

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.

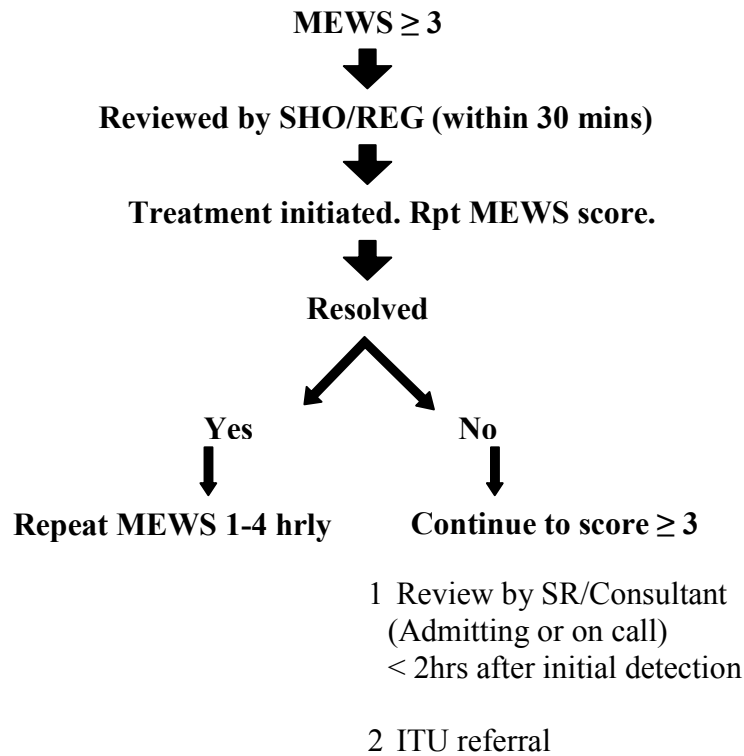
Early identification needs identification of early warning signs of critical illness.

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

SCORE	3	2	1	0	1	2	3
HR / PULSE	< 40	41-50		51 - 100	101 - 110	111 - 130	≥ 130
SBP	< 70	71-80	81-100	101 - 179		≥ 179	
RR		< 8		10 - 19	20 - 29	30 - 39	> 39
TEMP		< 35.0	35.0 - 35.9	36 - 37.4	37.5 - 38.4	> 38.4	
CNS				Alert	Voic e	Pain	Unco nscio us
URINE (ml/kg/hr)	Nil	< 0.5		0.5 - 3.0	> 3.0		
SpO ₂ Breathing air	< 85 %	85 - 89%	90 - 94%	> 94%			

BEWARE: SCORE > 3

2.3 The following patient referral algorithm is useful for further management.



2.4 References

1. Comprehensive Critical Care. Report of an Expert Group. Department of health.UK.2000. (<http://www.doh.gov.uk/pdfs/criticalcare.pdf>)
2. Stenhouse.C Coates S, Tivey M; The Modified Early Warning Score British Journal of Anaesthesia 2000:84:663

3 Sepsis

Sepsis is the body's response to an infection caused by a micro-organism invading the body and can be limited to a particular body region or be widespread in the blood stream.

3.1 Definitions

- **Sepsis** is defined as a **systemic response to an infection** caused by invading micro organisms 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 $>38.3^{\circ}\text{C}$ or hypothermia $<36^{\circ}\text{C}$
 - ii. Tachypnoea $>20/\text{min}$ or $\text{PaCO}_2 <32\text{ mmHg}$
 - iii. Tachycardia $>90/\text{min}$
 - iv. $\text{WBC} >12,000/\mu\text{L}$ OR $<4000/\mu\text{L}$ OR $> 10\%$ bands
 - v. Acutely altered mental status
 - vi. Hyperglycemia $>120\text{ mg/dl}$ 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 $>38.3^{\circ}\text{C}$
 - hypothermia $<36^{\circ}\text{C}$
 - tachypnoea >20 bpm
 - tachycardia >90 bpm
 - leukopenia $\text{WBC} < 4000 /\mu\text{L}$
 - leukocytosis $\text{WBC} > 12,000 /\mu\text{L}$

Consider;

Acutely altered mental status

Hyperglycaemia (bld glucose $>120\text{mg/dL}$) 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 \geq 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 $ScvO_2 < 70\%$
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

1. <http://www.advancesinsepsis.com>
2. <http://www.ihl.org/IHI/Topics/CriticalCare/Sepsis>
3. <http://www.survivingsepsis.org>

