National Sepsis
Outcome Report 2016

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HSE Sepsis Programme
Sepsis

“Sepsis is a life threatening condition that arises when the body’s response to an infection injures its own tissues and organs.” Merinoff Definition

- The only proven method of reducing mortality is early recognition and treatment.

National Clinical Guideline No. 6: Sepsis Management


National Sepsis Programme

- Clinical Strategy & Programmes Division
Process aims

- Patients correctly diagnosed
- Sepsis 6 within 1 hour of diagnosis

<table>
<thead>
<tr>
<th>Give 3</th>
<th>Take 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oxygen</td>
<td>Cultures</td>
</tr>
<tr>
<td>Fluids</td>
<td>Blood tests</td>
</tr>
<tr>
<td>Antimicrobials</td>
<td>Assess urinary output</td>
</tr>
</tbody>
</table>

- Escalated to specialised care as required
Outcome aims

• Mortality reduction of 20%
• Decrease by 10%
  o Critical care admission
  o Hospital length of stay
• Decrease the chronic sequelae in survivors
National Sepsis Programme

• Support implementation
  o Hospital site visits
  o Undergraduate & Postgraduate Bodies
  o E-learning programme
  o Sepsis summits
  o Sepsis conferences & workshops

• Audit and feedback
  o Gap analysis
  o Compliance audits

• Measure burden and effect of changes implemented
  o Annual sepsis report
Sepsis report data set

- Hospital in-patient enquiry system (HIPE)
- Patients with a diagnosis of sepsis at any point in their hospitalisation
- 26% had sepsis as principal diagnosis
- Mortality rates reported are sepsis-associated as causality cannot be inferred from HIPE data
- Crude hospital mortality rate 22.7%
- 20% cases were surgical, crude mortality rate 26%
Sepsis is increasing in incidence

FIGURE 1: The number of inpatients with a diagnosis of sepsis, 2011-2015

Note: Data exclude paediatric and maternity inpatients
FIGURE 2: In-hospital mortality for inpatients with a diagnosis of sepsis by age groups, 2015

Note: Figure 2 includes paediatrics and maternity cases. ICD-10-AM diagnosis codes O85 [Puerperal Sepsis] and P36 [Bacterial Sepsis of Newborn] are included in addition to the sepsis diagnosis codes specified in Appendix 4a.
Gender impact

FIGURE 5: In-hospital mortality for males and females with a diagnosis of sepsis, 2011-2015

Age-standardised Mortality Rate per 100 Inpatients

- Males
- Females

2011 2012 2013 2014 2015
FIGURE 3: Inpatients with a diagnosis of sepsis with selected co-morbidities; crude mortality rates by number of co-morbidities, 2015

Note: the number of co-morbidities refers only to the 7 selected conditions listed in table above.
Seasonal variation in mortality

FIGURE 8: In-hospital mortality for inpatients with a diagnosis of sepsis, monthly data, 2013-2015
15% decrease in hospital mortality
9% decrease in critical care patient hospital mortality
Bed occupancy offset by reduced aLOS
Acute bed usage

FIGURE 18: Inpatients with a diagnosis of sepsis or infection: Number & Bed days as a percentage of total inpatients & bed days (appendix 6)
## TABLE 5: Admission and crude hospital mortality rates of inpatients admitted to a critical care area with a sepsis, severe sepsis, or septic shock diagnosis.

<table>
<thead>
<tr>
<th></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>Sepsis</td>
<td>8275</td>
<td>2136</td>
<td>25.8%</td>
<td>31.6%</td>
</tr>
<tr>
<td>Severe Sepsis</td>
<td>117</td>
<td>76</td>
<td>65.0%</td>
<td>39.5%</td>
</tr>
<tr>
<td>Septic Shock</td>
<td>496</td>
<td>363</td>
<td>73.2%</td>
<td>42.4%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>8888</strong></td>
<td><strong>2575</strong></td>
<td><strong>29.0%</strong></td>
<td><strong>33.4%</strong></td>
</tr>
</tbody>
</table>
FIGURE 20: Number of inpatients with a diagnosis of sepsis by age group, 2015

Cases by age groups
In-hospital mortality by age-groups

FIGURE 21: In-hospital mortality for inpatients with a diagnosis of sepsis, by age group, 2015

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Crude Mortality Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>16-44 Years</td>
<td></td>
</tr>
<tr>
<td>45-64 Years</td>
<td></td>
</tr>
<tr>
<td>65-84 Years</td>
<td></td>
</tr>
<tr>
<td>85+ Years</td>
<td></td>
</tr>
</tbody>
</table>
Critical care admission by age-group

FIGURE 24: Number of inpatients with a diagnosis of sepsis, severe sepsis or septic shock and admission to critical care, 2015

Number of Cases

- 16-44 Years
- 45-64 Years
- 65-84 Years
- 85+ Years
Hospital mortality for critical care patients, by age-group

FIGURE 25: In-hospital mortality for inpatients with a diagnosis of sepsis, severe sepsis or septic shock and admission to critical care, 2015
Hospital mortality of sepsis patients admitted to critical care

FIGURE 26: SPC Funnel plot of in-hospital mortality rates amongst patients with a diagnosis of sepsis and critical care admission, by hospital, 2015

Note: hospitals with < 40 sepsis cases admitted to critical care not displayed due to insufficient numbers for this statistical analysis. These hospitals all had mortality rates lower than the mean.
### FIGURE 27: Inpatients & Deaths with a Diagnosis of Sepsis or Infection, 2015

<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 hospital mortality rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sepsis</td>
<td>8,888</td>
<td>2.1%</td>
<td>2,021</td>
<td>18.8%</td>
<td>22.7%</td>
</tr>
<tr>
<td>Infection</td>
<td>102,647</td>
<td>24.0%</td>
<td>4,776</td>
<td>44.4%</td>
<td>4.7%</td>
</tr>
<tr>
<td>All other diagnoses</td>
<td>315,720</td>
<td>73.9%</td>
<td>3,963</td>
<td>36.8%</td>
<td>1.4%</td>
</tr>
<tr>
<td>Total</td>
<td>427,255</td>
<td>100%</td>
<td>10,760</td>
<td>100%</td>
<td>2.5%</td>
</tr>
</tbody>
</table>
Process audit

• Patients with a suspicion of infection
  o As evidenced by blood cultures taken

• Screened for
  o Diagnosis & documentation
  o Use of sepsis screening form (SSF)
  o Time to first dose antimicrobials
  o Impact of Sepsis Screening Form

• Feedback
  o To clinicians and wards
  o Sepsis committees
### Audit results

**n = 1489**

<table>
<thead>
<tr>
<th></th>
<th>With form</th>
<th>Without form</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diagnosis made and documented</td>
<td>87%</td>
<td>44%</td>
</tr>
<tr>
<td>Risk stratification correct</td>
<td>74%</td>
<td>24%</td>
</tr>
<tr>
<td>1st dose antimicrobials within 1 hour</td>
<td>74.5%</td>
<td>46.5%</td>
</tr>
</tbody>
</table>

Only 56% of sepsis cases were documented as sepsis in the case notes.
Integrated care

- Paramedic pathway
- Primary Care
  - Nursing homes
  - Prison service
  - Rehabilitation
- Neonatal
- Paediatric
Q1: The overall layout of the pathway (green page) follows a logical sequence.

- Strongly Disagree: 9%
- Disagree: 5%
- Neutral: 5%
- Agree: 50%
- Strongly Agree: 31%
Q3. The 'concerns a woman could have sepsis' section is helpful with identifying women with suspicion of infection/sepsis.

- Strongly Disagree: 3%
- Disagree: 2%
- Neutral: 11%
- Agree: 32%
- Strongly Agree: 52%
Q7 Where in the woman's file do you think the form should be kept

- Consequential to infection/ Clinical notes: 53
- Front of chart: 24
- Admission/Antenatal: 6
- Bedside: 3
- Alert sheet: 2
- Septic tab: 3
- With lab results: 25
- Didn't answer: 24

With IMEWS: 24
Sepsis Predisposition & Recognition

(ALWAYS USE CLINICAL JUDGEMENT)

Complete this form and apply if the Irish Maternity Early Warning Score (IMEWS) triggers 2 YELLOWS or 1 PINK and/or Infection is suspected.

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

Are you concerned that the woman could have infection

<table>
<thead>
<tr>
<th>History of fevers or rigors</th>
<th>Possible intrauterine infection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cough/sputum/breathlessness</td>
<td>Myalgia/back pain/general malaise/headache</td>
</tr>
<tr>
<td>Flu like symptoms</td>
<td>New onset of confusion</td>
</tr>
<tr>
<td>Unexplained abdominal pain/distention</td>
<td>Recent surgery/ cellulitis/wound infection</td>
</tr>
<tr>
<td>Pelvic pain</td>
<td>Possible breast infection</td>
</tr>
<tr>
<td>Vomiting and/or diarrhoea</td>
<td></td>
</tr>
<tr>
<td>Little associated infection/redness/swelling/pain</td>
<td>Others</td>
</tr>
</tbody>
</table>

Obstetric History

Para: [ ]
Gestation: [ ]
Pregnancy-related complaints:

Days post-natal: [ ]
Delivery:
- [ ] Spontaneous vaginal birth (SVB)
- [ ] Vacuum assisted birth
- [ ] Forceps assisted birth
- [ ] Caesarian section

Risk factors

Pregnancy Related
- [ ] Cervage
- [ ] PFROM
- [ ] Retained Products
- [ ] History Pelvic Infection
- [ ] Group A Strep in close contacts
- [ ] Amniocentesis

Non Pregnancy Related
- [ ] Age > 35 years
- [ ] Minority ethnic group
- [ ] Vulnerable socio-economic background
- [ ] Obesity
- [ ] Diabetes
- [ ] Immunocompromised e.g. Systemic Lupus
- [ ] Chronic renal failure
- [ ] Chronic liver failure
- [ ] Chronic heart failure

Record observations on the Irish Maternity Early Warning (IMEWS) chart.
Request immediate medical review if you are concerned the woman has INFECTION plus ANY ONE of the following:

1. [ ] IMEWS positive for immediate review, i.e. ≥2 YELLOWS or ≥2 PINKS
2. [ ] SIRS Response, i.e. ≥2 modified SIRS criteria listed below.
   Modified SIRS criteria:
   - [ ] Respiratory rate ≥ 20 breaths/min
   - [ ] Heart rate ≥ 100bpm
   - [ ] Temperature < 36°C or > 38°C
   - [ ] WCC < 4 x 10^9/L
   - [ ] Acutely altered mental status
   - [ ] Urine glucose > 3.7mmol/L (in the absence of diabetes mellitus)
3. [ ] At risk of neutropenia, e.g. on anti-cancer treatment.

If sepsis suspected follow screening and escalate to Medical review. Use ISBAR as outlined.

Time Doctor Contacted: [ ]
Midwife Signature: [ ]
Sepsis Screening Form

There is separate sepsis criteria for non-pregnant adult patients

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

Section 2: Clinical Suspicion of Infection

Document site:
- Respiratory Tract
- Intra-abdominal
- Genito-urinary Tract
- Central Nervous System
- Intra-articular/Bone

No clinical suspicion of infection: proceed to section 5

Doctor's Initials: MCRH

Section 3: Who needs to get the “Sepsis 6” at risk of sepsis

1. Infection plus circle either a or b as appropriate.
   a. SIRS Response, i.e. ≥2 modified SIRS criteria listed on page 1.
   b. No SIRS but presenting with clinically apparent new onset organ dysfunction due to infection, i.e. with new respiratory, renal or cardiovascular failure.

2. Patients who present unwell who are on treatment that puts them at risk of neutropenia, e.g. anti-cancer treatment.

Doctor's Initials: MCRH

Section 4: Time Zero

Yes. AT RISK OF SEPSIS

Start Maternity Sepsis 6

SEPSIS SIX + 1st (complete within 1 hour)

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

BLOODS: Check point of care lactate & full blood count. U&E, LFTs if Coag. Other tests and investigations as per history and examination.

URINE OUTPUT: Assess urine output and consider urinary catheterisation for hourly measurement in severe sepsis/septic shock.

OXYGEN: Titrate O2 to saturations of 94-98% or 60-92% in chronic lung disease.

ANTIMICROBIALS: Give antibiotics according to the site of infection and following local抗菌acterial guidelines.

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

Doctor's Initials: MCRH

Section 5: Following history and examination, and in the absence of clinical criteria or signs, at risk of sepsis is not diagnosed.

If infection is diagnosed proceed with usual treatment pathway for that infection.

Doctor's Name: Date: Time:

Section 6: Look for signs of new organ dysfunction:

Lactate > 2 mmol/L (reducing administration of fluid bolus)
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%
Renal - Urine output < 0.5mL/kg for 2 hours - despite adequate fluid resuscitation
Renal - Creatinine > 177 umol/L
Liver - Bilirubin > 70 micromol/L
Glucone > 7.7 mmol/L (in the absence of diabetes)
Coagulation - INR > 1.5 or PTPT > 60
Platelets < 100 x 10^9/L
Central Nervous System - Acutely altered mental status

Any new organ dysfunction due to infection: THIS IS SEPSIS

Inform Registrar/Consultant and Anaesthetist immediately. Reassess frequently in 1 hour. Consider other investigations and management + source control if patient does not respond to initial therapy as evidenced by haemodynamic stabilisation then improvement.

Doctor's Initials: MCRH

Section 7: Look for signs of septic shock

Lactate > 2 mmol/L, AND

THIS IS SEPSIS

Inform Consultant
Contact CRITICAL CARE

Doctor's Initials

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.

Clinical Handover. Use ISBAR Communication Tool.

File this document in patient notes - Document management plan.
• Continue to support sepsis guideline implementation
• Scheduled update of National Guideline No. 6
  o Sepsis-3 compliant
• Further development of sepsis outcome analysis
  o Irish sepsis mortality prediction model and score for HIPE data
• National Sepsis Report 2016
  o National Sepsis Summit September 2017
The Sepsis Audit Subcommittee

- Gráinne Cosgrove, Senior Statistician, Measurement for Improvement Team, Quality Improvement Division, HSE
- Margaret Brennan, Quality and Patient Safety Lead, Acute Hospitals Division
- Deirdre Murphy, Head of HIPE & NPRS, HPO
- Jacqui Curley, Coding Manager, HPO
- Declan McKeown, Health Information Unit, Division of Health & Wellbeing
- Christina Doyle, Programme Manager, National Sepsis Programme, CSPD
Thank you

www.hse.ie/sepsis