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, avoiding unnecessary antibiotics and vaccination for vaccine preventable infections.

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.

Three 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);
ii) escalation to review when a thorough history and examination identifies infection as the likely (or suspected) cause of the patient being unwell and either clinically detecting acute organ dysfunction consequent to that infection or identifying that the patient has characteristics that puts them at increased risk of developing and indeed dying from sepsis;
iii) the patient is treated with the sepsis 6, which includes blood tests being sent to assess organ function.

An important part of this approach is the three hour review where the patient’s response to initial therapy, and the infection aetiology and sepsis diagnosis are reviewed with the results of further clinical examination, and the available tests and investigations and the treatment plan amended accordingly.

This report outlines the status of sepsis in Ireland in 2017 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 healthcare record data, fortunately the project for developing such a system in Ireland has started. 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 2017 standalone data it is not and this is clearly documented where this occurs.

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 who had a fantastic attendance at the Sepsis for Coders ‘Sepsis-3’ update
and 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 Quality Improvement
Directorate, without whom this report would not be possible. Also, thank you to Christina Doyle,
Programme Manager, for her dedicated work that positively impacted on the success of the programme.

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,

Dr Vida Hamilton BE MB BAO MCh LRCP & SI FCARCSI FJFICMI
National Clinical Lead Sepsis
THE MOST EFFECTIVE WAY TO REDUCE MORTALITY FROM SEPSIS IS BY PREVENTION, GOOD SANITATION, PERSONAL HYGIENE, EATING HEALTHILY AND EXERCISING MODERATELY, BREAST FEEDING, AVOIDING UNNECESSARY ANTIBIOTICS AND VACCINATION FOR VACCINE PREVENTABLE INFECTIONS.
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Executive Summary

Key Findings

Number of cases of SIRS of infectious origin, sepsis, septic shock cases, 2017 18,411
Crude mortality rate, 2017 16.8%

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

Number of cases of SIRS of Infectious Origin, Sepsis, Septic Shock 17,106
In-hospital mortality SIRS of Infectious Origin, Sepsis, Septic Shock 17.9%
Number of cases of Sepsis & Septic Shock 16,312
In-hospital mortality rate: Sepsis & Septic Shock 18.4%
Average length of stay 20.5 days

Specialty based data:

Paediatric sepsis-associated hospital mortality rate 3.9%
Maternal sepsis-associated hospital mortality rate 0.2%
Surgical DRG sepsis-associated hospital mortality rate 24.1%
Medical DRG sepsis-associated hospital mortality rate 17.2%
Key Comparators with 2016

There was a 15.5% increase in documented cases of SIRS of Infectious Origin, Sepsis and Septic Shock with a 4% decrease in associated in-hospital mortality rate in adult, non-maternity cohort. There was no change in average length of stay.

Sepsis: There were 15,341 cases documented in 2017, a 16.6% increase over 2016, with an in-hospital mortality of 17%, representing a 2.5% decrease in mortality.

Septic Shock: There were 971 cases documented, 5.5% increase over 2016, with an in-hospital mortality of 40.3%, representing a 2.7% decrease in mortality compared with 2016.

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.
National Sepsis Report 2017


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, since 2016 the 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 2016 analysis. However, in order to be Sepsis-3 compliant R65.0 has been excluded from national sepsis-associated hospital mortality rate (18.4%) and for the purpose of international benchmarking.

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.
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. Prior to this, sepsis cases were increasing by approximately 7% per annum. The effect of ongoing sepsis awareness education is reflected in the 15.5% increase in cases documented between 2016 and 2017.

In the process audits carried out in 2017, the average patient with sepsis was in their seventies and had 1.3 co-morbidities. The following figures outline the effects of age and co-morbidity on incidence and mortality.
While sepsis incidence increases with age, 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 immuno-senescence occurs leading to increases in both incidence and mortality.

<table>
<thead>
<tr>
<th>Co-morbidity</th>
<th>Number of cases</th>
<th>Crude Mortality Rate %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mental &amp; behavioural abnormalities due to alcohol</td>
<td>679</td>
<td>23.1%</td>
</tr>
<tr>
<td>Chronic obstructive pulmonary disease</td>
<td>2,165</td>
<td>23.8%</td>
</tr>
<tr>
<td>Cancer</td>
<td>3,675</td>
<td>20.2%</td>
</tr>
<tr>
<td>Chronic kidney disease</td>
<td>2,151</td>
<td>29%</td>
</tr>
<tr>
<td>Chronic liver disease</td>
<td>555</td>
<td>38.2%</td>
</tr>
<tr>
<td>Diabetes</td>
<td>3,432</td>
<td>18.9%</td>
</tr>
<tr>
<td>HIV Disease</td>
<td>45</td>
<td>11.1%</td>
</tr>
</tbody>
</table>

Note: Cases with more than one of the co-morbidities above are included in each of the relevant co-morbidity groups. Paediatric and maternity patients are excluded.
FIGURE 4: The in-hospital mortality rate for adult inpatients with a diagnosis of sepsis and selected co-morbidities, 2017.

![Graph showing the in-hospital mortality rate for adult inpatients with sepsis and co-morbidities, 2017.](image)


![Graph showing the number of adult males and females with a diagnosis of SIRS of Infectious Origin and Sepsis, 2011-2017.](image)
Whilst sepsis is most common in the male gender there is no gender impact on mortality.

Mortality continues to decrease due to improved recognition and management.

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of Inpatients with a Diagnosis of Sepsis</th>
<th>Number of Deaths among Inpatients with a Diagnosis of Sepsis</th>
<th>Crude Mortality Rate per 100 Inpatients</th>
<th>Age-standardised Mortality Rate per 100 Inpatients*</th>
</tr>
</thead>
<tbody>
<tr>
<td>2011</td>
<td>6,495</td>
<td>1,686</td>
<td>26.0</td>
<td>26.8</td>
</tr>
<tr>
<td>2012</td>
<td>7,227</td>
<td>1,720</td>
<td>23.8</td>
<td>24.1</td>
</tr>
<tr>
<td>2013</td>
<td>7,797</td>
<td>1,799</td>
<td>23.1</td>
<td>23.5</td>
</tr>
<tr>
<td>2014</td>
<td>8,275</td>
<td>1,821</td>
<td>22.0</td>
<td>22.1</td>
</tr>
<tr>
<td>2015</td>
<td>8,888</td>
<td>2,021</td>
<td>22.74</td>
<td>22.7</td>
</tr>
<tr>
<td>2016</td>
<td>14,804</td>
<td>2,735</td>
<td>18.5</td>
<td>18.3</td>
</tr>
<tr>
<td>2017</td>
<td>17,106</td>
<td>3,068</td>
<td>17.9</td>
<td>17.6</td>
</tr>
</tbody>
</table>

* 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 2016  ↓ 4.0%
% CHANGE IN AGE-ADJUSTED MORTALITY SINCE 2014  ↓ 20.5%
% CHANGE IN AGE-ADJUSTED MORTALITY SINCE 2011  ↓ 34.2%
Quarterly rates of in-hospital mortality for inpatients with a diagnosis of sepsis from 2011 to 2017 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.

Between 2011 and 2015 the average in-hospital mortality for inpatients with a diagnosis of sepsis was 23.4%. Using control limits based on SPC methods it was expected during this period that the quarterly mortality rate would vary from around 20 to 26% by chance alone. Since 2016 the quarterly mortality rate has averaged 18.2% and has been below this lower control limit of 20% indicating a real improvement in mortality rates that is not explained by chance alone.

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

The effect of this improvement is between 353 and 1,380 additional lives saved due to the increased recognition and improved management of sepsis. There is an important caveat and that is that the education and awareness campaign will have lead to the improved documentation of lower acuity sepsis cases that bring with them a lower mortality rate and this will have impact. 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, 2016-2017

<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>2016</th>
<th>2017</th>
<th>Crude Mortality Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>SIRS of Infectious Origin</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sepsis</td>
<td>12,516 2,097 16.8%</td>
<td>14,763 2,439 16.5%</td>
<td></td>
</tr>
<tr>
<td>Severe Sepsis</td>
<td>643 198 30.8%</td>
<td>578 174 30.1%</td>
<td></td>
</tr>
<tr>
<td>Septic Shock</td>
<td>920 381 41.4%</td>
<td>971 391 40.3%</td>
<td></td>
</tr>
<tr>
<td>Total for Sepsis-3</td>
<td>14,079 2,676 19.0%</td>
<td>16,312 3,004 18.4%</td>
<td></td>
</tr>
<tr>
<td>Total for SIRS of Infectious Origin + Sepsis-3</td>
<td>14,804 2,735 18.5%</td>
<td>17,106 3,068 17.9%</td>
<td></td>
</tr>
</tbody>
</table>

### 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.
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 being prepared for the phase 2 pilot. This form will contribute to the development of standardised 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 it.

<table>
<thead>
<tr>
<th>Year</th>
<th>Children aged 0-15 Years with a Diagnosis of Sepsis</th>
<th>Pregnancy Related Cases with a Diagnosis of Sepsis</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number of Inpatients</td>
<td>Crude Mortality Rate</td>
</tr>
<tr>
<td>2011</td>
<td>737</td>
<td>3.0%</td>
</tr>
<tr>
<td>2012</td>
<td>763</td>
<td>3.9%</td>
</tr>
<tr>
<td>2013</td>
<td>763</td>
<td>3.8%</td>
</tr>
<tr>
<td>2014</td>
<td>746</td>
<td>4.0%</td>
</tr>
<tr>
<td>2015</td>
<td>766</td>
<td>2.1%</td>
</tr>
<tr>
<td>2016</td>
<td>802</td>
<td>3.5%</td>
</tr>
<tr>
<td>2017</td>
<td>822</td>
<td>3.9%</td>
</tr>
</tbody>
</table>
MEDICINE AND SURGERY

In 2016, it was 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.

In quarter 1, 240 charts with a Medical DRG and coded for pneumonia and acute kidney injury were audited; quarter 2, 144 charts with a Surgical DRG, operative intervention, infection code and acute kidney injury were audited; quarter 3, 139 charts who had blood cultures taken, an infection code and acute kidney injury were audited.

The results of this granular audit are:

### TABLE 5: Granular process audit, all acute hospitals, performed by Hospital Group Sepsis ADONs, 2017.

<table>
<thead>
<tr>
<th></th>
<th>Medical</th>
<th>Surgical</th>
<th>Emergency Dept</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cases</td>
<td>240</td>
<td>144</td>
<td>139</td>
</tr>
<tr>
<td>Average age</td>
<td>78.9</td>
<td>72.66</td>
<td>67</td>
</tr>
<tr>
<td>Co-morbidities</td>
<td>1.36</td>
<td>1.28</td>
<td>1.27</td>
</tr>
<tr>
<td>Septic documented</td>
<td>50%</td>
<td>58%</td>
<td>52%</td>
</tr>
<tr>
<td>Cultures before 1st dose antimicrobial</td>
<td>72%</td>
<td>56%</td>
<td>83%</td>
</tr>
<tr>
<td>Antimicrobials within 1 hour of infection diagnosis</td>
<td>58%</td>
<td>60%</td>
<td>61%</td>
</tr>
<tr>
<td>Antimicrobials as per guideline</td>
<td>85%</td>
<td>81%</td>
<td>88%</td>
</tr>
<tr>
<td>Lactate taken</td>
<td>68%</td>
<td>72%</td>
<td>81%</td>
</tr>
<tr>
<td>Fluid bolus given when indicated</td>
<td>72%</td>
<td>65%</td>
<td>80%</td>
</tr>
</tbody>
</table>

It can be seen from this process audit that the medical patient is older and has more co-morbidities and the rate of sepsis documentation is best in the surgical cohort. In terms of treatment with antimicrobials and fluid resuscitation the emergency department performed best with not much difference between medicine and surgery.

Thus, it can be inferred that the difference in mortality between the medical and surgical cohorts, which is widely replicated in other jurisdictions, is not due to issues related to recognition and management, although there is certainly room for improvement, 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. 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, 2017

<table>
<thead>
<tr>
<th>Surgical / Medical DRG*</th>
<th>Number of Inpatients</th>
<th>Number of Bed Days</th>
<th>Average Length of Stay</th>
<th>Crude Mortality Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surgical</td>
<td>2,794</td>
<td>119,802</td>
<td>42.9</td>
<td>24.1%</td>
</tr>
<tr>
<td>Medical</td>
<td>13,518</td>
<td>220,480</td>
<td>16.3</td>
<td>17.2%</td>
</tr>
<tr>
<td>Total</td>
<td>16,312</td>
<td>340,282</td>
<td>20.9</td>
<td>18.4%</td>
</tr>
</tbody>
</table>

*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 43 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

<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>Medical</th>
<th>Surgical</th>
<th>Medical</th>
<th>Surgical</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number of inpatients</td>
<td>Number of Bed Days</td>
<td>Average Length of Stay</td>
<td>Number of inpatients</td>
</tr>
<tr>
<td>Sepsis</td>
<td>13,518</td>
<td>220,480</td>
<td>16.3</td>
<td>2,794</td>
</tr>
<tr>
<td>Infection</td>
<td>97,562</td>
<td>973,544</td>
<td>10.0</td>
<td>12,616</td>
</tr>
<tr>
<td>All other diagnoses</td>
<td>239,513</td>
<td>1,130,415</td>
<td>4.7</td>
<td>81,323</td>
</tr>
<tr>
<td>Total</td>
<td>350,593</td>
<td>2,324,439</td>
<td>6.6</td>
<td>96,733</td>
</tr>
</tbody>
</table>

### 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, 2011-2017.**
### TABLE 8: Number of adult inpatients, bed days and average length of stay by admission to critical care, 2011-2017.

<table>
<thead>
<tr>
<th>Year</th>
<th>Admitted to Critical Care</th>
<th></th>
<th>Not Admitted to Critical Care</th>
<th></th>
<th></th>
<th>% of Inpatients with a Diagnosis of Sepsis Admitted to Critical Care</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number of inpatients</td>
<td>Number of Bed Days</td>
<td>Average Length of Stay</td>
<td>Number of inpatients</td>
<td>Number of Bed Days</td>
<td>Average Length of Stay</td>
</tr>
<tr>
<td>2011</td>
<td>2,185</td>
<td>86,568</td>
<td>39.6</td>
<td>4,310</td>
<td>99,695</td>
<td>23.1</td>
</tr>
<tr>
<td>2012</td>
<td>2,362</td>
<td>88,810</td>
<td>37.6</td>
<td>4,865</td>
<td>104,380</td>
<td>21.5</td>
</tr>
<tr>
<td>2013</td>
<td>2,315</td>
<td>85,678</td>
<td>37.0</td>
<td>5,482</td>
<td>117,352</td>
<td>21.4</td>
</tr>
<tr>
<td>2014</td>
<td>2,469</td>
<td>83,441</td>
<td>33.8</td>
<td>5,806</td>
<td>115,420</td>
<td>19.9</td>
</tr>
<tr>
<td>2015</td>
<td>2,575</td>
<td>92,704</td>
<td>36.0</td>
<td>6,313</td>
<td>127,547</td>
<td>20.2</td>
</tr>
<tr>
<td>2016</td>
<td>3,635</td>
<td>120,927</td>
<td>33.3</td>
<td>11,169</td>
<td>183,187</td>
<td>16.4</td>
</tr>
<tr>
<td>2017</td>
<td>3,992</td>
<td>134,433</td>
<td>33.7</td>
<td>13,114</td>
<td>216,580</td>
<td>16.5</td>
</tr>
</tbody>
</table>

In 2017, 23% of sepsis patients were admitted to a critical care bed and the average length of stay (aLOS) is twice as long in these patients and their mortality is also twice that of those managed on the ward.


| % CHANGE MORTALITY 2016 – 2017 | ↓ 2.3% |
| % CHANGE MORTALITY 2011 – 2017 | ↓ 18.6% |

Crude Mortality Rate

Mean 2011-2015 34.0%

Mean 2016-2017 30.9%
FIGURE 12: The number of bed days and average length of stay for adult inpatients with a diagnosis of Sepsis, 2011-2017.

SUMMARY CHANGES 2011 – 2017:
CHANGE IN THE NUMBER OF DOCUMENTED CASES  ↑ 163.4%
CHANGE IN THE NUMBER OF BED DAYS USED  ↑ 88.4%
CHANGE IN THE ALOS  ↓ 28.4%

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.
Sepsis-associated crude hospital mortality, 2017


<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>Number of cases</th>
<th>Crude mortality Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>SIRS of infectious origin</td>
<td>794</td>
<td>8.1%</td>
</tr>
<tr>
<td>Sepsis</td>
<td>14,763</td>
<td>16.5%</td>
</tr>
<tr>
<td>Severe sepsis</td>
<td>578</td>
<td>30.1%</td>
</tr>
<tr>
<td>Septic shock</td>
<td>971</td>
<td>40.3%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>17,106</strong></td>
<td><strong>17.9%</strong></td>
</tr>
</tbody>
</table>

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, 2017.

<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>Total Number of Cases</th>
<th>Number of cases admitted to critical care</th>
<th>Proportion of cases admitted to critical care</th>
<th>Crude Mortality Rate of cases admitted to critical care</th>
</tr>
</thead>
<tbody>
<tr>
<td>SIRS of Infectious Origin</td>
<td>794</td>
<td>99</td>
<td>12.5%</td>
<td>12.1%</td>
</tr>
<tr>
<td>Sepsis</td>
<td>14,763</td>
<td>2,921</td>
<td>19.8%</td>
<td>28.6%</td>
</tr>
<tr>
<td>Severe Sepsis</td>
<td>578</td>
<td>223</td>
<td>38.6%</td>
<td>36.8%</td>
</tr>
<tr>
<td>Septic Shock</td>
<td>971</td>
<td>749</td>
<td>77.1%</td>
<td>39.4%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>17,106</strong></td>
<td><strong>3,992</strong></td>
<td><strong>23.3%</strong></td>
<td><strong>30.6%</strong></td>
</tr>
</tbody>
</table>

The Centers 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 a mortality rate of 14%. Capacity in critical care is the limiting factor for admission and increasing capacity and critical care admission of a higher proportion 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.

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.
In the absence of age and co-morbidity adjustment, which would allow hospital sepsis-associated mortality 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 more than 40 of such cases. It demonstrates no difference in mortality, other than that which can be accounted by statistical variation, amongst these units. 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.
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 labeled 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 4.6-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, 2017.**

<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>Number of inpatients</th>
<th>% of total inpatients</th>
<th>Number of deaths</th>
<th>% of total deaths</th>
<th>Crude mortality rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sepsis</td>
<td>16,312</td>
<td>3.6%</td>
<td>3,004</td>
<td>27.6%</td>
<td>18.4%</td>
</tr>
<tr>
<td>Infection</td>
<td>110,178</td>
<td>24.6%</td>
<td>4,391</td>
<td>40.3%</td>
<td>4.0%</td>
</tr>
<tr>
<td>All other diagnoses</td>
<td>320,836</td>
<td>71.7%</td>
<td>3,503</td>
<td>32.1%</td>
<td>1.1%</td>
</tr>
<tr>
<td>Total</td>
<td>447,326</td>
<td>100%</td>
<td>10,898</td>
<td>100%</td>
<td>2.4%</td>
</tr>
</tbody>
</table>
TABLE 12: Comparison between inpatients discharged with an infection vs. a sepsis code and all other diagnoses, 2017.

<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>Number of Inpatients</th>
<th>Number of Bed Days</th>
<th>Average Length of Stay</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sepsis</td>
<td>16,312</td>
<td>340,282</td>
<td>20.9</td>
</tr>
<tr>
<td>Infection</td>
<td>110,178</td>
<td>1,227,043</td>
<td>11.1</td>
</tr>
<tr>
<td>All Other Diagnoses</td>
<td>320,836</td>
<td>1,526,263</td>
<td>4.8</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>447,326</strong></td>
<td><strong>3,093,588</strong></td>
<td><strong>6.9</strong></td>
</tr>
</tbody>
</table>

Balancing measures:
The following data is extracted from the HSE/HPSC Hospital Antibiotics 2017 Full Year report which is available in its entirety at www.hpsc.ie.

FIGURE 19: Antimicrobial consumption

There has been no significant detrimental impact of the national sepsis programme implementation on the amounts of antimicrobial used, a continued decrease in carbepenem and quinolone use, and an increased use of third generation cephalosporins. Ireland is in the mid-range for antimicrobial consumption in comparison with other European countries.
Multidrug resistant organisms:
We cannot be complacent, MRSA bloodstream infections increased for the first time in 10 years, and there are an increasing number of invasive infections due to:

**K. pneumoniae** which, although cephalosporin-resistance and ESBL-positivity has stabilized, had four carbopenemase producing isolates reported.

**E. coli**, the proportion of 3rd generation cephalosporin, gentamicin resistance and ESBL-positivity has increased and four carbopenemase-producing isolates were reported.

**VRE**, the proportion of VRE bloodstream infections has decreased, with one linezolid-resistant isolate reported.

**E. faecalis**, one linezolid-resistant isolate reported.

**Acinetobacter spp**, one carbepenemase-producing MDR isolate was reported.

Data collected for EARS-NET by HPSC, 2018.
Maternal Sepsis Summary

Lead ADON Dr Karn Cliffe

Irish data based on the codes specified for sepsis and infections, with the inclusion also of specific sepsis and infection codes from Chapter 15 (Pregnancy, Childbirth and the Puerperium) of the ICD-10-AM classification demonstrates clearly an increase in reported diagnosis of both sepsis and infection. While not excluding the possibility that the reporting itself has improved in contrast to an increase in cases, the insidious nature of sepsis in pregnancy will benefit from clearer guidance on recognition and appropriate escalation (National Sepsis Report 2011 to 2015, 2016).

In 2017, there were 62,053 (CSO, 2018) births in Ireland. There were 9,253 in-patient admissions with a diagnosis of infection and there were 483 inpatient admissions with a diagnosis of sepsis (Hospital Inpatient Enquiry HIPE 2017).

In 2016 a new definition for sepsis was proposed for the adult non-pregnant population (Singer et al. 2016) and the importance of different criteria for identification of maternal sepsis was acknowledged. The maternity sepsis definition (WHO 2016) was agreed using an iterative process in an expert face-to-face consensus development meeting convened by WHO and Jhpiego.

The Irish National Sepsis Programme developed a Clinical Decision Support Tool (Maternity Sepsis Form), to facilitate recognition, diagnosis, and the early treatment of Maternal Sepsis. This form was piloted in participating maternity units and feedback was used to inform the final version. The updated form also incorporated the new WHO (2016) definition for maternal sepsis i.e. “Maternal sepsis is a life-threatening condition defined as organ dysfunction resulting from infection during pregnancy, childbirth, post-abortion, or post-partum period”. The tool needs to be sensitive to include patients at risk of sepsis and specific to avoid excessive antimicrobial therapy use.

In order to monitor improvements in the management of sepsis in the maternity population, baseline audits were carried out this year in 17 of the 19 maternity units. The audits focused on screening, recognition and management of sepsis. The audit criteria were all maternity patients in 2017 with infection and organ dysfunction, or diagnosis of Sepsis/Septic Shock as identified by HIPE. Also included were women who were treated for pyrexia in labour. While pyrexia in labour is not necessarily of infectious origin it was important to review in terms of appropriate follow through from a sepsis and antimicrobial stewardship perspective.

Of the healthcare records audited 29.6% were women in the antenatal period, 25.8% intrapartum and 42.5% postnatal. The mean and median length of stay was 6.7 days and 5.1 days respectively, with 7.7% requiring critical care.

SCREENING

Considering the initial trigger 66.4% of women had an early warning score as per the Irish Maternity Early Warning System; 62.5% had a systemic inflammatory response (SIRS), 41.3% triggered consideration for screening based on clinical judgment, with 1.9% meeting the criteria for being at risk of neutropenia. With regards to SIRS; 70.9% of women had a temperature of < 36°C or ≥ 38°C and 26.4% had a respiratory rate of ≥ 20 breaths per minute. The fetal heart rate was >160 beats per minute in 31.4% of cases. The sensitivity for screening for sepsis using the Maternal Sepsis Form criteria is 100% and the specificity is 63.3%. As this section of the form is a screening tool not a diagnostic tool it is designed to be sensitive so as not to miss any cases.
RISK FACTORS
The most frequently identified risk factor in this cohort of women was prolonged rupture of membranes 12.6% compared to the least frequently documented risk factor of 1.5% for Group A Strep contact. There were no women with a cerclage or recent amniocentesis. The most frequent non-pregnancy related risk factor was Age > 35, 19.25% and symptoms of infection in the last week 17.8% compared to immune-compromised 1.5%. There were no women in this audit with a chronic renal, liver or heart failure condition.

TREATMENT WITH THE SEPSIS 6+ 1
Overall 78.7% of women received antimicrobials within 1 hour. However, when the maternity sepsis form was used 89.2% of women received antimicrobials which shows a 13.3% increase when the form is used. 81.3% of antimicrobials were administered in line with local policy. Lactate levels were taken 61.3% of the time. Of these 22.6% of women had a lactate > 2mmol/l, 78.8% of women with a lactate > 2mmol/l or who were hypotensive received a fluid bolus. 60% of women with a lactate > 2mmol/l had lactate levels repeated. 71.6% of women had blood cultures taken prior to administration of antimicrobials, and 53.5% of women had urinary output assessment. While these results are very encouraging, there remain areas for improvement.

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). 55.5% of women had SIRS of infectious origin, influenza constituted 1.3% of the infections, 21.9% had sepsis, 0% had shock. Also included in the audit were women with pyrexia in labour (10.3%), and women with an infection without SIRS (9%). Data for ‘Pyrexia in Labour’ was collected for one third of maternity units. Of those women who required on-going antimicrobial therapy, 100% received appropriate therapy, 25% were continued on antimicrobials inappropriately and 75% were deescalated appropriately.
Sepsis as per the maternal definition (2016) was documented 85.3%, with a correct diagnosis 79.4%.

FORM USAGE
When maternity sepsis forms were used it guided screening for sepsis 100% of the time. It guided treatment in 79.3%, and guided diagnosis in 60.3%. Of the forms used 71.4% were signed and could consequently be coded accurately. These percentages are based on the overall form usage. Of note though 39.6% of forms were not completed and 28.5% were not signed. When the form was used diagnosis was documented 95.2%, with the correct diagnosis in 76.2% of cases.
Paediatric Sepsis
Lead ADON Celine Conroy

A paediatric sepsis clinical decision support tool is currently in development and will take place in two stages ensuring 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. Chaired by Dr. David Vaughan, Director Quality & Patient Safety, Children's Hospital Group, this group is tasked with reviewing the feedback received at stage 1, re-designing and re-piloting the Paediatric Sepsis Form.

All paediatric hospitals/units will be invited to take part in the re-pilot and amendments will be made based on the feedback prior to National roll out.

Residential Care
Lead ADON Mary Bedding

The RCSI ADON continues to be involved in a national project to develop a sepsis form and pathway for use in community residential care settings. In 2017 St Mary’s Hospital, Phoenix Park piloted a sepsis form which was generally well received and provided excellent feedback which was used to update the form. Currently work is ongoing with Leopardstown Park Hospital with plans for them to pilot the updated form in 2018.
RCSI Hospital Group

The hospitals within the RCSI Hospitals group continue to consolidate on work done in the last two years and have made great strides to improve the recognition and treatment of patients with sepsis. Implementation of the sepsis programme at a local level continues to be governed by local Sepsis/ Deteriorating Patient Governance Committees with active involvement by the Sepsis ADON who provides liaison on national and local initiatives and supports the rollout of the National Sepsis Guideline.

In late 2017 the new Sepsis-3 definition was adopted by Ireland and with this came the launch of new and updated resources including the adult and maternity Sepsis Forms and algorithms. The adult form has been rolled out in 100% hospitals and the maternity form has been rolled out in 2 out of 3 maternity units with rollout planned in the third hospital by the end of the year. In addition the paediatric units and EDs in Cavan General Hospital and Our Lady of Lourdes Hospital participated in a pilot of a new paediatric sepsis form giving valuable feedback to inform the development process. It is hoped that the final version of the form will be launched nationally before the end of 2018.

To support the staff in the implementation of the Sepsis-3 definition and the use of the new resources there has been a huge education drive within the hospital group, both at a local level and at a group level supported by the Sepsis ADON. Early in 2018 the Senior Management of the group mandated that the HSELand Sepsis eLearning module is mandatory for all nurses and doctors working in acute areas and the PROMPT (PRactical Obstetric Multi-Professional Training) course is mandatory for all obstetric doctors and midwives. Data on staff completion is now collected regularly as a KPI.

To further promote sepsis awareness among staff, patients and visitors events were held at 4 hospital sites; Beaumont Hospital, Cavan General Hospital, St. Joseph’s Hospital, Raheny and Our Lady of Lourdes Hospital to mark World Sepsis Day 2017 and 3 hospital sites held events to ‘launch’ the new Sepsis-3 definition and related resources; Our Lady of Lourdes Hospital, Louth County and Connolly Hospital. All of these events were hugely successful and the staff involved in the organisation of the events must be commended on their commitment to the sepsis programme and their resourcefulness. Also once again a RCSI Hospital featured in the awards at the Sepsis Summit with the award for the best poster presentation being presented to members of staff from Beaumont Hospital. The poster showcased the fantastic work by staff to increase awareness with their ‘Sepsis Stars’ initiative.

The hospitals within RCSI Hospitals participated in the 3 national sepsis process audits undertaken in 2018. The results demonstrated that although only 34% audited cases had a sepsis form used that there was good management of the patients with 85% having blood cultures taken prior to antimicrobial administration, 86% having had a lactate taken and 97% patients receiving fluid boluses when required. There was also an increase in the number of sepsis cases documented. However, there is still some work to be done as only 69% patients received their antimicrobials within the recommended 60 minutes.

In 2017 the RCSI Hospital Group sepsis-associated crude mortality rate was 17.5%, and the number of patients with sepsis documented increased by 28.6%. Of note, as this data is not age or co-morbidity adjusted it cannot be used to compare with other Hospital Groups or jurisdictions.
South/ South West Hospital Group

There are ten hospitals in the South/South West Hospital Group. All ten hospitals have committees in place that oversee the implementation of the National Clinical Guideline No.6 - Sepsis Management. The updated Sepsis-3 forms were launched by Minister Harris at the 4th National Sepsis Summit and to date nine of the ten hospitals in the SSWHG have successfully launched the new forms.

Four of the sites participated in the 1st pilot for the development of the Paediatric Sepsis Form and provided feedback to the programme – South Tipperary General Hospital, University Hospital Kerry, University Hospital Waterford and Cork University Hospital.

There is recognition within the SSWHG of the importance of dedicated Clinical Nurse Managers (CNM) in sepsis management. There are now 4 nurses in dedicated roles. Three of these posts have been formalised with one post covering two hospitals. In the short time these posts have been in place there has been a notable impact on supporting the frontline staff through the provision of education and conducting local audits. These roles are a great asset to Hospital Inpatient Enquiry (HIPE) personnel who discuss queries to the CNM who provide clarification and feedback to medical teams. This has been shown to improve both clinical care and data collection and into the future will result in more accurate remuneration of sepsis cases. Mercy University Hospital and University Hospital Kerry were awarded joint first place for the best quality improvement programme at the Sepsis Summit in 2017. The Hospital Pricing Office figures showed a 300% increase in reported sepsis cases in 2016 from the figures in 2015 in both hospitals.

In 2018 the SSWHG ADON worked with Cork University Maternity Hospitals’ (CUMH) Sepsis Committee in completing local sepsis audits to test the Maternal Newborn- Clinical Management System (MN-CMS). CUMH have led out on and actively engaged with CERNER to build the new form into the electronic chart. The audits highlighted a number of processes on the system that needed minor adjustment. Consequently, these have been forwarded to CERNER to enable process improvement in the management of suspected sepsis. CUMH works closely with University Hospital Kerry who also has the electronic system to identify opportunities for improvement in the documentation of sepsis in the electronic record.

Creating sepsis awareness is a priority in all sites. Mercy University Hospital in conjunction with the Cork Film Project supported by the SSWHG arranged for a viewing of the film Starfish, a movie based on the true-life story of Tom Ray who is a sepsis survivor. This was well received and was attended by staff from hospitals in the SSWHG and the public. Other initiatives that created more sepsis awareness were seasonal educational quizzes and a poetry, art and photography competition by Mercy University Hospital and the South Infirmary Victoria University Hospital. In Cork University Hospital and Cork University Maternity Hospital celebrated World Hand Hygiene Day on May 3rd. The Infection Prevention and Control team ran an information day throughout the hospitals campus for sepsis awareness for patients, visitors and staff. The message of the campaign was - ‘It’s in your hands - prevent sepsis in health care’. Dr Vida Hamilton visited University Hospital Kerry for World Sepsis Day and did an interview with Radio Kerry to raise awareness. In South Tipperary General Hospital a quality improvement initiative by the local sepsis taskforce has shown the effectiveness of sepsis trollies which have been introduced throughout the hospital to assist with timely management of sepsis cases.

The hospitals participated in the 3 national sepsis process audits undertaken in 2017 which demonstrated improvements:
• 58.5% of cases having utilised the sepsis form
• 60% of patients given antimicrobials within 1 hour of diagnosis
• 94% receiving antimicrobials according to local guidelines.

In 2017 the number of cases of Sepsis and Septic shock documented in the Group increased by 12.8%. The crude mortality rate for these cases during the same period was 16.6%. Of note, as this data is not age or co-morbidity adjusted it cannot be used to compare with other Hospital Groups or jurisdictions.
UL Hospital Group

Three National Compliance Audits were completed in 6 out of 7 UL hospitals in 2017, UMHL was not included as Maternity and post partum patients were excluded. 50 patients that fulfilled the inclusion criteria were examined (43 medical & 7 surgical patients). The average age of patients audited was 73.3 years, 97.7% of these patients had 1 or more identified co-morbidities associated with high mortality with sepsis. Although sepsis form usage was limited (34%), correct documentation (81.2%) and elements of the treatment pathway were excellent. 83.5% of patients audited received 1st dose antimicrobials within the first hour of diagnosis, 100% of patients had antimicrobials prescribed as per local guidelines. 82.4% had lactates taken and 100% of patients who had initial lactates above 2 had them repeated. 87.2% had blood cultures taken pre administration of antimicrobials within 1 hour of diagnosis. A fluid bolus was indicated in 82% of patients and 75.6% of these patients received it. The Sepsis ADON has presented sepsis education sessions in all 7 UL Hospitals and attends the Group Sepsis Committee meetings when required, presenting national compliance report feedback, updates on the implementation of the new Sepsis 3 definitions and promoting local quality improvement projects.

The sepsis-associated hospital crude mortality rate in ULHG for 2017 is 20.6%, which is an 8.3% decrease from 2016, excluding maternity cases. Of note, as this data is not age or co-morbidity adjusted it cannot be used to compare with other Hospital Groups or jurisdictions.

In 2017, there were 513 adult patients aged 16+ years in ULHG coded with sepsis. 22.8% of all inpatients in ULHG had a sepsis or infection diagnosis.

There has been a 4.8% increase in documented sepsis cases in ULHG since 2016. This reflects increased awareness, education, engagement and improved documentation.

A very successful World Sepsis Day Campaign 2017 took place in ULHG to raise awareness for sepsis. It included the live screening of the World sepsis day online conference in UMHL, radio interview with National Clinical lead, Dr. Hamilton, grand rounds by Dr. Hamilton in UHL and Education session in UHE, press release, WSD Quiz, ULHG Twitter campaign, information and awareness stands in multiple sites in group, Sepsis information stand at the NCHD information evening, WSD banner to entrance of UHL, 2 images from ULHG added to WSD International poster, Sepsis information added to the loop infomercials on the hospital T.V.s. and the “Sepsis 6 in ULHG” pull up banner displayed in Dublin Castle at 4th National Sepsis summit.

Easy availability and accessibility to the Sepsis clinical support tools i.e. sepsis forms, sepsis management & fluid algorithms, staff & patient information leaflets, have been a focus in ULHG. They are now available on QPulse, iHub, UL Hospitals section on Microguide app and in hard copy on all wards and departments and patient information points in all hospitals in ULHG. A Sepsis section has been added to the e-discharge letter in UHL.

The Maternity sepsis form was piloted in UMHL and has now been 100% implemented. The paediatric unit in UHL took part in the Paediatric sepsis form pilot in Q1 of 2018. The Group sepsis ADON from ULHG lead nationally on the ED Sepsis form pilot that informed new updated adult ED sepsis form. UHL participated in this pilot and the new ED sepsis forms have been fully implemented.

Group ADON ULHG led on National sepsis awareness survey completed in all hospital groups. Sample consisted of public, patients and Health care workers. The aim of this survey was to assess the public and professional awareness and understanding of sepsis in order to inform the national sepsis quality improvement (QI) programme.
Ongoing sepsis education sessions continue across the hospital group and sepsis has been incorporated into many foundation courses and study days such as the Emergency Department and Paediatric high dependency foundation course, medical and perioperative study days. 8 hour Adult sepsis study days and standalone Maternity sepsis study days are now integrated into the CNME curriculum. All new staff nurses and healthcare assistants receive sepsis education on induction and the sepsis e-learning programme is now a mandatory part of the medical Intern Induction week. There has been a successful established link with University of Limerick, with regard to including sepsis into the Infection Prevention and Control in Healthcare module.
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. Paediatric Sepsis/PEWS and Maternal Sepsis/IMEWS subgroups have been established to provide a forum to guide the implementation of the relevant Sepsis and EWS Guidelines and both subgroups report directly to the Group EWS & Sepsis Committee. 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.

All Saolta Paediatric Units contributed to the national pilot of the Paediatric Sepsis form and provided valuable, constructive feedback to the Development Group.

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.

Following the publication of the Sepsis 3 definition, amended Sepsis documentation was implemented in all Saolta hospitals including Maternity Units. Sepsis algorithms were printed and are now displayed in all clinical areas.

Completion of the National Sepsis e-learning programme has been mandatory for all Saolta Medical, Nursing & Midwifery staff since 2016. 40% of all Sepsis e-learning programmes completed nationally are by Saolta staff. The Sepsis ADON conducted Sepsis blitzes, Grand Rounds, Induction programmes, Study Days and Departmental meetings in all hospitals to support the implementation of the new Sepsis 3 documentation. Sepsis training including the Saolta Sepsis Study Day incorporated the new sepsis definitions. This event is video-linked to 5 Centres for Nursing and Midwifery and 2 Saolta Hospitals. Sepsis is an established part of the education schedule in all hospitals.

The High Impact Critical care – Sepsis Conference was held in Galway on November 22nd and was supported by the Saolta Group, National University of Ireland, Galway and the Western Anaesthesia Society. The Conference programme included a number of renowned international, national and local speakers and over 260 delegates attended the event.

3 National Compliance Audits were conducted all Saolta hospitals in 2017 and examined 175 cases. In summary, audit results demonstrated improvements including 68% of cases diagnosed according to current guidelines and 45% of patients given antimicrobials within 1 hour of diagnosis. Audit results were discussed with individual hospital Sepsis Committees and local action plans agreed and implemented.

A pilot of a process to develop closer links between individual HIPE Departments and Sepsis Leads to establish a process whereby individual cases of under-documentation or non-completion of the sepsis form can be discussed with individual Consultants and NCHDs was completed in 1 hospital and is to be rolled out throughout the Group.

The Sepsis ADON attended local Sepsis Committee meetings regularly providing feedback on national developments and supporting local quality improvement projects. The National Sepsis Lead presented at a number of Saolta hospital Grand Rounds and Departmental meetings.

In 2017, the sepsis-associated hospital crude mortality rate was 20%, a decrease by 4.5% from 2016. There was an 8% increase in the documentation of cases in the same year. Of note, as this data is not age or co-morbidity adjusted it cannot be used to compare with other Hospital Groups or jurisdictions.
Dublin Midland Hospital Group

There are 7 hospitals within the Dublin Midland Hospital group. Since the implementation process began all have assigned a medical, nursing/midwifery lead, and have had dedicated sepsis education sessions. 6 have sepsis committees, with the 7th currently being convened and all 7 have rolled out the Clinical Decision Support tool (sepsis screening form) throughout the hospitals.

The aim of the audits last year was to review the management of sepsis amongst medical patients (pneumonia was chosen as respiratory tract infection is the most common cause of sepsis) (quarter 1); the management of sepsis amongst surgical patients (quarter 2); emergency department management of sepsis, as per sepsis 3 consensus definitions i.e. infection + organ dysfunction as a result of infection.

Antimicrobials were prescribed as per local guidelines 93% of the time. The Consultant Microbiologist was consulted in many cases and appropriately pre-commencement of restricted antimicrobials. 88.6% patients had lactate levels taken. 93.3% had blood cultures taken; all blood cultures were taken pre administration of antimicrobials as per guidelines. 66.2% had antimicrobials prescribed and administered within the 1 hour recommended target. Using the sepsis form shows higher compliance of 81% with first dose antimicrobials within 1 hour of diagnosis or 2 hours of triage compared to 63% when not using the sepsis form. Using the sepsis forms will facilitate early recognition and early initiation of the treatment pathway for sepsis. Use of the form reduces variation and improves quality of clinical decisions by facilitating appropriate and early risk stratification. There remains an under-documentation of sepsis by approximately 26% and using the forms will also improve documentation.

Whilst sepsis education and awareness is on-going in the hospital setting, the entire month of September was seen as an ideal opportunity to intensify the awareness amongst healthcare teams and also an occasion to educate patients and members of the public on the signs and symptoms of infection and sepsis. The hospitals in the Dublin Midlands Group held sepsis awareness events for healthcare professionals, patients and members of the public. On World Sepsis Day 13th September St. Lukes, Rathgar, Midlands Regional Hospital Tullamore, Midlands Regional Hospital Portlaoise and St. James’s Hospital set up information hubs in the foyers of their respective hospitals disseminating the updated sepsis 3 forms and patient information leaflets. On 20th September Tallaght Hospital held their second Sepsis Zero Harm event with information stands in the hospital foyer and the hospital canteen with roving teams going to all wards, as some staff were unable to visit the information stands.

The Maternity sepsis form was introduced at the 4th National Sepsis Summit in Dublin Castle 5th September and The Coombe Maternity and Infant University Hospital commenced education and implementation of the maternity tool on 18th and 21st September with excellent engagement from both medical and midwifery teams.

Through engagement with the National Sepsis Programme and various local initiatives the hospitals of the Dublin Midlands Hospital Group have contributed to the reduction in mortality rates nationally and the a reduction in the overall length of stay attributed to sepsis management.

In 2017, the sepsis-associated crude hospital mortality rate was 18.5% and there was an increase of 11.7% in the number of cases documented. Of note, as this data is not age or co-morbidity adjusted it cannot be used to compare with other Hospital Groups or jurisdictions.
Ireland East Hospital Group

The Ireland East Hospital Group is the largest Group with eleven hospitals, all of which have sepsis committees in place that meet regularly to oversee implementation of National Clinical Guideline No. 6-Sepsis Management (NCG). Each hospital has an identified medical and nurse sepsis lead to co-ordinate and monitor implementation in their hospital and report progress back through the local sepsis committee to hospital Leadership Teams. The IEHG ADON for Sepsis also attends local sepsis committee meetings to provide support, information and updates as relevant.

World Sepsis Day events were held by eight hospitals in September 2017 to promote sepsis awareness amongst staff and members of the public. All eleven hospitals are planning World Sepsis Day events this year. In addition, the Group ADON for Sepsis will support the National Clinical Programme’s launch of the public awareness campaign being launched at this year’s ploughing championships.

The sepsis leads in each hospital liaise with the Group ADON to arrange and help with planned process audits throughout the year. When process audits conducted in 2016 and 2017 are compared some improvements are evident. Of note, improvements in 2017 included:

- 27.6% increase in documentation of sepsis,
- 29.9% increase in sepsis forms used to aid recognition, diagnosis and appropriate treatment,
- 190% increase in the administration of antimicrobials in the first hour of diagnosis,
- antimicrobials were prescribed as per local antimicrobial guidelines 77% of the time.

It is worth noting that for every case of sepsis not documented as sepsis the hospital could be losing more than €2,500 per inpatient episode.

A baseline maternity sepsis audit was carried out earlier this year and provides a benchmark from which to measure progress in the future.

The Ireland East Hospital Group Leadership have supported implementation of the NCG by:

- Making Sepsis a standing item at the quarterly HCAI/AMR Governance Group, chaired by the Group’s CEO.
- Facilitating sepsis presentations at Group Leadership/GMs/CEOs meetings
- Facilitating sepsis presentations at Chief DONM/DON/DONM meeting
- Making the sepsis elearning programme mandatory for all clinical staff in the IEHG

There was very good uptake of the HSElAnD National Sepsis eLearning programme in the IEHG with more than 1600 staff completing the online Elearning programme successfully (up to July 2018).

The number of patients with sepsis documented increased by 20.6%, and the sepsis-associated crude hospital mortality rate was 18% in 2017. These figures are not age or co-morbidity adjusted and, therefore, are not comparable with other groups.
## Appendix 1: The Sepsis Audit Subcommittee

<table>
<thead>
<tr>
<th>Member</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vida Hamilton</td>
<td>National Sepsis Clinical Lead</td>
</tr>
<tr>
<td>Grainne Cosgrove</td>
<td>Senior Statistician, Measurement for Improvement Team, QID</td>
</tr>
<tr>
<td>Christina Doyle</td>
<td>Programme Manager National Sepsis Programme</td>
</tr>
<tr>
<td>Deirdre Murphy</td>
<td>Head of HIPE &amp; NPRS, HPO</td>
</tr>
<tr>
<td>Jacqui Curley</td>
<td>Coding Manager, Healthcare Pricing Office</td>
</tr>
<tr>
<td>Marie Glynn</td>
<td>Head of Clinical Coding Education</td>
</tr>
<tr>
<td>Declan McKeown</td>
<td>Health Intelligence</td>
</tr>
<tr>
<td>Sinead Horgan</td>
<td>Group Sepsis ADON South/South West Hospital Group</td>
</tr>
</tbody>
</table>
## Appendix 2: The Sepsis Steering Committee

<table>
<thead>
<tr>
<th>Member</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fidelma Fitzpatrick</td>
<td>Consultant Microbiologist, Chair Sepsis Steering Committee</td>
</tr>
<tr>
<td>Vida Hamilton</td>
<td>National Sepsis Clinical Lead</td>
</tr>
<tr>
<td>Kevin Rooney</td>
<td>National Clinical Lead on Sepsis Healthcare Improvement Scotland</td>
</tr>
<tr>
<td>Christina Doyle</td>
<td>Programme Manager National Sepsis Programme</td>
</tr>
<tr>
<td>Garry Courtney</td>
<td>National Clinical Lead Acute Medicine Programme</td>
</tr>
<tr>
<td>Blathnaid Connolly</td>
<td>Programme Manager Acute Medicine Programme</td>
</tr>
<tr>
<td>Michael Turner</td>
<td>National Clinical Lead Obstetrics and Gynaecology</td>
</tr>
<tr>
<td>Michael Power</td>
<td>National Clinical Lead Critical Care</td>
</tr>
<tr>
<td>Frank Keane</td>
<td>National Clinical Lead Surgery</td>
</tr>
<tr>
<td>Jeremy Smith</td>
<td>National Clinical Lead Anaesthesia</td>
</tr>
<tr>
<td>Robert Cunney</td>
<td>National Clinical Lead – HCAI and AMR prevention &amp; QID representation</td>
</tr>
<tr>
<td>Marie Keogan</td>
<td>National Clinical Lead Pathology</td>
</tr>
<tr>
<td>Cathal O’Brien</td>
<td>NCHD representation</td>
</tr>
<tr>
<td>Karen Power</td>
<td>Project Manager Obs and Gynae</td>
</tr>
<tr>
<td>Deirdre Murphy</td>
<td>Head of HIPE &amp; NPRS, HPO</td>
</tr>
<tr>
<td>Declan McKeown</td>
<td>Health Intelligence representation</td>
</tr>
<tr>
<td>Diarmuid O’Shea</td>
<td>National Clinical Lead Older Person Programme</td>
</tr>
<tr>
<td>Siobhan Horan</td>
<td>Programme Manager Paeds and Neonatal Programme</td>
</tr>
<tr>
<td>Linda Dillon</td>
<td>Patient Advocacy Representative</td>
</tr>
<tr>
<td>David Hanlon</td>
<td>National Clinical Lead Primary Care Lead</td>
</tr>
<tr>
<td>Colm Henry</td>
<td>National Clinical Advisory and Group Lead – Acute Hospital</td>
</tr>
<tr>
<td>Tony McNamara</td>
<td>CEO/Hospital Manager Representative</td>
</tr>
<tr>
<td>Jean Kelly</td>
<td>Group Director of Nursing and IADNAM representative</td>
</tr>
<tr>
<td>Brian Power</td>
<td>Pre-Hospital Emergency Care Council</td>
</tr>
<tr>
<td>Anne McCabe</td>
<td>National Ambulance Service- Critical Care Retrieval Services</td>
</tr>
<tr>
<td>Gerry McCarthy</td>
<td>National Clinical Lead Emergency Medicine</td>
</tr>
<tr>
<td>Fiona McDaid</td>
<td>Emergency Nursing Representative</td>
</tr>
<tr>
<td>Rachel Gilmore</td>
<td>Emergency Medicine Representative</td>
</tr>
<tr>
<td>Geraldine Shaw</td>
<td>Office of the Nursing &amp; Midwifery Services Director representative</td>
</tr>
<tr>
<td>Gethin White</td>
<td>Library Services DSH representative</td>
</tr>
<tr>
<td>Mary Bedding</td>
<td>Group Sepsis ADON RCSI Hospital Group</td>
</tr>
<tr>
<td>Karn Cliffe</td>
<td>Group Sepsis ADON Dublin Midlands Hospital Group</td>
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<tr>
<td>Ronan O’Cathasaigh</td>
<td>Group Sepsis ADON Saolta Hospital Group</td>
</tr>
<tr>
<td>Yvonne Young</td>
<td>Group Sepsis ADON University Hospital Group</td>
</tr>
</tbody>
</table>
# Appendix 3: The National Sepsis Programme team

<table>
<thead>
<tr>
<th>Member</th>
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<tbody>
<tr>
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<tr>
<td>Ronan O’Cathasaigh</td>
<td>Group ADON Saolta Hospital Group</td>
</tr>
<tr>
<td>Yvonne Young</td>
<td>Group ADON University Limerick Hospital Group</td>
</tr>
</tbody>
</table>
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

<table>
<thead>
<tr>
<th>ICD-10-AM Diagnosis Codes</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A40</td>
<td>Streptococcal sepsis</td>
</tr>
<tr>
<td>A41</td>
<td>Other sepsis</td>
</tr>
<tr>
<td>A02.1</td>
<td>Salmonella sepsis</td>
</tr>
<tr>
<td>A22.7</td>
<td>Anthrax sepsis</td>
</tr>
<tr>
<td>A26.7</td>
<td>Erysipelothrix sepsis</td>
</tr>
<tr>
<td>A32.7</td>
<td>Listerial sepsis</td>
</tr>
<tr>
<td>A42.7</td>
<td>Actinomycotic sepsis</td>
</tr>
<tr>
<td>B37.7</td>
<td>Candidal sepsis</td>
</tr>
<tr>
<td>T81.42</td>
<td>Sepsis following a procedure</td>
</tr>
<tr>
<td>R65.1(^1)</td>
<td>Systemic inflammatory response syndrome (SIRS) of infectious origin with acute organ failure</td>
</tr>
</tbody>
</table>

\(^1\) 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

<table>
<thead>
<tr>
<th>ICD-10-AM 8th Edition Codes</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>R57.2(^1)</td>
<td>Septic Shock</td>
</tr>
</tbody>
</table>


### 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

<table>
<thead>
<tr>
<th>ICD-10-AM 8th Edition Codes</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A00 - B99(^1)</td>
<td>Certain Infectious &amp; Parasitic Diseases</td>
</tr>
<tr>
<td>G00 - G07</td>
<td>Meningitis, Encephalitis, Intracranial and intraspinal abscess and granuloma</td>
</tr>
<tr>
<td>J00 - J06</td>
<td>Acute upper respiratory infections</td>
</tr>
<tr>
<td>J09 - J18</td>
<td>Influenza and pneumonia</td>
</tr>
<tr>
<td>J20 - J22</td>
<td>Other acute lower respiratory infections</td>
</tr>
<tr>
<td>J36</td>
<td>Peritonsillar abscess</td>
</tr>
<tr>
<td>J44.0</td>
<td>Chronic obstructive pulmonary disease with acute lower respiratory infection</td>
</tr>
<tr>
<td>K35.0(^2)</td>
<td>Acute appendicitis with generalised peritonitis</td>
</tr>
<tr>
<td>K35.2(^3)</td>
<td>Acute appendicitis with generalised peritonitis</td>
</tr>
<tr>
<td>K35.3(^4)</td>
<td>Acute appendicitis with localised peritonitis</td>
</tr>
<tr>
<td>K57.0, K57.2, K57.4, K57.8</td>
<td>Diverticular disease of intestine with perforation and abscess</td>
</tr>
<tr>
<td>K61</td>
<td>Abscess of anal and rectal regions</td>
</tr>
<tr>
<td>K65</td>
<td>Peritonitis</td>
</tr>
<tr>
<td>L00–L08</td>
<td>Infections of the skin and subcutaneous tissue</td>
</tr>
<tr>
<td>M00–M03</td>
<td>Infectious arthropathies</td>
</tr>
<tr>
<td>M86</td>
<td>Osteomyelitis</td>
</tr>
<tr>
<td>N10 - N12</td>
<td>Acute, chronic &amp; not specified tubulo-interstitial nephritis</td>
</tr>
<tr>
<td>N13.6</td>
<td>Pyonephrosis</td>
</tr>
<tr>
<td>N39.0</td>
<td>Urinary tract infection, site not specified</td>
</tr>
<tr>
<td>N45</td>
<td>Orchitis and epididymitis</td>
</tr>
<tr>
<td>T802</td>
<td>Infections following infusion, transfusion and therapeutic injection</td>
</tr>
<tr>
<td>T81.41</td>
<td>Wound infection following a procedure</td>
</tr>
<tr>
<td>T82.6</td>
<td>Infection and inflammatory reaction due to cardiac valve prosthesis</td>
</tr>
<tr>
<td>T82.7</td>
<td>Infection and inflammatory reaction due to other cardiac and vascular devices, implants and grafts</td>
</tr>
<tr>
<td>T83.5</td>
<td>Infection and inflammatory reaction due to prosthetic device, implant and graft in urinary system</td>
</tr>
<tr>
<td>T83.6</td>
<td>Infection and inflammatory reaction due to prosthetic device, implant and graft in genital tract</td>
</tr>
<tr>
<td>T84.5</td>
<td>Infection and inflammatory reaction due to internal joint prosthesis</td>
</tr>
<tr>
<td>T84.6</td>
<td>Infection and inflammatory reaction due to internal fixation device [any site]</td>
</tr>
<tr>
<td>T84.7</td>
<td>Infection and inflammatory reaction due to other internal orthopaedic prosthetic devices, implants and grafts</td>
</tr>
<tr>
<td>T85.71</td>
<td>Infection and inflammatory reaction due to peritoneal dialysis catheter</td>
</tr>
<tr>
<td>T85.72</td>
<td>Infection and inflammatory reaction due to nervous system device, implant and graft</td>
</tr>
<tr>
<td>T85.78</td>
<td>Infection and inflammatory reaction due to other internal prosthetic devices, implants and grafts</td>
</tr>
<tr>
<td>T89.02</td>
<td>Open wound with infection</td>
</tr>
</tbody>
</table>

\(^1\) 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


\(^3\) ICD-10-AM 8th Edition code.

\(^4\) 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

<table>
<thead>
<tr>
<th>ICD-10-AM 8th Edition Codes</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>C00-C96</td>
<td>Malignant Neoplasms</td>
</tr>
</tbody>
</table>

### ICD-10-AM Diagnosis Codes for Chronic Liver Disease

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

<table>
<thead>
<tr>
<th>ICD-10-AM 8th Edition Codes</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>E10</td>
<td>Type 1 diabetes mellitus</td>
</tr>
<tr>
<td>E11</td>
<td>Type 2 diabetes mellitus</td>
</tr>
<tr>
<td>E13</td>
<td>Other specified diabetes mellitus</td>
</tr>
<tr>
<td>E14</td>
<td>Unspecified diabetes mellitus</td>
</tr>
</tbody>
</table>

### ICD-10-AM Diagnosis Codes for Chronic Kidney Disease

<table>
<thead>
<tr>
<th>ICD-10-AM 8th Edition Codes</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>N18</td>
<td>Chronic kidney disease</td>
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### ICD-10-AM Diagnosis Codes for COPD

<table>
<thead>
<tr>
<th>ICD-10-AM 8th Edition Codes</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>J41</td>
<td>Simple and mucopurulent chronic bronchitis</td>
</tr>
<tr>
<td>J42</td>
<td>Unspecified chronic bronchitis</td>
</tr>
<tr>
<td>J43</td>
<td>Emphysema</td>
</tr>
<tr>
<td>J44</td>
<td>Other chronic obstructive pulmonary disease</td>
</tr>
<tr>
<td>J47</td>
<td>Bronchiectasis</td>
</tr>
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</table>

### ICD-10-AM Diagnosis Codes for HIV

<table>
<thead>
<tr>
<th>ICD-10-AM 8th Edition Codes</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>B20</td>
<td>Human immunodeficiency virus [HIV] disease resulting in infectious and parasitic diseases</td>
</tr>
<tr>
<td>B21</td>
<td>Human immunodeficiency virus [HIV] disease resulting in malignant neoplasms</td>
</tr>
<tr>
<td>B22</td>
<td>Human immunodeficiency virus [HIV] disease resulting in other specified diseases</td>
</tr>
<tr>
<td>B23</td>
<td>Human immunodeficiency virus [HIV] disease resulting in other conditions</td>
</tr>
<tr>
<td>B24</td>
<td>Unspecified human immunodeficiency virus [HIV] disease</td>
</tr>
</tbody>
</table>
ICD-10-AM Diagnosis Codes for Mental and Behavioral Disorders due to use of Alcohol

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

SEPSIS ALGORITHM
INPATIENT ADULT

SEPSIS FORM
INPATIENT ADULT

SEPSIS ALGORITHM
EMERGENCY DEPARTMENT ADULT

PATIENT CARD
EMERGENCY DEPARTMENT ADULT

TRIAGE SEPSIS SCREENING ALGORITHM
EMERGENCY DEPARTMENT ADULT

SEPSIS FORM
EMERGENCY DEPARTMENT ADULT

SEPSIS ALGORITHM
MATERNITY PATIENTS

PATIENT CARD
MATERNITY PATIENTS

SEPSIS SCREENING ALGORITHM
MATERNITY PATIENTS

SEPSIS FORM
MATERNITY PATIENTS

ADULT SEPSIS FLUID ALGORITHM
In-Patient Sepsis Algorithm
(Exercising Clinical Judgment)

**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

**Complete Sepsis 6 Bundle**

**Assess patient’s clinical status**
Review blood tests and other investigations
Repeat lactate if 1st abnormal
Continue fluid resuscitation 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**

**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
Section 1  Sepsis screen for Nursing Staff
Suspicion of infection ☐
AND
Patient presentation ☐ 1 ☐ 2 ☐ 3
(see Section 3 and Adult In-Patient Sepsis Management Algorithm).

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 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  ☐ O₂ 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 10⁹/L  ☐ Bedside glucose >7.7 mmol/L
   ☐ Heart rate > 90 beats/min  ☐ Temperature <36 or >38.3°C  (in the absence of diabetes mellitus)

   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: ______________________

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

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

Doctor’s Name: ______________________  Doctor’s Signature: ______________________
MCRN: ______________________  Date: ______________________  Time: ______________________

Page 1 of 2
Continue overleaf
Sepsis Form - In-Patient Adult

ALWAYS USE CLINICAL JUDGEMENT

Treatment, Risk Stratification and Escalation

Page 2 of 2

Section 6

**SEPSIS 6 - aim to complete within 1 hour**

- **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.

<table>
<thead>
<tr>
<th>Type</th>
<th>Dose</th>
<th>Time given</th>
</tr>
</thead>
</table>

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-assess 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, 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.

Page 2 of 2
ED Sepsis Algorithm
(Exercising Clinical Judgment)

**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

**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**

**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

**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.
Clinical suspicion of infection?

**Sepsis Screen Required**
Identify which of the following 4 groups the patient belongs to and assign appropriate triage category.

1. **At risk of neutropenia**
   - Follow the 'Febrile Neutropenia' pathway if on chemo/radiotherapy.
   - Note: these patients may present without fever
   - START SEPSIS FORM

2. **Any 1 sign of acute organ dysfunction**
   - ≥ 1 co-morbidity
   - START SEPSIS FORM

3. **SIRS Response, i.e. ≥2 SIRS criteria**
   - ≥ 2 SIRS criteria
     - RR ≥ 20
     - HR > 90
     - T > 38.3°C or < 36°C
     - BSL > 7.7 mmol/l (in non-diabetic patient)
   - PLUS ≥ 1 co-morbidity
   - START SEPSIS FORM

4. **No co-morbidities**
   - No co-morbidities
   - These patients may require re-triage and sepsis screening if they deteriorate prior to medical review or if lactate >2.
   - 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

Always exercise clinical judgement

“Think SEPSIS” at Triage

1. “Think SEPSIS” at Triage
   (Exercising Clinical Judgment)

   **At risk of neutropenia**
   (bone marrow failure, autoimmune disorder, treatment including but not limited to chemo/radiotherapy).

   **Any 1 sign of acute organ dysfunction**
   - Altered ental State
   - RR > 30
   - O₂ sat < 90%
   - SBP < 100
   - HR > 130
   - Mottled or ashen appearance
   - Non-blanching rash
   - Other organ dysfunction

2. **≥ 2 SIRS criteria**
   - RR ≥ 20
   - HR > 90
   - T > 38.3°C or < 36°C
   - BSL > 7.7 mmol/l (in non-diabetic patient)

   **PLUS ≥ 1 co-morbidity**

   **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

3. **No co-morbidities**
   - These patients may require re-triage and sepsis screening if they deteriorate prior to medical review or if lactate >2.
   - START SEPSIS FORM
Sepsis Form - Emergency Department Adult

ALWAYS USE CLINICAL JUDGEMENT

There are separate sepsis criteria for maternity patients and children.

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 [ ] 3

(see Section 3 and “Think Sepsis” poster).

Date: __________________________ Triage Time: __________________________ Triage Category: __________________________

Signature: __________________________ NMBI PIN: __________________________

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

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
   - O2 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
     - Heart rate > 90 beats/min
     - WCC < 4 or > 12 x 10⁹/L
     - Temperature <36 or >38.3°C (in the absence of diabetes mellitus)
     - Bedside glucose >7.7mmol/L
   - 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 - ED Adult**

**Treatment, Risk Stratification and Escalation**

**Section 6**

**SEPSIS 6 - aim to complete within 1 hour**

- **BLOOD CULTURES:** Take blood cultures prior to giving antimicrobials unless this leads to delay > 45 minutes. 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 10⁹/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-assess 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, 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)

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

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

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

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

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

Screen Positive
START SEPSIS FORM
and escalate to medical review

Screen Negative
Follow usual IMEWS escalation protocol

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 Strept. 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
- Immuno-compromised e.g. Systemic Lupus
- Chronic renal failure
- Chronic liver failure
- Chronic heart failure

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

If there is infection, “Think SEPSIS” (Exercising Clinical Judgment)
Maternal Sepsis is a life-threatening condition defined as organ dysfunction resulting from infection during pregnancy, childbirth, post-abortion or postpartum period (WHO 2016).

**Section 1:**
- Midwife Name: [ ]
- Midwife Signature: [ ]
- NMBI PIN: [ ]
- IMEWS: [ ]
- Date: [ ]
- Time: [ ]

**Patient label here**

**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

**Section 3:**
- Obstetric History
- Risk factors

- Para: [ ]
- Gestation: [ ]
- Pregnancy related complaints:
- Days post-natal: [ ]
- Delivery:
  - [ ] Spontaneous vaginal delivery (SVD)
  - [ ] Vacuum assisted delivery
  - [ ] Forceps assisted delivery
  - [ ] Cesarean section

**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
- [ ] Immuno-compromised e.g. Systemic Lupus
- [ ] Chronic renal failure
- [ ] Chronic liver failure
- [ ] Chronic heart failure

**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 10⁹/L
  - [ ] Temperature <36° or ≥ 38.3°C
  - [ ] Bedside glucose > 7.7mmol/L
  - [ ] Acutely altered mental status
  - [ ] (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.

**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)

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

Section 6: Clinical Suspicton of Infection

Document site:
- Genital Tract
- Urinary Tract
- Respiratory Tract
- Intra-abdominal
- Central Nervous System
- Intra-articular/Bone
- Skin
- Catheter/Device Related
- 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
   - HR > 130
   - Urine output < 500mls/24 hrs – despite adequate fluid resuscitation
   - MAP ≥ 65
   - SBP < 90
   - Systolic BP < 90 or Mean Arterial Pressure < 65 or Systolic BP more than 40 below patient's normal
   - Oligo or anuria
   - Pallor/mottling with prolonged capillary refill
   - 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

SEPSIS 6 + 1* – complete within 1 hour

☐ 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&Es +/- 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

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.

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)

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, 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: 

Date: 

Time: 

Sections completed:

File this document in patient notes - Document management plan.

Doctor's Name: 

Doctor's Signature: 

MCRN: 

Date: 

Time: 

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.
Fluid resuscitation algorithm for adults with sepsis

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

**Hypoperfusion:**
Tachycardia
Vasoconstriction
Oliguria
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
- Oliguria
- Raised lactate

15-minute reviews and continuous monitoring

**Fluid overloaded**
- Increasing respiratory rate
- Decreasing O₂ saturations
- JVP distension
- New onset crepitations
- New onset discomfort lying flat

30mls/kg IVT administered

**Normotensive**
- Repeat Lactate < 2mmol/L

**Hypotensive**
- Repeat Lactate ≥ 2mmol/L

**Hypotensive**
- Repeat Lactate ≥ 4mmol/L

**Normotensive**
- Repeat Lactate < 4mmol/L

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

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

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

- **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