Management of Sepsis
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2 Modified Early Warning Scoring System

2.1 Introduction

Prevention is better than cure. Therefore identifying the impending critically ill early would help in early resuscitation and management at ward level and also help ward staff to identify patients who need referral to the ITU team. This would be useful in a country as ours where ITU resources are limited as it would help in reducing the number of cardiac arrests in hospital, emergency ITU admissions and re admissions.

Early identification needs identification of early warning signs of critical illness.

2.2 A simple Modified Early Warning Scoring system (MEWS) is given below.

<table>
<thead>
<tr>
<th>SCORE</th>
<th>&lt; 3</th>
<th>2</th>
<th>1</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>HR / PULSE</td>
<td>&lt; 40</td>
<td>41-50</td>
<td>51-100</td>
<td>101-110</td>
<td>111-130</td>
<td>≥ 130</td>
<td></td>
</tr>
<tr>
<td>SBP</td>
<td>&lt; 70</td>
<td>71-80</td>
<td>81-100</td>
<td>101-179</td>
<td>≥ 179</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RR</td>
<td>&lt; 8</td>
<td>10 - 19</td>
<td>20 - 29</td>
<td>30 - 39</td>
<td>≥ 39</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TEMP</td>
<td>≤ 35.0</td>
<td>35.0 - 35.9</td>
<td>36 - 37.4</td>
<td>37.5 - 38.4</td>
<td>≥ 38.4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CNS</td>
<td>Alert</td>
<td>Voice</td>
<td>Pain</td>
<td>Unconscious</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>URINE (ml/kg/hr)</td>
<td>Nil</td>
<td>&lt; 0.5</td>
<td>0.5 - 3.0</td>
<td>&gt; 3.0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SpO2 Breathing air</td>
<td>&lt; 85%</td>
<td>85 - 89%</td>
<td>90 - 94%</td>
<td>&gt; 94%</td>
<td></td>
<td></td>
<td></td>
</tr>
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</table>

BEWARE: SCORE > 3
2.3 The following patient referral algorithm is useful for further management.

\[
\text{MEWS} \geq 3 \\
\downarrow \\
\text{Reviewed by SHO/REG (within 30 mins)} \\
\downarrow \\
\text{Treatment initiated. Rpt MEWS score.} \\
\downarrow \\
\text{Resolved} \\
\downarrow \\
\text{Yes} \\
\downarrow \\
\text{Repeat MEWS 1-4 hrly} \\
\downarrow \\
\text{No} \\
\downarrow \\
\text{Continue to score } \geq 3
\]

1. Review by SR/Consultant (Admitting or on call) < 2hrs after initial detection
2. ITU referral

2.4 References


3 Sepsis

Sepsis is the body’s response to an infection caused by a microorganism invading the body and can be limited to a particular body region or be widespread in the bloodstream.

3.1 Definitions

- **Sepsis** is defined as a **systemic response to an infection** caused by invading microorganisms and can be limited to one organ or involve multiple organ systems.

- Systemic Inflammatory Response Syndrome (SIRS) is manifested by having the following features.

  i. Hyperthermia >38.3°C or hypothermia <36°C
  ii. Tachypnoea >20/min or PaCO₂ <32 mmHg
  iii. Tachycardia >90/min
  iv. WBC >12,000/µL OR <4000/µL OR >10% bands
  v. Acutely altered mental status
  vi. Hyperglycemia >120 mg/dl in the absence of DM

- Severe sepsis means sepsis with more than one organ dysfunction, hypoperfusion or hypotension.

- Septic shock is defined as sepsis with arterial hypotension, despite adequate fluid resuscitation.
3.2 Diagnostic criteria

- Is the patient’s history suggestive of a new infection?
  - pneumonia
  - wound infection
  - acute abdominal infection
  - urinary tract
  - bone/joints
  - meningitis
  - blood stream catheter
  - implantable device

- Are any 2 of the following signs & symptoms present and new to the patient?
  - hyperthermia >38.3°C
  - hypothermia <36°C
  - tachypnoea >20 bpm
  - tachycardia > 90 bpm
  - leukopenia WBC < 4000/µL
  - leukocytosis WBC >12,000/µL

Consider;
Acutely altered mental status
Hyperglycaemia (bld glucose >120mg/dL) in the absence of diabetes
If yes, to both suspicion of infection is present.

- Are any of the following organ dysfunction criteria present at a site remote from site of infection that are not considered to be chronic?

  - CVS
    - Systolic Blood Pressure < 90 mmHg or
    - Mean Arterial Pressure < 65 mmHg or
    - Systolic Blood Pressure decrease < 40 mmHg from baseline

  - RS
    - Bilateral pulmonary infiltrates with an increased O₂ requirement to maintain SpO₂ >90%.
    - Bilateral pulmonary infiltrates with PaO₂/FiO₂ ratio < 300

  - Renal
    - Creatinine > 2 mg/dL or
    - Urine Output < 0.5 ml/kg/Hr for > 2 hrs

  - Liver
    - Bilirubin > 2 mg/dL

  - Coagulation
    - Platelet count < 100,000/mm3
    - INR > 1.5 or
    - APTT > 60 secs

  - Metabolic
    - Lactate > 2 mmol/L

If suspicion of infection + organ dysfunction = SEVERE SEPSIS
3.3 Sepsis Bundles

- Bundle management in sepsis has been introduced to develop guidelines that would be of use at the bed-side to increase awareness and improve outcome.

- A bundle is a group of interventions related to a disease process, when executed together, result in better outcome than when implemented individually.

Individual bundle elements are built upon evidence based practices.

- 2 different Severe Sepsis Bundles
  - Severe Sepsis Resuscitation Bundle
  - Severe Sepsis Management Bundle

3.4 Timing

- Perform all indicated tasks of resuscitation bundle 100% of the time within first 6 hours of identification of severe sepsis.

- Perform all indicated tasks of management bundle immediately. Complete within 24 hours.

3.5 Investigations for a septic patient

- Full Blood Count with Differential count, Platelet count;

- Sepsis Screen Cultures - blood, urine, sputum

- Basic chemistry – serum bilirubin, serum lactate, renal function tests

- Coagulation screen
• At physician’s discretion:
  - US abdomen
  - Chest X ray,
  - CT scan.
  - Arterial Blood Gas analysis,
  - Serum amylase,
  - Serum lipase,
  - C Reactive protein (if available)

3.6 Management – is applicable to a patient identified as septic in the ward, ETU or in an ICU.

• General
  - Start O₂ via a face mask after clearing the airway.
  - Insert 2 large bore IV cannulae.

• Specific
  - Fluid resuscitation

    ➢ Type of fluid
      - Crystalloids - 0.9% saline, Hartmann’s solution or Colloid – 5% albumin, starch

    ➢ How much?
      - 20 ml/kg body weight of crystalloid or 0.2 – 0.3 g/kg of colloid

    ➢ Goals to achieve;
Early Goal Directed Therapy

- MAP > 70 mmHg
- HR < 110/min
- UOP > 0.5 ml/kg/hr
- Skin perfusion, level of consciousness
- Look for pulmonary & systemic oedema

Grade X

- Central venous pressure measurement

Grade Y

If goals not achieved by fluid resuscitation.
(Call anaesthetic team)

Place CVP catheter
Maintain CVP e’”8 mmHg (>10cmH₂O)
Repeated fluid challenges till target reached
If mechanically ventilated – CVP 12-15 mm Hg

- Inotropes

  ➢ When?
  If goals still not achieved

  ➢ What?
  Noradrenaline - 0.01-0.2 mcg/kg/min via central IV catheter.

  ➢ Goals
  - MAP > 70 mmHg
  - UOP > 0.5 ml/kg/hr
  - ScvO₂ > 70% (central venous oxygen saturation)
Grade Z

- If ScvO2 < 70%
  Add dobutamine up to 20 mcg/kg/min

  Antibiotics

Grade X

Choice dependent on:
  Susceptibility of likely pathogens
  Patient factors
  Drug tolerance
  Underlying disease
  Clinical syndrome

Regimen should cover all likely pathogens

Prescribe broad spectrum therapy till causative organism and antibiotic sensitivity defined.
  Use a full loading dose.
  If renal or hepatic dysfunction identified, discuss with the consultant microbiologist.

Re evaluate in 48 - 72 hrs. Identify causative organism which should be available from ABST report and use narrow spectrum antibiotic for 7-10 days, guided by clinical response.

Other aspects

Blood sugar control
Grade X

Check blood sugar and start insulin infusion to maintain around 90-110mg/dl

➢ **Haemoglobin**

Grade X

Check and optimize with packed red cells to have Hb > 8 g/dl, PCV> 24 or ScvO2 >70%

➢ **Low dose steroid**

Grade X

Recommended in patients with septic shock, who despite adequate fluid replacement, require vasopressors to maintain blood pressure.

**Hydrocortisone** 200-300 mg daily for 7 days in 3-4 divided doses or continuous infusion.

➢ **Activated Protein C**

Grade Z

For patients with severe sepsis and an increased risk of death 24 µg/kg/min for 96 hours

➢ **Lung protective ventilation**

Grade X

Low tidal volumes 6ml/kg
Inspiratory plateau pressure < 30 cm H2O
3.7 Reassess and check whether goals achieved.

3.8 Source Control

Grade X

- Drainage
- Debridement
- Device removal
- Definite control (complete removal of the source of sepsis) and repeat control techniques.

References
