The National Sepsis QI Programme of Ireland

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National Clinical Lead Sepsis
Sepsis-3 Definition

• ‘A life-threatening organ dysfunction caused by a dysregulated host response to infection’
  • Syndrome
  • No confirmatory test
Clinical presentation

- Micro-organism
  - Virulence
  - Innoculation dose
  - Multi-drug resistance
  - Source
    - 70-80% cases arise in the community

- Host
  - Genetic polymorphisms
  - Age
  - Co-morbidities
Sepsis related organ dysfunction

Abnormal microcirculatory flow

Persistent inflammation, immunosuppression and catabolism

Kidney, liver, brain and heart dysfunction

Cell hibernation and stunning
Evidence

• Surviving sepsis campaign guideline update 2016:
  • ‘That hospitals and hospital systems have a performance improvement program for sepsis’
  • Meta-analysis: performance improvement programs were associated with
    o a significant increase in compliance with the SSC bundles
    o a reduction in mortality (OR 0.66; 95% CI, 0.61–0.72)
Sepsis is up in incidence
Hospital In-patient Enquiry (HIPE) database

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

Note: Data exclude paediatric and maternity inpatients
Number of cases with age

FIGURE 15: Number of inpatients with a diagnosis of sepsis (excluding SIRS of infectious origin & septic shock) and without admission to a critical care area, 2016.
Mortality ↑ with age
(and in < 1 years)

Mortality rate is 25.8% over 75 years of age
Mortality > 20% with ≥ 1 co-morbidity
**Surgical DRG**

<table>
<thead>
<tr>
<th>Surgical / Medical DRG*</th>
<th>Number of Inpatients</th>
<th>Increase in cases 2015-2016</th>
<th>% of total cases 2016</th>
<th>Crude Mortality Rate</th>
<th>Change in Mortality Rate 2015-2016</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surgical</td>
<td>2,429</td>
<td>30.8%</td>
<td>16.4%</td>
<td>24.1%</td>
<td>7.3% downward</td>
</tr>
<tr>
<td>Medical</td>
<td>12,375</td>
<td>76%</td>
<td>83.6%</td>
<td>17.4%</td>
<td>20.5% downward</td>
</tr>
<tr>
<td>Total</td>
<td>14,804</td>
<td>66.6%</td>
<td>100%</td>
<td>18.5%</td>
<td>18.8%* downward</td>
</tr>
</tbody>
</table>

* 19.4% reduction between 2015 and 2016 after adjusting for age differences.

Note: ‘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.
Seasonal variation


↑ in winter
No gender difference

• Early recognition and treatment vs. over diagnosis, overtreatment with antimicrobials, and misdiagnosis
• Physician resistance to guidelines/ protocols
  o Checkbox medicine
  o Loss of clinical autonomy
  o Loss of flexibility
• Achieving behavior change
  o Requires effort
  o Difficult to sustain
Implementation

• Clear outcome aims
• Defined process to achieve those aims
  o Evidence based
  o Clearly assigned roles & responsibilities
• Measurement & Feedback
  o Process measurement
  o Outcome measurement
  o Balancing measures
A multimodal approach to achieve process aims

• ‘Just do it’ approach doesn’t work
• Leadership
• Education
  o Undergraduate
  o Postgraduate
  o Hospital
• Involve endusers and service users in process development
  o Pilots, PDSA cycles, Conferences, Awareness campaigns, Awards
  o Engage resistors – they have valuable points of view
• Make it easier to do the right thing than not
• Normalise the right thing
  o Generational change
Sepsis tool validity audit, 2016, 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.
## Compliance audit 2017

\( n = 489 \)

<table>
<thead>
<tr>
<th>Process aim</th>
<th>Compliance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sepsis documented</td>
<td>60%</td>
</tr>
<tr>
<td>Sepsis form used</td>
<td>37%</td>
</tr>
<tr>
<td>Cultures taken before 1(^{st}) dose</td>
<td>72%</td>
</tr>
<tr>
<td>Antimicrobials within 1 hour</td>
<td>64%</td>
</tr>
<tr>
<td>Antimicrobial as per guideline</td>
<td>80%</td>
</tr>
<tr>
<td>Lactates taken</td>
<td>75%</td>
</tr>
<tr>
<td>2(^{nd}) lactate taken (when indicated)</td>
<td>71%</td>
</tr>
<tr>
<td>Fluid bolus</td>
<td>42%</td>
</tr>
</tbody>
</table>
67% increase in cases documented 2015/16
Hospital sepsis-associated mortality trends


17% decrease
2015/16

14,000 cases
19% mortality
Inform the Sepsis Screening Tool

- Presentation: Infection plus one of the following:
  - Immunosuppressed eg chemo/ radiotherapy
  - Clinically overt new organ dysfunction
  - A SIRS response and ≥ 1 co-morbidity
    - Patients with > 20% mortality risk from sepsis

- Action:
  - Sepsis 6 bundle within 1 hour of infection diagnosis
  - 3 hour review
    - Diagnosis, response, escalation
  - 6 hour review
"Think SEPSIS" at Triage

Clinical suspicion of infection?

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

1. Unwell and on chemotherapy/radiotherapy with risk of neutropenia
   - Follow the 'Febrile Neutropenia' pathway if pathway in operation.
   - Note: these patients may present without fever

2. Any 1 of the following signs of acute organ dysfunction:
   - Altered Mental State
   - RR > 30
   - O₂ sat < 90%
   - SBP < 100
   - HR > 130
   - Mottled or ashen appearance
   - Non-blanching rash
   - Other organ dysfunction

3. ≥ 2 SIRS criteria
   - RR ≥ 20
   - HR > 90
   - T > 38.3°C or < 36°C
   - BSL > 7.7 mmol/l (in non-diabetic patient)

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

PLUS ≥ 1 co-morbidity

Category 2

Category 3

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

START SEPSIS FORM
**Sepsis-3 Adult In-Patient Sepsis Management Algorithm**

**NEWS ≥ 4 (or ≥ 5 on oxygen)
Or Exercising clinical judgement**

**Suspicion of infection?**

**NO**
- Sepsis screen not required

**Yes**
- Screen for high risk of sepsis → 1, 2 or 3

1. **On Chemotherapy/radiotherapy - risk of neutropenia**
2. **Clinical evidence of new onset organ dysfunction**
3. **Co-morbidities PLUS ≥ 2 modified SIRS**

**Pre-Assessment Screen**

**Yes - Start Sepsis Form**
- Medical examination supports infection – this is ‘Time Zero’
- Start Sepsis Six 1 hour bundle

**By 3hr - Patient Review**
- Confirm or out-rule sepsis diagnosis.
- Assess response to ‘Sepsis 6’ bundle.
- Repeat Lactate if 1st abnormal
- Continue fluid resuscitation as required to restore tissue perfusion
- Escalate care if deteriorating or septic shock

**By 6hr - Patient Review**
- Start pressors if haemodynamic stability not achieved with IV fluids
- Critical care consult for patients with acute organ failure
- Document septic shock if requiring pressors to achieve MAP ≥ 65mmHg

**1hr from Time Zero**

**By 3 hours from Time Zero**

**By 6 hours from Time Zero**

**Daily Review**
- Response to treatment
  - Improvement – follow ‘Start Smart then Focus’ Policy
  - No change – review diagnosis & treatment and consider source control
  - Deterioration – consider ‘Deterioration Actions’ under 6hr Patient Review

**Actions**

**Complete Sepsis Six within 1 hour**
- **Take 3**
  - Blood cultures
  - Blood tests
  - Urine output
  - Use local antimicrobial guideline
- **Give 3**
  - Oxygen
  - IV fluids
  - Antimicrobials

**Deterioration Actions**
- Seek senior input
- Review diagnosis & treatment
- Consider source control

**Deterioration Actions**
- Review diagnosis, treatment and need for source control with senior input and results of tests and investigations
- Critical Care consult for acute organ support if required
- Consider Microbiology review for complex cases

**Antimicrobial Management**
- Review diagnosis with laboratory & radiology results and:
  - Stop – if alternate diagnosis or no evidence of infection
  - Change antimicrobials - narrow or broaden spectrum as indicated by clinical response and culture result
  - Continue - review in 24 hrs
Sepsis Predisposition & Recognition

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>Symptom</th>
<th>Possible Infection</th>
</tr>
</thead>
<tbody>
<tr>
<td>History of fevers or rigors</td>
<td>Possible intrauterine infection</td>
</tr>
<tr>
<td>Cough, haemoptysis, breathlessness</td>
<td>Pneumonia/pneumococcal pneumonia</td>
</tr>
<tr>
<td>Flu-like symptoms</td>
<td>Possible streptococcal infection</td>
</tr>
<tr>
<td>Unexplained abdominal pain/distension</td>
<td>Possible peritonitis</td>
</tr>
<tr>
<td>Pelvic pain</td>
<td>Pelvic abscess</td>
</tr>
<tr>
<td>Vomiting and/or diarrhoea</td>
<td>Multiple presentation with non-specific malaria</td>
</tr>
<tr>
<td>Lower body temperature, headache, malaise</td>
<td>Endocarditis/septicemia</td>
</tr>
<tr>
<td>Low associated infection/meningitis/swelling/pain</td>
<td>Others</td>
</tr>
</tbody>
</table>

Obstetric History

Pari:

<table>
<thead>
<tr>
<th>Gestation</th>
<th></th>
</tr>
</thead>
</table>

Pregnancy related complaints:

Days post-natal:

Delivery:

- Spontaneous vaginal delivery (SVD)
- Vacuum assisted delivery
- Forceps assisted delivery
- Caesarean section

Risk factors

Pregnancy Related

- Gestation
- Pre-term/predischarge rupture of membranes
- Prolonged products of conception
- History of pelvic infection
- Duplication of uterus in close contact
- Recent antimicrobial

Non Pregnancy Related

- Age > 35 years
- Minority ethnic group
- Vulnerable socio-economic background
- Obesity
- Diabetes, including pre-gestational diabetes
- Recent surgery
- Immunosuppressed e.g. Systemic Lupus
- Chronic renal failure
- Chronic liver failure
- Chronic heart failure

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

If you are concerned the woman has INFECTION plus ANY 1 of the following:

1. IMH/ES trigger for immediate review, i.e. ≥ 3 YELLS or ≥ 3 PINS
2. SHS Response, i.e. ≥ 2 modified SHS criteria listed below.

- Modified SHS criteria:
  - Respiratory rate ≥ 20 breaths/min
  - Temperature <36.5° or >38°C
  - Systolic blood pressure <90 mmHg
  - Heart rate ≥ 100bpm
  - Respiratory rate ≥ 20 breaths/min

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.

Doctor’s Name: ____________________________

Midwife’s Signature: ____________________________

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

The sepsis 6 bundle should be given to the following women: Women with a presenting complaint suspicious of infection

AND 1 of the following
1. Reduced organ perfusion (physiological changes must be sustained).
   Or
2. Clinically apparent new organ dysfunction due to infection.
   Or
3. Women who present unwell who are on treatment that puts them at risk of neutropenia e.g. anti-cancer treatment.

Summary of Management algorithm

1st HOUR BUNDLE:
- Sepsis 6 completed and fetal monitoring if pregnant
- Assess for source control
- Escalate to consultant obstetrician/gynaecologist and anaesthetic/critical care if clinical or biochemical organ dysfunction is apparent

3-HOUR BUNDLE:
- Review clinical response to sepsis 6 bundle
- Lactate repeated if 1st abnormal
- Reviewed diagnosis and treatment with blood and other test results
- Diagnose Sepsis/Septic shock and document as appropriate
- If sepsis confirmed escalate care as appropriate

6-HOUR BUNDLE:
- Review response to treatment
- Is the woman responding, stabilising or deteriorating?
- Escalate as appropriate
- Vasopressors commenced in women with fluid resistant shock
SEPSIS: A life-threatening condition triggered by infection

It is a rare but important diagnosis during and immediately after pregnancy because pregnancy affects the body's ability to respond to infection, leading to an increased risk of sepsis.

Whilst most women do not suffer from infection or sepsis during or after pregnancy, sepsis, if it occurs, is best treated when recognised early.
MATERNAL SEPSIS

Sepsis is a life-threatening condition triggered by infection.

Risk Factors

- Non Pregnancy Related Risk Factors
  - Age over 65
  - Underlying chronic illness
  - Immunosuppression
  - Diabetes
  - Renal disease
  - Previous infection
  - Certain types of cancer

- Pregnancy Related Risk Factors
  - Previous sepsis
  - Recent surgery
  - Pre-existing medical condition
  - Diabetes
  - Renal disease
  - Immunosuppression
  - Systemic lupus erythematosus

The signs of sepsis: if your loved one has been infected and is getting worse, do the sepsis checklist (below).

If any one of the organ systems is newly abnormal seek urgent medical review and ask:

COULD IT BE SEPSIS?

Infection & Sepsis Prevention

Good Hygiene
Keep yourself and your environment clean. Change your hands and wash the number of bugs down.

Good Sanitation
Use clean drinking water and clean toilet facilities.

Vaccination
Vaccination stimulates the immune system to recognise and destroy potential life-threatening bugs.

Breastfeeding
Breast milk contains proteins from the mother’s immune system, which can help to fight infection.

Early identification and treatment saves lives in SEPSIS.
Future plans:
Sepsis mortality prediction model and scoring system

Key patient safety indicator
Thank you

www.hse.ie/sepsis

Ireland’s HSE Sepsis programme implementing the Ministerial endorsed NCEC National Clinical Guideline No 6.