Sepsis
Bundle Basics & Beyond

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Disclaimer
Advanced Practice Registered Nurse

- 4 Advanced Practice Nurse Roles
  - Clinical Nurse Specialist
  - Certified Nurse Midwife
  - Certified Registered Nurse Anesthetist
  - Certified Nurse Practitioner
- Requires Masters in Nursing, *title protected*
- Nurse Practitioner:
  - Clinical expert in managing patient care
- Clinical Nurse Specialist:
  - Clinical expert, consultant, direct care provider, educator, researcher
  - Patient/client, nursing personnel, organization/network
Objectives

• Discuss why sepsis is important
• Define sepsis according to national definitions and in the context of the CMS Sepsis Bundle
• Identify barriers to recognizing and providing evidence based treatment
• Understand best practice related to the identification and management of sepsis
• Determine what can be done to stop sepsis and improve patient outcomes
Faces of Sepsis

Christopher Reeve, Pope John Paul II, Jim Henson, Anna Nicole Smith, Etta James, Muhammad Ali
Faces of Pediatric Sepsis

Ben age 8 weeks - son of former Olympic sprinter Allyn Condon

Gabby Galbo age 5
It’s Personal
Septic Shock: 40% Mortality Rate
Severe Sepsis: Healthcare significance

- Major cause of morbidity and mortality worldwide
  - Leading cause of death in noncoronary ICUs
  - 10th leading cause of death overall
- Most expensive condition treated in hospitals in 2013, $23.7 billion

Pediatric Sepsis: Healthcare significance

- Major cause of mortality worldwide
- Pneumonia is most common cause of pediatric sepsis
- Costs the US $4.8 billion each year
Sepsis in the ED
Definitions

• SIRS: systemic inflammatory response syndrome; includes temperature, HR, RR, WBC

• Sepsis: presence of infection (suspected or confirmed) with systemic manifestations of infection

• Severe Sepsis: sepsis-induced tissue hypoperfusion or organ dysfunction

• Septic Shock: hypotension that persists despite adequate fluid resuscitation or lactate ≥ 4mmol
Pediatric Definitions

- Differ slightly from adult definitions given the variation in age-specific cutoffs for physiologic and organ system-related parameters
  - Healthy ped can maintain cardiac output with extreme tachycardia for prolonged period of time without myocardial ischemia

Pediatric Sepsis
http://dx.doi.org/10.4161/viru.27045 (2013)
Disease Continuum

- SIRS: SIRS + Infection
  - Temp. >38°C or <36°C, HR >90, RR >20
  - WBCs >12,000 or <4,000 or >10% bands
- Sepsis: Sepsis + End Organ Damage
- Severe Sepsis: Sepsis + Hypotension
- Septic Shock
Barriers to Treatment

- We lack a gold standard for diagnosis
  - No single criteria makes the diagnosis (unlike new ST elevation on EKG)

- We have an incomplete understanding of disease pathophysiology

- We have been facing a rapidly changing landscape
  - MDROs
  - Complex Patients/Comorbidities & Age
    - AWARENESS of Sepsis
  - Research & Definitions
    - Lacking for specific populations (cancer, etc)
Looking Ahead: New Definitions

- **SIRS:** systemic inflammatory response syndrome; includes temperature, HR, RR, WBC
- **qSOFA:** measurement of organ dysfunction (Sequential Organ Failure Assessment) – altered mental status, SBP <100, RR>22
- **Sepsis:** presence of infection (suspected or confirmed) with systemic manifestations of infection
- **Sepsis:** life-threatening organ dysfunction caused by a disregulated host response to infection
- **Severe Sepsis:** sepsis-induced tissue hypoperfusion or organ dysfunction
- **Septic Shock:** hypotension that persists despite adequate fluid resuscitation or lactate >4mmol
- **Septic Shock:** vasopressor-dependent hypotension + lactate>2
Incognito: Sepsis Look-Alikes

- Drug Overdose
- Trauma
- Burns
- Alcohol Withdrawal
- Acute Pancreatitis
- Pulmonary Embolus
- Anaphylaxis
- Adrenal Insufficiency
- Neurogenic Shock
- Thyrotoxicosis
SIRS and a SOURCE

- SIRS alone
- Infection alone
- SIRS+ Infection= Sepsis
  - The imbalance rages beyond the control of the body

“...a malignant intravascular inflammation”

Neviere, 2016
From the Beginning

- Sepsis must have a source
  - Can be bacterial, viral, fungal, or parasitic
    - Bacterial origin far outpaces the others
    - Gram + > Gram – (but both still occur)

- Most common infections
  - Pneumonia
  - UTI
  - Wound/Skin
  - Abdominal Infections
  - Device related
RECOGNITION
Electronic Screening

Example Criteria for SEPSIS BPA

Criteria:
>18yr old +
T>100.9 or <96.8 +
HR>90 or RR>20

Criteria:
Above + elevation in bilirubin, creatinine, INR, PTT, OR lactate; decrease in platelets, SBP, OR MAP
Routine Manual Screening

- Every shift and prn with condition changes
- Screen with every rapid response
≥2 SIRS Criteria Met?
- Temp >100.9F or <96.8F
- HR >90
- RR >20
- WBC >12K or <4K or >10% immature bands

Suspected/confirmed infection?
- Yes
- No

Organ dysfunction – ≥1 change from baseline?
- Bilirubin>2
- INR>1.5
- MAP<65
- Cr>2
- PTT>60
- SBP<90
- PLT<100K
- Lactate>2

Negative screen

POSITIVE SEPSIS SCREEN
NOTIFICATION
What good is your knowledge if you can’t communicate?
Rapid Response Teams/CODE SEPSIS
Norton Algorithm Code Sepsis

- Code Sepsis Activated
  - Designated ANM/relief charge nurse responds to patient bedside. If designee is unavailable, contact RPM
  - Focused assessment completed
  - Patient hemodynamically stable?
    - Yes: Activate Sepsis Standing Orders
    - No: Call RRT
INTERVENTION
Sepsis Bundle: 3 hour & 6 hour

- Completed within 3 hours of presentation
  - Measure lactate (*if >2, re-measure within 6 hours*)
  - Obtain blood cultures
  - Administer antibiotics
  - Administer 30ml/kg IVF bolus for hypotension or lactate ≥4

- Completed within 6 hours of presentation
  - Apply vasopressors for persistent hypotension not responsive to IVF bolus
  - Reassessment of volume status & tissue perfusion (focused exam, for septic shock)
  - Re-measure lactate if original result was >2
3 Hour: Initial Lactate

- Elevated lactate typically present in patients with severe sepsis or septic shock
- Essential to identifying tissue hypoperfusion
- Elevated levels in sepsis support aggressive resuscitation
- Limitations
  - Various reasons for elevated lactate
- *Doesn’t define sepsis, but it’s a good prognostic evaluator*
3 Hour: Blood Cultures

- **Goal 45 minutes from presentation**
- 30-50% positive with clinical syndrome of severe sepsis or shock
- Offers best hope of identifying causative organism
- Obtain culture from any suspicious site prior to antibiotic administration
- *Obtain blood cultures when r/o sepsis if none have been obtained 48 hours prior*
3 Hour: Administer Antibiotics

- **Goal within 1 hour from presentation**
- Initiate empiric anti-infective therapy having activity against all likely pathogens
- Reassess antimicrobial regimen daily, deescalate when appropriate, *usually no longer than 3 to 5 days*
- Usual therapy duration: 7-10 days

*Broad-spectrum coverage administered first*

*For every hour delay in administering antibiotics, the patient’s risk of death increases 7.6%*
2016 SSC GUIDELINES

Suggest that measurement of procalcitonin levels can be used to support shortening the duration of antimicrobial therapy in sepsis patients *(weak recommendation, low quality of evidence)*
3 Hour: 30mL/kg Crystalloid Fluid Bolus

- **Goal 500mL q 15-30minutes (true definition of bolus)**
- Given to expand circulating volume and restore perfusion pressure
- Ineffective circulation due to vasodilation associated with infection or impaired cardiac output
- Even if not hypotensive, poorer outcomes correlated with lactate ≥4mmol/L
- Targets for resuscitation:
  - CVP ≥8mmHg
  - ScvO2 ≥70%
  - Normalization of lactate

*We can pull fluid off. We can’t fix a dead person.*
Recommend crystalloids as the fluid of choice for initial resuscitation and subsequent volume replacement *(strong recommendation, moderate quality of evidence)*

Suggest using albumin in addition to crystalloids when patients require substantial amounts of crystalloids *(weak recommendations, low quality of evidence)*
6 Hour: Vasopressors

- *Per CMS guidelines*, apply vasopressors if patient has **persistent hypotension** (2 consecutive low blood pressures within the hour after stopping the 30ml/kg bolus)
- Norepinephrine: first line, *central line access as soon as possible*
- Epinephrine: added to norepi if needed
- Vasopression: considered in patient despite adequate fluid resuscitation and high-dose conventional vasopressors, 0.03 units/minute (can cause coronary and splanchnic vasoconstriction)
- Phenylephrine: use cautiously – reported to reduce splanchnic blood flow and oxygen delivery
- Dopamine: alternative to norepi only in highly selective patients (absolute or relative bradycardia, low risk of tachyarrhythmias)
2016 SSC GUIDELINES

Recommend norepi as first choice vasopressor (*strong recommendation, moderate quality of evidence*)

Suggest adding either vasopressin or epi to norepi with intent of raising MAP or adding vasopressin to decrease norepi dosage (*weak recommendations, low quality of evidence*)

Suggest against using IV hydrocortisone if adequate fluid resuscitation and vasopressor therapy are able to restore hemodynamic stability (*weak recommendation, low quality of evidence*)
6 Hour: Reassessment of volume status & tissue perfusion

• Must be completed by licensed independent practitioner
• Completed after initial fluid resuscitation (so for lactate ≥4, or persistent hypotension)
• Focused exam: includes vital signs, cardiopulmonary, capillary refill, peripheral pulse, and skin findings
• **OR 2 of the following:**
  – CVP (requires central venous access)
  – ScVO2 (requires arterial line)
  – Bedside cardiovascular ultrasound (requires training)
  – Passive leg raise or fluid challenge (arterial line)
2016 SSC GUIDELINES

Recommend further hemodynamic assessment (such as assessing cardiac function) to determine the type of shock if the clinical exam does not lead to clear diagnosis (*Best Practice Statement*)

Suggest dynamic over static variables be used to predict fluid responsiveness (*weak recommendations, low quality of evidence*)
6 Hour: Lactate

• Repeat if initial lactate >2
• Q6hx24, q4hx3...
• Arnold et al, 2009
  – If lactate is clearing (10% decrease in approx. 2hr), 19% mortality rate
  – If lactate is increasing, 60% mortality rate
• Questions to ask:
  – Appropriate source?
  – Additional issues occurring?
  – Appropriate interventions?

I ❤️ Lactate Clearance
2016 SSC GUIDELINES
Suggest guiding resuscitation to normalize lactate in patients with elevated lactate levels as a marker of tissue hypoperfusion (weak recommendation, low quality of evidence)
ORDER SETS & SMART PHRASES/Templates

Saving Lives, Time and Money

https://www.slideshare.net/mobile/thitconference/order-sets-saving-lives-time-and-money
https://consultqd.clevelandclinic.org/2014/12/special-emr-templates-help-medical-students-learn/

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TIME OF PRESENTATION (CLOCK START) REVIEW
To ED 9/19 SOA, altered mental status, DKA
Xray and UA negative
v/s at 0853: T 97.7, HR 90, RR 30, BP 80/40
  – 0900: (HR 93) RR 26, BP 76/37
Notable labs: WBC 12.60 at 0954, lactate 4.6 at 1012
0913 blood cultures
0905 MD note “...treatment for DKA, hypotension, sepsis, renal failure...”

Severe sepsis time: 9/19 0905
Completed by 1205: -lactate, blood cultures, antibiotics, 30ml/kg bolus
Completed by 1505: -repeat lactate, vasopressors for persistent hypotension
Septic shock time: 1012
Completed by 1612: -focused exam
Recap

Questionably Professional (*though highly accurate*) Song Interpretation of Sepsis
EDUCATION FOR PREVENTION
Sepsis in ED – What’s the Evidence Say?

• Increased ED crowding significantly increased time to treatment for severe sepsis patients
  
  American Journal of Emergency Medicine, 2017

• More rapid completion of a 3-hour bundle, rapid initiation of bolus a/w lower in-hospital mortality
  
  New England Journal of Medicine, 2017
Improving Recognition of Pediatric Severe Sepsis in the Emergency Department: Contributions of a Vital Sign–Based Electronic Alert and Bedside Clinician Identification

Fran Balamuth, MD, PhD*; Elizabeth R. Alpern, MD, MSCE; Mary Kate Abaddessa, MSN, RN; Katie Hayes, BS; Aileen Schast, PhD; Jane Lavelle, MD; Julie C. Fitzgerald, MD, PhD; Scott L. Weiss, MD, MSCE; Joseph J. Zorc, MD, MSCE

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- Electronic sepsis alert alone
  - 86.2% sensitivity, 99.1% specificity
- Electronic alert + Clinician screening (CRITICAL THINKING)
  - 99.4% sensitivity, 99.1% specificity
- ED detection increased from 83% to 96%
- 43 cases identified by clinicians that had negative electronic screens
Conclusion

• TIME IS TISSUE
• Prevent the spread of infection
• Early recognition of patients
• Early initiation of bundles
• Treat all patient who screen positive as positive until
  ruled out (just like AMI)
...and in the end

David Rothbart
Survivor
In October of 2015 after returning from a vacation with my

Mary Banahasky
Survivor
My symptoms were cough and

Di
Survivor
In August 2015 I developed on a Monday. (Sepsis and UTI) The doctor gave me Bactrim. On Friday of that week I passed out in my car. When I came to

Nicole Jenkins
Survivor
Hi, my name is Nicole. I'm a 2x sepsis survivor. My story is unique

Marie Plazyk
Survivor
I was happy enjoying life with my husband, 11-year old daughter, and 7-month-old son. It hit like a brick. It started off with

Maria Richard
Survivor
My story begins with a gallbladder surgery that I thought went well. I went back to work about three weeks after the surgery, feeling pretty good. Then all of a sudden about 5 weeks after my surgery

Bentley Edmonds
Survivor
I’m sorry for how long this post is but once I started typing, the rest kind of happened so bear with me. First and foremost, I just want to say “don’t be sad because I am a m

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Questions?

Thank you!

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References


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