

Sepsis Communication

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Objectives

- Review Essential facts of sepsis, its effects and understand the need for speed.
- Learn how to recognize sepsis as early as possible
- Various treatment modalities
- 3 and 6 hour bundles
- Importance of communication to assist with this.

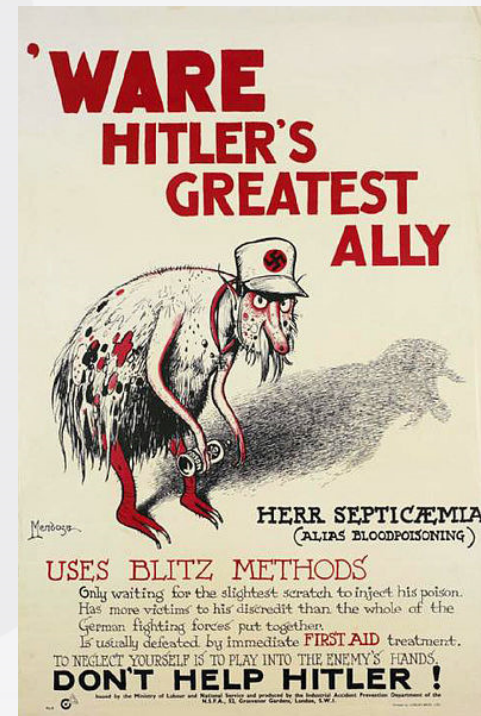
QUIZ

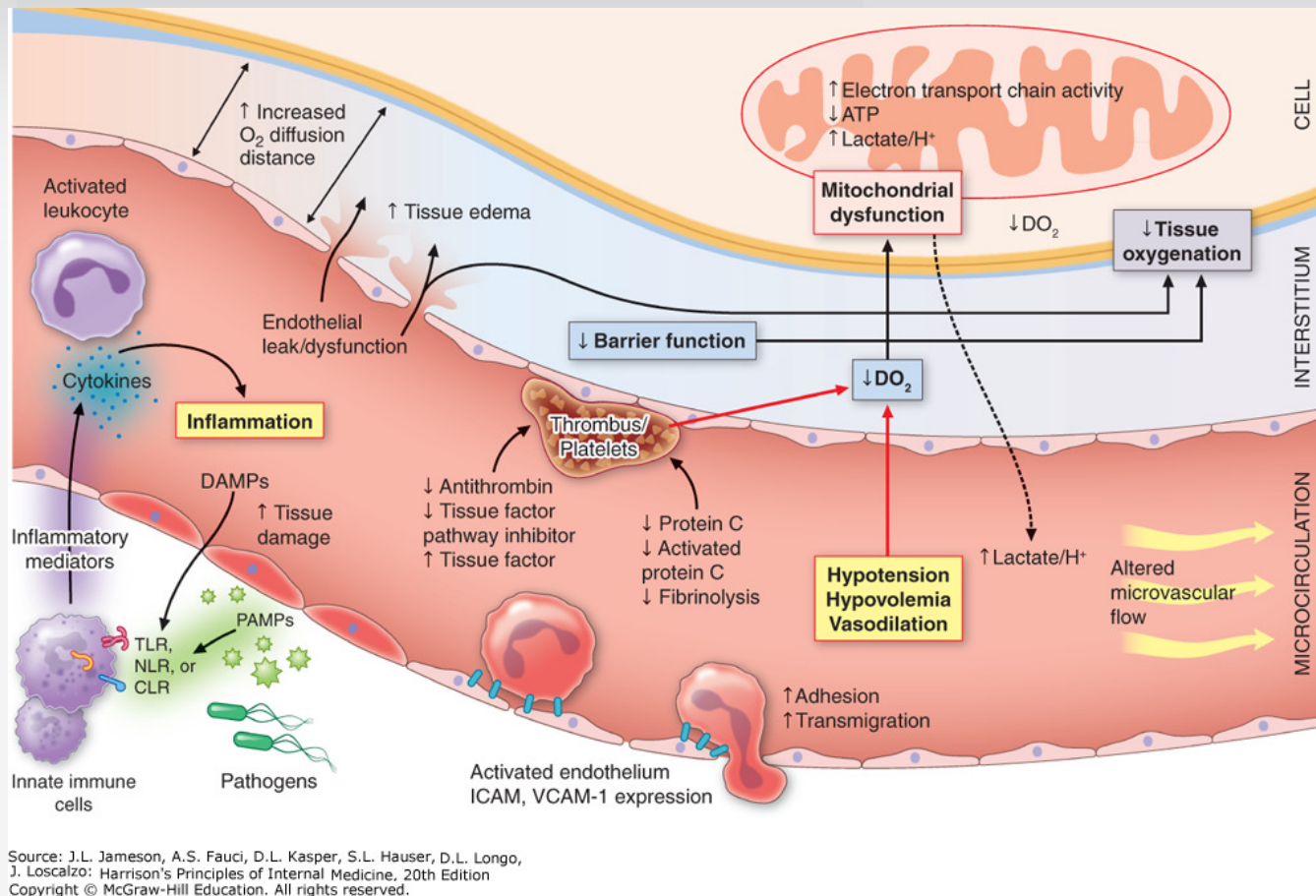
What is sepsis?

- A: An infection in the blood
- B: A contagious disease
- C: Your body's toxic reaction to an infection
- D: Something to scare your patient's with.

Origin of Sepsis

- Hippocrates claimed that sepsis (σήψις) was the process by which flesh rots, swamps generate foul airs, and wounds fester.
- Blood Poisoning
- Germ theory- microbes and toxins
- Body's response, including pro and
- Anti- inflammatory response





Select mechanisms implicated in the pathogenesis of sepsis-induced organ and cellular dysfunction. The host response to sepsis involves multiple mechanisms that lead to decreased oxygen delivery (DO_2) at the tissue level. The duration, extent, and direction of these interactions are modified by the organ under threat, host factors (e.g., age, genetic characteristics, medications), and pathogen factors (e.g., microbial load and virulence). The inflammatory response is typically initiated by an interaction between pathogen-associated molecular patterns (PAMPs) expressed by pathogens and pattern recognition receptors expressed by innate immune cells on the cell surface (Toll-like receptors [TLRs] and C-type lectin receptors [CLRs]), in the endosome (TLRs), or in the cytoplasm (retinoic acid inducible gene 1-like receptors and nucleotide-binding oligomerization domain-like receptors [NLRs]). The resulting tissue damage and necrotic cell death lead to release of damage-associated molecular patterns (DAMPs) such as uric acid, high-mobility group protein B1, S100 proteins, and extracellular RNA, DNA, and histones. These molecules promote the activation of leukocytes, leading to greater endothelial dysfunction, expression of intercellular adhesion molecule (ICAM) and vascular cell adhesion molecule 1 (VCAM-1) on the activated endothelium, coagulation activation, and complement activation. This cascade is compounded by macrovascular changes such as vasodilation and hypotension, which are exacerbated by greater endothelial leak tissue edema, and relative intravascular hypovolemia. Subsequent alterations in cellular bioenergetics lead to greater glycolysis (e.g., lactate production), mitochondrial injury, release of reactive oxygen species, and greater organ dysfunction.

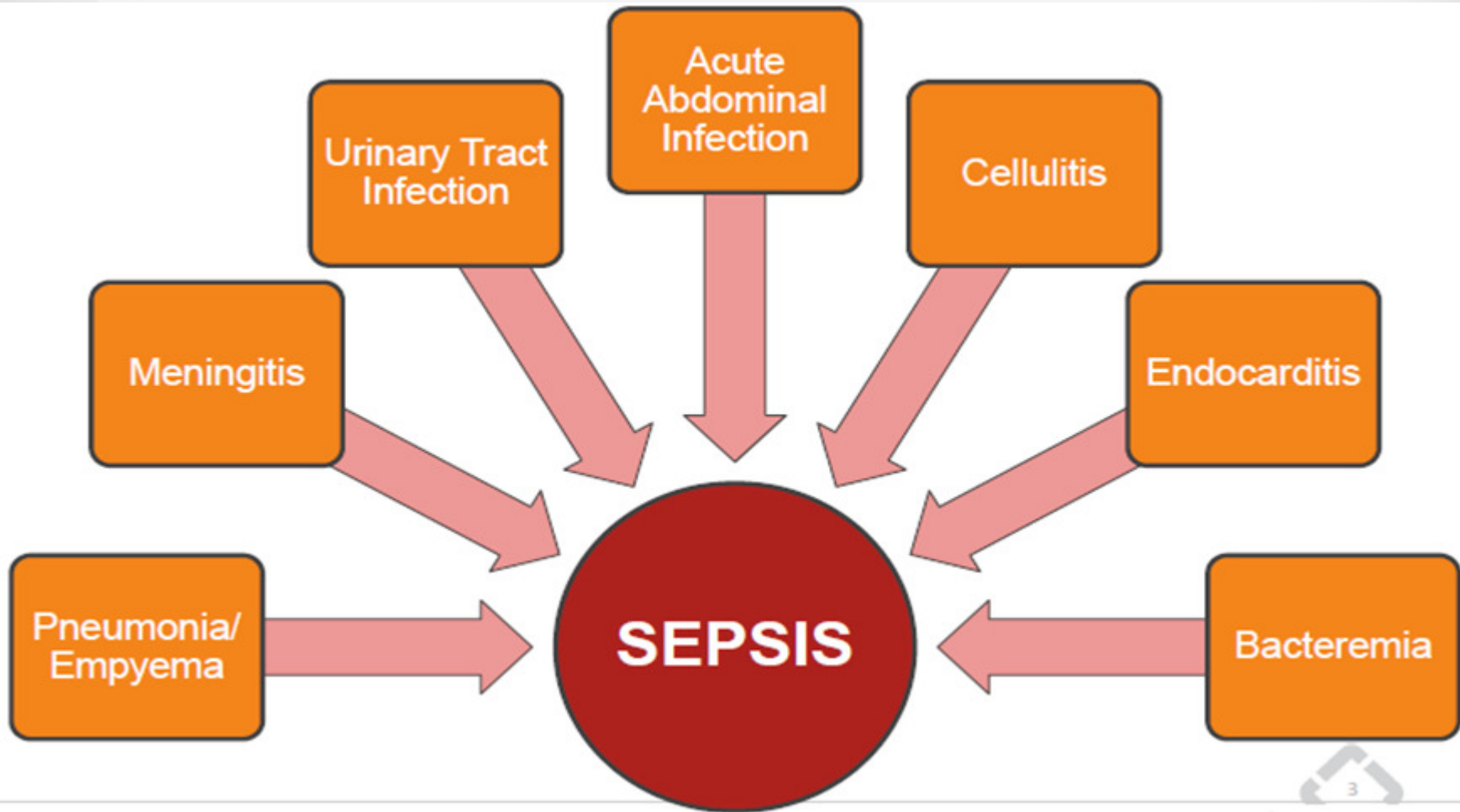
Sepsis Definition

- It is a potentially life threatening organ dysfunction caused by the body's response to infection.
- Four independent variables linked by a causal pathway
- Infection > Dysregulated host response > organ dysfunction > threat to life.

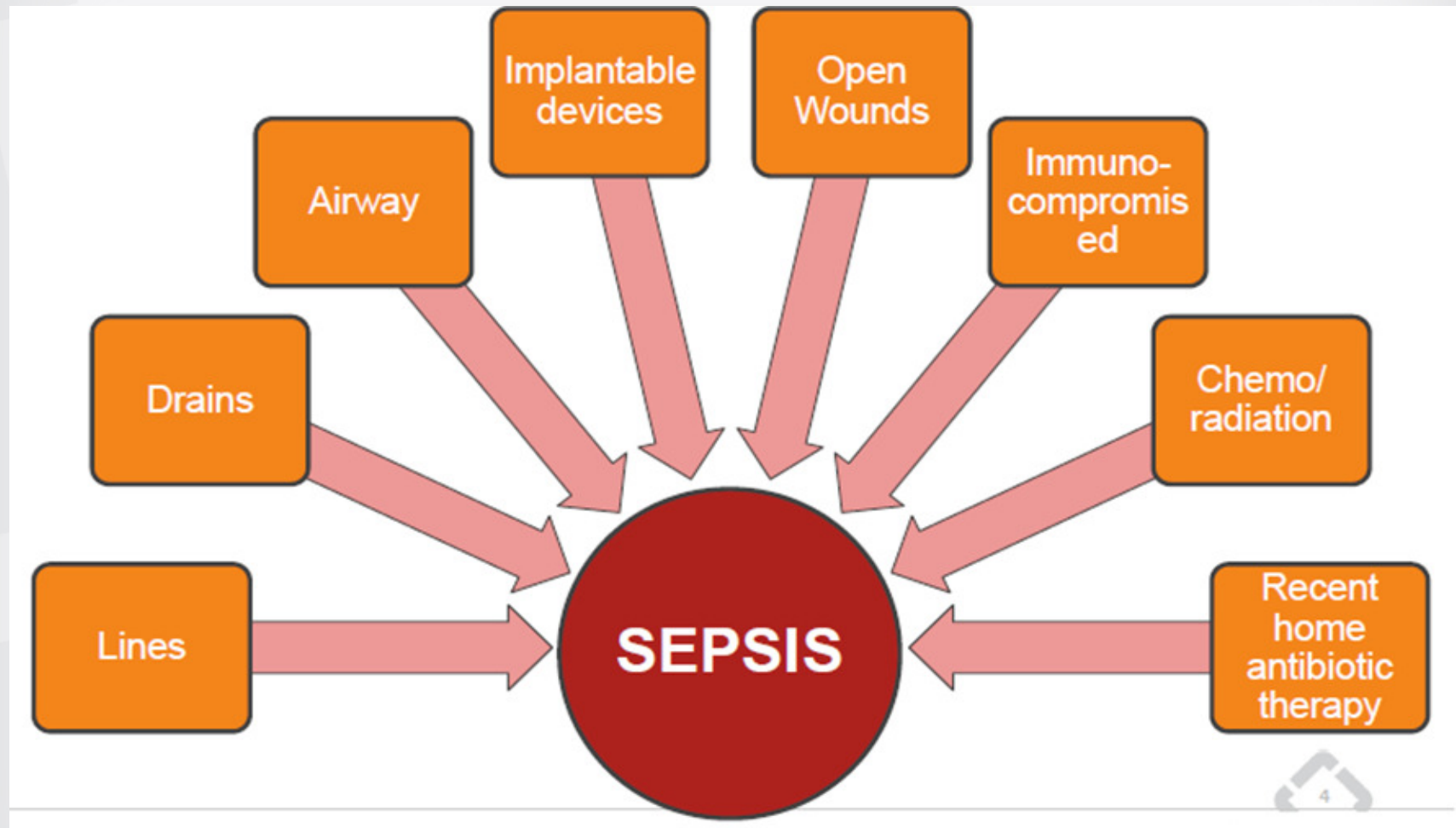
Incidence

- Estimates range from 1-2% of all hospitalizations
- Annually 500,000- 2 million cases in U.S.A.
- Severe sepsis is recorded in >2% of patients admitted to the hospital.
- Of these patients, half are treated in the intensive care unit (ICU), representing 10% of all ICU admissions.
- Since 2013 most expensive condition treated, about 24 billion dollars at that time.

Common Infection That Can Lead to Sepsis



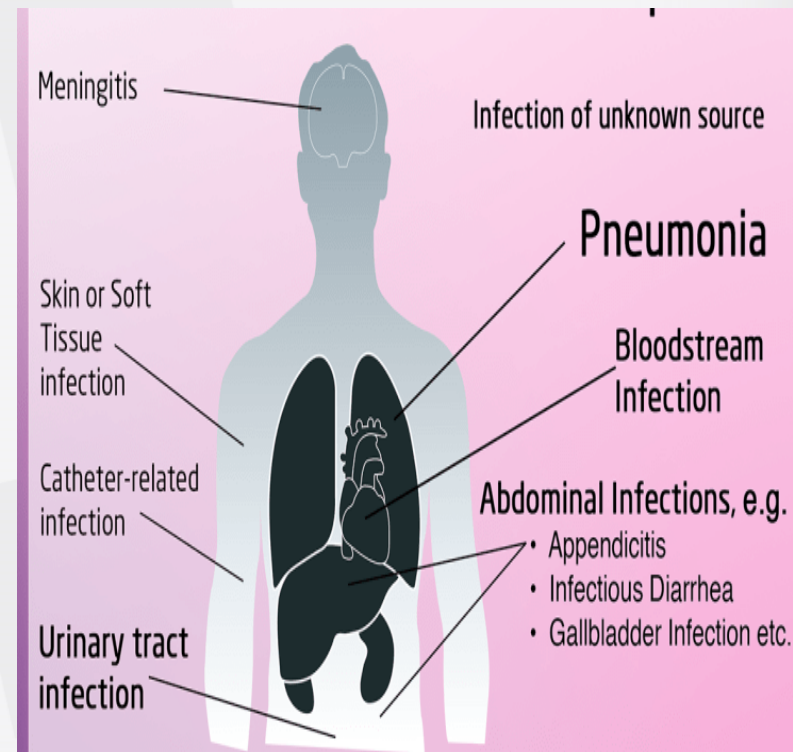
Common Sources of Infection



QUIZ

Q: What is the most common cause of sepsis?

- A: Urinary Tract Infection
- B: Pneumonia
- C: Intra Abdominal Infection-
Enteral causes
- D: Meningitis
- E: Other



Presentations

- Pneumonia is the most common cause, accounting for about half of all cases
- Next most common are intraabdominal
- Followed by urinary tract infections.
- Blood cultures are typically positive in only one third of cases, and in up to a third of cases, cultures from all sites are negative

QUIZ

Which of the following is not a sign of sepsis?

- A: Fever
- B: Rapid breathing
- C: Slow heart Rate
- D: Confusion

Sepsis - Diagnosis

- No GOLD standard
- Formerly based on SIRS criteria (systemic inflammatory response syndrome)
- More than 2/3 patients meet these criteria during the hospital stay
- ≥ 2 of the following:
 1. temperature $>38^{\circ}\text{C}$ or $<36^{\circ}\text{C}$
 2. heart rate >90 per min
 3. Respiratory rate >20 per min or $\text{PaCO}_2 <32$ mm Hg
 4. WBC $>12,000$ or <4000 or $>10\%$ bands

Sepsis - SOFA

- Due to the non-specificity of the SIRS criteria, SOFA was introduced
- Sequential Organ Failure Assessment
- The score is calculated at admission and every 24 hours until discharge, using the worst parameters measured during the prior 24 hours. –LOOK FOR A CHANGE

Sequential Organ Failure Assessment (SOFA) Score

System	Criteria	0	1	2	3	4
Respiratory	PaO ₂ /FiO ₂ (partial pressure of oxygen over fraction of inspired oxygen)	≥400 mmHg (53.3 kPa)	<400 mmHg (53.3 kPa)	<300 mmHg (40 kPa)	<200 mmHg (26.7 kPa)	<100 mmHg (13.3 kPa) with respiratory support
Coagulation	Platelets	≥150 x10 ³ /μL	<150 x10 ³ /μL	<100 x10 ³ /μL	<50 x10 ³ /μL	<20 x10 ³ /μL
Liver	Bilirubin	<1.2 mg/dL (20 μmol/L)	1.2-1.9 mg/dL (20-32 μmol/L)	2.5-5.9 mg/dL (33-101 μmol/L)	6-11.9 mg/dL (102-204 μmol/L)	>12 mg/dL (204 μmol/L)
Cardiovascular	Mean arterial pressure (MAP) or vasopressors requirement	MAP ≥70mmHg	MAP <70mmHg	Dopamine <5 μg/kg/min or dobutamine (any dose)*	Dopamine 5.1-15 μg/kg/min* or epinephrine ≤0.1 μg/kg/min or norepinephrine ≤0.1 μg/kg/min*	Dopamine >15 μg/kg/min or epinephrine >0.1 μg/kg/min or norepinephrine >0.1 μg/kg/min*
Neurologic	Glasgow coma scale score	15	13-14	10-12	6-9	<6
Renal	Creatinine (Cr) or urine output (UOP)	Cr <1.2 mg/dL (110 μmol/L)	Cr 1.2-1.9 mg/dL (110-170 μmol/L)	Cr 2.0-3.4 mg/dL (171-299 μmol/L)	Cr 3.5-4.9 mg/dL (300-440 μmol/L) or UOP <500 cc/day	Cr >5 mg/dL (440 μmol/L) or UOP <200 cc/day

*Doses given for at least 1 hour

NEJM Resident 360

Drawbacks

- Validated for mortality
- Time consuming, lab tests oriented--- so quick Sequential Organ Failure Assessment developed qSOFA---
- Alteration in mental status ([Glasgow Coma Score](#) ≤ 13)
- Systolic blood pressure ≤ 100 mm Hg
- Respiratory rate ≥ 22 /min

Septic Shock

- Subset of sepsis
- Persistent arterial hypotension (SBP, <90 mmHg; MAP <60 mmHg; or change in systolic by >40 mmHg from baseline)
- Vasopressor therapy needed to maintain mean arterial pressure at ≥ 65 mmHg and serum lactate >2.0 mmol/L despite adequate fluid resuscitation

QUIZ

What is the mortality rate for septic shock?

- A: 10%
- B: 20%
- C: 50%
- D: 80%



Sepsis Treatment

- Obtaining samples for culture, lactic acid- mainly for abdominal, urinary and soft-tissue infections and blood cultures
- Initiating empirical antimicrobial therapy- location of infection, onset, medical history
- Volume resuscitation – 30ml/kg initially
- Source control- significant improvement in mortality and morbidity

Delays are deadly

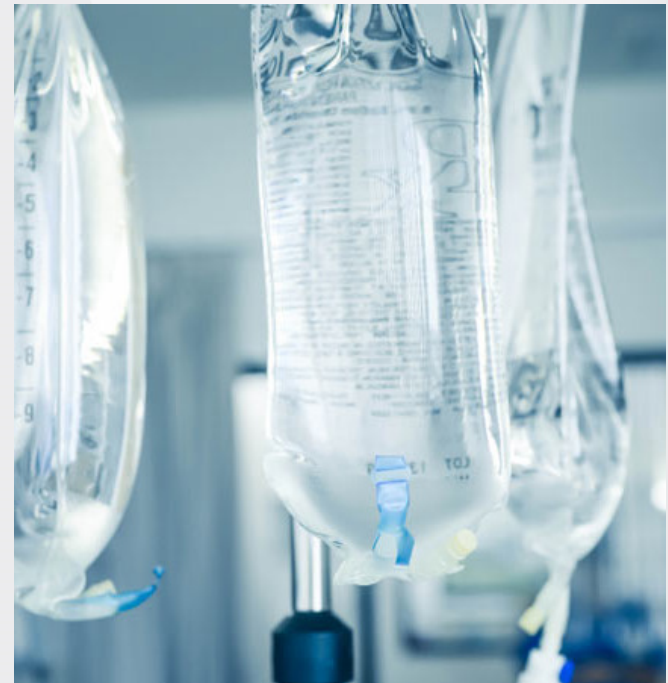
- Early recognition and therapy is ideal- Includes labs, fluids, vasopressors.
- For every 1 hour delay in antibiotics, ↑ in mortality by 3-7%.
- If more than a 45 minute delay in obtaining culture, go ahead and transfuse antibiotics.



Volume Resuscitation

Fluids, Fluids, Fluids

- Crystalloids including 0.9% Normal saline, Ringer's lactate, Hartmann's solution and Plasma-Lyte
- Bolus 30ml/kg in first 3 hours
- Afterwards could include blood, blood products or colloids
- Aim for a MAP of 65mm of Hg, if not consider pressors



Pressor Agents

- ❖ Norepinephrine – best mortality (alpha plus beta adrenergic stimulation)- Levophed
- ❖ Phenylephrine – next choice – probably higher mortality (alpha)- Neosynephrine
- ❖ Vasopressin – works via different receptor and may lower heart rate – mortality data not available
- ❖ Dopamine – higher mortality, arrhythmias
- ❖ Epinephrine – when all else fails

Dobutamine

- ❖ **Cardiogenic shock – low mixed venous oxygen that does not respond to fluids**

Steroids

- ❖ No mortality benefit in routine use
- ❖ Reserved for patients not responding to pressors for the most part
- ❖ Adrenal insufficiency- individuals on routine corticosteroids.

Response to Treatment

30 minute re-evaluation.

- Mean arterial pressure
- Skin color and capillary refill
- Mental status
- Temperature
- Vitals, heart rate, respiratory rate
- What does an elevated lactic acid signify?
- Why measure mixed venous oxygen saturation – 65%

Center for Medicare & Medicaid Recommendations

- 3 and 6 hour bundles
- Result reports
- **Improved Mortality**
- Piedmont hospital cohorts

3 Hour Bundle

Looks at 4 things:

- 1. Cultures**
- 2. Antibiotic deliverance (Right choice is key)**
- 3. Lactic acid results and subsequent follow up ≥ 4 critical, less than that not so – we act on 2 and above**
- 4. Volume resuscitation 30 mls/ kg**

6 Hour Bundle

- **Follow up after 3 hours**
- **Document response to therapy;**
 - **i.e. improved lactate and BP**
- **Start vasopressors and insert central line**
 - **Document response to vasopressors**

We fail in documentation and are slow in implementing

QUIZ

What can trigger a Sepsis Time Zero & subsequent need for completion of the 3hr Bundle?

- Check all that apply.
- A: Positive Sepsis Orange Alert
- B: Positive Sepsis Red Alert
- C: Placement of Order Set by provider
- D: When your shift starts



Sepsis Alerts - Nursing

Sepsis Screening: Step #1

- Identify patients who are showing signs of a **NEW** infection
- Identify patients who are showing signs of a current infection getting **WORSE**

Is my patient showing...

Signs and/or Symptoms

Hypo—or Hyperthermia

WBC <4000 or >12000

Elevated Heart Rate

Elevated Respiratory Rate

Altered Mental Status

Unexplained or Newly Developed:

Cough

Abdominal Pain

Vomiting or Diarrhea

Reddened or purulent wound or IV site

Hot/red area of skin

Pain on urination or cloudy/foul-smelling urine

Body aches or general malaise

Confusion, Memory Loss, Hallucinations

...of **NEW** or **WORSENING**

Present on admission

Develops while hospitalized

New Antibiotic Order

Sepsis is often associated with infections of the:

Lung

UTI

Skin

Gut

Bloodstream

Spikes Fever

↑ White Blood Count

↑ Lactate

↓ Blood Pressure

Elevated MEWS

On Abx with no improvement

Infection?

Patients will be screened for infection in several ways

On admission. . .

- By using the Admissions Navigator

On inpatient units, every shift







- By using the Daily Cares/Safety Flowsheet or the Screening Flowsheet

Infection Screening Question:

Is the patient showing signs and symptoms of a new or worsening infection?

Sepsis Screening: Step #2




Clinical indicators for potential infection include:

Indicator	
	Temperature: < 96.8°F or > 101°F
	Heart Rate: > 90 bpm
	Respirations: > 20 min
	White Blood Cells: < 4,000 μ L or > 12,000 μ L
	Blood Glucose: > 140 mg/dL
	Altered Mental Status: Present

Altered mental status will be assessed every shift by using the Neurological Section of the Assessment Flowsheet or the Screenings Flowsheet

Sepsis Screening: Step #3

Clinical indicators for organ dysfunction include:

Indicator	
	Systolic Blood Pressure < 90 mmHg Mean Arterial Pressure < 65 mmHg SBP Δ more than 40mmHg from baseline
	Lactate > 2 mmol/L Creatinine >2.0 mg/dL Bilirubin >2.0 mg/dL INR >1.5 PTT > 60 secs
	Acute lung injury w/ P/F ratio < 250 (in the absence of PNA) Acute lung injury w/ P/F ratio < 200 (in the presence of PNA)

Electronic Medical Record Combines Data Points to Generate an Alert



March 11, 2019

SITUATION

- **ORANGE ALERT:** Patient has screened positive for sepsis.
- **RED ALERT:** Patient has activated a **CODE SEPSIS**.

BACKGROUND

1. Primary reason for admission
2. Admission date

ASSESSMENT

Patient is exhibiting signs and symptoms of infection and/or organ dysfunction

CONFIRMED OR SUSPECTED INFECTION

POSITIVE SEPSIS SCREEN

CODE SEPSIS

Criteria: Patient has a suspected or confirmed infection.

Clinical Suspicion for Infection:

- Line, drain, airway, or implantable device
- Open wound
- Infection in abdomen, bloodstream, bone/joint, heart, lungs, skin/soft tissue, bladder, CNS
- Recent home antibiotics
- Immunocompromised and/or chemotherapy/radiation
- Unsure of source

Criteria: Suspected/confirmed infection + ≥ 2 signs/symptoms of infection

Signs/symptoms of infection:

- RR > 20/min
- Temp < 36°C/96.8°F
- Temp > 38.3°C/101°F
- HR > 90 bpm
- WBC < 4,000 μ /L
- WBC > 12,000 μ /L
- Blood glucose > 140 mg/dL
- Altered Mental Status present

Criteria: Suspected/confirmed infection + ≥ 2 signs/symptoms of infection + ≥ 1 sign of organ dysfunction

Signs and Symptoms of Organ Dysfunction:

- Lactate > 2 mmol/L
- SBP < 90 mmHg
- MAP < 65 mmHg
- Cr > 2.0 mg/dL
- Bilirubin > 2.0 mg/dL
- PLT < 100,000 μ /L
- INR > 1.5
- aPTT > 60 secs
- Acute lung injury w/ P/F ratio < 250 (in the absence of PNA)
- Acute lung injury w/ P/F ratio < 200 (in the presence of PNA)

Version 1.0 Rev. 8/2017

The **Positive Sepsis (Orange)** BPA will fire when:

Infection Screening Positive

≥2 Clinical Criteria of Infection

- Blood WBC < 4,000 μ L or > 12,000 μ L
- Glucose > 140 mg/dL
- Altered Mental Status
- Temp < 96.8°F or > 101°F
- HR > 90 bpm
- Resp > 20 min

The screenshot shows a clinical advisory window titled "POSITIVE SEPSIS SCREENING". The window contains the following text:

Notify Attending with the following information:

- S:** Patient has screened positive for sepsis.
- E:** Primary reason for admission is--
- A:** Currently the patient is exhibiting signs and symptoms of infection which are--
- R:** Piedmont protocol recommends the Sepsis orderset and appropriate antibiotics be ordered.

For an additional resource contact the code sepsis team.
Code Sepsis Team Contact Information and SBAR Communication Tool [4](#)

Acknowledge Reason
Notify Provider:

Buttons at the bottom:

Quiz

Per the [Sepsis Promise Package](#), who should be notified when a Positive Sepsis Screening (Orange) Alert fires?

- A: Charge Nurse
- B: Current Attending
- C: Code Sepsis Response Team
- D: Administrator on Call
- E: EMR will let them know

Positive Sepsis (Orange) Alerts

Notify Provider:
Indicates that the immediate action following the appearance of the BPA was to call the attending provider noted on the patients chart.

Alert:

POSITIVE SEPSIS SCREENING

Notify Attending with the following information:

S: Patient has screened positive for sepsis.
B: Primary reason for admission is--
A: Currently the patient is exhibiting signs and symptoms of infection which are--
R: Piedmont protocol recommends the Sepsis orderset and appropriate antibiotics be ordered.

For an additional resource contact the code sepsis team.

[Code Sepsis Team Contact Information and SBAR Communication Tool](#)

Acknowledge Reason _____

Notify Provider **Sepsis orderset is active** ▼

Enter comment **Select Other Option**
Sepsis orderset is active

Positive Sepsis (Orange) Alerts

Alert:

POSITIVE SEPSIS SCREENING

Notify Attending with the following information:

S: Patient has screened positive for sepsis.
B: Primary reason for admission is--
A: Currently the patient is exhibiting signs and symptoms of infection which are--
R: Piedmont protocol recommends the Sepsis orderset and appropriate antibiotics be ordered.

For an additional resource contact the code sepsis team.
[Code Sepsis Team Contact Information and SBAR Communication Tool](#)

Acknowledge Reason _____

Notify Provider **Sepsis orderset is active** ▼

Enter comment **Select Other Option**
Sepsis orderset is active □

Sepsis Order Set is Active: Indicates that the patient has had the sepsis order set and three hour bundle elements initiated.

Positive Sepsis (Orange) Alerts

Alert:

POSITIVE SEPSIS SCREENING

Notify Attending with the following information:

S: Patient has screened positive for sepsis.
B: Primary reason for admission is--
A: Currently the patient is exhibiting signs and symptoms of infection which are--
R: Piedmont protocol recommends the Sepsis orderset and appropriate antibiotics be ordered.

For an additional resource contact the code sepsis team.

[Code Sepsis Team Contact Information and SBAR Communication Tool](#)

Acknowledge Reason _____

Notify Provider **Sepsis orderset is active** ▼

Enter comment **Select Other Option**
Sepsis orderset is active

✓ Accept Dismiss

Dismiss: Allows the nurse to briefly close the alert in order to gather necessary information for the SBAR

Quiz

Per the [Sepsis Promise Package](#), who should be notified when a Code Sepsis (Red) Alert fires?



- A: Charge Nurse
- B: Current Attending
- C: Code Sepsis Response Team
- D: Administrator on Call
- E: Gift of Life Team

The **Code Sepsis (Red)** BPA will fire when:

Infection Screening
Positive

≥2 Clinical Criteria of
Infection

- Blood WBC < 4,000 μ L or > 12,000 μ L
- Glucose > 140 mg/dL
- Altered Mental Status
- Temp < 96.8° F or > 101° F
- HR > 90 bpm
- Resp > 20 min

≥1 Clinical Criteria of
Organ Dysfunction

- SBP < 90 mmHg
- MAP < 65 mmHg
- SBP Δ more than 40 from baseline
- Lactate > 2 mmol/L
- Creatinine >2.0 mg/dL
- Bilirubin >2.0 mg/dL
- INR >1.5
- PTT > 60 secs
- Acute lung injury w/ P/F ratio < 250 (in the absence of PNA)
- Acute lung injury w/ P/F ratio < 200 (in the presence of PNA)

DevPractice Advisory - Willow_Holbert
Patient Safety (Advisory: 1)

Alert:

CODE SEPSIS

TIME ZERO BEGINS NOW

ACTIVATE THE CODE SEPSIS TEAM

Notify the Code Sepsis Team with the following information:
S: Patient has activated a CODE SEPSIS
B: Primary reason for admission is--
A: Currently the patient is exhibiting signs and symptoms of infection which are--
R: The Sepsis orderset and appropriate antibiotics should be activated.

Code Sepsis Team Contact Information and SBAR Communication Tool

Acknowledge Reason
Notify Code Sepsis Team Select Other Option
Select Other Option
Sepsis orderset is active

Accept & Stay Accept Denies

Code Sepsis (Red) Alerts

Notify Code Sepsis Team: Indicates that the immediate action following the appearance of the BPA was to call the code sepsis team to initiate a rapid response.

Alert:

CODE SEPSIS

TIME ZERO BEGINS NOW

ACTIVATE THE CODE SEPSIS TEAM

Notify the Code Sepsis Team with the following information:

- S:** Patient has activated a CODE SEPSIS
- B:** Primary reason for admission is--
- A:** Currently the patient is exhibiting signs and symptoms of infection which are--
- R:** The Sepsis orderset and appropriate antibiotics should be activated.

[Code Sepsis Team Contact Information and SBAR Communication Tool](#)

⚠ Acknowledge Reason

Notify Code Sepsis Team

Code Sepsis (Red) Alerts

Alert:

CODE SEPSIS

TIME ZERO BEGINS NOW

ACTIVATE THE CODE SEPSIS TEAM

Notify the Code Sepsis Team with the following information:
S: Patient has activated a CODE SEPSIS
B: Primary reason for admission is--
A: Currently the patient is exhibiting signs and symptoms of infection which are--
R: The Sepsis orderset and appropriate antibiotics should be activated.

[Code Sepsis Team Contact Information and SBAR Communication Tool](#)

Acknowledge Reason

Notify Code Sepsis Team **Select Other Option** ▼
Select Other Option
Sepsis orderset is active

Accept & Stay ✓ Accept Dismiss

Sepsis Order Set is Active: Indicates that the patient has had the sepsis order set and three hour bundle elements initiated.

Code Sepsis (Red) Alerts

Alert:

CODE SEPSIS

TIME ZERO BEGINS NOW

ACTIVATE THE CODE SEPSIS TEAM

Notify the Code Sepsis Team with the following information:
S: Patient has activated a CODE SEPSIS
B: Primary reason for admission is--
A: Currently the patient is exhibiting signs and symptoms of infection which are--
R: The Sepsis orderset and appropriate antibiotics should be activated.

[Code Sepsis Team Contact Information and SBAR Communication Tool](#)

Acknowledge Reason

Dismiss: Allows the nurse to briefly close the alert in order to gather necessary information for the SBAR

PATIENT LABEL

not part of the medical record

Sepsis 3 Hour Bundle Completion Tracker

Use this tracker when a Code Sepsis Red Alert Fires or the Sepsis order set is placed. Time Zero is defined as the earliest of these two happening.

NOT PART OF THE
MEDICAL RECORDSubmit to Manager
When Complete**TIME ZERO Source:**

- Code Sepsis Red Alert Fired
 Sepsis Order Set Placed

TIME ZERO:**3 HOUR GOAL:**

Time Completed	Element	Key Notes
	Lactic Acid Drawn	Compliance = Lactic Acid collected within 2 hours prior to or 3 hours after Time Zero <ul style="list-style-type: none"> includes POC Lactate
	Blood Cultures Drawn	Compliance = two blood cultures required, at least one collected <u>before</u> administering antibiotics and <u>both</u> within 48 hours prior to or 3 hours after Time Zero <ul style="list-style-type: none"> If there is a delay of more than 45 min from Time Zero in obtaining blood cultures, administer antibiotics first and continue to attempt blood cultures
	Antibiotic Administration	Compliance = IV and IM antibiotics started within 2 hours prior to or 3 hours after Time Zero <ul style="list-style-type: none"> If a <u>mono-therapy antibiotic</u> is being used (ex., Zosyn), the antibiotic will be compliant as long as it's administered within the time frame If <u>two antibiotics</u> are being used (ex., Vancomycin and Zosyn), <u>both</u> need to be started within the time frame to be compliant.
	Fluid Administration Completed	Compliance = calculated fluid target (30 mL/kg) <u>completely infused</u> within 2 hours prior to or 3 hours after Time Zero <ul style="list-style-type: none"> Fluids can be any crystalloid fluid, not just normal saline To receive credit for Fluid Administration, all 3 elements must be present: <ol style="list-style-type: none"> Target volume of crystalloid fluids were <u>ordered</u> (verified by order on MAR) Fluids were <u>started and completely infused</u> (verified by administration/scan time and stop time on MAR) Target volume was <u>documented</u> (verified by <u>total volume infused</u> on Intake/Output flowsheet)

All Four Elements Completed at:

Add relevant notes to the back side of this page.

RN

STAT/RN

MD

Revised: 4/12/19 Version 8

Take Away

- Use the nursing tools in Epic to communicate with the physicians. Ideally verbal/page.
- Assess the patient for response to treatment and notify the physician if there is one or not
- Respond to Red Alerts – make sure the physician/resident addresses the issue triggering the alert

The End

Questions/Comments



References & Acknowledgements

- Dr. Vijay Rathinam – Director of Hospital Medicine
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