Severe sepsis and EGDT

2013/10/05

林口長庚急診醫學科

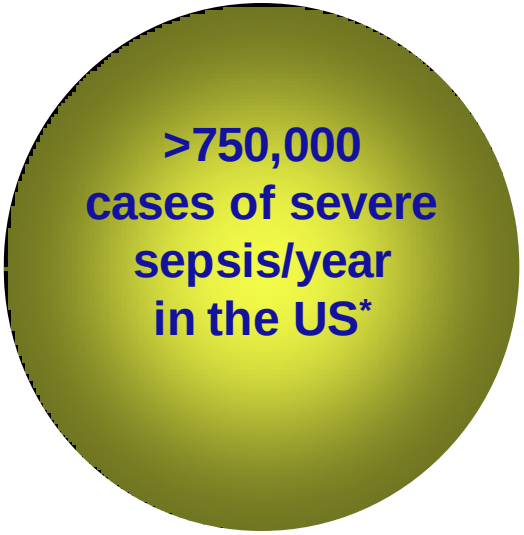
蘇哲萱

Outlines

- Why is it important ?
- Definition about sepsis
- Pathophysiology ?
- Management of sepsis and EGDT.

Why is this so important ?!

Today

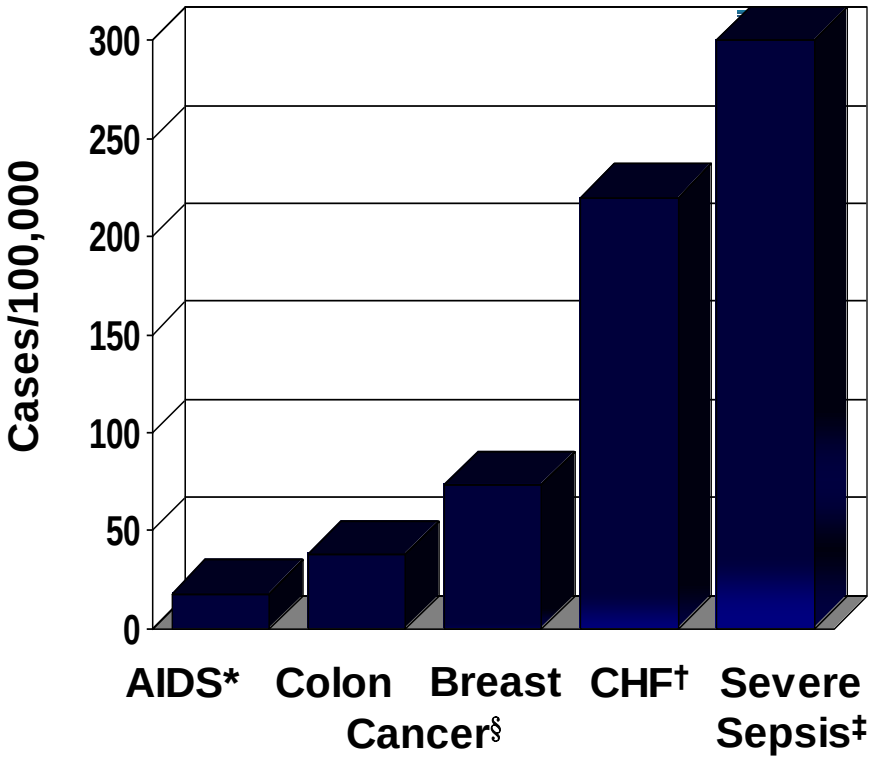


- 750,000 cases/yr of severe sepsis in US
- 215,000 deaths/yr directly related to sepsis
- Tenth leading cause of death in USA
- Rate of sepsis cases is increasing faster than the population
- 37% of severe sepsis patients come through the ED

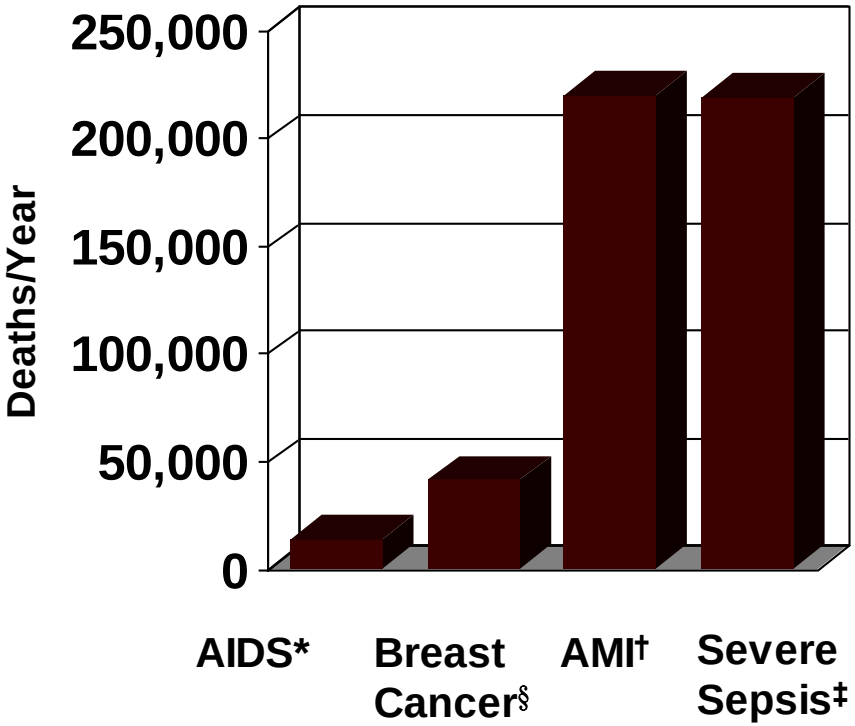
Angus DC. *Crit Care Med.* 2001;29(7):1303-1310.

Comparison With Other Major Diseases

Incidence of Severe Sepsis



Mortality of Severe Sepsis



†National Center for Health Statistics, 2001. §American Cancer Society, 2001. *American Heart Association. 2000. ‡Angus DC et al. *Crit Care Med.* 2001;29(7):1303-1310.

Surviving Sepsis Campaign

A global program to:

- *Reduce mortality rates*
- *Improve standards of care*
- *Secure adequate funding*

Definition

- SIRS
- Sepsis
- Severe sepsis
- Septic shock

SIRS

- Systemic inflammatory response syndrome
  - TPR+ WBC
    - BT >38.3 (38) or <36ºC
    - HR > 90 bpm or ≧2 SD normal value of age;
    - RR > 20 /min or PaCO2 < 32 mmHg
    - WBC > 12000 μL or < 4000 μL
      or > 10 % immature forms
  - Infectious or non-infectious

Sepsis

- Sepsis:
  - Infection (documented or suspected) + SIRS

Infection, documented or suspected, and some of the following:
General variables
Fever (> 38.3°C)
Hypothermia (core temperature < 36°C)
Heart rate > 90/min^{-1} or more than two SD above the normal value for age
Tachypnea
Altered mental status
Significant edema or positive fluid balance (> 20 mL/kg over 24 hr)
Hyperglycemia (plasma glucose > 140 mg/dL or 7.7 mmol/L) in the absence of diabetes
Inflammatory variables
Leukocytosis (WBC count > 12,000 μL^{-1})
Leukopenia (WBC count < 4000 μL^{-1})
Normal WBC count with greater than 10% immature forms
Plasma C-reactive protein more than two SD above the normal value
Plasma procalcitonin more than two SD above the normal value
Hemodynamic variables
Arterial hypotension (SBP < 90 mm Hg, MAP < 70 mm Hg, or an SBP decrease > 40 mm Hg in adults or less than two SD below normal for age)
Organ dysfunction variables
Arterial hypoxemia (Pao_2/Fio_2 < 300)
Acute oliguria (urine output < 0.5 mL/kg/hr for at least 2 hrs despite adequate fluid resuscitation)
Creatinine increase > 0.5 mg/dL or 44.2 μmol/L
Coagulation abnormalities (INR > 1.5 or aPTT > 60 s)
Ileus (absent bowel sounds)
Thrombocytopenia (platelet count < 100,000 μL^{-1})
Hyperbilirubinemia (plasma total bilirubin > 4 mg/dL or 70 μmol/L)
Tissue perfusion variables
Hyperlactatemia (> 1 mmol/L)
Decreased capillary refill or mottling

Severe sepsis

- Severe sepsis
  - Sepsis + sepsis induced organ dysfunction or tissue hypoperfusion

TABLE 2. Severe Sepsis

Severe sepsis definition = sepsis-induced tissue hypoperfusion or organ dysfunction (any of the following thought to be due to the infection)
Sepsis-induced hypotension
Lactate above upper limits laboratory normal
Urine output < 0.5 mL/kg/hr for more than 2 hrs despite adequate fluid resuscitation
Acute lung injury with $Pa_{O_2}/F_{IO_2} < 250$ in the absence of pneumonia as infection source
Acute lung injury with $Pa_{O_2}/F_{IO_2} < 200$ in the presence of pneumonia as infection source
Creatinine > 2.0 mg/dL (176.8 μmol/L)
Bilirubin > 2 mg/dL (34.2 μmol/L)
Platelet count < 100,000 μL
Coagulopathy (international normalized ratio > 1.5)

Septic shock

- Septic shock
  - Sepsis-induced hypotension persisting despite adequate fluid resuscitation

- Sepsis-induced tissue hypoperfusion
  - Infection-induced hypotension ,elevated lactate, or oliguria

Surviving Sepsis Campaign: International Guidelines for Management of Severe Sepsis and Septic Shock: 2012

R. Phillip Dellinger, MD[1]; Mitchell M. Levy, MD[2]; Andrew Rhodes, MB BS[3]; Djillali Annane, MD[4]; Herwig Gerlach, MD, PhD[5]; Steven M. Opal, MD[6]; Jonathan E. Sevransky, MD[7]; Charles L. Sprung, MD[8]; Ivor S. Douglas, MD[9]; Roman Jaeschke, MD[10]; Tiffany M. Osborn, MD, MPH[11]; Mark E. Nunnally, MD[12]; Sean R. Townsend, MD[13]; Konrad Reinhart, MD[14]; Ruth M. Kleinpell, PhD, RN-CS[15]; Derek C. Angus, MD, MPH[16]; Clifford S. Deutschman, MD, MS[17]; Flavia R. Machado, MD, PhD[18]; Gordon D. Rubenfeld, MD[19]; Steven A. Webb, MB BS, PhD[20]; Richard J. Beale, MB BS[21]; Jean-Louis Vincent, MD, PhD[22]; Rui Moreno, MD, PhD[23]; and the Surviving Sepsis Campaign Guidelines Committee including the Pediatric Subgroup*

MANAGING OF SEVERE SEPSIS AND SEPTIC SHOCK

- A. Initial resuscitation
- B. Screening for sepsis and performance improvement
- C. Diagnosis
- D. Anti-microbial therapy
- E. Source control
- F. Infection prevention
- G. Fluid therapy of severe sepsis
- H. Vasopressors
- I. inotropic therapy
- J. Corticosteroids
- K. Blood transfusion
- L. Immunoglobulins
- M. Selenium
- N. Old Hx: recombinant activated protein C
- O. Mechanical ventilation of sepsis undced ARDS.
- P. Sedation, analgesia, and neuromuscular blockade in sepsis
  Q. Glucose control
  R. renal replacement Tx.
  S. Bicarbonate Tx.
- T. Deep vein thrombosis prophylaxis
  U. Stress ulcer prophylaxis
  V. Nutrition
  W. Setting goals of care.

TARGET ??

Target

- Who should use protocolized, quantitative resuscitation ?
  - Severe sepsis & septic shock
    - Sepsis-induced tissue hypoperfusion

Case 1

- 78 y/o 王美美, 來急診complained dysuria
  BT 39 degree, HR 110, BP 80/ 60

  給予 1000 ml N/S, BP 120/70;

  Lab :

  WBC 10000; Seg 90 % ;

- **Initial resuscitation**
- **Infection control**
- **Hemodynamic support**
- **Endocrine**
- **Others**
  - Support : ventilator, nutrition
  - Sedation and analgesia, NM blockadge
  - Prophylaxis : DVT, stress ulcer

- Sepsis Resuscitation bundle
- Sepsis Management bundle

Initial Resuscitation

6 Hour Resuscitation Bundle

- Early Identification
- Early Antibiotics and Cultures
- Early Goal Directed Therapy

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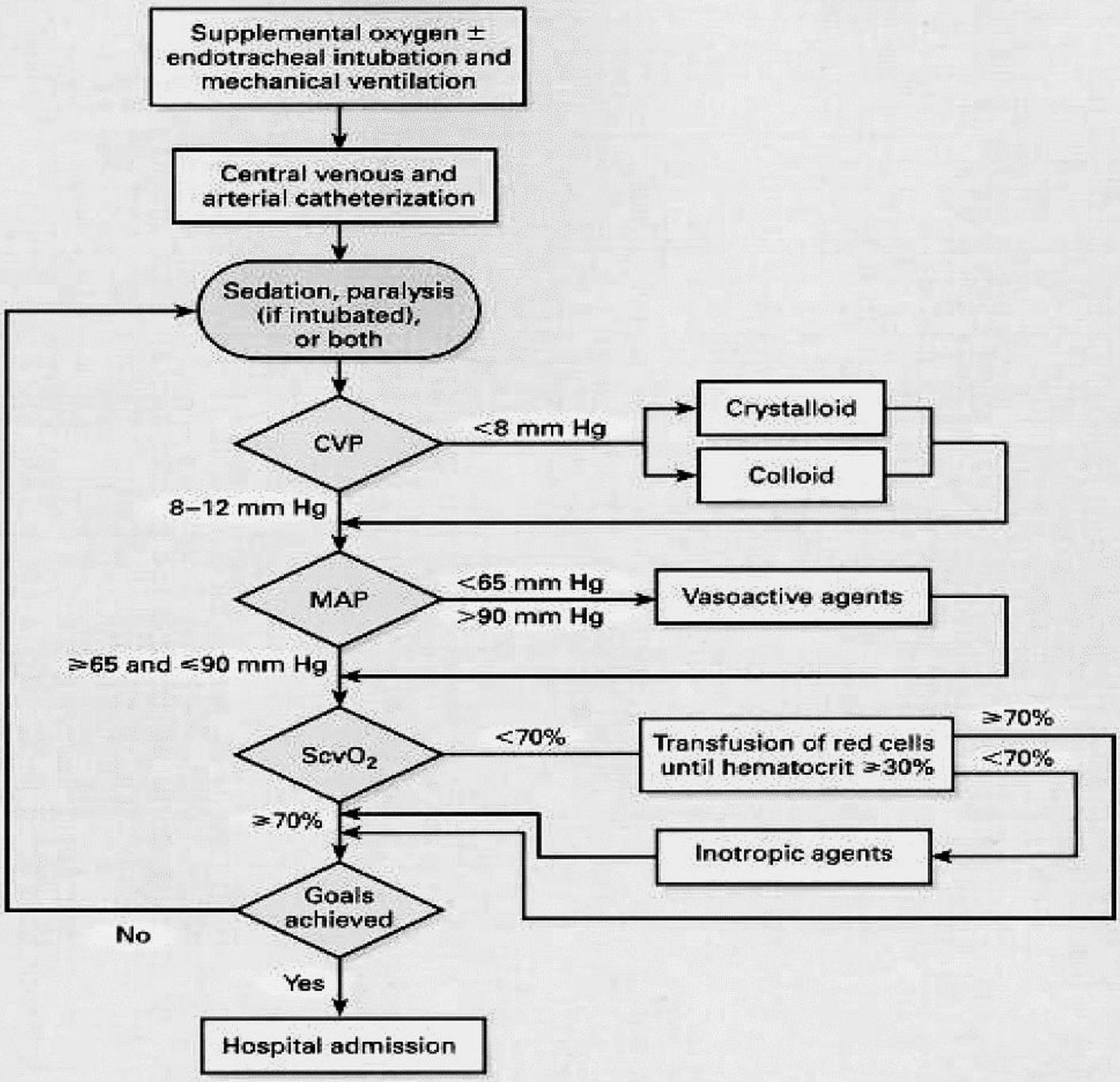
EARLY GOAL-DIRECTED THERAPY IN THE TREATMENT OF SEVERE SEPSIS AND SEPTIC SHOCK

EMANUEL RIVERS, M.D., M.P.H., BRYANT NGUYEN, M.D., SUZANNE HAVSTAD, M.A., JULIE RESSLER, B.S., ALEXANDRIA MUZZIN, B.S., BERNHARD KNOBLICH, M.D., EDWARD PETERSON, PH.D., AND MICHAEL TOMLANOVICH, M.D., FOR THE EARLY GOAL-DIRECTED THERAPY COLLABORATIVE GROUP*


Supplemental oxygen ± endotracheal intubation and mechanical ventilation
Central venous and arterial catheterization
Sedation, paralysis (if intubated), or both
CVP
<8 mm Hg
Crystalloid
Colloid
8–12 mm Hg
MAP
<65 mm Hg
>90 mm Hg
Vasoactive agents
≥65 and ≤90 mm Hg
ScvO2
<70%
Transfusion of red cells until hematocrit ≥30%
≥70%
<70%
≥70%
Inotropic agents
Goals achieved
No
Yes
Hospital admission

TISSUE OXYGENATION EQUATIONS

→ A - a $DO_2 = P_AO_2 - PaO_2$ (A)

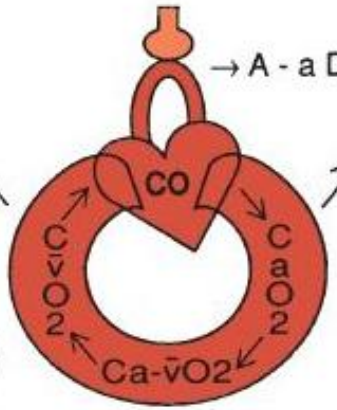
O_2 reserve = venous O_2 supply

O_2 reserve = $\dot{D}O_2 - \dot{V}O_2$

= content mixed venous O_2 x cardiac output

= $C\bar{v}O_2 \times CO \times 10$

Normal O_2 reserve = 750 ml/min (E)



Arterial O_2 supply = O_2 delivery ($\dot{D}O_2$) (O_2 transport)

$\dot{D}O2$ = Content arterial O_2 x cardiac output

= $CaO_2 \times CO \times 10$

normal $\dot{D}O_2$ = 1000 ml/min (B)

O_2 consumption ($\dot{V}O_2$) (O_2 demand)

$\dot{V}O_2$ = Fick equation

= arterial O_2 supply - venous reserve

= $(CaO_2 \times CO) - (C\bar{v}O_2 \times CO) \times 10$

= $Ca - \bar{v}O_2 \times CO \times 10$

normal $\dot{V}O_2$ = 250 ml/min (C)

O_2 extraction ratio (O_2 ER) = $\frac{O_2 \text{ consumption (demand)}}{O_2 \text{ delivery (supply)}}$

$$O_2ER = \frac{\dot{V}O_2}{\dot{D}O_2} \times 100$$

Normal O_2ER = 25% (D)

A-E (see next page)

A) **$A\text{-}aDO_2 = PAO_2 - PaO_2$**

$= [(PB - PH_2O)\ FIO_2 - (PaCO_2 \times 1.25)] - PaO_2$

$= [(760 - 47)\ .21 - (40 \times 1.25)] - 95$

$= [100] - 95$

$= 5$ mmHg

B) **$DO_2 = CaO_2 \times CO \times 10$**

$= [(SaO_2{}^{1} \times Hgb^{2} \times 1.36^{3}) + (PaO_2 \times 0.0031^{4})] \times CO^{5} \times 10^{6}$

$= [(0.98 \times 15\ gm/dl \times 1.36) + (100 \times 0.0031)] \times 5\ L/m \times 10$

$= [20\ vol\ (ml/dl)\ \%] \times 5\ L/m \times 10$

$= 1000\ ml/min$

C) **$VO_2 = (CaO_2 - CvO_2{}^{7}) \times CO \times 10$**

$= (20\ vol\ \%^{B} - 15\ vol\ \%^{E}) \times 5\ L/m \times 10^{5}$

$= 5\ vol\ \% \times 5\ L/m \times 10$

$= 250\ ml/min$

D) **$O_2ER = \frac{VO_2}{DO_2} \times 100$**

$= \frac{(CaO_2 - CvO_2) \times CO \times 10}{CaO_2 \times CO \times 10}$

$= \frac{250\ ml/min^{C}}{1000\ ml/min^{B}}$

$= 25\%$

E) **O_2 Reserve**

$= DO_2 - VO_2 = 1000\ ml/min - 250\ ml/min = 750\ ml/min$ **or**

$= CvO_2{}^{7} \times CO \times 10$

$= [(SvO_2{}^{1} \times Hgb^{2} \times 1.36^{3}) + (PvO_2 \times 0.0031^{4})] \times CO^{5} \times 10^{6}$

$= [(0.75 \times 15\ gm/dl \times 1.36) + (40 \times 0.0031)] \times 5\ L/m \times 10$

$= [15\ vol\ (ml/dl)\ \%] \times 5\ L/m \times 10$

$= 750\ ml/min$

SURVIVING SEPSIS CAMPAIGN BUNDLES

TO BE COMPLETED WITHIN 3 HOURS:

1) Measure lactate level
2) Obtain blood cultures prior to administration of antibiotics
3) Administer broad spectrum antibiotics
4) Administer 30 mL/kg crystalloid for hypotension or lactate ≥4mmol/L

TO BE COMPLETED WITHIN 6 HOURS:

5) Apply vasopressors (for hypotension that does not respond to initial fluid resuscitation) to maintain a mean arterial pressure (MAP) ≥ 65 mm Hg
6) In the event of persistent arterial hypotension despite volume resuscitation (septic shock) or initial lactate ≥4 mmol/L (36 mg/dL):
   - Measure central venous pressure (CVP)*
   - Measure central venous oxygen saturation ($Scvo_2$)*
7) Remeasure lactate if initial lactate was elevated*

*Targets for quantitative resuscitation included in the guidelines are CVP of ≥8 mm Hg, $Scvo_2$ of ≥70%, and normalization of lactate.

Goal of initial resuscitation

- Initial 6hr hrs resuscitation (Grade IC)

TABLE 5. Recommendations: Initial Resuscitation and Infection Issues

A. Initial Resuscitation

1. Protocolized, quantitative resuscitation of patients with sepsis- induced tissue hypoperfusion (defined in this document as hypotension persisting after initial fluid challenge or blood lactate concentration ≥ 4 mmol/L). Goals during the first 6 hrs of resuscitation:
   a) Central venous pressure 8–12 mm Hg
   b) Mean arterial pressure (MAP) ≥ 65 mm Hg
   c) Urine output ≥ 0.5 mL/kg/hr
   d) Central venous (superior vena cava) or mixed venous oxygen saturation 70% or 65%, respectively (grade 1C).
2. In patients with elevated lactate levels targeting resuscitation to normalize lactate (grade 2C).

Fluid

TABLE 6. Recommendations: Hemodynamic Support and Adjunctive Therapy

G. Fluid Therapy of Severe Sepsis

1. Crystalloids as the initial fluid of choice in the resuscitation of severe sepsis and septic shock (grade 1B).
2. Against the use of hydroxyethyl starches for fluid resuscitation of severe sepsis and septic shock (grade 1B).
3. Albumin in the fluid resuscitation of severe sepsis and septic shock when patients require substantial amounts of crystalloids (grade 2C).
4. Initial fluid challenge in patients with sepsis-induced tissue hypoperfusion with suspicion of hypovolemia to achieve a minimum of 30 mL/kg of crystalloids (a portion of this may be albumin equivalent). More rapid administration and greater amounts of fluid may be needed in some patients (grade 1C).
5. Fluid challenge technique be applied wherein fluid administration is continued as long as there is hemodynamic improvement either based on dynamic (eg, change in pulse pressure, stroke volume variation) or static (eg, arterial pressure, heart rate) variables (UG).

Vasopressors

H. Vasopressors

1. Vasopressor therapy initially to target a mean arterial pressure (MAP) of 65 mm Hg (grade 1C).
2. Norepinephrine as the first choice vasopressor (grade 1B).
3. Epinephrine (added to and potentially substituted for norepinephrine) when an additional agent is needed to maintain adequate blood pressure (grade 2B).
4. Vasopressin 0.03 units/minute can be added to norepinephrine (NE) with intent of either raising MAP or decreasing NE dosage (UG).
5. Low dose vasopressin is not recommended as the single initial vasopressor for treatment of sepsis-induced hypotension and vasopressin doses higher than 0.03-0.04 units/minute should be reserved for salvage therapy (failure to achieve adequate MAP with other vasopressor agents) (UG).
6. Dopamine as an alternative vasopressor agent to norepinephrine only in highly selected patients (eg, patients with low risk of tachyarrhythmias and absolute or relative bradycardia) (grade 2C).
7. Phenylephrine is not recommended in the treatment of septic shock except in circumstances where (a) norepinephrine is associated with serious arrhythmias, (b) cardiac output is known to be high and blood pressure persistently low or (c) as salvage therapy when combined inotrope/vasopressor drugs and low dose vasopressin have failed to achieve MAP target (grade 1C).
8. Low-dose dopamine should not be used for renal protection (grade 1A).
9. All patients requiring vasopressors have an arterial catheter placed as soon as practical if resources are available (UG).

Inotropic agents and steroid

I. Inotropic Therapy

1. A trial of dobutamine infusion up to 20 micrograms/kg/min be administered or added to vasopressor (if in use) in the presence of (a) myocardial dysfunction as suggested by elevated cardiac filling pressures and low cardiac output, or (b) ongoing signs of hypoperfusion, despite achieving adequate intravascular volume and adequate MAP (grade 1C).
2. Not using a strategy to increase cardiac index to predetermined supranormal levels (grade 1B).

J. Corticosteroids

1. Not using intravenous hydrocortisone to treat adult septic shock patients if adequate fluid resuscitation and vasopressor therapy are able to restore hemodynamic stability (see goals for Initial Resuscitation). In case this is not achievable, we suggest intravenous hydrocortisone alone at a dose of 200 mg per day (grade 2C).
2. Not using the ACTH stimulation test to identify adults with septic shock who should receive hydrocortisone (grade 2B).
3. In treated patients hydrocortisone tapered when vasopressors are no longer required (grade 2D).
4. Corticosteroids not be administered for the treatment of sepsis in the absence of shock (grade 1D).
5. When hydrocortisone is given, use continuous flow (grade 2D).

SURVIVING SEPSIS CAMPAIGN BUNDLES

TO BE COMPLETED WITHIN 3 HOURS:

1) Measure lactate level
2) Obtain blood cultures prior to administration of antibiotics
3) Administer broad spectrum antibiotics
4) Administer 30 mL/kg crystalloid for hypotension or lactate ≥4mmol/L

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6) In the event of persistent arterial hypotension despite volume resuscitation (septic shock) or initial lactate ≥4 mmol/L (36 mg/dL):
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   - Measure central venous oxygen saturation ($Scvo_2$)*
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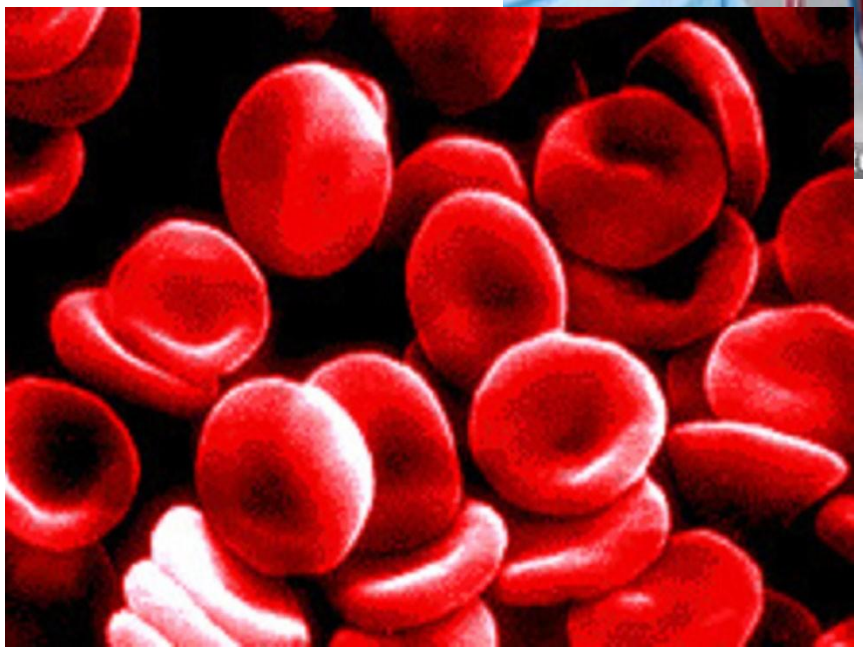


TABLE 8. Recommendations: Other Supportive Therapy of Severe Sepsis

K. Blood Product Administration

1. Once tissue hypoperfusion has resolved and in the absence of extenuating circumstances, such as myocardial ischemia, severe hypoxemia, acute hemorrhage, or ischemic heart disease, we recommend that red blood cell transfusion occur only when hemoglobin concentration decreases to <7.0 g/dL to target a hemoglobin concentration of 7.0 –9.0 g/dL in adults (grade 1B).
2. Not using erythropoietin as a specific treatment of anemia associated with severe sepsis (grade 1B).
3. Fresh frozen plasma not be used to correct laboratory clotting abnormalities in the absence of bleeding or planned invasive procedures (grade 2D).
4. Not using antithrombin for the treatment of severe sepsis and septic shock (grade 1B).
5. In patients with severe sepsis, administer platelets prophylactically when counts are <10,000/mm^3 (10 x 10^9/L) in the absence of apparent bleeding. We suggest prophylactic platelet transfusion when counts are < 20,000/mm^3 (20 x 10^9/L) if the patient has a significant risk of bleeding. Higher platelet counts (≥50,000/mm^3 [50 x 10^9/L]) are advised for active bleeding, surgery, or invasive procedures (grade 2D).

L. Immunoglobulins

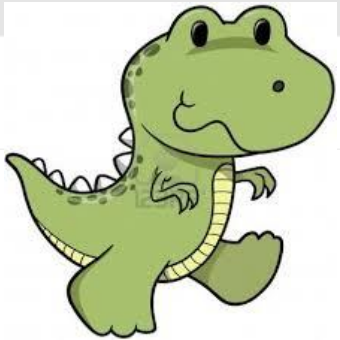
1. Not using intravenous immunoglobulins in adult patients with severe sepsis or septic shock (grade 2B).

M. Selenium

1. Not using intravenous selenium for the treatment of severe sepsis (grade 2C).

N. History of Recommendations Regarding Use of Recombinant Activated Protein C (rhAPC)

A history of the evolution of SSC recommendations as to rhAPC (no longer available) is provided.

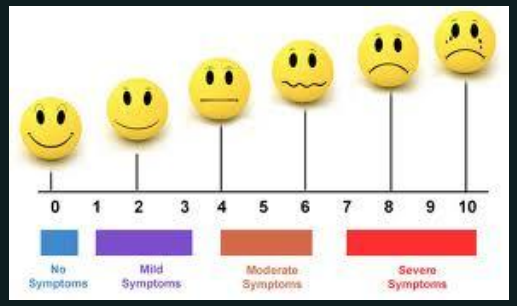


O. Mechanical Ventilation of Sepsis-Induced Acute Respiratory Distress Syndrome (ARDS)

1. Target a tidal volume of 6 mL/kg predicted body weight in patients with sepsis-induced ARDS (grade 1A vs. 12 mL/kg).
2. Plateau pressures be measured in patients with ARDS and initial upper limit goal for plateau pressures in a passively inflated lung be ≤30 cm H_2O (grade 1B).
3. Positive end-expiratory pressure (PEEP) be applied to avoid alveolar collapse at end expiration (atelectotrauma) (grade 1B).
4. Strategies based on higher rather than lower levels of PEEP be used for patients with sepsis- induced moderate or severe ARDS (grade 2C).
5. Recruitment maneuvers be used in sepsis patients with severe refractory hypoxemia (grade 2C).
6. Prone positioning be used in sepsis-induced ARDS patients with a Pao_2/Fio_2 ratio ≤ 100 mm Hg in facilities that have experience with such practices (grade 2B).
7. That mechanically ventilated sepsis patients be maintained with the head of the bed elevated to 30-45 degrees to limit aspiration risk and to prevent the development of ventilator-associated pneumonia (grade 1B).
8. That noninvasive mask ventilation (NIV) be used in that minority of sepsis-induced ARDS patients in whom the benefits of NIV have been carefully considered and are thought to outweigh the risks (grade 2B).
9. That a weaning protocol be in place and that mechanically ventilated patients with severe sepsis undergo spontaneous breathing trials regularly to evaluate the ability to discontinue mechanical ventilation when they satisfy the following criteria: a) arousable; b) hemodynamically stable (without vasopressor agents); c) no new potentially serious conditions; d) low ventilatory and end-expiratory pressure requirements; and e) low Fio_2 requirements which can be met safely delivered with a face mask or nasal cannula. If the spontaneous breathing trial is successful, consideration should be given for extubation (grade 1A).
10. Against the routine use of the pulmonary artery catheter for patients with sepsis-induced ARDS (grade 1A).
11. A conservative rather than liberal fluid strategy for patients with established sepsis-induced ARDS who do not have evidence of tissue hypoperfusion (grade 1C).
12. In the absence of specific indications such as bronchospasm, not using beta 2-agonists for treatment of sepsis-induced ARDS (grade 1B).

P. Sedation, Analgesia, and Neuromuscular Blockade in Sepsis

1. Continuous or intermittent sedation be minimized in mechanically ventilated sepsis patients, targeting specific titration endpoints (grade 1B).
2. Neuromuscular blocking agents (NMBAs) be avoided if possible in the septic patient *without ARDS* due to the risk of prolonged neuromuscular blockade following discontinuation. If NMBAs must be maintained, either intermittent bolus as required or continuous infusion with train-of-four monitoring of the depth of blockade should be used (grade 1C).
3. A short course of NMBA of not greater than 48 hours for patients *with* early sepsis-induced ARDS and a Pa_{O_2}/F_{IO_2} < 150 mm Hg (grade 2C).



Q. Glucose Control

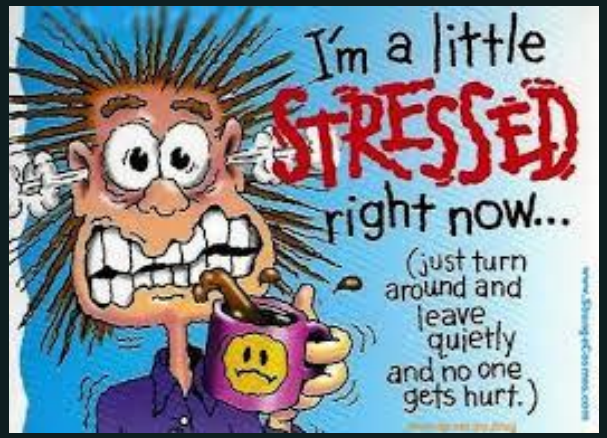
1. A protocolized approach to blood glucose management in ICU patients with severe sepsis commencing insulin dosing when 2 consecutive blood glucose levels are >180 mg/dL. This protocolized approach should target an upper blood glucose ≤180 mg/dL rather than an upper target blood glucose ≤ 110 mg/dL (grade 1A).
2. Blood glucose values be monitored every 1–2 hrs until glucose values and insulin infusion rates are stable and then every 4 hrs thereafter (grade 1C).
3. Glucose levels obtained with point-of-care testing of capillary blood be interpreted with caution, as such measurements may not accurately estimate arterial blood or plasma glucose values (UG).

R. Renal Replacement Therapy

1. Continuous renal replacement therapies and intermittent hemodialysis are equivalent in patients with severe sepsis and acute renal failure (grade 2B).
2. Use continuous therapies to facilitate management of fluid balance in hemodynamically unstable septic patients (grade 2D).

S. Bicarbonate Therapy

1. Not using sodium bicarbonate therapy for the purpose of improving hemodynamics or reducing vasopressor requirements in patients with hypoperfusion-induced lactic acidemia with pH ≥7.15 (grade 2B).



T. Deep Vein Thrombosis Prophylaxis

1. Patients with severe sepsis receive daily pharmacoprophylaxis against venous thromboembolism (VTE) (grade 1B). This should be accomplished with daily subcutaneous low-molecular weight heparin (LMWH) (grade 1B versus twice daily UFH, grade 2C versus three times daily UFH). If creatinine clearance is <30 mL/min, use dalteparin (grade 1A) or another form of LMWH that has a low degree of renal metabolism (grade 2C) or UFH (grade 1A).
2. Patients with severe sepsis be treated with a combination of pharmacologic therapy and intermittent pneumatic compression devices whenever possible (grade 2C).
3. Septic patients who have a contraindication for heparin use (eg, thrombocytopenia, severe coagulopathy, active bleeding, recent intracerebral hemorrhage) not receive pharmacoprophylaxis (grade 1B), but receive mechanical prophylactic treatment, such as graduated compression stockings or intermittent compression devices (grade 2C), unless contraindicated. When the risk decreases start pharmacoprophylaxis (grade 2C).

U. Stress Ulcer Prophylaxis

1. Stress ulcer prophylaxis using H2 blocker or proton pump inhibitor be given to patients with severe sepsis/septic shock who have bleeding risk factors (grade 1B).
2. When stress ulcer prophylaxis is used, proton pump inhibitors rather than H2RA (grade 2D)
3. Patients without risk factors do not receive prophylaxis (grade 2B).

V. Nutrition

1. Administer oral or enteral (if necessary) feedings, as tolerated, rather than either complete fasting or provision of only intravenous glucose within the first 48 hours after a diagnosis of severe sepsis/septic shock (grade 2C).
2. Avoid mandatory full caloric feeding in the first week but rather suggest low dose feeding (eg, up to 500 calories per day), advancing only as tolerated (grade 2B).
3. Use intravenous glucose and enteral nutrition rather than total parenteral nutrition (TPN) alone or parenteral nutrition in conjunction with enteral feeding in the first 7 days after a diagnosis of severe sepsis/septic shock (grade 2B).
4. Use nutrition with no specific immunomodulating supplementation rather than nutrition providing specific immunomodulating supplementation in patients with severe sepsis (grade 2C).

W. Setting Goals of Care

1. Discuss goals of care and prognosis with patients and families (grade 1B).
2. Incorporate goals of care into treatment and end-of-life care planning, utilizing palliative care principles where appropriate (grade 1B
3. Address goals of care as early as feasible, but no later than within 72 hours of ICU admission (grade 2C).

Summary of the Key in sepsis campaign

- Early reorganization
- Early antibiotics and infection control
- Adequate CO., fluid support
- Delicate Tx
  - Sugar, nutrition, prophylaxis, sedation ….etc

More specific Keys at ED setting

- Early adequate antibiotics and culture
- Adequate fluid resuscitation
  - Crystalloid 30 ml/kg (1B)
  - Colloid: albumin (2C)
- Vasopressors and inotropic Tx if needed MAP > 65 mmHg
  - Levophed (1B), Bosmine (2B), Dopamine (2C,depends)
  - Dobutamine (1C) : Max 20 mcg/kg/min

- Corticosteroid in refractory septic shock
  - Hydrocortisone 200 mg/day (2C), tapering as fast as condition suitable

- Blood transfusion
  - PRBC if Hb < 7 with target 7~9 g/dL
    (If tissue hypoperfusion resolved….)
  - FFP not routinely use to correct lab coagulopathy
  - PLT transfusion if
    PLT < 10K; or
    < 20K if high risk bleeding
    Keep ≧ 50K if invasive procedures, surgery, bleeding.

- Sugar control : Target ≦ 180 mg/dL
- Stress ulcer prophylaxis

SURVIVING SEPSIS CAMPAIGN BUNDLES

TO BE COMPLETED WITHIN 3 HOURS:

1) Measure lactate level
2) Obtain blood cultures prior to administration of antibiotics
3) Administer broad spectrum antibiotics
4) Administer 30 mL/kg crystalloid for hypotension or lactate ≥4mmol/L

TO BE COMPLETED WITHIN 6 HOURS:

5) Apply vasopressors (for hypotension that does not respond to initial fluid resuscitation) to maintain a mean arterial pressure (MAP) ≥ 65 mm Hg
6) In the event of persistent arterial hypotension despite volume resuscitation (septic shock) or initial lactate ≥4 mmol/L (36 mg/dL):
   - Measure central venous pressure (CVP)*
   - Measure central venous oxygen saturation ($Scvo_2$)*
7) Remeasure lactate if initial lactate was elevated*

*Targets for quantitative resuscitation included in the guidelines are CVP of ≥8 mm Hg, $Scvo_2$ of ≥70%, and normalization of lactate.

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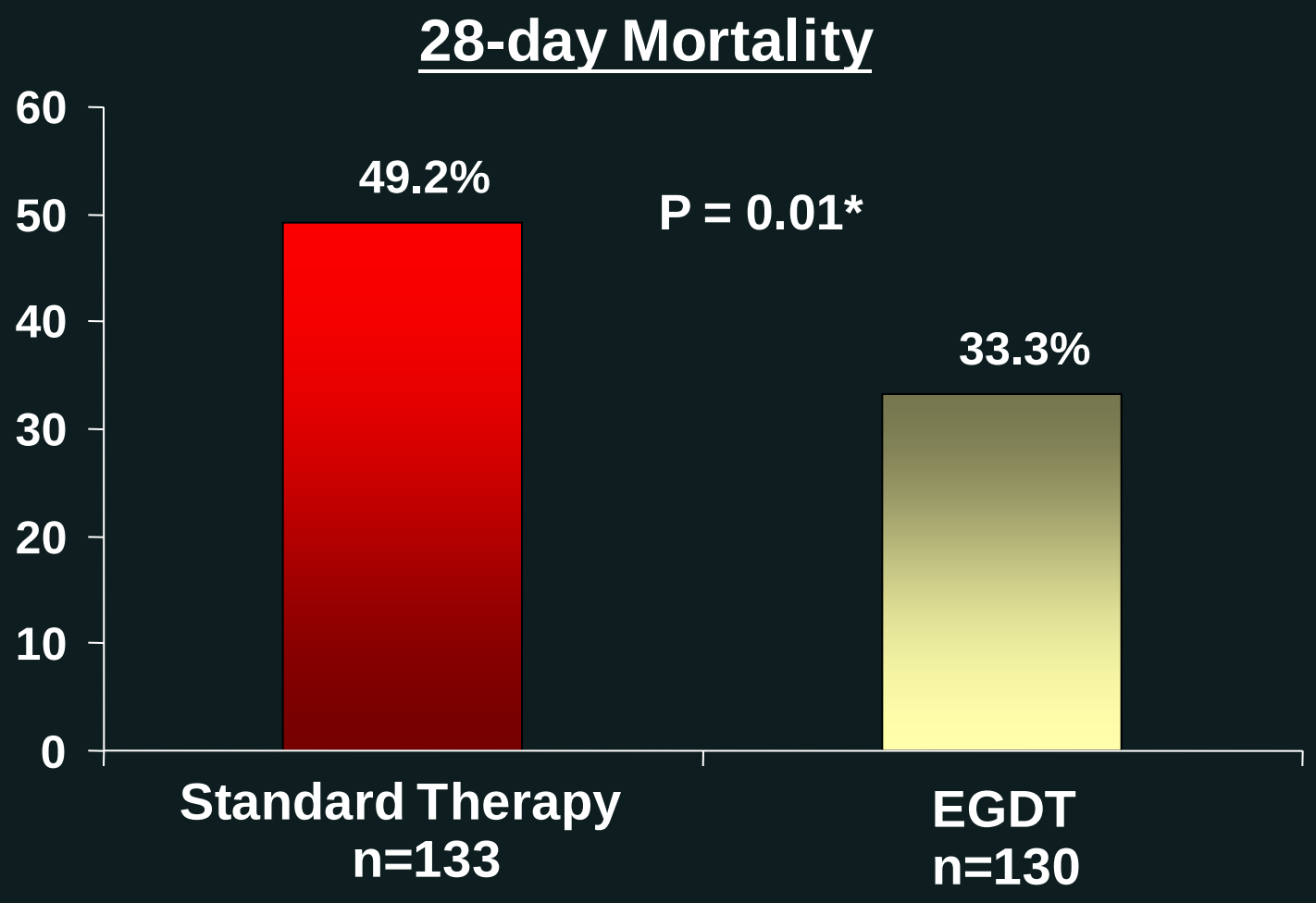
WHY

EGDT Results



Rivers E. N Engl J Med 2001;345:1368-77.

Early Interventions in Medicine

- AMI – “Time is Muscle”
  - ACC/AHA guidelines for STEMI
    - Door-to-needle time for initiation of fibrinolytic therapy should be achieved within 30 minutes
    - Door-to-balloon (or medical contact–to-balloon) time for PCI can be kept under 90 minutes.
- Stroke – “Time is Brain”
  - ASA
    - IV rtPA is strongly recommended within 3 hours of onset of ischemic stroke (grade A).
- Trauma - Time is Life
  - Golden Hour – …the lives of severely injured people could be saved if treated by trauma specialists

Time Matters in the Treatment of Sepsis

WE WANT YOU!