SSC RECOMMENDATIONS AND PREGNANCY

- The SSC tools for sepsis screening don't work well in pregnancy.
  - Physiology is altered in pregnancy.
  - Low specificity to signs.
  - Young patients can be quite ill with few signs.
  - Pregnancy complicates the use of those tools.
- A modified strategy is needed.
  - California Maternal Quality Care Collaborative (CMQCC).
  - Two step process
    - Universal screening.
    - Confirmatory Step detecting organ dysfunction.

PREGNANCY CONSIDERATIONS

- Pregnant patients tend to be young and healthy.
- The non-pregnant adult bundles may not be right for pregnancy.
- The risk of Pulmonary Edema with preeclampsia.
- Women with epidurals have higher risk of low grade fevers and fever with epidural is common.
- Antibiotic resistance from treatment during pregnancy.
- Lactate is commonly elevated in laboring patients.
- Screening can be unreliable during pushing, as lactate, HR, and RR can be elevated.

UNIVERSAL SCREENING

- Since sepsis can be obscured by pregnancy, we will screen everyone with a simple bedside tool.
  - The SOFA and other screening tools from the Surviving Sepsis Campaign have low specificity for pregnant patients.
  - OB specific tools such as MOEWS, omqSOFA and S.O.S. have their own limitations.
  - Adjustments in HR, RR, WBC, and mental status changes are needed.
  - For example, The Surviving Sepsis Campaign suggests a positive screen would include HR>90, RR>20, and WBC>12,000.
  - ACOG suggests HR>110, RR>24, and does not even utilize WBC.
  - Kaiser suggests HR>110, RR>24, and WBC >15,000 as positive screen values.
  - The goal is to maximize sensitivity while minimizing false positive results.

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ALLINA TWO STEP PROCESS TO IDENTIFY SEPSIS

- Step 1: Screen for sepsis when patient admitted and every shift.
  - Four questions:
  - Does your patient have:
    - 1. Unexplained hypotension: SBP<90 or MAP<65?
    - 2. Temperature >= 39 degrees C?
    - 3. Two or more Signs of Sepsis?
    - 4. A Suspected infection based on your assessment?
  - Any Yes is a Positive Screen->Activate Bundle(Step 2).

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SIGNS OF SEPSIS: VITAL SIGN SCREENING

- HR > 120 bpm or <50 bpm.
- Respiratory Rate >= 24 bpm or <10 bpm or SpO2 < 95% on room air.
- Temp. > 100.4 F (38.0 C).
- Fetal Tachycardia >160 bmp at baseline.
- WBC > 15,000 or <4,000, OR >10% immature neutrophils.
- Acutely altered mental status.

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SUSPECTED INFECTION

- Generalized symptoms: shaking, chills, weakness, lethargy, new onset headache or neck stiffness.
- Uterine tenderness and/or foul-smalling amniotic fluid/vaginal discharge.
- Prolonged rupture of membranes (with s/s infection).
- Respiratory: cough, SOB, increasing oxygen needs, decreasing O2 sats.
- Urinary: pain with urination, flank pain.
- GI: new abdominal pain, new diarrhea.
- High risk for infection (PROM, prolonged IOL, immunocompromised) with s/s infection.
- Skin/wound: new drainage, redness, or rash.
- Bone/joint symptoms: new warm, or swollen joint.

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SUSPECTED INFECTION

- Known or suspected chorioamnionitis.
- Manual removal of placenta (with s/s infection).
- Other.

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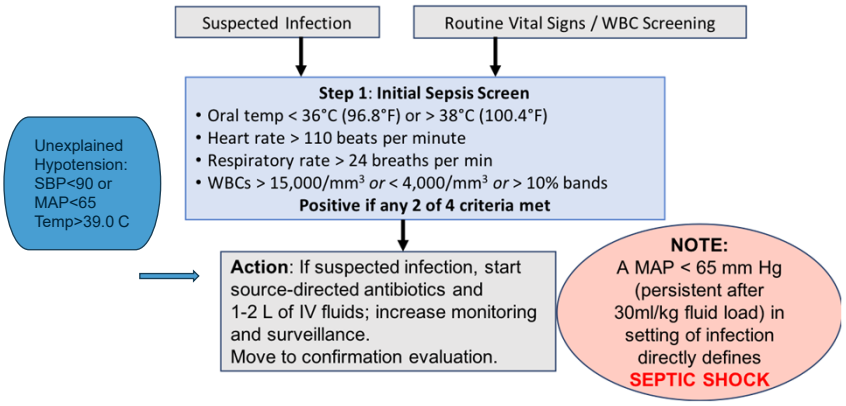
INITIAL SEPSIS SCREEN (CMQCC)



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ACTION: SEPSIS BUNDLE (STEP 2)

- Act to begin treatment and verify sepsis diagnosis from a positive screen.
  - Source directed antibiotics (after Blood Cultures).
  - Fluids 30 cc/kg crystalloid.
- Notify Provider and RRT.
- RRT/Provider to confirm positive screen and not another illness.
- Verify and treat sepsis (Provider and RRT). Bundled orders are implemented.
  - Evaluate with Laboratory Tests, monitor vital signs.
  - Fluid bolus response.
  - Begin Antibiotics.
  - Follow Lactate levels.
  - Search for organ dysfunction.
  - Pressors as needed.
  - Source identification.

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LABORATORY TESTS

- Evaluation
  - I &O
  - Oximetry
  - Blood Cultures
  - CBC and Diff
  - Coagulation panel
  - Metabolic panel
  - Lactate, Venous

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FLUID BOLUS

- 500 cc bolus to see if patient responds, diagnostic test.
- If sepsis is confirmed, then 30 ml/kg is standard, but the evidence of benefit is small.
- Reperfusion injury is important.

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BEGIN ANTIBIOTICS

- Early administration of antibiotics, ideally within one hour of presentation, is critically important in sepsis.
- The initial choice of antibiotics in critically-ill patients is generally empiric and broad spectrum to cover most or all likely pathogens.
- Assessment for source control (such as surgical/percutaneous drainage or debridement) should be initiated in a timely fashion using the least invasive approach possible.

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CHOICE OF ANTIBIOTICS

- First Line
  - Chorioamnionitis (IAI)
    - Ampicillin-Sulbactam 3 g IV q 6 hours
  - Septic Shock (Ob related)
    - Piperacillin-tazobactam 4.5 g IV x 1 over 30 minutes
- Second Line
  - Chorioamnionitis (IAI)
    - Ertapenem 1 g IV q 24
  - Septic Shock
    - Imipenem-cilastin 500 mg IV q6 hours
- Antibiotic Reference Guide for your Hospital

LACTATE LEVELS

- If initial lactate is <2.0 it doesn't support sepsis
- If initial lactate is >4.0 presume septic shock.
- Follow lactate to guide fluid therapy and treatment

LACTATE CONSIDERATIONS IN PREGNANCY

- Lactate can be elevated by metabolic changes
  - Decreased metabolism in the liver occurs with sepsis before LFT changes.
  - Production can be increased by:
    - Catecholamine effects.
    - Adrenergic caused aerobic glycolysis.
    - Insulin resistance.
    - Muscle proteolysis creating pyruvate.
    - Impairment of pyruvate dehydrogenase.

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ORGAN DYSFUNCTION

- Pulmonary:
  - Increased O2 requirements to maintain an SpO2 of >90%.
  - Lactate greater than 2.
- Renal::
  - Low urine output less than 0.5 ml/kg/hr for >2 hours.
  - Creatinine greater than 2.0 mg/dL.
- Central Nervous System:
  - Altered mental status.
- Cardiovascular:
  - SBP less than 90 mmHg or 40 mm Hg below the baseline or MAP <65 mm Hg.
- Hematologic:
  - Platelet count less than 100,000.
- Liver:
  - Bilirubin greater than 2.0 mg/dL.
  - Coagulopathy, INR> 1.5 or PTT greater than 60 sec.

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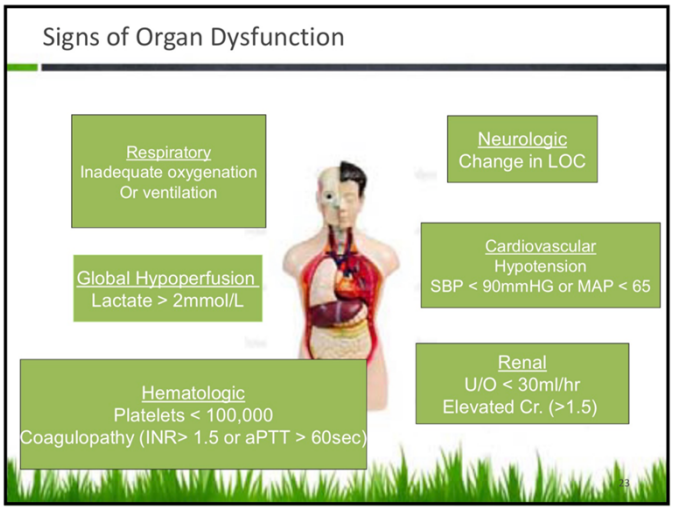
SIGNS OF ORGAN DYSFUNCTION



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PRESSORS

- Norepinephrine is the preferred pressor
- Can use peripherally early.
- Change to central by 24 hours
- No benefit to higher MAP than 65.

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IDENTIFY THE SOURCE

- Source control is critical
- Delivery can be delayed if the source can be treated
- Obstetric vs non-obstetric sources

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TREATMENT AND EVALUATION

- Simultaneous treatment and evaluation.
- Golden Hour (Start).
  - antibiotics and fluid resuscitation.
  - Give fluid, order tests, give antibiotics.
- Refine resuscitation and antibiotics as tests come back.
  - For example, decrease fluid as lactate normalizes to avoid pulmonary edema.
  - Narrow spectrum of antibiotics as cultures and sensitivities return.

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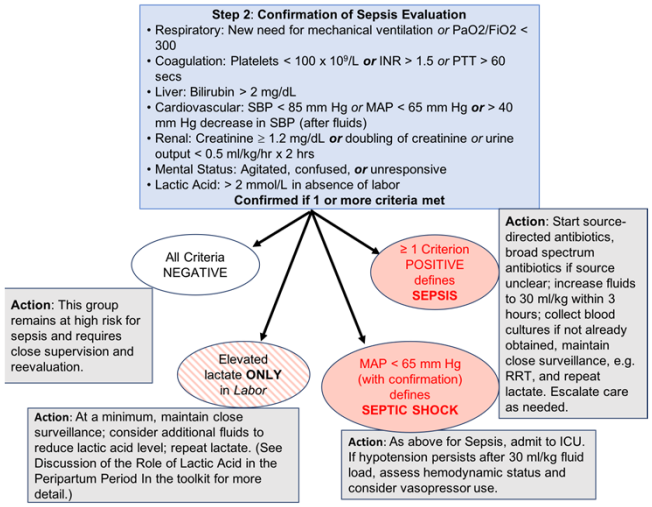
CONFIRMATION OF SEPSIS EVALUATION (CMQCC)



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STRONG RECOMMENDATIONS IN SEPSIS MANAGEMENT

- Hospitals institute a standard screening and standard operating procedures to address Sepsis.
- Give antimicrobials ASAP ideally within 1 hour.
  - If probable sepsis give ABX immediately.
  - For possible sepsis without shock and other possible reasons, evaluate rapidly and if concern persists for possible infection after a time limited evaluation, start ABX within 3 hours.
  - For low likelihood of Sepsis without shock and positive SIRS criteria, suggest continuing evaluation and deferring antibiotics.
  - For hypotension early norepinepherine to achieve minimum MAP even if it has to be given peripherally for a short time. Balanced crystalloid is preferred over saline. Albumin is suggested in patients with substantial crystalloid administration.

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SEPSIS SCREEN POSITIVE BUNDLE

- Bundle starts with confirmation of screen positive.
- Then bolus of fluid (half will be fluid responsive).
- Evaluation:
  - I &O
  - Oximetry
  - CBC and Diff
  - Coagulation panel
  - Metabolic panel
  - Lactate, Venous
  - Blood Cultures
- Treatment:
  - IV antibiotics.

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SEPTIC SHOCK BUNDLE

- Bundle starts with confirmation of Septic Shock
  - Persistent hypotension within one hour of fluid bolus.
  - Lactate >= 4.0.
  - Need for vasopressors to keep MAP >65.
  - Provider documents septic shock
- Antibiotics (Blood cultures first if possible).
- Then Bolus of fluid.
- Evaluation:
  - I &O, Oximetry, CBC and Diff, PT, Metabolic panel, Lactate, Venous, Blood Cultures.
- Treatment:
  - IV antibiotics. Broad spectrum.
  - Pressors as required.
  - Transfer to ICU.

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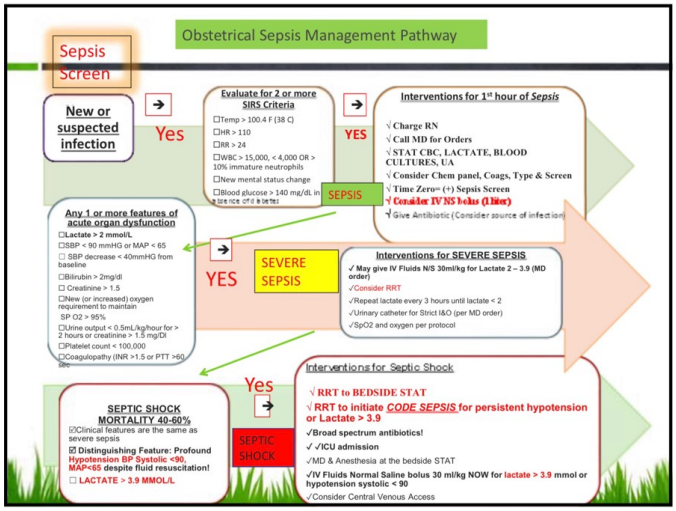
OBSTETRICAL SEPSIS



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- Summary

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SEPSIS ESSENTIALS

- Early Recognition and ACTION are key to saving moms with Sepsis
  - Have a high suspicion for Sepsis
  - Have a screening program with education, performance review and improvement plan.
  - Golden hour
    - Create bundled order sets to streamline early evaluation and treatment
    - Fluid bolus with active volume monitoring and replacement
    - Early antibiotics
  - Individualize treatment to patient as quickly as possible.
    - Fluid administration
    - Antibiotic choice.
    - ICU as needed

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AND MORE

- New in Sepsis:
  - No longer use SIRS
  - No longer use Severe Sepsis. Since Sepsis has a 10% mortality in hospital it is already "Severe"
  - Changed to include recommendation for 30 cc/kg crystalloid in the first 3 hours for sepsis or septic shock.
  - Use balanced crystalloid rather than normal saline (weak evidence)
  - Start vasopressors peripherally rather than waiting for central line access in patients with hypotension in order to restore MAP to desired levels.
  - Don't use vitamin C.
  - Suggest using IV corticosteroids in patients with ongoing shock requiring vasopressin.
  - For adult survivors of Septic Shock-recommend assessment and follow-up for physical, cognitive, and emotional problems after hospital discharge.

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