicine Representative
Geraldine Shaw	Office of the Nursing & Midwifery Services Director representative
Gethin White	Library Services DSH representative
Mary Bedding	Group Sepsis ADON RCSI Hospital Group
Karn Cliffe	Group Sepsis ADON/M Dublin Midlands Hospital Group
Celine Conroy	Group Sepsis ADON Ireland East Hospital Group
Sinead Horgan	Group Sepsis ADON South/South West Hospital Group
Ronan O Cathasaigh	Group Sepsis ADON Saolta Hospital Group
Yvonne Young	Group Sepsis ADON University Limerick Hospital Group

Appendix 3: The National Sepsis Programme team 2018/2019

Member	Title
Vida Hamilton	National Sepsis Clinical Lead
Martina Healy (2018 onwards)	National Sepsis Clinical Lead
Christina Doyle	Programme Manager National Sepsis Programme
Ciara Hughes (2019 onwards)	Programme Manager National Sepsis Programme
Mary Bedding	Sepsis ADON RCSI Hospital Group
Karn Cliffe	Sepsis ADON/M Dublin Midlands Hospital Group
Celine Conroy	Sepsis ADON Ireland East Hospital Group
Sinead Horgan Kay O'Mahony (2018 onwards)	Group ADON South/South West Hospital Group
Ronan O'Cathasaigh Fidelma Gallagher (2018 onwards)	Group ADON Saolta Hospital Group
Yvonne Young	Group ADON University Limerick Hospital Group

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 8th 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 validation 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

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
R65.0[1]	Systemic inflammatory response syndrome [SIRS] of infectious origin without acute organ failure
R65.1	Systemic inflammatory response syndrome [SIRS] of infectious origin with acute organ failure

[1] ICD-10-AM 8th Edition code only, no corresponding 6th Edition Code. *This code is excluded from the new Sepsis-3 definition.*

ICD-10-AM Diagnosis Codes for Septic Shock

ICD-10-AM 8th Edition Codes	Description
R57.2[1]	Septic Shock

[1] ICD-10-AM 8th Edition code only, no corresponding 6th Edition Code.

NOTE:

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

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

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

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

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

ICD-10-AM 8th Edition 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
T802	Infections following infusion, transfusion and therapeutic injection
T81.41	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 and vascular 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
T85.71	Infection and inflammatory reaction due to peritoneal dialysis catheter
T85.72	Infection and inflammatory reaction due to nervous system device, implant and graft
T85.78	Infection and inflammatory reaction due to other internal prosthetic devices, implants and grafts
T89.02	Open wound with infection

[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 6h 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

Appendix 4d: Codes for selected co-morbidities

ICD-10-AM Diagnosis Codes for Cancer

ICD-10-AM 8th Edition Codes	Description
C00-C96	Malignant Neoplasms

ICD-10-AM Diagnosis Codes for Chronic Liver Disease

ICD-10-AM 8th Edition Codes	Description
K70.0	Alcoholic fatty liver
K70.2	Alcoholic fibrosis and sclerosis of liver
K70.3	Alcoholic cirrhosis of liver
K70.4	Alcoholic hepatic failure
K70.9	Alcoholic liver disease, unspecified
K71.3	Toxic liver disease with chronic persistent hepatitis
K71.4	Toxic liver disease with chronic lobular hepatitis
K71.5	Toxic liver disease with chronic active hepatitis
K71.7	Toxic liver disease with fibrosis and cirrhosis of liver
K72.1	Chronic hepatic failure
K72.9	Hepatic failure, unspecified
K73.0	Chronic persistent hepatitis, not elsewhere classified
K73.1	Chronic lobular hepatitis, not elsewhere classified
K73.2	Chronic active hepatitis, not elsewhere classified
K73.8	Other chronic hepatitis, not elsewhere classified
K73.9	Chronic hepatitis, unspecified
K74.0	Hepatic fibrosis
K74.1	Hepatic sclerosis
K74.2	Hepatic fibrosis with hepatic sclerosis
K74.3	Primary biliary cirrhosis
K74.4	Secondary biliary cirrhosis
K74.5	Biliary cirrhosis, unspecified
K74.6	Other and unspecified cirrhosis of liver
K76.0	Fatty (change of) liver, not elsewhere classified
K76.9	Liver disease, unspecified

ICD-10-AM Diagnosis Codes for Diabetes

ICD-10-AM 8th Edition Codes	Description
E10	Type 1 diabetes mellitus
E11	Type 2 diabetes mellitus
E13	Other specified diabetes mellitus
E14	Unspecified diabetes mellitus

ICD-10-AM Diagnosis Codes for Chronic Kidney Disease

ICD-10-AM 8th Edition Codes	Description
N18	Chronic kidney disease

ICD-10-AM Diagnosis Codes for COPD

ICD-10-AM 8th Edition Codes	Description
J41	Simple and mucopurulent chronic bronchitis
J42	Unspecified chronic bronchitis
J43	Emphysema
J44	Other chronic obstructive pulmonary disease
J47	Bronchiectasis

ICD-10-AM Diagnosis Codes for HIV

ICD-10-AM 8th Edition Codes	Description
B20	Human immunodeficiency virus [HIV] disease resulting in infectious and parasitic diseases
B21	Human immunodeficiency virus [HIV] disease resulting in malignant neoplasms
B22	Human immunodeficiency virus [HIV] disease resulting in other specified diseases
B23	Human immunodeficiency virus [HIV] disease resulting in other conditions
B24	Unspecified human immunodeficiency virus [HIV] disease

ICD-10-AM Diagnosis Codes for Mental and Behavioral Disorders due to use of Alcohol

ICD-10-AM 8th Edition Codes	Description
F10.1	Mental and behavioural disorders due to use of alcohol, harmful use
F10.2	Mental and behavioural disorders due to use of alcohol, dependence syndrome
F10.3	Mental and behavioural disorders due to use of alcohol, withdrawal state
F10.4	Mental and behavioural disorders due to use of alcohol, withdrawal state with delirium
F10.5	Mental and behavioural disorders due to use of alcohol, psychotic disorder
F10.6	Mental and behavioural disorders due to use of alcohol, amnesic syndrome
F10.7	Mental and behavioural disorders due to use of alcohol, residual and late-onset psychotic disorder
F10.8	Mental and behavioural disorders due to use of alcohol, other mental and behavioural disorders
F10.9	Mental and behavioural disorders due to use of alcohol, unspecified mental and behavioural disorder
Z86.41	Personal history of alcohol use disorder

Appendix 5: Sepsis Forms

SEPSIS ALGORITHM
INPATIENT ADULT

SEPSIS FORM
INPATIENT ADULT

SEPSIS ALGORITHM
EMERGENCY DEPARTMENT ADULT

POCKET CARD
EMERGENCY DEPARTMENT ADULT

TRIAGE SEPSIS SCREENING ALGORITHM
EMERGENCY DEPARTMENT ADULT

SEPSIS FORM
EMERGENCY DEPARTMENT ADULT

SEPSIS ALGORITHM
MATERNITY PATIENTS

POCKET CARD
MATERNITY PATIENTS

SEPSIS SCREENING ALGORITHM
MATERNITY PATIENTS

SEPSIS FORM
MATERNITY PATIENTS

ADULT SEPIS FLUID ALGORITHM

In-Patient Sepsis Algorithm

(Exercising Clinical Judgment)

Screening and Medical Review – 1 hour

Sepsis Screen

NEWS ≥ 4 (or ≥ 5 on oxygen) and suspicion of infection
Check for 1, 2 or 3

1. At risk of neutropenia, e.g. on chemotherapy/ radiotherapy
2. Clinical evidence of **new onset** organ dysfunction
3. Systemic inflammatory response (≥2 SIRS) plus ≥ 1 co-morbidity

Actions
Screen Positive

1. Escalate as per NEWS protocol
2. Place sepsis form with documentation

Actions
Screen Negative

1. Follow usual management pathway
2. Usual NEWS escalation protocol

Medical Review

History & examinations supports infection as likely cause of presentation
This is Time Zero

By 1 hour

Complete Sepsis 6 Bundle

Give antimicrobials as per local antimicrobial guideline

Assess for source control

Urgent Anaesthetic/ Critical Care review for: Fluid resistant Shock, Respiratory failure, Purpuric rash

By 3 hours

Assess patient's clinical status

Review blood tests and other investigations
Repeat lactate if 1st abnormal
Continue fluid resuscitation as indicated

Review differential diagnosis

Escalate for source control or Critical Care as indicated

Infection and organ dysfunction –
This is SEPSIS
On pressors –
This is SEPTIC SHOCK

Infection no organ dysfunction
This is INFECTION
Usual treatment pathway

Aetiology unclear + Organ dysfunction
Continue IV antimicrobials until senior review

Non-infective aetiology
STOP antimicrobials

Complete and sign the Sepsis Form

Daily Review

Assess clinical, haematological and biochemical response to treatment

Follow local antimicrobial guideline

Improving
Follow "Start Smart then Focus" policy

No change
Review diagnosis and treatment, check for source control

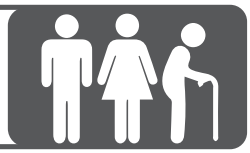
Deteriorating
Urgent senior input.
Review diagnosis and treatment.
Consider microbiology review.
Consider Critical Care review.

In-Patient Sepsis Algorithm Short Version - 27/08/2018

Sepsis Form - In-Patient Adult

Start Sepsis form if there is a suspicion of infection and NEWS ≥ 4 (or ≥ 5 on oxygen) or Exercising clinical judgement

There are separate sepsis criteria for maternity patients and children



Section 1 Sepsis screen for Nursing Staff

Suspicion of infection ☐

AND

Patient presentation ☐ **1** ☐ **2 or** ☐ **3**
(see Section 3 and Adult In-Patient Sepsis Management Algorithm).

Action:
NEWS ≥ 4 or Exercising clinical judgement – escalate to medical review within 30 mins.
1) Inform if screen positive
2) Start Sepsis Form and put with clinical notes

Addressograph here

Date: Time of NEWS: NEWS:

Signature: NMBI PIN:

Section 2 Sepsis diagnosis for Medical Staff

Document site of suspected infection after medical review

- ☐ Respiratory Tract
- ☐ Intra-abdominal
- ☐ Urinary Tract
- ☐ Skin
- ☐ Catheter/Device Related
- ☐ Intra-articular/Bone
- ☐ Central Nervous System
- ☐ Unknown
- ☐ Other suspected site:

☐ **No clinical suspicion of INFECTION**: terminate form and sign at bottom.

Section 3

Who needs to get the "Sepsis 6" – infection plus any one of the following:

1. ☐ Patients at risk of neutropenia, due to bone marrow failure, autoimmune disorder or treatment including but not limited to, chemotherapy and radiotherapy, who present unwell.

2. ☐ Clinically apparent new onset organ failure, any one of the following:

- ☐ Acutely altered mental state
- ☐ RR > 30
- ☐ O_2 sat < 90%
- ☐ HR > 130
- ☐ Oligo or anuria
- ☐ Pallor/mottling with prolonged capillary refill
- ☐ SBP < 100
- ☐ Non-blanching rash
- ☐ Other organ dysfunction

3. ☐ Patients with a systemic inflammatory response (≥2 SIRS) plus ≥ 1 co-morbidity.

SIRS criteria: Note – physiological changes should be sustained not transient.

- ☐ Respiratory rate ≥ 20 breaths/min
- ☐ WCC < 4 or > 12 x 10^9/L
- ☐ Bedside glucose >7.7mmol/L *(in the absence of diabetes mellitus)*
- ☐ Heart rate > 90 beats/min
- ☐ Temperature <36 or >38.3^{0}C

Co-morbidities associated with increased mortality in sepsis.

- ☐ COPD
- ☐ DM
- ☐ HIV/AIDS
- ☐ Chronic liver disease
- ☐ Cancer
- ☐ Chronic kidney disease
- ☐ Immunosuppressant medications
- ☐ Age ≥75 years
- ☐ Frailty
- ☐ Recent surgery/major trauma

Section 4

☐ **If YES** after medical review to Section 2 **PLUS** 1,2 or 3 in Section 3.

Start SEPSIS 6 (Section 6)

Time Zero:

Section 5

☐ **If NO** to infection with a high-risk presentation (1, 2 or 3), tick NO and sign off. If infection and low-risk presentation, tick infection and continue usual treatment pathway. Review diagnosis if patient deteriorates.

☐ **Infection**

Antimicrobial given:

Has a decision been made to apply a relevant treatment limitation plan.

☐ Do not proceed with Sepsis pathway. Document limitations in clinical notes.

Doctor's Name: **Doctor's Signature:**

MCRN: **Date:** **Time:**

Sepsis Form - In-Patient Adult

ALWAYS USE CLINICAL JUDGEMENT

Addressograph here

Treatment, Risk Stratification and Escalation

Section 6

TAKE 3 **SEPSIS 6 - aim to complete *within 1 hour*** **GIVE 3**

- ☐ **BLOOD CULTURES:** Take blood cultures prior to giving antimicrobials unless this leads to delay > 45minutes. Other cultures as indicated by history and examination.
- ☐ **BLOOD TESTS:** Point of care lactate (venous or arterial). FBC, U&E, LFTs +/- Coag. Other tests and investigations as indicated.
- ☐ **URINE OUTPUT:** Assess urinary output as part of volume/perfusion status assessment. For patients with sepsis or septic shock start hourly urinary output measurement.
- ☐ **OXYGEN:** _____ **%.** Range 21% (R/A) to 100%. Titrate to saturations of 94-98%, 88-92% in chronic lung disease.
- ☐ **FLUIDS: Volume in 1st hour** _____ **mls.** Patients who present with hypotension should receive 30mls/kg of a balanced salt solution within 1 hour of presentation. Start pressors in patients who are fluid unresponsive. Patients with hypoperfusion should receive fluid to restore perfusion using a bolus and review technique. 500ml boluses are recommended but may be amended based on clinical context. See fluid resuscitation algorithm.
- ☐ **ANTIMICROBIALS:** Give antimicrobials as per local antimicrobial guideline based on the site of infection, community or healthcare acquired and the patients allergy status. Assess requirement for source control.

Type: _____ Dose: _____ Time given: _____

Section 7

Look for signs of new organ dysfunction after the Sepsis 6 bundle has been given or from blood test results – any one is sufficient:

- ☐ Lactate ≥ 4 after 30mls/kg Intravenous therapy
- ☐ Cardiovascular - Systolic BP < 90 or Mean Arterial Pressure (MAP) < 65 or Systolic BP more than 40 below patient's normal
- ☐ Respiratory - New need for oxygen to achieve saturation > 90% (note: this is a definition not the target)
- ☐ Renal - Creatinine > 170 micromol/L **or** Urine output < 500mls/24 hrs – despite adequate fluid resuscitation
- ☐ Liver - Bilirubin > 32 micromol/L
- ☐ Haematological - Platelets < 100 x 10^9/L
- ☐ Central Nervous System - Acutely altered mental status

One or more new organ dysfunction due to infection:

☐ **This is SEPSIS**: Seek senior input as per local guideline.

No new organ dysfunction due to infection:

☐ **This is NOT SEPSIS**: If infection is diagnosed proceed with usual treatment pathway for that infection.

Section 8

Look for signs of septic shock

(following adequate initial fluid resuscitation, typically 2 litres in the first hour unless fluid intolerant)

- ☐ Requiring inotropes/pressors to maintain MAP ≥ 65
- ☐ **This is SEPTIC SHOCK**
- ☐ Inform Consultant
- ☐ Contact CRITICAL CARE

Practical Guidance

Re-assess the patient's clinical response frequently. Re-assess and repeat lactate, if the first is abnormal, by 3hrs.
Achieve source control as soon as practicable.
If the patient is deteriorating, despite appropriate treatment, seek senior assistance, re-asssess antimicrobial therapy and the need for source control.

Pathway Modification

All Pathway modifications need to be agreed by the Hospital's Sepsis Committee and be in line with the National Clinical Guideline.

Section 9

Clinical Handover. Use ISBAR$_3$ Communication Tool

This section only applies when handover occurs before the form is completed and the form is then signed off by the receiving doctor.

Doctor's Name (PRINT): _____ Doctor's Signature: _____ **Doctor's Initials** _____ **MCRN** _____

Patient care handed over to: _____ Time: _____ Sections completed: _____

Form completed by

Doctor's Name: _____ **Doctor's Signature:** _____

MCRN: _____ **Date:** _____ **Time:** _____

File this document in the patient notes – other aspects of patient management should be documented on the continuation sheets.

ED Sepsis Algorithm

(Exercising Clinical Judgment)

EMERGENCY MEDICINE

RECOGNISE SEPSIS • ENHANCE SURVIVAL

Screening and Medical Review – 1 hour

Sepsis Screen at Triage

Likely infection
Check for 1, 2 or 3

1. At risk of neutropenia, e.g. on chemotherapy/ radiotherapy
2. Clinical evidence of **new onset** organ dysfunction
3. Systemic inflammatory response (≥2 SIRS) plus ≥ 1 co-morbidity

Actions
Screen Positive

1. Triage Category 2
2. Place sepsis form with documentation

Actions
Screen Negative

1. Follow usual management pathway
2. Re-assess if deteriorates

Medical Review

History & examinations supports infection as likely cause of presentation
This is Time Zero

By 1 hour

Complete Sepsis 6 Bundle

Give antimicrobials as per local antimicrobial guideline

Assess for source control

Urgent Anaesthetic/ Critical Care review for: Fluid resistant Shock, Respiratory failure, Purpuric rash

By 3 hours

Assess patient's clinical status

Review blood tests and other investigations
Repeat lactate if 1st abnormal
Continue fluid resuscitation as indicated

Review differential diagnosis

Escalate for source control or Critical Care as indicated

Infection and organ dysfunction –
This is SEPSIS
On pressors –
This is SEPTIC SHOCK

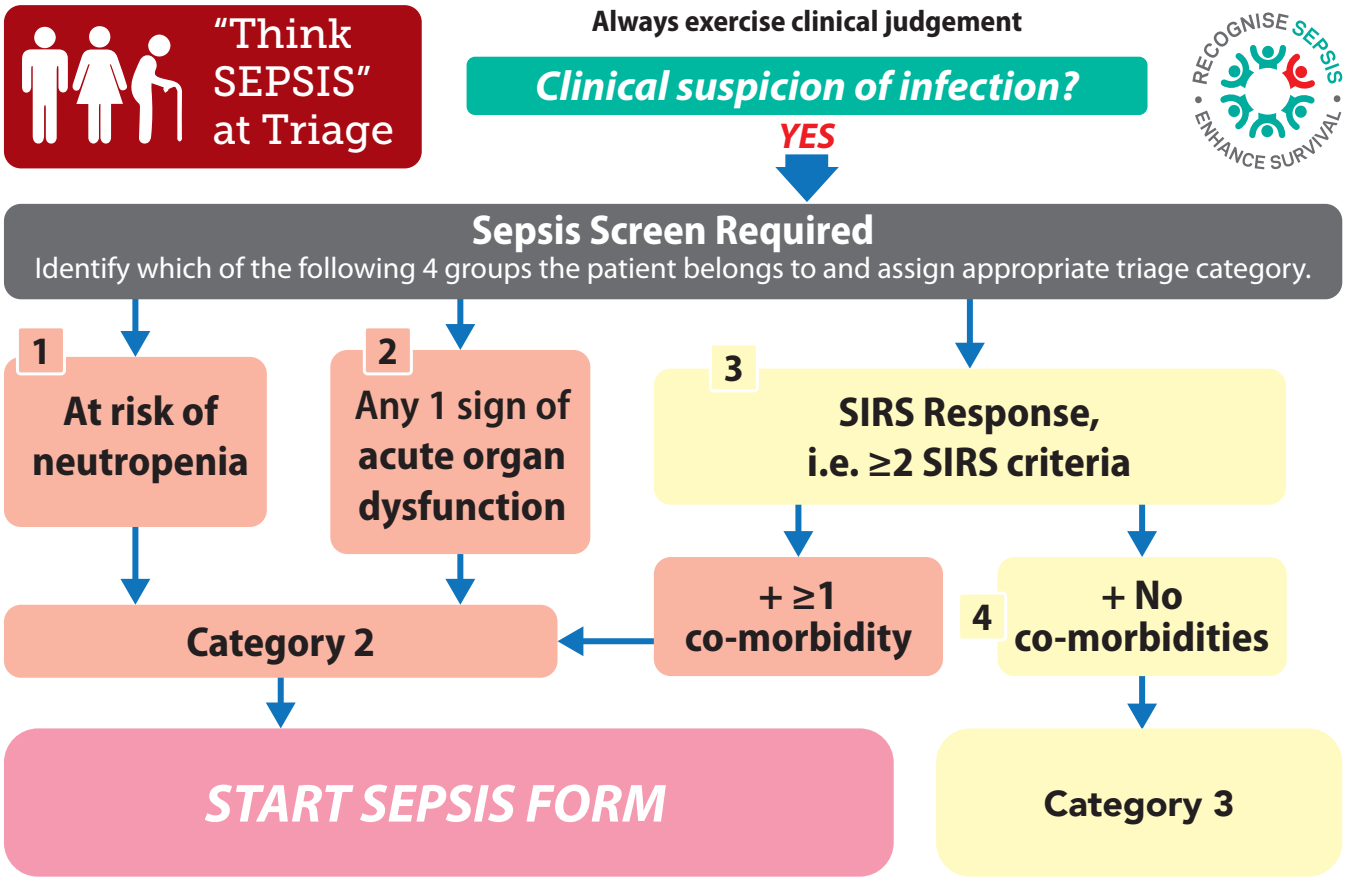
Infection no organ dysfunction
This is INFECTION
Usual treatment pathway

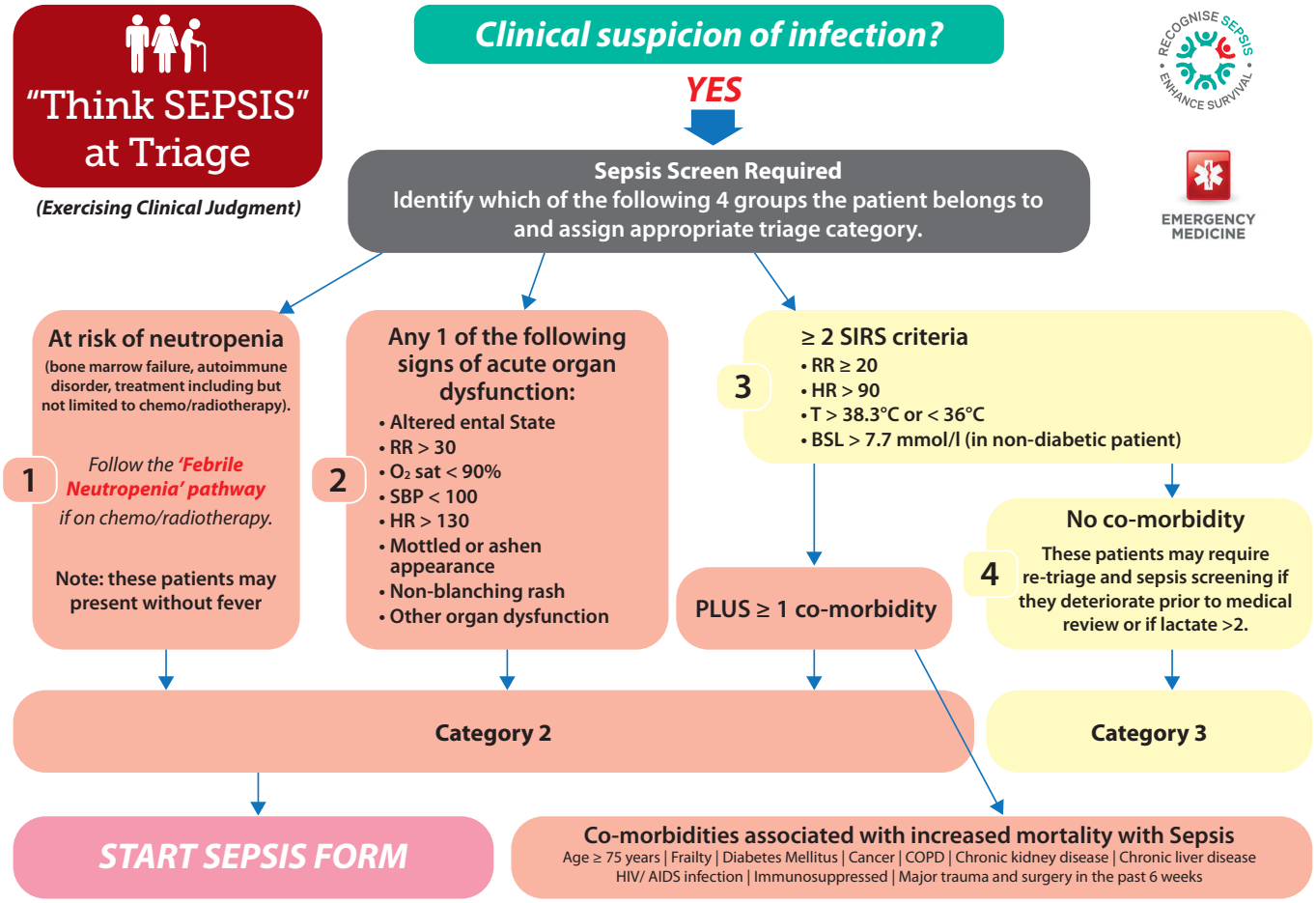
Aetiology unclear + Organ dysfunction
Continue IV antimicrobials until senior review

Non-infective aetiology
STOP antimicrobials

Complete and sign the Sepsis Form.
Put with clinical notes if patient admitted.

ED Sepsis Algorithm Short Version - 27/08/2018


"Think SEPSIS" at Triage
Always exercise clinical judgement
Clinical suspicion of infection?
YES
RECOGNISE SEPSIS • ENHANCE SURVIVAL
Sepsis Screen Required
Identify which of the following 4 groups the patient belongs to and assign appropriate triage category.
1
At risk of neutropenia
2
Any 1 sign of acute organ dysfunction
3
SIRS Response, i.e. ≥2 SIRS criteria
+ ≥1 co-morbidity
4
+ No co-morbidities
Category 2
START SEPSIS FORM
Category 3


"Think SEPSIS" at Triage
(Exercising Clinical Judgment)
Clinical suspicion of infection?
YES
RECOGNISE SEPSIS • ENHANCE SURVIVAL
EMERGENCY MEDICINE
Sepsis Screen Required
Identify which of the following 4 groups the patient belongs to and assign appropriate triage category.
At risk of neutropenia
(bone marrow failure, autoimmune disorder, treatment including but not limited to chemo/radiotherapy).
1
Follow the 'Febrile Neutropenia' pathway if on chemo/radiotherapy.
Note: these patients may present without fever
Any 1 of the following signs of acute organ dysfunction:
2
• Altered ental State
• RR > 30
• O2 sat < 90%
• SBP < 100
• HR > 130
• Mottled or ashen appearance
• Non-blanching rash
• Other organ dysfunction
≥ 2 SIRS criteria
3
• RR ≥ 20
• HR > 90
• T > 38.3°C or < 36°C
• BSL > 7.7 mmol/l (in non-diabetic patient)
PLUS ≥ 1 co-morbidity
No co-morbidity
4
These patients may require re-triage and sepsis screening if they deteriorate prior to medical review or if lactate >2.
Category 2
Category 3
START SEPSIS FORM
Co-morbidities associated with increased mortality with Sepsis
Age ≥ 75 years | Frailty | Diabetes Mellitus | Cancer | COPD | Chronic kidney disease | Chronic liver disease
HIV/ AIDS infection | Immunosuppressed | Major trauma and surgery in the past 6 weeks
27.08.2018
www.mochaprint.ie

Sepsis Form - Emergency Department Adult

ALWAYS USE CLINICAL JUDGEMENT

There are separate sepsis criteria for maternity patients and children

EMERGENCY MEDICINE

RECOGNISE SEPSIS • ENHANCE SURVIVAL

Complete this form and apply if a patient presents to the Emergency Department with symptoms and/or signs of infection.

Section 1 Sepsis screen for Nursing Staff

Suspicion of infection ☐

AND

Patient presentation ☐ **1** ☐ **2 or** ☐ **3**

(see Section 3 and "Think Sepsis" poster).

Triage as Category 2 / Orange, commence Sepsis Form and put with clinical notes

Date: Triage Time: Triage Category:

Signature: NMBI PIN:

Addressograph here

Section 2 Sepsis diagnosis for Medical Staff

Document site of suspected infection after medical review

☐ Respiratory Tract ☐ Intra-abdominal ☐ Urinary Tract

☐ Skin ☐ Catheter/Device Related ☐ Intra-articular/Bone

☐ Central Nervous System ☐ Unknown

☐ Other suspected site:

☐ **No clinical suspicion of INFECTION**: terminate form and sign at bottom.

Section 3

Who needs to get the "Sepsis 6" – infection plus any one of the following:

1. ☐ Patients at risk of neutropenia, due to bone marrow failure, autoimmune disorder or treatment including but not limited to, chemotherapy and radiotherapy, who present unwell.

2. ☐ Clinically apparent new onset organ failure, any one of the following:

☐ Acutely altered mental state ☐ RR > 30 ☐ O_2 sat < 90% ☐ HR > 130

☐ Oligo or anuria ☐ Pallor/mottling with prolonged capillary refill ☐ SBP < 100

☐ Non-blanching rash ☐ Other organ dysfunction

3. ☐ Patients with a systemic inflammatory response (≥2 SIRS) plus ≥ 1 co-morbidity.

SIRS criteria: Note – physiological changes should be sustained not transient.

☐ Respiratory rate ≥ 20 breaths/min ☐ WCC < 4 or > 12 x 10^9/L ☐ Bedside glucose >7.7mmol/L *(in the absence of diabetes mellitus)*

☐ Heart rate > 90 beats/min ☐ Temperature <36 or >38.3°C

Co-morbidities associated with increased mortality in sepsis.

☐ COPD ☐ DM ☐ HIV/AIDS ☐ Chronic liver disease ☐ Cancer ☐ Chronic kidney disease

☐ Immunosuppressant medications ☐ Age ≥75 years ☐ Frailty ☐ Recent surgery/major trauma

Section 4

☐ **If YES** after medical review to Section 2 **PLUS** 1,2 or 3 in Section 3.

Start SEPSIS 6 (Section 6)

Time Zero:

Section 5

☐ **If NO** to infection with a high-risk presentation (1, 2 or 3), tick NO and sign off. If infection and low-risk presentation, tick infection and continue usual treatment pathway. Review diagnosis if patient deteriorates.

☐ **Infection**

Antimicrobial given:

Has a decision been made to apply a relevant treatment limitation plan.

☐ Do not proceed with Sepsis pathway. Document limitations in clinical notes.

Doctor's Name: **Doctor's Signature:**

MCRN: **Date:** **Time:**

Continue overleaf

Sepsis Form - ED Adult

ALWAYS USE CLINICAL JUDGEMENT

Addressograph here

Treatment, Risk Stratification and Escalation

Section 6

TAKE 3 **SEPSIS 6 - aim to complete *within 1 hour*** **GIVE 3**

- ☐ **BLOOD CULTURES:** Take blood cultures prior to giving antimicrobials unless this leads to delay > 45minutes. Other cultures as indicated by history and examination.
- ☐ **BLOOD TESTS:** Point of care lactate (venous or arterial). FBC, U&E, LFTs +/- Coag. Other tests and investigations as indicated.
- ☐ **URINE OUTPUT:** Assess urinary output as part of volume/perfusion status assessment. For patients with sepsis or septic shock start hourly urinary output measurement.
- ☐ **OXYGEN: %.** Range 21% (R/A) to 100%. Titrate to saturations of 94-98%, 88-92% in chronic lung disease.
- ☐ **FLUIDS: Volume in 1st hour mls.** Patients who present with hypotension should receive 30mls/kg of a balanced salt solution within 1 hour of presentation. Start pressors in patients who are fluid unresponsive. Patients with hypoperfusion should receive fluid to restore perfusion using a bolus and review technique. 500ml boluses are recommended but may be amended based on clinical context. See fluid resuscitation algorithm.
- ☐ **ANTIMICROBIALS:** Give antimicrobials as per local antimicrobial guideline based on the site of infection, community or healthcare acquired and the patients allergy status. Assess requirement for source control.

Type: Dose: Time given:

Section 7

Look for signs of new organ dysfunction after the Sepsis 6 bundle has been given or from blood test results – any one is sufficient:

- ☐ Lactate ≥ 4 after 30mls/kg Intravenous therapy
- ☐ Cardiovascular - Systolic BP < 90 or Mean Arterial Pressure (MAP) < 65 or Systolic BP more than 40 below patient's normal
- ☐ Respiratory - New need for oxygen to achieve saturation > 90% (note: this is a definition not the target)
- ☐ Renal - Creatinine > 170 micromol/L **or** Urine output < 500mls/24 hrs – despite adequate fluid resuscitation
- ☐ Liver - Bilirubin > 32 micromol/L
- ☐ Haematological - Platelets < 100 x 10^9/L
- ☐ Central Nervous System - Acutely altered mental status

One or more new organ dysfunction due to infection:

☐ **This is SEPSIS**: Seek senior input as per local guideline.

No new organ dysfunction due to infection:

☐ **This is NOT SEPSIS**: If infection is diagnosed proceed with usual treatment pathway for that infection.

Section 8

Look for signs of septic shock

(following adequate initial fluid resuscitation, typically 2 litres in the first hour unless fluid intolerant)

- ☐ Requiring inotropes/pressors to maintain MAP ≥ 65
  - ☐ **This is SEPTIC SHOCK**
- ☐ Inform Consultant
- ☐ Contact CRITICAL CARE

Practical Guidance

Re-assess the patient's clinical response frequently. Re-assess and repeat lactate, if the first is abnormal, by 3hrs.
Achieve source control as soon as practicable.
If the patient is deteriorating, despite appropriate treatment, seek senior assistance, re-asssess antimicrobial therapy and the need for source control.

Pathway Modification

All Pathway modifications need to be agreed by the Hospital's Sepsis Committee and be in line with the National Clinical Guideline.

Section 9

Clinical Handover. Use ISBAR$_3$ Communication Tool

This section only applies when handover occurs before the form is completed and the form is then signed off by the receiving doctor.

Doctor's Name (PRINT): Doctor's Signature: **Doctor's Initials** **MCRN**

Patient care handed over to: Time: Sections completed:

Form completed by

Doctor's Name: **Doctor's Signature:**

MCRN: **Date:** **Time:**

File this document in the patient notes – other aspects of patient management should be documented on the continuation sheets.

Maternity Sepsis Algorithm

(Exercising Clinical Judgment)

RECOGNISE SEPSIS • ENHANCE SURVIVAL •

Screening and Medical Review – 1 hour

Sepsis Screen

Likely infection

Check for 1, 2, 3 or 4

1. IMEWS trigger for immediate review, i.e. >2 YELLOWS or >1 PINK
2. SIRS Response, i.e. ≥2 modified SIRS criteria
3. At risk of neutropenia, e.g. on chemotherapy/ radiotherapy
4. Clinical evidence of **new onset** organ dysfunction

Actions

Screen Positive

1. Request immediate medical review
2. Place sepsis form with documentation. Sepsis form can be found in the ad-hoc tab in (MN-CMS)

Actions

Screen Negative

1. Follow usual management pathway
2. Usual IMEWS escalation protocol

Medical Review

History & examinations supports infection as likely cause of presentation

This is Time Zero

By 1 hour

Start Sepsis 6+1 Bundle

Ad-hoc in (MN-CMS)

Assess fetal well-being

Give antimicrobials as per local antimicrobial guideline

Assess for source control

Anaesthetic/Critical Care review for:
Fluid resistant Shock,
Respiratory failure,
Purpuric rash
or any other organ dysfunction.
Inform Consultant Obstetrician

By 3 hours

Assess patient's clinical status

Review blood tests and other investigations
Repeat lactate if 1st abnormal
Continue fluid resuscitation as indicated

Review differential diagnosis

Escalate for source control or Critical Care as indicated

Infection and organ dysfunction –
This is SEPSIS
On pressors –
This is SEPTIC SHOCK

Infection no organ dysfunction
This is INFECTION
Usual treatment pathway

Aetiology unclear + Organ dysfunction
Continue IV antimicrobials until senior review

Non-infective aetiology
STOP antimicrobials

Complete and sign the Sepsis Form

Daily Review

Assess clinical, haematological and biochemical response to treatment

Follow local antimicrobial guideline

Improving
Follow "Start Smart then Focus" policy

No change
Review diagnosis and treatment, check for source control

Deteriorating
Urgent senior input.
Review diagnosis and treatment.
Consider microbiology review.
Anaesthetic/Critical Care review.

Maternity Sepsis Algorithm Short Version - 27/08/2018

If there is infection, "Think SEPSIS"

Maternal Sepsis is a life-threatening condition defined as organ dysfunction resulting from infection during pregnancy, childbirth, post-abortion or postpartum period (WHO 2016).

RECOGNISE SEPSIS • ENHANCE SURVIVAL

Clinical suspicion of infection?

YES

Sepsis Screen Required

Identify which of the following 4 groups the woman belongs to and escalate appropriately.
Always exercise clinical judgement.

1. **IMEWS trigger for immediate review, i.e. >2 YELLOWS or >1 PINK**
2. **Any 1 sign of acute organ dysfunction**
3. **SIRS Response, i.e. ≥2 modified SIRS criteria**
4. **At risk of neutropenia**

Have a lower index of suspicion for infection or sepsis in the unwell women with risk factors

- Recent procedure
- Known colonisation/infection
- Chronic health problems

Screen Positive
START SEPSIS FORM
and escalate to medical review

None apply
Screen Negative
Follow usual IMEWS escalation protocol

If there is infection, "Think SEPSIS"

Maternal Sepsis is a life-threatening condition defined as organ dysfunction resulting from infection during pregnancy, childbirth, post-abortion or postpartum period (WHO 2016).

RECOGNISE SEPSIS • ENHANCE SURVIVAL

Clinical suspicion of infection?

YES

(Exercising Clinical Judgment)

Sepsis Screen Required

Identify which of the following 4 groups the woman belongs to and escalate appropriately.
Always exercise clinical judgement.

1. **IMEWS trigger for immediate review, i.e. >2 YELLOWS or >1 PINK**
2. **Any 1 of the following signs of acute organ dysfunction:**
   - Altered Mental State
   - RR > 30 rpm
   - O_2 sat < 90%
   - SBP < 90 mmHg
   - HR ≥ 130 bpm
   - Fetal heart rate >160 bpm
   - Mottled or ashen appearance
   - Non-blanching rash
   - Other organ dysfunction
3. **SIRS Response, i.e. ≥2 modified SIRS criteria listed below.**
   - Respiratory rate ≥ 20 bpm
   - Heart rate ≥100 bpm
   - Temperature <36°C or ≥38.3°C
   - Bedside glucose > 7.7mmol/L (in the absence of diabetes mellitus)
   - WCC < 4 or > 16.9 x 10^9/L
4. **At risk of neutropenia** (bone marrow failure, autoimmune disorder or treatment including but not limited to, **chemotherapy and radiotherapy**)

Have a lower index of suspicion for infection or sepsis in the unwell women with risk factors

Risk factors

Pregnancy Related
- Cerclage
- Pre-term/prolonged rupture of membranes
- Retained products
- History pelvic infection
- Group A Strep. infection in close contact
- Recent amniocentesis

Non Pregnancy Related
- Age > 35 years
- Minority ethnic group
- Vulnerable socio-economic background
- Obesity
- Diabetes, including gestational diabetes
- Recent surgery
- Symptoms of infection in the past week
- Immunocompromised e.g. Systemic Lupus
- Chronic renal failure
- Chronic liver failure
- Chronic heart failure

Screen Positive
START SEPSIS FORM
and escalate to medical review

None apply
Screen Negative
Follow usual IMEWS escalation protocol

www.mochuapm.ie 27/08/2018

Sepsis Predisposition & Recognition

(ALWAYS USE CLINICAL JUDGEMENT)

There are separate sepsis criteria for non-pregnant adult patients

RECOGNISE SEPSIS · ENHANCE SURVIVAL

MATERNITY PATIENTS

Complete this form and apply if there is a clinical suspicion of infection.

I

Section 1:

Midwife Name:

Midwife Signature:

NMBI PIN:

IMEWS:

Date: Time:

Patient label here

Maternal Sepsis is a life-threatening condition defined as organ dysfunction resulting from infection during pregnancy, childbirth, post-abortion or postpartum period (WHO 2016).

S

Section 2: Are you concerned that the woman could have infection

- ☐ History of fevers or rigors
- ☐ Cough/sputum/breathlessness
- ☐ Flu like symptoms
- ☐ Unexplained abdominal pain/distension
- ☐ Pelvic pain
- ☐ Vomiting and/or diarrhoea
- ☐ Line associated infection/redness/swelling/pain
- ☐ Possible intrauterine infection
- ☐ Myalgia/back pain/general malaise/headache
- ☐ New onset of confusion
- ☐ Cellulitis/wound infection/perineal infection
- ☐ Possible breast infection
- ☐ Multiple presentation with non-specific malaise
- ☐ Others

B

Section 3: Obstetric History

Para:

Gestation:

Pregnancy related complaints:

Days post-natal:

Delivery:

- ☐ Spontaneous vaginal delivery (SVD)
- ☐ Vacuum assisted delivery
- ☐ Forceps assisted delivery
- ☐ Cesarean section

Risk factors

Pregnancy Related

- ☐ Cerclage
- ☐ Pre-term/prolonged rupture of membranes
- ☐ Retained products
- ☐ History pelvic infection
- ☐ Group A Strep. infection in close contact
- ☐ Recent amniocentesis

Non Pregnancy Related

- ☐ Age > 35 years
- ☐ Minority ethnic group
- ☐ Vulnerable socio-economic background
- ☐ Obesity
- ☐ Diabetes, including gestational diabetes
- ☐ Recent surgery
- ☐ Symptoms of infection in the past week
- ☐ Immunocompromised e.g. Systemic Lupus
- ☐ Chronic renal failure
- ☐ Chronic liver failure
- ☐ Chronic heart failure

Record observations on the Irish Maternity Early Warning (IMEWS) chart.

Request immediate medical review
if you are concerned the woman has INFECTION plus ANY 1 of the following:

A

Section 4:

1. ☐ IMEWS trigger for immediate review, i.e. **>2 YELLOWS** or **>1 PINK**
2. ☐ SIRS Response, i.e. ≥2 SIRS criteria listed below.
   SIRS criteria: Note - physiological changes must be sustained not transient.
   - ☐ Respiratory rate ≥ 20 breaths/min
   - ☐ Heart rate ≥ 100bpm
   - ☐ Fetal heart rate >160bpm
   - ☐ WCC < 4 or > 16.9 x 10^9/L
   - ☐ Temperature <36^0 or ≥ 38.3^{0}C
   - ☐ Acutely altered mental status
   - ☐ Bedside glucose > 7.7mmol/L *(in the absence of diabetes mellitus)*
3. ☐ At risk of neutropenia, due to bone marrow failure, autoimmune disorder or treatment including but not limited to, chemotherapy and radiotherapy, who present unwell.

R

Section 5:

If sepsis is suspected following screening, escalate to Medical review. Use ISBAR as outlined.

Doctor's Name: **Time Doctor Contacted:**

Midwife's Signature:

Sepsis Form - Maternity

(ALWAYS USE CLINICAL JUDGEMENT)

There are separate sepsis criteria for non-pregnant adult patients

If infection suspected following History and Examination, Doctor to complete and sign sepsis screening form

Section 6: Clinical Suspicion of Infection

Document site:

☐ Genital Tract ☐ Urinary Tract ☐ Skin
☐ Respiratory Tract ☐ Intra-abdominal ☐ Catheter/Device Related
☐ Central Nervous System ☐ Intra-articular/Bone ☐ Unknown
☐ Other suspected site:

☐ **No clinical suspicion of INFECTION**: proceed to section 9.

Section 7: Who needs to get the "Sepsis 6" – infection plus any one of the following:

1. ☐ SIRS Response, i.e. ≥2 SIRS criteria listed on page 1.
2. ☐ Clinically or biochemically apparent new onset organ dysfunction, i.e. any one of the following:
   ☐ Acutely altered mental state ☐ RR > 30 ☐ O_2 sat < 90% ☐ HR > 130
   ☐ Oligo or anuria ☐ Pallor/mottling with prolonged capillary refill ☐ SBP < 90
   ☐ Non-blanching rash ☐ Other organ dysfunction
3. ☐ Patients at risk of neutropenia, due to bone marrow failure, autoimmune disorder or treatment including but not limited to, chemotherapy and radiotherapy, who present unwell.

☐ **YES. Start Maternal Sepsis 6 + 1** Time Zero:

Section 8 TAKE 3 — SEPSIS 6 + 1* – complete *within 1 hour* — GIVE 3

☐ **BLOOD CULTURES:** Take blood cultures before giving antimicrobials (if no significant delay i.e. >45 minutes) and other cultures as per examination.

☐ **BLOODS:** Check point of care lactate & full blood count, U&E +/- LFTs +/- Coag. Other test and investigations as indicated by history and examination.

☐ **URINE OUTPUT:** assess urinary output as part of volume/perfusion status assessment. For patients with sepsis or septic shock start hourly urinary output measurement.

***+1 If Pregnant, Assess Fetal Wellbeing ☐**

☐ **OXYGEN:** Titrate O_2 to saturations of 94 -98% or 88-92% in chronic lung disease. **N/A ☐**

☐ **FLUIDS:** Start IV fluid resuscitation if evidence of hypovolaemia. 500ml bolus of isotonic crystalloid over 15mins & give up to 2 litres, reassessing frequently. Call Anaesthesia/Critical Care if hypotensive or not fluid responsive. Caution in pre-eclampsia. **N/A ☐**

☐ **ANTIMICROBIALS:** Give IV antimicrobials according to the site of infection and following local antimicrobial guidelines.

Type: Dose: Time given:
Type: Dose: Time given:
Type: Dose: Time given:

Laboratory tests should be requested as EMERGENCY aiming to have results available and *reviewed within 1 hour*

Section 9

Following history and examination, and in the absence of clinical criteria or signs. Sepsis 6+1 is not commenced. If infection is diagnosed, proceed with usual treatment pathway for that infection.

☐ **NO.** Doctor's Name: Date: Time:

Section 10

Look for signs of new organ dysfunction after the Sepsis 6+1 bundle or from blood tests - any one is sufficient:

☐ Lactate ≥ 4 after 30mls/kg Intravenous therapy

☐ Cardiovascular - Systolic BP < 90 or Mean Arterial Pressure (MAP) < 65 or Systolic BP more than 40 below patient's normal

☐ Respiratory - New or increased need for oxygen to achieve saturation > 90% (note: this is a definition, not the target)

☐ Renal - Creatinine > 170 micromol/L **or** Urine output < 500mls/24 hrs – despite adequate fluid resuscitation

☐ Liver - Bilirubin > 32 micromol/L

☐ Haematological - Platelets < 100 x 10^9/L

☐ Central Nervous System - Acutely altered mental status

One or more new organ dysfunction due to infection:

☐ **This is SEPSIS.** Inform Registrar, Consultant and Anaesthetics immediately. Reassess frequently in 1st hour. Consider other investigations and management +/- source control if patient does not respond to initial therapy as evidenced by haemodynamic stabilisation then improvement.

No new organ dysfunction due to infection:

☐ **This is NOT SEPSIS**: If infection is diagnosed proceed with usual treatment pathway for that infection.

Section 11

Look for signs of septic shock

(following adequate initial fluid resuscitation, typically 2 litres in the first hour unless fluid intolerant)

☐ Requiring inotropes/pressors to maintain MAP ≥ 65

☐ **This is SEPTIC SHOCK**

☐ Inform Consultant

☐ Contact CRITICAL CARE/Anaesthesia

Pathway Modification

All Pathway modifications need to be agreed by the Hospital's Sepsis Steering Committee and be in line with the National Clinical Guideline No 6 Sepsis Management.

Section 12

Clinical Handover. Use ISBAR$_3$ Communication Tool

This section only applies when handover occurs before the form is completed and is then signed off by the receiving doctor.

Doctor's Name (PRINT): Doctor's Signature: **Doctor's Initials** **MCRN**

Patient care handed over to: Time: Sections completed:

File this document in patient notes - Document management plan.

Doctor's Name: **Doctor's Signature:** **MCRN:** **Date:** **Time:**

Fluid resuscitation algorithm for adults with sepsis

RECOGNISE SEPSIS • ENHANCE SURVIVAL •

NATIONAL CLINICAL EFFECTIVENESS COMMITTEE

Hypotension:
SBP < 90mmHg or > 40mmHg drop from baseline
or
MAP < 65mmHg

OR

Hypoperfusion:
Tachycardia
Vasoconstriction
Oligouria
Lactate ≥ 2mmol/L

Give bolus 500mls isotonic crystalloid over 15 minutes and reassess

Give patients who present with hypotension a minimum of 30mls/kg in the 1st hour, unless fluid intolerant

Hypovolaemia:
- Altered mental state
- Hypotension
- Hypoperfused
  - tachycardia
  - cold mottled peripheries
  - prolonged capillary refill
- Oligouria
- Raised lactate

15-minute reviews and continous monitoring

Fluid overloaded
- Increasing respiratory rate
- Decreasing O_2 saturations
- JVP distension
- New onset crepitations
- New onset discomfort lying flat

30mls/kg IVT administered

Normotensive + Repeat Lactate < 2mmol/L

- Stop all IVT
- Consider diuretic
- NIV or intubation as indicated
- Continuous monitoring

Hypotensive or Repeat Lactate ≥ 2mmol/L

- Stop all IVT
- Vasopressors
- NIV or intubation as indicated
- **Not** for diuretic
- Continuous monitoring
- **Call Critical Care**

Hypotensive or Repeat Lactate ≥ 4mmol/L

- **High mortality risk**
- Continue fluid resuscitation as above
- Consider Vasopressors
- Continuous monitoring
- **Call Critical Care**

Normotensive + Repeat Lactate < 4mmol/L

- Continue fluid resuscitation as above until Lactate < 2mmol/L as tolerated, then stop
- 1/2-hourly observations
- Reassess and treat if hypoperfusion / hypotension reoccurs

Exercise professional judgement – if patient co-morbidity indicates use 250ml boluses and reassess more frequently.

SBP: Systolic blood pressure, **MAP**: Mean arterial pressure, **JVP**: Jugular venous pressure, **IVT**: Intravenous therapy, **NIV**: Noninvasive ventilation

For more information on National Clinical Guideline No 6. Sepsis Management go to: www.hse.ie/sepsis

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Notes

www.hse.ie/sepsis