6702.01 SEPSIS SYNDROME

INTRODUCTION

Sepsis has been defined as a life threatening condition that arises when the body's response to an infection injures its own tissues and organs. Sepsis may lead to shock, multiple organ failure and death, especially if not recognized early and treated promptly.

Severe sepsis accounts for 20% of admissions to ICUs, has an approximate 30% mortality rate and is the leading cause of death in non-cardiac ICUs. Sepsis has a similar mortality rate to AMIs.

Sepsis starts as a Systemic Inflammatory Response Syndrome (SIRS) and can progress to severe sepsis and/or septic shock if left unrecognized and untreated.

SAFETY

Be conscious that sepsis patients may be likely to decompensate rapidly, develop an altered level of consciousness or become hypotensive. Patients should be monitored closely and be transferred by stretcher or stair chair.

Consider the source of infection and wear appropriate personal protective equipment.

ASSESSMENT

During the assessment of a patient with possible sepsis, any signs of infection should be noted as well as the presence of any SIRS criteria.

SIRS

SIRS is deemed to be present if 2 or more of the following criteria are met:

- Temperature greater than 38°C or less than 36°C
- Heart Rate greater than 90 bpm
- Respiratory Rate greater than 20 or PaCO2 less than 32 mmHg
- White Blood Cell Count greater than 12,000 or less than 4,000 or greater than 10% immature white blood cells

As white blood cell count cannot be determined in the pre-hospital setting, temperature, heart rate and respiratory rate are the three components most commonly used during assessment for SIRS.

People who have been exercising, have been out in the heat, or are anxious may meet the SIRS criteria, but are not considered to be septic as there is no source of infection. SIRS may also be caused by trauma, burns, toxins and other medical conditions.

Once it has been established that a patient meets the SIRS criteria in the setting of infection, further assessment can be done to determine whether the patient has sepsis, severe sepsis or septic shock.

Sepsis

Sepsis is diagnosed when a patient meets the SIRS criteria in the presence of infection. The infection could have been acquired through any of 4 routes: airborne, contact with bodily fluids or feces, blood borne and/or droplets. Sources of infection may include (but are not limited to):

- Urinary tract infections
- Respiratory tract infections
- Skin (e.g. abscesses, pressure sores)
- Gastrointestinal tract infections
- Recent surgeries

A detailed history is critical to assess for infectious etiologies. The presence of cough, fever/chills, shortness of breath, urinary symptoms, GI symptoms, skin changes, headache, or EENT symptoms (e.g. sore throat) should be assessed and documented. The respiratory and urinary tract are the most common sources of infection; keep in mind that infection may present atypically in the elderly. Changes in the patient's diet, activity level, or possible sick contacts may also provide useful information. It is sometimes difficult to determine the source of infection, which can lead to a delay in the patient receiving the most appropriate antibiotic. A thorough history can help to identify the source more rapidly.

Severe Sepsis

A patient is deemed to have severe sepsis when they have met the sepsis criteria (SIRS plus infection) and also have signs of hypoperfusion. Signs of hypoperfusion can include:

- Altered mental status
- Cardiac dysfunction
- Acute respiratory distress/hypoxia

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- Decreased urine output (normal output is 0.5-1 mL/kg/hr)

Septic Shock
Septic shock is defined by the presence of severe sepsis and hypotension (systolic blood pressure < 80mmHg systolic).

Physical Exam
The physical exam should include:
- Vital signs (including temperature)
- 12 lead ECG
- Blood glucose
- Oxygen saturation
- Serial GCS assessments
- Head-to-toe exam for signs of infection

CTAS
Patients presenting with sepsis should be assigned a CTAS score of at least 2. CTAS 1 would be appropriate for patients in septic shock.

MANAGEMENT

During sepsis, tissue oxygen demand is very high and tissue hypoxia may lead to multi-organ failure and possibly death. This is further complicated by the fact that during sepsis, mediators of infection also cause peripheral vasodilation resulting in hypotension and hypoperfusion. This is a form of distributive shock.

Overall management of sepsis involves balancing tissue oxygen delivery with oxygen demand while also treating the source of infection. A systematic approach to treat severe sepsis and septic shock is referred to as Early Goal Directed Therapy. In the pre-hospital setting, therapy is focused on maximizing oxygenation (to increase SaO_2), and administering fluids and medications to increase peripheral vascular resistance and cardiac output.

Oxygen Therapy
In order to maximize oxygenation, the clinician should administer oxygen with a goal SpO_2 of 100%.

Fluid Therapy
Patients with sepsis require fluid, which increases preload. An IV should be established and **fluid bolus** given (**PEP 1 supportive**). Fluid resuscitation for patients with sepsis should be aggressive with frequent reassessment. A common error in sepsis management is inadequate fluid resuscitation. Sepsis may occur in patients with congestive heart failure and/or in the presence of pulmonary edema. This should not deter aggressive fluid administration. Frequent reassessment will allow the clinician to assess for signs of fluid overload and adjust the treatment strategy accordingly.

If signs of hypoperfusion and/or blood pressure do not respond to fluid resuscitation, the clinician may consider also using inotropes and/or **vasopressors** (e.g. dopamine) (**PEP 1 supportive**) to increase contractility and optimize afterload.

In cases of severe sepsis or septic shock, if an IV cannot be established after two attempts, consider obtaining tibial intraosseous (IO) access. The IO route can be used for both fluid resuscitation and medication administration.

Emergency department management will include antibiotics, aggressive fluid resuscitation and vasopressors if required. Further care may include blood transfusion, monitoring of central venous pressure (CVP), mean arterial pressure (MAP), and lactate.

Early Notification
Early notification to the receiving facility is important for patients with suspected sepsis. When clinicians state the term 'sepsis' in their communication with the receiving facility as well as in their PCR, it has been shown that there is a significantly reduced time to definitive treatment, including appropriate antibiotics. For every hour delay in receiving appropriate antibiotic therapy, the chance of survival decreases by 12%.

Pediatric Sepsis

Identifying pediatric SIRS criteria, and therefore sepsis, requires either a white blood cell count or central temperature reading (along with tachypnea and/or tachycardia). Tympanic thermometry is not sufficient to determine fever in the setting of sepsis in the pediatric population. This makes it difficult to determine if a pediatric patient has sepsis in the pre-hospital setting. However, septic shock should be suspected when a pediatric patient appears to have

an infection with hyper- or hypothermia and signs of inadequate tissue perfusion, which may include:

- Altered mental status (which can include poor feeding, irritability, inappropriate crying, drowsiness, confusion, lethargy, or poor interaction with care-givers)
- Prolonged capillary refill time
- Flash capillary refill
- Bounding peripheral pulses
- Diminished pulses
- Mottled cool extremities
- Warm flushed peripheral skin
- Decreased urine output

Pediatric patients can also get a purpuric (reddish or purple-coloured spots or patches) or petechial (pin-point) rash in the presence of septic shock or severe infections (e.g. meningitis). It is important to note that because children compensate for longer periods of time, hypotension is not always present with septic shock, rather it is a late sign of decompensated shock.

Initial management consists of administering oxygen, providing consecutive 20mL/kg boluses (IV/IO) with reassessments between each bolus. When administering crystalloids, watch for signs of fluid overload, such as crackles, hepatomegaly, or JVD. If the hypotension and/or poor tissue perfusion continues (i.e. fluid-refractory shock), initiate inotropes or vasopressors.

In pediatric sepsis patients, adequate treatment in the first hour is extremely critical in order to reduce mortality.

TRANSFER OF CARE

When presenting a patient with suspected sepsis to the ED staff the following information should be clearly communicated in the radio patch and report:

- SIRS criteria present
- Level of sepsis
- Detailed history including possible source of infection
- Treatments provided and patient response

CHARTING

When documenting care of a patient with suspected sepsis, it is important to document the word ‘sepsis’ on the PCR. SIRS criteria, sepsis level, CTAS level, and all treatments provided should also be documented.

KNOWLEDGE GAPS

Discussion is required regarding the possible role of trip destination policies specific to patients with suspected sepsis. Further research is required regarding the optimal role of the pre-hospital clinician in Early Goal Directed Therapy (e.g. antibiotics, lactate measurement, etc.)

EDUCATION

Clinicians should continually review the criteria to help identify sepsis in the pre-hospital setting so as to improve recognition and early intervention.

QUALITY IMPROVEMENT

Important elements in sepsis are: [1] early identification of sepsis, [2] provision of oxygen and aggressive fluid resuscitation, and [3] early antibiotic administration

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https://emspep.cdha.nshealth.ca/

PEP 3x3 TABLES for SEPSIS

Throughout the EHS Guidelines, you will see notations after clinical interventions (e.g.: **PEP 2 neutral**). PEP stands for: the Canadian **P**rehospital **E**vidence-based **P**rotocols Project.

The number indicates the Strength of cumulative evidence for the intervention:
1 = strong evidence exists, usually from randomized controlled trials;
2 = fair evidence exists, usually from non-randomized studies with a comparison group; and
3 = weak evidence exists, usually from studies without a comparison group, or from simulation or animal studies.

The coloured word indicates the direction of the evidence for the intervention:
Green = the evidence is supportive for the use of the intervention;
Yellow = the evidence is neutral;
Red = the evidence opposes use of the intervention;
White = there is no evidence available for the intervention, or located evidence is currently under review.

PEP Recommendations for Sepsis Interventions, as of 2013/04/09. PEP is continuously updated. See: http://emergency.medicine.dal.ca/ehsprotocols/protocols/toc.cfm for latest recommendations, and for individual appraised articles.

Septic Shock

Recommendation		RECOMMENDATION FOR INTERVENTION			
		SUPPORTIVE (Green)	NEUTRAL (Yellow)	AGAINST (Red)	NOT YET GRADED (White)
STRENGTH OF RECOMMENDATION FOR INTERVENTION	1 (strong evidence exists)	• Crystalloid Infusion • Dopamine			• Hypertonic Saline
	2 (fair evidence exists)		• Colloid Infusion		
	3 (weak evidence exists)		• Trendelenburg		

*PEP is the **Canadian Prehospital Evidence-based Protocols Project.** Every clinical intervention is given a recommendation based on the strength of available research evidence (1 = randomized controlled trials and systematic reviews of RCTs; 2 = studies with a comparison group; 3 studies without a comparison group or simulation) and direction of the compiled evidence: **supportive** of intervention; **neutral** evidence for intervention; or **opposing** evidence for intervention). See: **http://emergency.medicine.dal.ca/ehsprotocols/protocols/toc.cfm***

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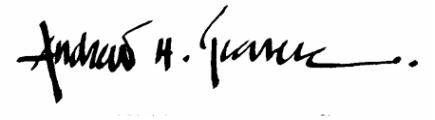
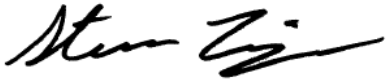
Signature of Program Director 	Signature of Program Document Coordinator 	

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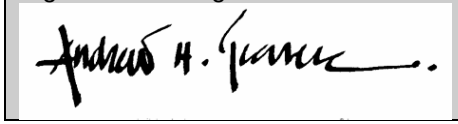
Signature of Program Director 	Signature of program Document Coordinator