SEPSIS
update 2018

CSIM/ACP Annual Meeting
Banff AB
October 2018

Scott McKee MD MPH FACP
DECLARATIONS:
Discussion Objectives

- The diagnostic approach/definition
- Evidence-based management strategies
- What is the role of steroids?
Discussion Objectives

- The diagnostic approach: THINK about it
- Evidence-based management strategies: Give fluids and antibiotics early
- What is the role of steroids? Try it when everything else isn’t working...
SIRS:

- Temp
- Pulse
- Respirations
- White count
The 1992 Definition:

- Infection
- Sepsis
  - Severe Sepsis
  - Septic Shock
- SIRS
  - Pancreatitis
  - Burns
  - Trauma
  - Other
SIRS

- Proposed in 1992
- Was revalidated in the 2003 “International Sepsis Definitions Conference”
- Ultimately revamped in 2016 (SEPSIS-3)
The Third International Consensus Definitions for Sepsis and Septic Shock (Sepsis-3)
JAMA  February 23, 2016

- Mervyn Singer, MD, FRCP; Clifford S. Deutschman, MD, MS; Christopher Warren Seymour, MD, MSc; Manu Shankar-Hari, MSc, MD, FFICM;
- Djillali Annane, MD, PhD; Michael Bauer, MD; Rinaldo Bellomo, MD; Gordon R. Bernard, MD; Jean-Daniel Chiche, MD, PhD;
- Craig M. Coopersmith, MD; Richard S. Hotchkiss, MD; Mitchell M. Levy, MD; John C. Marshall, MD; Greg S. Martin, MD, MSc;
- Steven M. Opal, MD; Gordon D. Rubenfeld, MD, MS; Tom van der Poll, MD, PhD; Jean-Louis Vincent, MD, PhD; Derek C. Angus, MD, MPH
SEPSIS-3

New Definition:

- “Limitations of previous definitions included an excessive focus on inflammation, the misleading model that sepsis follows a continuum through severe sepsis to shock, and inadequate specificity and sensitivity of the systemic inflammatory response syndrome (SIRS) criteria. Multiple definitions and terminologies are currently in use for sepsis, septic shock, and organ dysfunction, leading to discrepancies in reported incidence and observed mortality. The task force concluded the term severe sepsis was redundant.”
- “Sepsis should be defined as life-threatening organ dysfunction caused by a dysregulated host response to infection.”

- “Organ dysfunction can be represented by an increase in the Sequential [Sepsis-related] Organ Failure Assessment (SOFA) score of 2 points or more, which is associated with an in-hospital mortality greater than 10%.”
SEPSIS-3

- “Septic shock can be clinically identified by a vasopressor requirement to maintain a mean arterial pressure of 65 mm Hg or greater and serum lactate level greater than 2 mmol/L (>18 mg/dL) in the absence of hypovolemia.”
CONCLUSIONS AND RELEVANCE:

“These updated definitions and clinical criteria should replace previous definitions, offer greater consistency for epidemiologic studies and clinical trials, and facilitate earlier recognition and more timely management of patients with sepsis or at risk of developing sepsis.”
# SEPSIS definitions: 1992 vs 2016

<table>
<thead>
<tr>
<th></th>
<th>OLD</th>
<th>NEW</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SEPSIS</strong></td>
<td>SIRS</td>
<td>SUSPECTED/DOCUMENTED INFECTION</td>
</tr>
<tr>
<td></td>
<td>+</td>
<td>+</td>
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<tr>
<td></td>
<td>Suspected Infection</td>
<td>2 or 3 on qSOFA (HAT):</td>
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<tr>
<td></td>
<td></td>
<td>Hypotension (SBP ≤100 mmHg)</td>
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<tr>
<td></td>
<td></td>
<td>AMS (GCS ≤13)</td>
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<tr>
<td></td>
<td></td>
<td>Tachypnea (≥22/min)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>OR</td>
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<td></td>
<td></td>
<td>Rise in SOFA score by 2 or more</td>
</tr>
<tr>
<td><strong>SEVERE</strong></td>
<td>Sepsis</td>
<td></td>
</tr>
<tr>
<td><strong>SEPSIS</strong></td>
<td>SBP &lt;90 mmHg or MAP &lt; 65 mmHg</td>
<td></td>
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<tr>
<td></td>
<td>lactate &gt; 2.0 mmol/L</td>
<td></td>
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<td></td>
<td>INR &gt;1.5 or a PTT &gt;60 s</td>
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<tr>
<td></td>
<td>Bilirubin &gt;34 μmol/L</td>
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<tr>
<td></td>
<td>Urine output &lt;0.5 mL/kg/h for 2 h</td>
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<tr>
<td></td>
<td>Creatinine &gt;177 μmol/L</td>
<td></td>
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<tr>
<td></td>
<td>Platelets &lt;100 x109/L</td>
<td></td>
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<tr>
<td></td>
<td>SpO2 &lt;90% on room air</td>
<td></td>
</tr>
<tr>
<td><strong>SEPTIC</strong></td>
<td>SEPSIS</td>
<td>VASOPRESSORS needed for MAP &gt;65 mmHg</td>
</tr>
<tr>
<td><strong>SHOCK</strong></td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td></td>
<td>HYPOTENSION</td>
<td>LACTATE &gt;2 mmol/L</td>
</tr>
<tr>
<td></td>
<td>after adequate fluid resuscitation</td>
<td>after adequate fluid resuscitation</td>
</tr>
</tbody>
</table>
SOFA: can you do it?

- **Lung**: Respiration
  - PaO$_2$/FiO$_2$ >400 (0 points)
  - PaO$_2$/FiO$_2$ 301 to 400 (1 point)
  - PaO$_2$/FiO$_2$ ≤300 (2 points)
  - PaO$_2$/FiO$_2$ 101 to 200 with ventilatory support (3 points)
  - PaO$_2$/FiO$_2$ ≤100 with ventilatory support (4 points)

- **Coagulation**: Platelets
  - >150 x10$^3$/mm$^3$ (0 points)
  - 101 to 150 x10$^3$/mm$^3$ (1 point)
  - 51 to 100 x10$^3$/mm$^3$ (2 points)
  - 21 to 50 x10$^3$/mm$^3$ (3 points)
  - ≤20 x10$^3$/mm$^3$ (4 points)

- **Liver**: Bilirubin
  - <1.2 mg/dL (20 mcmol/L) (0 points)
  - 1.2 to 1.9 mg/dL (20 to 32 mcmol/L) (1 point)
  - 2 to 5.9 mg/dL (33 to 101 mcmol/L) (2 points)
  - 6 to 11.9 mg/dL (102 to 204 mcmol/L) (3 points)
  - >12 mg/dL (204 mcmol/L) (4 points)

- **Cardiovascular**: Blood pressure
  - Hypotension absent (0 points)
  - Mean arterial pressure <70 mmHg (1 point)
  - On dopamine ≤5 mcg/kg/min or any dobutamine (2 points)
  - On dopamine >5 mcg/kg/min, epinephrine ≤0.1 mcg/kg/min or norepinephrine ≤0.1 mcg/kg/min (3 points)
  - On dopamine >15 mcg/kg/min or epinephrine >0.1 mcg/kg/min or norepinephrine >0.1 mcg/kg/min (4 points)

- **Brain**: Glasgow coma score
  - 15 (0 points)
  - 13 to 14 (1 point)
  - 10 to 12 (2 points)
  - 6 to 9 (3 points)
  - <6 (4 points)

- **Kidney**: Renal function
  - Creatinine <1.2 mg/dL (110 mcmol/L) (0 points)
  - Creatinine 1.2 to 1.9 mg/dL (110 to 170 mcmol/L) (1 point)
  - Creatinine 2 to 3.4 mg/dL (171 to 299 mcmol/L) (2 points)
  - Creatinine 3.5 to 4.9 mg/dL (300 to 440 mcmol/L) or urine output 200 to 500 mL/day (3 points)
  - Creatinine >5 mg/dL (440 mcmol/L) or urine output <200 mL/day (4 points)


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Recommendations for:

- Initial resuscitation IVF and rate
- Vasopressor use
- Source Control identification
- Antimicrobials
- Steroids
- Blood products
- Mechanical Ventilation
- Sedation/Bicarb/Glucose control/RRT
- DVT prophylaxis
- Nutrition
- Goals of Care
INITIAL MANAGEMENT

- ABCs
- IV Access

Investigations:
- All the usual, PLUS:
- Cultures and serum lactate
- *Maybe* procalcitonin

Consider the Zebra:
- immunosuppressed, nosocomial, fungal, splenectomy, hardware

Goal: within 1 hour
Initial resuscitation IVF and rate

- 30ml/kg crystalloid, minimum 1L, in 3 hours
- No hetastarches or hypertonic saline
- Albumin a weak (2b) recommendation
- Consider echo (eval other causes of hypotension)
- Goal is lactate clearance and normotension (MAP > 65) (ScvO2, CVP, discarded)
- REASSESS FREQUENTLY
Disadvantages of Over-resuscitation:

**CARDIOVASCULAR SYSTEM**
- Myocardial oedema ↑
- Conduction disturbance
- Impaired contractility
- Diastolic dysfunction
- CVP ↑ and PAOP ↑
- Venous return ↓
- SV ↓ and CO ↓
- Myocardial depression
- GEF ↓ GEDVI ↑
- Pericardial effusion ↑
- CARS ↑

**CENTRAL NERVOUS SYSTEM**
- Cerebral oedema ↑
- Impaired cognition ↑
- Delirium ↑
- Intracranial pressure ↑
- Cerebral perfusion pressure ↓
- Intra-ocular pressure ↑
- ICH, ICS, OCS

**RESPIRATORY SYSTEM**
- Pulmonary oedema ↑
- Pleural effusion ↑
- Altered pulmonary and chest wall elastance (cfr IAP ↑)
- Impaired gas exchange:
  - Hypercarbia ↑
  - PaO2 ↓ and PaCO2/FIO2 ↓
- Extravascular lung water ↑
- Lung volumes ↓ (cfr IAP ↑)
- Prolonged ventilation ↑
- Difficult weaning ↑
- Work of breathing ↑

**HEPATIC SYSTEM**
- Hepatic congestion ↑
- Impaired synthetic function
- Cholestasis ↑
- Impaired Cytochrome P 450 activity
- Hepatic compartment syndrome

**GASTRO-INTESTINAL SYSTEM**
- Ascites formation ↑
- Gut oedema ↑
- Malabsorption ↑
- Ileus ↑
- Abdominal perfusion pressure ↓
- Bowel contractility ↓
- IAP ↑ and APP (=MAP-IAP) ↓
- IAH and ACS ↑
- Successful enteral feeding ↓
- Intestinal permeability ↑
- Bacterial translocation ↑
- Splanchnic microcirculatory flow ↓
- ICG-PDR ↓, pH ↓

**ABDOMINAL WALL**
- Tissue oedema ↑
- Impaired lymphatic drainage ↑
- Microcirculatory derangements ↑
- Poor wound healing ↑
- Wound infection ↑
- Pressure ulcers ↑
- Skin oedema ↑
- Abdominal compliance ↓

**ENDOCRINE SYSTEM**
- Release pro-inflammatory cytokines ↑
  - (IL-1b, TNF-α, IL-6)
Antimicrobials

- Administer within 1 hour for sepsis or septic shock
- Consider all access options: IO, Port-A-Cath, IM
  (i.e. don’t delay if periph access difficult)
- Broad-spectrum, consider double coverage for shock
- De-escalate asap
- 7-10 days duration “adequate for most” (weak recommendation)
Source ID and Control

- Begins with history and physical
- Appropriate imaging
- Invasive procedures (aspiration, BAL, I&D, hardware removal)
- **Prioritize** control asap (<6 hours preferred)
Vasopressor use

- Those failing IVF or in pulmonary edema

- Norepi 1st choice but consider the clinical scenario

- Vasopressin, epinephrine, phenylephrine, dopamine OK

- Dobutamine if low CO

- Prepare to change if arrhythmias, or aggravated hypotension

Arterial line
REASSESS FREQUENTLY
STEROIDS?

- If endpoints not met by initial measures.

- Hydrocortisone 200mg/day IV

- No role for stim testing or ACTH administration
Blood Products

- Suggested transfusion threshold: 70mg/L
- No to EPO, empiric FFP
- Suggested platelet transfusion threshold: 10
  - 20 if bleeding risk
  - 50 if bleeding, surgery
IVIG/Antithrombin/APC/thrombomodulin

- Just say “no”

Numerous IVIG preparations available
Mechanical Ventilation for ARDS

- **LTV Strategy**
- Keep plateau pressures <30 cm H₂O

- **Weak recommendations:**
  - Higher PEEP
  - Recruitment maneuvers
  - Go Prone (P/F <150
  - Limit paralysis <48 hrs

“No” to Swans/beta agonists/
Yes to daily wean trials, elevated HOB, conservative IVF
Bicarb and Glucose and RRT

- No NaCO₃ for pH >7.15 (or probably any pH)

- Protocolized glucose control targeting glucose at 180 mg/dL (10.0 mmol/L)

- Dialyze for firm indications (not for oliguria or “just because”)
DVT and stress ulcer prophylaxis

- Just say “yes”.
- UFH >> mechanical
- PPI or H2B if bleeding risk factors present (MV > 48 hrs and coagulopathy)
TPN

- Avoid if patient can be fed enterally
- Avoid in the first 7 days
- Avoid Omega-3-fatty acids, selenium/arginine/glutamine (?carnitine)
Goals of Care

- Start early and make it a priority
# Management Guidelines 2012 vs 2016:

## Surviving Sepsis Campaign Recommendation Highlights

<table>
<thead>
<tr>
<th></th>
<th>2012</th>
<th>2016</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sepsis Definition</strong></td>
<td>Systemic manifestation of infection + suspected infection</td>
<td>Life threatening organ dysfunction caused by dysregulated response to infection</td>
</tr>
<tr>
<td></td>
<td>Severe sepsis: sepsis + organ dysfunction</td>
<td>No severe sepsis category</td>
</tr>
<tr>
<td><strong>Initial Resuscitation</strong></td>
<td>at least 30 cc/kg in first 3 hours</td>
<td>Use dynamic resuscitation markers (passive leg raise)</td>
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<tr>
<td></td>
<td>Crystalloid fluid (no recommendations on 0.9% NaCl vs balanced solution)</td>
<td>Target MAP of 65mmHg</td>
</tr>
<tr>
<td></td>
<td>Albumin if patients require “substantial” fluids (weak)</td>
<td>Reassess hemodynamic status to guide resuscitation</td>
</tr>
<tr>
<td></td>
<td>Protocolized care including CVP ScVO2</td>
<td>Normalize lactate</td>
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<tr>
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<tr>
<td><strong>Vasopressors</strong></td>
<td>target MAP of 65 mmHg</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1. Norepinephrine</td>
<td></td>
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<tr>
<td></td>
<td>2. Epinephrine if not at target MAP OR vasopressin to reduce norepinephrine requirement</td>
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<tr>
<td></td>
<td>3. Avoid dopamine in most patients</td>
<td></td>
</tr>
<tr>
<td><strong>Steroids</strong></td>
<td>Only indicated for patients with septic shock refractory to adequate fluids and vasopressors</td>
<td></td>
</tr>
<tr>
<td><strong>Antibiotics</strong></td>
<td>One or more antibiotics active against presumed pathogen</td>
<td>Initial broad spectrum antibiotics (ex: vancomycin + piperacillin-tazobactam)</td>
</tr>
<tr>
<td></td>
<td>Combination therapy (double coverage) for neutropenic patients and pseudomonas</td>
<td>Against combined therapy (i.e. do not double cover pseudomonas)</td>
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<tr>
<td></td>
<td></td>
<td>May use procalcitonin to guide de-escalation</td>
</tr>
<tr>
<td><strong>Source Control</strong></td>
<td>Achieve within 12 hours, if feasible</td>
<td>Achieve as soon as medically and logically feasible</td>
</tr>
<tr>
<td><strong>Ventilator</strong></td>
<td>6 cc/kg tidal volume</td>
<td>Against high frequency oscillatory ventilation (HFOV)</td>
</tr>
<tr>
<td></td>
<td>prone patients with severe ARDS (P/F &lt;150 in 2017 guidelines)</td>
<td>Unable to make recommendation on noninvasive ventilation</td>
</tr>
<tr>
<td></td>
<td>no recommendation</td>
<td></td>
</tr>
<tr>
<td></td>
<td>weak recommendation for noninvasive ventilation in select patients with sepsis induced ARDS</td>
<td></td>
</tr>
</tbody>
</table>

CASE:

- 32 y/o M h/o TBI (remote) and resultant seizures. Complains of 1 week of cough, worsening pleuritic chest pain. Remote bioAVR for endocarditis.

- Upon presentation to ED, – T = 39.1 ; R = 24 ; P = 110 ; BP = 124 / 76; SPO2 89% 2L –

- Decreased breath sounds on right base with crackles throughout left side – Chemistry unremarkable; Lactate 2.4 – WBC 16.5; 75% segs; 10% bands
Assessment

SIRS = 4 + infection source = sepsis

qSOFA = 1-2 = 6% risk of “bad” outcome

SOFA = 1+ ?? ...more data needed.
What is your admit diagnosis?

- Pneumonia?
- Pleural effusion?
- Sepsis?
- Severe sepsis?
qSOFA: management guidelines

- **Patient with Suspected Infection**
  - qSOFA ≥2?
    - **YES**
      - Assess for Evidence of Organ Dysfunction
        - SOFA ≥2?
          - **YES**
            - Sepsis
          - **NO**
            - Sepsis Still Suspected?
              - **NO**
                - Monitor Clinical Condition; Reevaluate for Possible Sepsis if Clinically Indicated
              - **YES**
                - Despite Adequate Fluid Resuscitation:
                  1. Vasopressors Required to Maintain MAP ≥65mmHg AND
                  2. Serum Lactate Level >2mmol/L?
                    - **YES**
                      - Septic Shock
CASE 2

- 71 yo female with progressive SOB x 3 days. Also c/o small heel ulcer x 1 year, managed by WOC. On 10L O2 in triage.

A&O but distressed. T = 37.1, P = 110, RR = 26

- BP 84/66 MAP = 75

- LAB: WBC 11, Plts 425, LFTs 2x normal, Tbili = 24, Creat 188 (baseline 120). Lactate = 5.2. ABG = 7.46/35/74 on 50% FiO2
Assessment

- SIRS = 2
- qSOFA = 2
- SOFA = 2 + 1 + 1 = 4
SOFA: can you do it?

- **Lung:** Respiration
  - \( \text{PaO}_2/\text{FiO}_2 > 400 \) (0 points)
  - \( \text{PaO}_2/\text{FiO}_2 301 \text{ to } 400 \) (1 point)
  - \( \text{PaO}_2/\text{FiO}_2 \leq 300 \) (2 points)
  - \( \text{PaO}_2/\text{FiO}_2 101 \text{ to } 200 \) **with ventilatory support** (3 points)
  - \( \text{PaO}_2/\text{FiO}_2 \leq 100 \) **with ventilatory support** (4 points)

- **Coagulation:** Platelets
  - \( >150 \times 10^3/\text{mm}^3 \) (0 points)
  - \( 101 \text{ to } 150 \times 10^3/\text{mm}^3 \) (1 point)
  - \( 51 \text{ to } 100 \times 10^3/\text{mm}^3 \) (2 points)
  - \( 21 \text{ to } 50 \times 10^3/\text{mm}^3 \) (3 points)
  - \( \leq 20 \times 10^3/\text{mm}^3 \) (4 points)

- **Liver:** Bilirubin
  - \(<1.2 \text{ mg/dL (20 mcmol/L)} \) (0 points)
  - \( 1.2 \text{ to } 1.9 \text{ mg/dL (20 to 32 mcmol/L)} \) (1 point)
  - \( 2 \text{ to } 5.9 \text{ mg/dL (33 to 101 mcmol/L)} \) (2 points)
  - \( 6 \text{ to } 11.9 \text{ mg/dL (102 to 204 mcmol/L)} \) (3 points)
  - \( >12 \text{ mg/dL (>204 mcmol/L)} \) (4 points)

- **Cardiovascular:** Blood pressure
  - Hypotension absent (0 points)
  - Mean arterial pressure \(<70 \text{ mmHg} \) (1 point)
  - On dopamine \(\leq 5 \text{ mcg/kg/min or any dobutamine (2 points)} \)
  - On dopamine \(>5 \text{ mcg/kg/min or epinephrine \(\leq 0.1 \text{ mcg/kg/min or norepinephrine \(\leq 0.1 \text{ mcg/kg/min (3 points)} \)}
  - On dopamine \(>15 \text{ mcg/kg/min or epinephrine >0.1 mcg/kg/min or norepinephrine >0.1 mcg/kg/min (4 points)}

- **Brain:** Glasgow coma score
  - 15 (0 points)
  - 13 to 14 (1 point)
  - 10 to 12 (2 points)
  - 6 to 9 (3 points)
  - <6 (4 points)

- **Kidney:** Renal function
  - \(<1.2 \text{ mg/dL (20 mcmol/L)} \) (0 points)
  - \( 1.2 \text{ to } 1.9 \text{ mg/dL (20 to 32 mcmol/L)} \) (1 point)
  - \( 2 \text{ to } 3.4 \text{ mg/dL (171 to 299 mcmol/L)} \) (2 points)
  - \( 3.5 \text{ to } 4.9 \text{ mg/dL (300 to 440 mcmol/L)} \) or urine output 200 to 500 mL/day (3 points)
  - \( >5 \text{ mg/dL (440 mcmol/L)} \) or urine output <200 mL/day (4 points)
What is your diagnosis?

- Sepsis?
- Septic shock?
- ARDS?
- Something else?
Additional data:

- EKG = NSR with new anterolat Q waves
- Troponin I = 4.7
- BNP = 3800

- Bedside echo: global LV dysfunction with hypervolemia and congestive hepatopathy

- Admitting Dx: ischemic CM
History of Sepsis Care: A Summary:

- **Sepsis care, pre-2001:**
  1. recognize it early.
  2. give antibiotics, fluids, and vasopressors if needed. Monitor attentively.

- **Sepsis care, 2017 - :** See above. *(Do it better.)*
Thank you
EGDT:

1. **SBP <90 mmHg or MAP <65 mmHg after 20–30 cc/kg crystalloid IVF**
   - OR -
   **Lactate >4 mmol/L regardless of blood pressure**

   - Supplemental oxygen ± endotracheal intubation and mechanical ventilation (if necessary)
   - Perform central venous catheterization while continuing crystalloid IVF resuscitation (250–1,000 mL boluses)

2. **CVP <8 mmHg**
   - Crystalloid IVF

3. **8–12 mmHg**
   - MAP <65 mmHg
     - Vasopressor(s) (norepinephrine or dopamine preferred)
   - MAP ≥65 mmHg
     - **ScvO₂ <70%**
       - Transfusion of red cells to hematocrit ≥30%
     - **ScvO₂ ≥70%**
       - Inotropic agents (If PA catheter inserted, keep cardiac index ≥3.0 L/min/m²)

4. **Goals achieved**
   - Yes
     - Resuscitation completed
     - Establish reevaluation intervals
   - No

5. **Critical care consultation**
### SOFA 2016:

#### Sequential [Sepsis-Related] Organ Failure Assessment (SOFA) Score

<table>
<thead>
<tr>
<th>System</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Respiration PaO2/FiO2, mmHg (kPa)</td>
<td>( \geq 400 ) (53.3)</td>
<td>(&lt; 400 ) (53.3)</td>
<td>(&lt; 300 ) (40)</td>
<td>(&lt; 200 ) (26.7) with respiratory support</td>
<td>(&lt; 100 ) (13.3) with respiratory support</td>
</tr>
<tr>
<td>Coagulation Platelets, x10^3/μL</td>
<td>( \geq 150 )</td>
<td>(&lt; 150 )</td>
<td>(&lt; 100 )</td>
<td>(&lt; 50 )</td>
<td>(&lt; 20 )</td>
</tr>
<tr>
<td>Liver Bilirubin, mg/dL (umol/L)</td>
<td>(&lt; 1.2 ) (20)</td>
<td>(1.2 - 1.9 ) (20 - 32)</td>
<td>(2.0 - 5.9 ) (33 - 101)</td>
<td>(6.0 - 11.9 ) (102 - 204)</td>
<td>(&gt;12.0 ) (204)</td>
</tr>
<tr>
<td>Cardiovascular MAP ≥70mmHg</td>
<td>MAP ≥70mmHg</td>
<td>MAP ≥70mmHg</td>
<td>Dopamine &lt;5 or Dobutamine (any dose)</td>
<td>Dopamine 5.1 - 15 or Epinephrine &lt;0.1 or Norepinephrine &lt;0.1</td>
<td>Dopamine &gt;15 or Epinephrine &gt;0.1 or Norepinephrine &gt;0.1</td>
</tr>
<tr>
<td>CNS GCS Score</td>
<td>15</td>
<td>13 - 14</td>
<td>10 - 12</td>
<td>6 - 9</td>
<td>&lt;6</td>
</tr>
<tr>
<td>Renal Creatinine, mg/dL (umol/L) Urine Output, mL/d</td>
<td>(&lt; 1.2 ) (110)</td>
<td>(1.2 - 1.9 ) (110 - 170)</td>
<td>(2.0 - 3.4 ) (171 - 299)</td>
<td>(3.5 - 4.9 ) (300 - 440)</td>
<td>(&gt;5.0 ) (440)</td>
</tr>
</tbody>
</table>

* *Catecholamine Doses = ug/kg/min for at least 1hr*
**qSOFA vs NEWS:**

**qSOFA = simplified NEWS score?**

<table>
<thead>
<tr>
<th>PHYSIOLOGICAL PARAMETERS</th>
<th>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>Respiration Rate</td>
<td>≤8</td>
<td>9 - 11</td>
<td>12 - 20</td>
<td></td>
<td>21 - 24</td>
<td>≥25</td>
<td></td>
</tr>
<tr>
<td>Oxygen Saturations</td>
<td>≤91</td>
<td>92 - 93</td>
<td>94 - 95</td>
<td>≥96</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Any Supplemental Oxygen</td>
<td>Yes</td>
<td>No</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Temperature</td>
<td>≤35.0</td>
<td>35.1 - 36.0</td>
<td>36.1 - 38.0</td>
<td>38.1 - 39.0</td>
<td>≥39.1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Systolic BP</td>
<td>≤90</td>
<td>91 - 100</td>
<td>101 - 110</td>
<td>111 - 219</td>
<td></td>
<td>≥220</td>
<td></td>
</tr>
<tr>
<td>Heart Rate</td>
<td>≤40</td>
<td>41 - 50</td>
<td>51 - 90</td>
<td>91 - 110</td>
<td>111 - 130</td>
<td>≥131</td>
<td></td>
</tr>
<tr>
<td>Level of Consciousness</td>
<td>A</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>V, P, or U</td>
<td></td>
</tr>
</tbody>
</table>

The NEWS initiative flowed from the Royal College of Physicians' NEWSDIG, and was jointly developed and funded in collaboration with the Royal College of Physicians, Royal College of Nursing, National Outreach Forum and NHS Training for Innovation.

**qSOFA score:**

- Altered mental status
- Respiratory rate ≥ 22
- Systolic blood pressure ≤ 100
# qSOFA in the ED

## Prognostic Accuracy of Sepsis-3 Criteria for In-Hospital Mortality Among Patients With Suspected Infection Presenting to the Emergency Department

*JAMA. 2017;317(3):301-308.*

**quick SOFA:** Hypotension \( SBP < 100 \text{ mmHg} \), Altered Mental Status, Respiratory rate 22+ proposed by Sepsis 3.0 as a tool to “prompt clinicians to further investigate for organ dysfunction, to initiate or escalate therapy as appropriate, and to consider referral to critical care or increase the frequency of monitoring, if such actions have not already been undertaken…. positive qSOFA criteria should also prompt consideration of possible infection in patients not previously recognized as infected.”

<table>
<thead>
<tr>
<th>DESIGN</th>
<th>prospective observational cohort study</th>
</tr>
</thead>
<tbody>
<tr>
<td>POPULATION</td>
<td>consecutive patients presenting during a 4 week period to one of 30 European EDs between May and June 2016 with suspected infection</td>
</tr>
<tr>
<td>OUTCOME</td>
<td>Inpatient mortality (overall 8%) qSOFA score &lt; 2 had 3% mortality (95% CI, 2%-5%) qSOFA score 2+ had 24% mortality (95% CI, 18%-30%)</td>
</tr>
<tr>
<td>CHARACTERISTICS</td>
<td></td>
</tr>
<tr>
<td>AUROC</td>
<td></td>
</tr>
<tr>
<td>qSOFA 2+</td>
<td>0.80 (0.74-0.85)</td>
</tr>
<tr>
<td>SOFA 2+</td>
<td>0.77 (0.71-0.82)</td>
</tr>
<tr>
<td>SIRS</td>
<td>0.65 (0.59-0.70)</td>
</tr>
<tr>
<td>Sensitivity</td>
<td></td>
</tr>
<tr>
<td>qSOFA</td>
<td>70% (59-80)</td>
</tr>
<tr>
<td>SOFA</td>
<td>73% (61-83)</td>
</tr>
<tr>
<td>SIRS</td>
<td>93% (85-98)</td>
</tr>
<tr>
<td>Specificity</td>
<td></td>
</tr>
<tr>
<td>qSOFA</td>
<td>79% (76-82)</td>
</tr>
<tr>
<td>SOFA</td>
<td>70% (67-73)</td>
</tr>
<tr>
<td>SIRS</td>
<td>27% (24-31)</td>
</tr>
<tr>
<td>+ LR</td>
<td>qSOFA 3.40 (2.80-4.17)</td>
</tr>
<tr>
<td></td>
<td>SOFA 2.40 (2.00-2.90)</td>
</tr>
<tr>
<td></td>
<td>SIRS 1.29 (1.17-1.37)</td>
</tr>
<tr>
<td>-LR</td>
<td>qSOFA 0.37</td>
</tr>
<tr>
<td></td>
<td>SOFA 0.39</td>
</tr>
<tr>
<td></td>
<td>SIRS 0.25</td>
</tr>
<tr>
<td>LIMITATIONS</td>
<td>Excluded 20% of cohort, including patients who were: Retrospectively adjudicated to not have an infection (6%) or Had missing qSOFA identifiers (14%)</td>
</tr>
<tr>
<td></td>
<td>This study assessed mortality, in line with the Sepsis 3.0 definition of sepsis. However, just because a patient doesn’t die in the hospital, it doesn’t mean they don’t benefit from aggressive care or have sepsis like pathophysiology.</td>
</tr>
</tbody>
</table>
**A systematic review and meta-analysis of early goal-directed therapy for septic shock: the ARISE, ProCESS and ProMISe Investigators**

**A Primary mortality outcome of each study**

<table>
<thead>
<tr>
<th>Study</th>
<th>Events, OR (95% CI)</th>
<th>Events, EGDT</th>
<th>Events, control</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rivers et al. (2001)</td>
<td>0.52 (0.31, 0.86)</td>
<td>38/130</td>
<td>59/133</td>
<td>10.40</td>
</tr>
<tr>
<td>Jones et al. (2010)</td>
<td>1.47 (0.82, 2.60)</td>
<td>34/150</td>
<td>25/150</td>
<td>4.87</td>
</tr>
<tr>
<td>ProCESS Investigators (2014)</td>
<td>1.17 (0.88, 1.55)</td>
<td>92/439</td>
<td>167/902</td>
<td>21.78</td>
</tr>
<tr>
<td>ARISE Investigators (2014)</td>
<td>0.98 (0.76, 1.26)</td>
<td>147/792</td>
<td>150/796</td>
<td>30.71</td>
</tr>
<tr>
<td>ProMISe Investigators (2015)</td>
<td>1.02 (0.80, 1.30)</td>
<td>184/623</td>
<td>181/620</td>
<td>32.23</td>
</tr>
<tr>
<td>Overall (I-squared = 56.7%, p = 0.055)</td>
<td>1.01 (0.88, 1.16)</td>
<td>495/2134</td>
<td>582/2601</td>
<td>100.00</td>
</tr>
</tbody>
</table>

DOI 10.1007/s00134-015-3822-1