Society of Critical Care Medicine
The Intensive Care Professionals

FCCS Fundamental Critical Care Support

Fundamental Critical Care Support Skill Station
Integrated Severe Sepsis B Scenario
Participant Guide

Estimated completion time: 45-60 minutes

Though this skill station focuses on the identification and management of a septic patient, it also incorporates all the components of the FCCS course. The participant will start by identifying the early patient assessment, and then explain the diagnosis of acute respiratory failure. The participant must also be able to state what mode of ventilation and the appropriate settings for management. Hemodynamic monitoring, shock, acid-base balance, and electrolyte disturbances will also be discussed. The case presented here is intended to represent common problems encountered when caring for critically ill patients.

Station Goal

The goal of this station is to:

- Integrate multiple components of the FCCS course and sepsis into one skill station.

Participant Objectives

After completing this skill station, the student should be able to:

- Recognize the early signs and symptoms of critical illness.
- Describe the manifestation and treatment of acute respiratory failure.
- Outline the ventilator settings for a critically ill patient.
- Discuss the definition of sepsis.
- Explain the acid-base imbalance in a critically ill patient.
- Summarize the general principles of shock management.
- Identify clinical manifestations of life-threatening infections and needed laboratory tests in the diagnosis of infection.
- Outline antimicrobial treatment for specific infections.
- Review the emergent management of severe electrolyte disturbances.

Case Scenario

A 50-year-old white man came into the emergency department around 11 am, with a several days' history of hematemesis and melena. Other associated manifestations included weakness, dizziness, and anorexia. One day before admission, after eating oysters the night before, he saw his primary care provider for bilateral leg pain. He was given narcotics for presumptive peripheral neuropathy.

Assessment and findings: initial exam

History

- Sign and symptoms: bilateral leg pain, feeling weak
- Allergies: no known drug allergies
- Medications: loratadine, oxycodone/acetaminophen, aspirin, ibuprofen, acetaminophen, codeine
- Past medical history: right rib fracture, seasonal allergies, hepatitis C, liver cirrhosis, alcohol abuse. Patient had undergone a liver biopsy earlier and was diagnosed with cirrhosis secondary to alcohol. He was instructed to stop drinking.
- Social history: alcohol use, drinking a bottle of wine and several beers daily.

Exam

- Weight: 71 kg, 5 feet 10 inches (178 cm)
- Appearance: moderate distress
- Vital signs: temperature 36.6°C (97.8°F), pulse 104 beats/min, respiratory rate 22 breaths/min, blood pressure 91/57 mm Hg
- Head, eyes, ears, nose, and throat: scleral icterus
- Lungs: clear to auscultation bilaterally
- Heart: S1, S2 without murmur, gallop, or rub; rapid
- Abdomen: mildly distended, nontender, normoactive bowel sounds
- Central nervous system: alert and oriented to person, place, and time
- Extremities: 2+ edema both lower extremities, slight erythema, warm and tender to palpation, especially both feet
- Skin: spider angioma, mild jaundice

Assessment and findings: at 1130

Ancillary studies

Sodium 132 mmol/L Potassium 3.9 mmol/L Chloride 97 mmol/L CO_2 17 mmol/L Blood urea nitrogen (BUN) 54 mg/dL Creatinine 1.8 mg/dL Glucose 114 mg/dL	White blood cells (WBC) 6.9 x 10^9/L Hemoglobin (Hgb) 9.9 g/dL Hematocrit (Hct) 28.7% Platelets 112,000 x 10^9/L Aspartate aminotransferase (AST) 103 U/L Alkaline phosphatase 66 U/L Alanine aminotransferase (ALT) 96 U/L Total bilirubin 1.8 mg/dL	Total protein 6.1 g/dL Albumin 2.5 g/dL Magnesium 1 mmol/L Calcium 8.1 mg/dL Amylase 37 U/L Lipase 150 U/L Ammonia 5 µg/dL Acetaminophen & alcohol negative

Q. Does this patient have sepsis?

Critical Elements

Detection

Intervention

Reassessment

Effective Communication and Teamwork

Assessment and findings: at 1300

Patient was admitted to medical-surgical unit by the hospitalist with a diagnosis of GI bleeding.

Exam

- Vital signs: temperature 35.5°C (95.9°F), pulse 122 beats/min, respiratory rate 36 breaths/min, blood pressure 86/48 mm Hg
- Neurologic: becoming lethargic
- Respiratory: tachypneic
- Cardiac: rapid
- Abdomen: mildly distended, complains of nausea

Ancillary studies

- Arterial blood gas (ABG) measurements: pH 7.33; Pa_{CO_2} 19.3 mm Hg; Pa_{O_2} 79.2 mm Hg; HCO_3 9.8 mEq/L; base excess -14.6
- WBC 2.9 x 10^9/L
- Hgb 9 g/dL
- Hct 26.2%
- Platelets 93,000 x 10^9/L
- Neutrophils 33%
- Bands 34%

Detection

Intervention

Reassessment

Effective Communication and Team Performance

Assessment and findings: at 1500

Exam

- Vital signs: temperature 37.3°C (99.1°F), pulse 120 beats/min, respiratory rate 60 breaths/min, blood pressure 76/32 mm Hg
- Neurologic: more confused and disoriented
- Respiratory: rapid Kussmaul breathing
- Cardiac: rapid
- Abdomen: hypoactive
- Extremities: edematous, mottled, only pulses detected on Doppler ultrasound

Ancillary studies

- ABG results: pH 7.13; $PaCO_2$ 20 mm Hg; PaO_2 171 mm Hg; HCO_3 6.6 mEq/L; arterial oxygen saturation 99%; base excess -20

Q. What is the intervention for the acidosis?

- Sodium 133 mmol/L
- Potassium 5.8 mmol/L
- Chloride 104 mmol/L
- BUN 59 mg/dL
- Creatinine 2.8 mg/dL
- Glucose 93 mg/dL

Q. What is the cause of the hyperkalemia, and what are the treatments?

- WBC 1.6 x 10^9/L
- Hgb 9.9 g/dL
- Hct 25.1%
- Platelet 82,000 x 10^9/L
- Neutrophils 20%
- Bands 28%
- Lactate 13 mg/dL

Q. Is this patient in respiratory failure? Would you intubate him?

Q. What mode of ventilation and settings would you use?

Critical care consulted. Patient is intubated and transferred to the ICU.

Q. What is the initial treatment for the hypotension? What parameters do you use for fluid resuscitation?

Q. When would you use vasopressors? Which one would you use?

Q. Would you start an antibiotic? Which one would you use?

Detection

Intervention

Reassessment

Effective Communication and Teamwork

The patient is intubated and placed on assist-control mode with rate 18/minute, tidal volume 500 mL, positive end expiratory pressure 5 cm H_2O, fraction of inspired oxygen 100%.

Medications

- 0.9% normal saline 999 mL/h
- Magnesium 4 g over 4 h
- Norepinephrine 18 µg/min, titrate to keep mean arterial pressure ≥65 mm Hg
- Propofol 15 µg/kg/min
- Fentanyl 50 µg/h
- Piperacillin/tazobactam 4.5 g every 6 h
- Vancomycin at renal dose (ask for ICU pharmacy consult)

Assessment and findings: at 2000

Exam

- Appearance: calm
- Vital signs: temperature 38.8°C (101.8°F), pulse 120 beats/min, respiratory rate 24 breaths/min, mean arterial pressure 65-75 mm Hg
- Lungs: diminished
- Heart: rapid, sinus tachycardia
- Abdomen: distended, few scattered bowel sounds; nasogastric bilious output (1 L)
- Central nervous system: sedated
- Extremities: pitting edema, mottled, cold below knees, hot around thighs, pulses palpable, small bullous skin lesions forming on both lower extremities
- Skin: anasarca
- Intake/output: 10,251/1750 mL/(12 h)

Ancillary studies

ABG results: pH 7.43; $PaCO_2$ 34 mm Hg; PaO_2 102 mm Hg; HCO_3 22.5 mEq/L; base excess -1.2 mmol/L

Sodium 130 mmol/L Potassium 3.6 mmol/L Chloride 95 mmol/L CO_2 20 mmol/L BUN 52 mg/dL Creatinine 2 mg/dL Glucose 358 mg/dL AST 132 U/L ALT 63 U/L Alkaline phosphatase 33 U/L Total bilirubin 1 mg/dL	Magnesium 2 mmol/L Total protein 3.3 g/dL Albumin 1 g/dL Lactate 4.4 mg/dL	WBC 1.2 x 10^9/L Hgb 6.7 g/dL Hct 18.8% Platelet 45,000 x 10^9/L Neutrophils 11% Bands 13% PT/international normalized ratio 22.5 s/3/8 PTT 66 s D-dimer 773 µg/mL Fibrinogen 194 mg/dL Fibrin split products <10 µg/mL Thrombin 22 s

Q. What is the etiology of this pancytopenia?

Detection

Intervention

Reassessment

Effective Communication and Teamwork

Blood culture results reveal Gram-negative rods in all 4 bottles. Urine WBC 17 x 10^9/L, few bacteria, leukocyte esterase negative **Q. Is his tissue being perfused?** **Q. What interventions and reassessments would you implement?**	

Assessment and findings: at 0700 Surgical consult has been performed: bullous lesions cultured; surgeon felt no surgical intervention required at this time. **Q. What is the cause of the bullous lesions?** **Assessment and findings: at 0900** Gastroenterologist has arrived and is aware of patient's alcoholic history with cirrhosis. The patient's wife confirmed that patient had consumed raw oysters recently. **Exam** ● Vital signs: temperature 39°C (102.2°F), pulse 120 beats/min, respiratory rate 30 breaths/min, blood pressure 108/57 mm Hg ● Lungs: unchanged ● Heart: unchanged ● Abdomen: unchanged ● Central nervous system: sedated ● Extremities: bullous lesions are more pronounced and hemorrhagic **Q. What is your diagnosis?** **Assessment and findings: at 1000** Infectious disease consultant arrived. Piperacillin/tazobactam and vancomycin are discontinued. Antibiotics changed to levofloxacin, ceftazidime, doxycycline, and metronidazole.	**Detection** **Intervention** **Reassessment** **Effective Communication and Teamwork**

Assessment and findings: at 1200

Exam

- Vital signs: temperature 39°C (102.2°F), pulse 118 beats/min, respiratory rate 31 breaths/min, blood pressure 92/59 mm Hg

Ancillary studies

- Finger-stick glucose level dropped to 54 mg/dL (on insulin at 1 U/h).
- Urinary output dropped from 100 mL in last hour to 20 mL.

Q. What interventions and reassessments would you implement?

Assessment and findings: at 1600

Exam

- Vital signs: temperature 38.1°C (100.5°F), pulse 113 beats/min, respiratory rate 20 breaths/min, blood pressure 82/53 mm Hg
- Urinary output: 5 mL
- Bullous skin lesions: more pronounced than at 0900
- Extremities: extremely mottled and cold

Assessment and findings: at 1800

Exam

- Vital signs: temperature 37.2°C (98.9°F), pulse 109 beats/min, respiratory rate 18 breaths/min, blood pressure 82/53 mm Hg
- Respiratory: no spontaneous rate
- Urinary output: 5 mL

Q. What interventions and reassessments would you implement?

Norepinephrine is increased to 25 µg/min.

Q. Would you add a second vasopressor? If yes, what would you consider?

Detection

Intervention

Reassessment

Effective Communication and Teamwork

Assessment and findings: at 2014

Exam

- Vital signs: temperature 37.2°C (98.9°F), pulse 109 beats/min, respiratory rate 30 breaths/min, blood pressure 87/54 mm Hg

Ancillary studies

- ABG results: pH 7.06; $PaCO_2$ 58 mm Hg; PaO_2 56 mm Hg; HCO_3 16.4 mEq/L; base excess -12.2

Q. What interventions and reassessments would you implement?

Assessment and findings: at 2107

Exam

- Vital signs: pulse 103 beats/min, respiratory rate 30 breaths/min, blood pressure 86/54 mm Hg

Ancillary studies

- ABG results: pH 6.99; $PaCO_2$ 67 mm Hg; PaO_2 51 mm Hg; HCO_3 16.1 mEq/L; base excess -13.6
- O_2 saturation on pulse oximetry is decreased 64%

Q. What interventions and reassessments would you implement?

Assessment and findings: at 2200

Adult daughter arrives from out of town.

Q. Would you speak to the family regarding withdrawal of care?

Assessment and findings: at 0015

Family withdraws care. Patient dies at 0120.
Final blood cultures revealed *Vibrio vulnificus*!

Detection

Intervention

Reassessment

Effective Communication and Teamwork