



<p>Section: S</p>	<p>Manual: Nursing Protocols</p> <p>Protocol No.: NP-S-8</p> <p>Approved By: Care of the ICU Patient Committee, Emergency Department, Care of the Adult Medical Patient Committee, Medical Executive Committee, ICU and ED Nursing Management VP & CNO, Nursing Services</p>
<p>Subject: Severe Sepsis and Septic Shock, Diagnosis and Management of Adult Patients</p>	<p>Effective Date: 6/04</p> <p>Revised Date:</p> <p>Reviewed Date: 4/07</p>

PURPOSE

1. To outline the urgency and methods of early diagnosis and treatment of adult patients who are severely septic or are in septic shock in the Emergency Department, Critical Care Units, and medical/surgical floors.
2. To outline a consistent treatment plan for patients who are transferred from one nursing unit to another.

Use in conjunction with the MSICU Intravenous Insulin Protocol, and the ICU Pain Management Protocol

LEVEL

Interdependent. **= **requires physician order**

DEFINITIONS:

Severe sepsis is an “infection induced organ dysfunction or hypoperfusion abnormalities” (Dellinger, et al. 2004).

Septic shock is “hypotension not reversed with fluid resuscitation and associated with organ dysfunction or hypoperfusion abnormalities” (Dellinger, et al. 2004).

SUPPORTIVE DATA

It is estimated that severe sepsis and septic shock affect 750,000 Americans each year causing more than 200,000 deaths, and with an annual cost of almost \$16.7 billion (Angus, et al., 2001). Similar to an acute myocardial ischemic attack and a cerebral vascular attack, immediate recognition and treatment are most predictable of optimal patient outcome (Dellinger, et al., 2004). Clinical research showed that ‘Early Goal Directed Therapy’*, delivered at the earliest stages of severe sepsis and septic shock, by itself has demonstrated a reduction of mortality rate by 16% and length of stay by 3.8 days (Rivers, et al., 2001). The aim of Early Goal Directed Therapy is to achieve a balance between systemic oxygen delivery and oxygen demand, restore circulatory normality, and prevent global tissue hypoxia or shock. This protocol incorporates guidelines on management of sepsis and septic shock published by the Surviving Sepsis Campaign which is a joint effort by the European Society of Intensive Care Medicine, International Sepsis Forum, and the Society of Critical Care Medicine (Dellinger, et al, 2004).

Early Goal Directed Therapy* (Rivers, et al., 2001) listed in their order of intervention:

1. administer crystalloid 20-30 ml/kg over 30 minutes
2. establish central venous catheter (CVL) access to measure central venous oxygen saturation (ScvO₂); but do not delay additional fluid administration as outlined

3. give bolus of 500 ml crystalloid, or 250 ml of colloid every 30 minutes to achieve a central venous pressure (CVP) of 8-12 mm Hg;
4. if the mean arterial pressure (MAP) is less than 65 mm Hg, vasopressors are administered to maintain a MAP of at least 65 mm Hg;
5. if the MAP is greater than 90mm Hg; vasodilators are given until it is 90mm Hg or below
6. if the central SvO₂ is less than 70 %, red cells are transfused to achieve a hematocrit (Hct) of at least 30 %;
7. After CVP, MAP, and Hct are optimized, if the central SvO₂ is still less than 70%, Dobutamine administration is started at a dose of 2.5 microgram per kilogram of body weight per minute (mcg/kg/min), a dose that is increased by 2.5 mcg/kg/min every 30 minutes until the central SvO₂ is 70% or higher, or until a max dose of 20 mcg/kg/min is given;
8. Dobutamine is decreased in dose or discontinued if the MAP is less than 65 mm Hg or if the heart rate is above 120 beats per minute.
9. To decrease oxygen consumption, patients in whom hemodynamic optimization cannot be achieved receive mechanical ventilation and sedatives

***Refer to Appendix A: Early Goal Directed Therapy Flow Diagram for detail**

Goal of therapy: to achieve the following parameters **in less than 6 hours**

- **CVP ≥8 to 12 mm Hg**
- **MAP ≥65 and <90 mm Hg**
- **Central SvO₂ or mixed venous oxygen saturation >70%**
- **Urine output ≥ 0.5 ml per kg per hour**

INCLUSION CRITERIA:

Adult patients, 18 years and older, who are presented with all three below:

1. Suspected **Infection**
2. **Two out of four** criteria for Systemic Inflammatory Response Syndrome (SIRS) –
 - a. Temperature (T) ≥38° C or <36° C;
 - b. Heart Rate (HR) >90 beats per minute
 - c. Respiratory Rate (RR) >20 breaths per minute **or** partial pressure of arterial carbon dioxide (PaCO₂)<32 mmHg
 - d. White Blood Cell Count (WBC) >12,000 per cm **or** <4,000 per cm, **or** immature band forms >10%
3. Systolic Blood Pressure (**SBP**) <**90** (or greater than 50mm Hg below normal baseline) **or** Blood **Lactate** concentration >**4** mmol per liter

EXCLUSION CRITERIA:

Less than 18 years of age; presence of an acute cerebral vascular event, acute coronary syndrome, acute pulmonary edema, status asthmaticus, cardiac dysrhythmias as a primary diagnosis, seizures, trauma, and uncontrolled hemorrhage.

OUTCOME MEASURES

- In hospital mortality
- First 72 hour Serial Acute Physiology and Chronic Health Evaluation (APACH II) Scores, **or** serial vital signs (temp, RR, HR), MAP, CVP, ScvCO₂, Blood Lactate concentrate, and urine output
- Length of Stay

<p>Initial Assessment for Qualifying Patients Key Point: Diagnosis and initial treatment may occur in the ED, ICU, or on the medical/surgical floors.</p> <p>Note: 20 to 30 ml/kg will be on an average of 1.5 to 3 liters of fluid</p>	<ol style="list-style-type: none"> 1. <u>Rapidly identify</u> qualifying patients per inclusion criteria -- 3 things: <ol style="list-style-type: none"> A. Suspected Infection B. Any Two of the following: <ol style="list-style-type: none"> a. $T \geq 38^{\circ} C$ or $< 36^{\circ} C$; b. HR >90 beats per minute; c. RR >20 breaths per minute or $PaCO_2 < 32$ mmHg; d. WBC >12,000 per cm or <4,000 per cm, or Band >10% C. SBP <90 (or greater than 50 mm Hg below normal baseline) or Blood Lactate concentration >4 mmol per liter 2. <u>Notify</u> physician when qualified patient is identified. 3. <u>Screen</u> all infected patients for severe sepsis. **Draw a venous or arterial blood lactate level (2ml in a blood gas syringe) on all patients from whom a blood culture is drawn 4. <u>Obtain</u> a physician order to **initiate Early Goal Directed Therapy.
<p>Initiate Early Goal Directed Therapy to be initiated ASAP Key Point:</p> <ol style="list-style-type: none"> 1. Although interventions are listed in numeric order, they need to occur simultaneously in order to achieve timely fluid resuscitation. More than one nurse is often needed. Physicians and Nurses need to familiarize with the protocol. Interventions listed are considered to be emergent, and team approach with effective communication is the key. <p>2. <u>Initial</u> Fluid Resuscitation can occur in areas where CVP line access and CVP&ScvO₂ monitoring are not available. Fluids can be administered using a large bore peripheral IV using the same fluid volume guideline outlined under item 9. A. (on right). Evaluation can be achieved by the physician using neck vein distension as a guide. It is essential to initiate fluid resuscitation as soon as possible; <u>at the same time, every effort should be made to transfer the patient to the MSICU ASAP.</u></p> <ol style="list-style-type: none"> 3. Blood Cultures: draw at least two; one central and one peripheral, and one from each IV access (if access >48 hours old) (Rivers, 2001). 	<ol style="list-style-type: none"> 5. <u>Ensure</u> adequate airway and oxygenation; <u>Provide</u> **supplemental oxygen; <u>Prepare</u> for intubation if indicated. 6. <u>Assist</u> Physician to establish central venous line and arterial line (arterial line is optional). <u>If central venous access is delayed, immediate fluid resuscitation should begin via a peripheral line (see Key Point #2 on left margin).</u> 7. <u>Initiate</u> **continuous monitoring of CVP, central SvO₂ and arterial BP. <u>Follow</u> CVP and when applicable, Arterial Line monitoring protocol. <u>If a patient is in an area where continuous CVP, ScvO₂, and Arterial line monitoring is not available, physician may temporarily use neck vein distension to evaluate initial fluid resuscitation, and the patient needs to be transferred to the MSICU ASAP. The physician will determine the frequency when vital signs and blood pressure are to be checked in the area until patient transfer occurs (see Key Point #2 on left margin).</u> The patient must be in an area where continuous monitoring is available if vasoreactive agents were to be administered. 8. **Draw and <u>Send</u> to lab: CBC, blood cultures, blood lactate level, and other labs/tests/cultures per physician order. 9. <u>Initiate</u> **fluid resuscitation per Early Goal Directed Therapy, (See Appendix A for detail) Goal to be achieved in sequence: (achieve within 6 hours) <ol style="list-style-type: none"> A. CVP ≥8 to 12mm Hg (**use crystalloid, start with 20-30 ml/kg, and then 500ml of crystalloid or 250 ml of colloid over 30 minutes. Repeat as needed to achieve goal). In the presence of pulmonary hypertension, RV dysfunction, or early achievement of other goal parameters, this goal may be modified by the M.D. B. MAP ≥65 and <90mm Hg (**use vasoactive agents); Goal may be modified with knowledge of baseline BP. C. ScvO₂ >70% (**Transfuse to keep Hct ≥30%, Dobutamine) D. Urine output ≥ 0.5 ml/kg/hour 10. **Administer Antibiotics per physician order within one hour of presumptive diagnosis. 11. <u>Identify</u> source of infection if any, and **control source.

<p>Continual Management These are guidelines as listed in the Surviving Sepsis Campaign (Dellinger, et al, 2004)</p> <p><u>Key Point:</u> Continual fluid resuscitation with large amounts of fluid may be required during the first 24 hours of management due to vasodilation and ongoing capillary leaks.</p>	<p>12. **Continue fluid resuscitation with crystalloids to reach stated goal.</p> <p>13. **Titrates vasoreactive agents to their desired effect.</p> <p>14. **Consider intravenous corticosteroid and administer an ACTH stimulation test to identify responders.</p> <p>15. **Consider recombinant activated protein C (rhAPC).</p> <p>16. When **mechanical ventilation is utilized: Consider low tidal volume (6 ml/kg of lean body weight) with end-inspiratory plateau pressures (<30 cmH₂O) as a goal.</p> <p>17. **Maintain blood glucose <150 mg/dl.</p> <p>18. **Consider DVT prophylaxis.</p> <p>19. **Consider stress ulcer prophylaxis.</p> <p>20. In acute renal failure, **continuous veno-venous hemofiltration or intermittent hemodialysis are considered equivalent.</p>
<p>Nursing Interventions and Monitoring</p> <p><u>Key Points:</u></p> <p>1. Early recognition of cardiovascular compromise by interpreting hemodynamic parameter changes and monitoring trend values are essential.</p> <p>2. Be prepared to intubate.</p> <p>3. Sepsis creates a hypermetabolic state. Adequate, but not excessive nutritional state should be maintained. An adequate nutritional state promotes cellular function and enhances the patient's overall immune status (Kleinpell, 2003).</p>	<p>21. Monitor and Maintain line accesses.</p> <p>22. Monitor effects of vasopressors, and inotropic agents when applicable.</p> <p>23. Monitor for signs of sepsis induced cardiovascular system dysfunction: Tachycardia, hypotension, decreased skin perfusion, poor capillary refill, skin mottling, pallor, elevated cardiac output and low systemic vascular resistance.</p> <p>24. Continuous monitoring of vital signs, pulse oxymetry, and CVP, ScvO₂, and MAP.</p> <p>25. **Obtain serial laboratory and other tests per physician order in a timely manner.</p> <p>26. Ensure all labs /tests results are reported in a timely manner.</p> <p>27. Monitor for signs of respiratory dysfunction: P/F ratio, changes in pulse oxymetry.</p> <p>28. Have intubation supplies ready at the bedside.</p> <p>29. Maximize respiratory function, and follow Mechanical Ventilation protocol when applicable.</p> <p>30. Keep HOB at 30° unless contraindicated.</p> <p>31. Provide optimal oral care.</p> <p>32. Maintain glucose at <150 mg / dl or per physician order; **Implement MSICU IV Insulin Protocol when indicated and per physician order.</p> <p>33. Monitor serum creatinine and BUN.</p> <p>34. Follow Renal Replacement Protocol when indicated.</p> <p>35. Monitor patient for signs of bleeding, such as bleeding from venipuncture sites, petechiae, and ecchymosis.</p> <p>36. **Utilize compression stockings to prevent thromboembolic disease as needed.</p> <p>37. Monitor for liver or gastrointestinal system dysfunction.</p> <p>38. Ensure an adequate nutritional state. Consult with Register Dietician when indicated.</p> <p>39. Provide **pain relief and **sedation as appropriate. Follow ICU Pain Management Protocol.</p> <p>40. Monitor patient's level of consciousness and neurological status. Utilize the Glasgow coma scale when indicated.</p> <p>41. Maintain urine catheter when applicable; Monitor for signs of urinary track infections.</p> <p>42. Follow Universal Precautions guidelines, Maintain optimal hand hygiene practice.</p> <p>43. Monitor and Identify source of infection, if any, and **Control source.</p>

Patient/Family Education	44. <u>Keep</u> patient/family informed on various treatment modalities and interventions. 45. <u>Utilize</u> an interpreter when indicated. 46. <u>Provide</u> the family with education on End-of-Life issues when indicated.
Reportable Conditions	47. <u>Notify</u> MD when any of the hemodynamic markers (such as MAP, ScvO ₂ , CVP, or urine output) deviates from the goal. 48. <u>Notify</u> MD when there are indications of central, arterial or peripheral line displacement. 49. <u>Notify</u> MD of any abnormal lab findings. 50. <u>Notify</u> MD when there is a change in the patient's vital signs, pulse oxymetry, oxygen level, level of consciousness, or neurological status. 51. <u>Notify</u> MD when there are signs of cardiovascular system dysfunction: tachycardia, hypotension, decreased skin perfusion, poor capillary refill, skin mottling, pallor, elevated cardiac output and low systemic vascular resistance. 52. <u>Notify</u> MD when there are signs of bleeding or bruising tendencies. 53. <u>Notify</u> MD when patient exhibits gastrointestinal system dysfunction, such as nausea and vomiting, large amount of residuals on those who receive enteral feedings, abdominal distension, and decreased or increased bowel sounds. 54. <u>Notify</u> MD when there are signs of thromboembolic disease.
Documentation	In addition to routine Nursing documentation: 55. <u>Record</u> initial hemodynamic assessment findings on the Patient Care flow sheet. 56. <u>Document</u> initiation of, use of, and modifications to this protocol on the Patient Care Flow Sheet. 57. <u>Record</u> patient's vital signs, pulse oximetry, MAP, CVP, ScvO ₂ , and urine output every 30 minutes or per physician order. 58. <u>Document</u> the amount, type, and time interval when each fluid therapy is administered. 59. <u>Document</u> the concentration, rate, name, and titrating pattern of vasoreactive agents when they are administered. 60. <u>Document</u> the effectiveness of fluid therapy and vasoreactive agents (when applicable). 61. <u>Document</u> the time when goal is achieved. 62. <u>Record</u> assessment findings and any significant changes on patient progress notes. 63. <u>Document</u> patient teaching on patient progress notes, and check off appropriate boxes on Multidisciplinary Teaching Record.

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