Medical Emergencies: Sepsis in the Oncology Patient

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Objectives

• To identify how the body responds to infection when immunosuppressed.
  – Describe the sepsis process
  – Identification of sepsis in the immunosuppressed
  – Understand how sepsis management takes a team
  – Describe tools to recognize and treat sepsis
Sepsis Definitions

- **Sepsis** – Infection plus the presence of at least two SIRS criteria
- **Severe Sepsis** – Organ dysfunction caused by sepsis
- **Septic Shock** – Severe sepsis plus low BP or high lactate not reversed with fluid resuscitation

Sepsis: A Complex Disease

- Infection
- Systemic Inflammatory Response Syndrome (SIRS)
- Sepsis
- Severe Sepsis
- Septic Shock

Butcher, 2016

Dellinger et al, 2013
Sepsis: A Complex Disease

- Presence of organisms in a closed space or location where they are not normally found

SIRS: Systemic Inflammatory Response Syndrome

- A clinical response arising from a non-specific insult manifested by ≥ 2 of the following:
  - Temperature ≥ 38°C (100.4°F) or ≤ 36°C (96.8°F)
  - HR ≥ 90 beats per minute
  - RR ≥ 20 breaths per minute or PaCO₂ < 32 mmHg
  - WBC ≥ 12,000/mm³, ≤ 4,000/mm³, or > 10% bands
Sepsis

- Known or suspected infection with SIRS criteria
  - More than just an inflammatory response

Severe Sepsis

- Sepsis with signs of **acute** organ dysfunction associated with the following system:
  - Cardiovascular
  - Renal
  - Respiratory
  - Hepatic
  - Nervous
  - Unexplained metabolic acidosis
Septic Shock

- Severe Sepsis with hypotension refractory to adequate fluid resuscitation and/or a lactic acid ≥ 4 mmol/L

Sepsis: A Complex Disease

- Infection
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New Sepsis Definitions

• Sepsis is defined as a life-threatening organ dysfunction caused by a dysregulated host response to infection.
  – Organ dysfunction – acute change in total SOFA score ≥ 2 points consequent to the infection.
    • A SOFA score ≥ 2 reflects an overall mortality risk of approximately 10% in a general hospital population with suspected infection.

Singer et al, 2016

New Sepsis Definitions

• Septic shock is a subset of sepsis in which underlying circulatory and cellular/metabolic abnormalities are profound enough to substantially increase mortality.
  – Patients with septic shock can be identified with a clinical construct of sepsis with persisting hypotension requiring vasopressors to maintain MAP ≥ 65 mmHg and having a serum lactate level ≥ 2 mmol/L despite adequate fluid resuscitation.
Understanding Risk

• Sepsis is the leading cause of non-relapse mortality in oncology patients.
• Incidence of sepsis in oncology patients is estimated to be 25%, with an associated mortality of 28%.

Understanding Risk

• Neutropenia = Neutrophil <500 or <1000 and expected to decline in the next 48 hours.
• Low Risk
  – Expected neutropenia for ≤7 days &
  – No active co-morbidities, or hepatic or renal dysfunction
  – Most patients receiving chemo for solid tumors
Understanding Risk

• Neutropenia = Neutrophil <500 or <1000 and expected to decline in the next 48 hours.

• High Risk
  – Expected neutropenia for >7 days.
  – Neutropenic fever with ongoing co-morbidities or significant hepatic or renal dysfunction.
  – Receiving chemotherapy for a hematologic pathology

Identifying Neutropenic Sepsis

SIRS

✓ Fever: most common and often only initial response to infection:
  – One time oral temperature > 101, or
  – Oral temp of 100.4 lasting 1 consecutive hour

✓ Respiratory rate: RR ≥ 20 breaths per minute

✓ Heart Rate: HR ≥ 90 beats per minute

✓ WBC: null and void due to chemo induced
Identifying Neutropenic Sepsis

### Sepsis

- **Source of infection:**
  - **Respiratory** – abnormal lung sounds, respiratory rate
  - **GI tract** – tenderness with guarding and diarrhea
  - **Mucus Membranes** – integrity, tenderness, ulcers
  - **Catheter sites** – edema, drainage, erythema, edema

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Identifying Neutropenic Sepsis

### Severe Sepsis

- **Blood Pressure**: SBP <90 or MAP < 65
- **Mental status change**: somnolent, confusion
- **Renal**: urine output less than 30mL/hr
- **Respiratory**: hypoxia
Case Study

1200
120/66
P80
RR20
T 98.4

1520
146/79
P80
RR20
T 101.8

1735
Complaints of fever and chills
103/60
(74) P128
RR24
T 103.1

1900
87/34 (46)
P 110
RR 32
T 103

2100

Septic Shock

19/2/2017

Treatment Algorithm

Bow, E., 2017
Management

• Blood Cultures
  – Lactic acid, CBC, Chemistry, etc
• Antibiotic within 1 hour (after blood cultures)
  – Antibiotic within 1 hour of fever, decreases morality by 14%
• Fluid resuscitation
• If needed, cardiovascular support (vasopressors)

Progressing Sepsis Identification

• Astute assessment skills
  – Use critical thinking about signs and symptoms
  – “Trust your gut”
• Recognize and act upon acute changes
  – Early recognition and implementation of interventions leads to improved outcomes
    • Significant change in respiratory status
    • Rigors from an acutely rising temperature
    • Slowly worsening trends
Progression of Sepsis Identification

• Monitor for subtle clinical signs that demonstrate impending/start of organ dysfunction/failure
  – Increase in respiratory rate
  – Increase in oxygen needs
  – Decrease in blood pressure
  – Decrease in urine output
  – Change in mentation
    • First sign of worsening sepsis in elderly and young

Progression of Sepsis

• Cardinal signs of shock; imbalance between supply and demand
  – Hypotension
  – Oliguria
  – Metabolic acidosis
  – Cool and clammy skin; majority but not all
  – Abnormal mental status

• Do not be deceived; young, healthy people can clinically compensate for shock
Compensation for Sepsis Progression

• Hypotension
  – Result of “leaky vessels” and vasodilatation from cytokines and endotoxins
  – Bounding pulse and increase in HR to increase CO
  – Results in hypoxia so respiratory rate is increased to increase delivery of oxygen

• Oliguria
  – Kidneys activate renin-angiotensin-aldosterone system to reabsorb water into vascular system

Compensation for Sepsis Progression

• Metabolic acidosis from lactic acidemia
  – Increase in respiratory rate to “blow off CO\textsubscript{2}”

• Cool and clammy skin; majority, but not all
  – Classic signs of cardiovascular compromise; can no longer compensate for increased CO demands

• Abnormal mental status
  – Result of hypotension and hypoxia
  – Ensure patient is able to protect airway
Sepsis Initiatives

- Best Practice Alert
- Sepsis Order Sets
- Code Sepsis
- Core Measure Case Review
- qSOFA

Sepsis Best Practice Alert

- Alert fires, to nursing and providers, for adult patients 18-110, with at least 3 of 8 criteria present:
  - Temp > 101 or < 96.8 in the last 4 hours
  - HR > 110 in the last 2 hours
  - SBP < 90 mmHg X2 readings in the last 6 hours
  - MAP < 65 mmHg X2 readings in the last 6 hours
  - Respiration > 25/min in the last 2 hours or arterial PCO₂ < 32 mmHg in the last 24 hours
  - WBC > 12.0 or < 4.0 K/µL or bands > 10% within the last 24 hours
  - Lactic acid > 2.0 mmol/L in the last 24 hours
Sepsis Best Practice Alert

Sepsis Order Sets

- Developed from an interdisciplinary approach based on evidence
- Order sets based on location of patient and stage of sepsis
  - Emergency Trauma Center Sepsis Order Set
  - Non-Critical Care Sepsis Order Set
  - Critical Care Sepsis Order Set
- Working towards a single inpatient Sepsis Order Set
Core Measure Miss Review

- Monthly, retrospective review of sepsis patients
- Recognition of performance improvement opportunities
  - Core Measure Compliance
  - Clinical Practice Improvement

Code Sepsis

- Initiated on 3/7/17
- Sepsis BPA fires and directs to call a “Code Sepsis”
  - RN encouraged to assess patient to validate the BPA did not fire for another reason (clinical condition change)
  - RN calls “Code Sepsis” and notifies provider
- ICU RN, RT, & Phlebotomist respond
- ICU RN validates the patient meets criteria for sepsis and provides necessary interventions
- Phlebotomists performs venipuncture for a “stat” lactic acid per Acute Response Emergent Order Set
### qSOFA

- **Subset of Sequential Organ Failure Assessment**: gauges severity of organ failure
- **Score of ≥ 2 indicative of organ dysfunction**
  - Respiratory rate ≥ 22/min
  - Altered mentation
  - Systolic blood pressure ≤ 100 mmHg
- **Predictor of increased mortality in sepsis patients**

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### Summary

- **Sepsis recognition and management takes a team** (RN, LPNs, PCAs, Physicians, Lab, Pharmacy, etc.)
  - Hand off – keep everyone in the know
  - Vital signs trends
  - Proactive plan of care
- **Is it time for change?**
  - Febrile Neutropenia versus Neutropenic Sepsis

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_Singer, et al., 2016_
References


