



Obstetric Sepsis

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Conflicts of Interest

- None to disclose

Learning Objectives

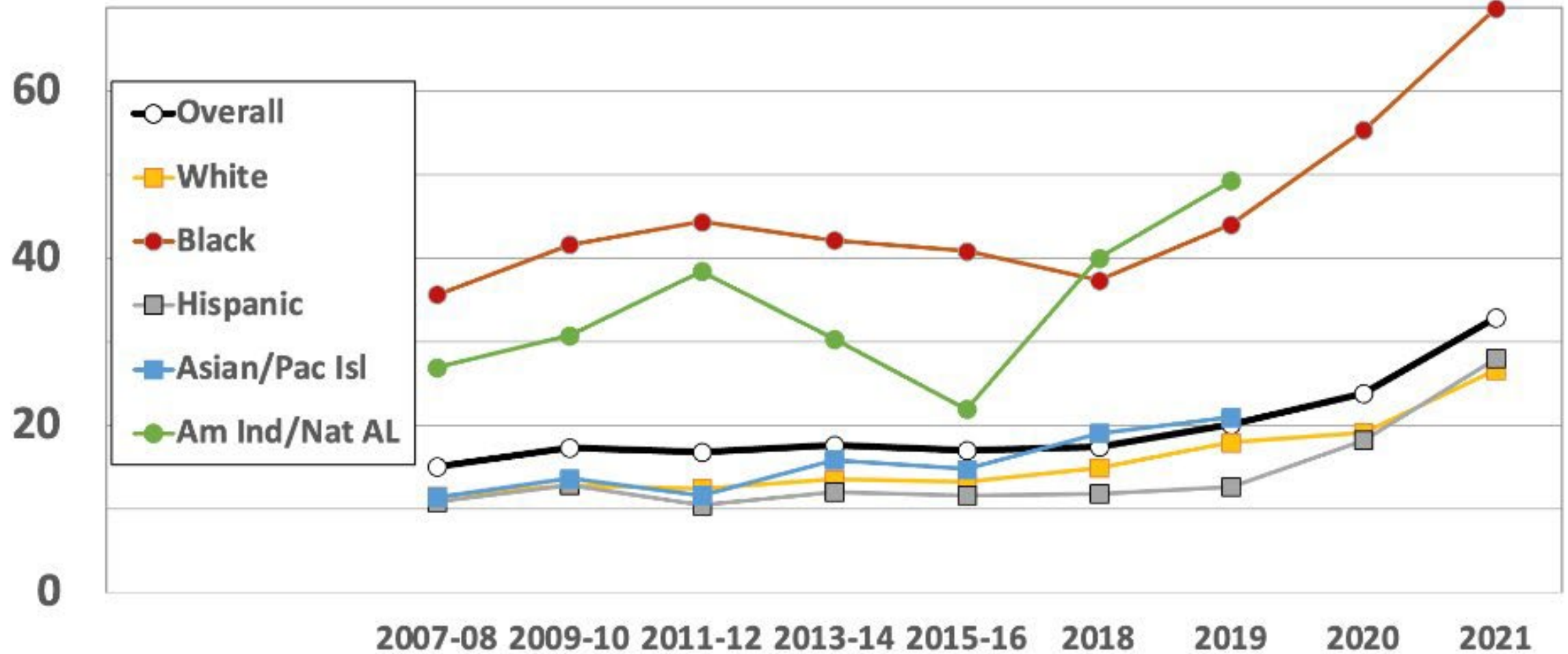
- 1) Discuss the pathophysiology of obstetric sepsis including specific physiologic changes in pregnancy that contribute to delayed recognition and sepsis related morbidity/mortality
- 2) Compare and contrast sepsis screening systems and describe how they perform in pregnancy
- 3) Describe OB specific sepsis escalation and management considerations and provide examples for how OB-specific algorithms can be integrated into overall hospital-level sepsis care
- 4) Identify at least two strategies being utilized to improve sepsis outcomes in pregnant and postpartum patients



Level Setting:

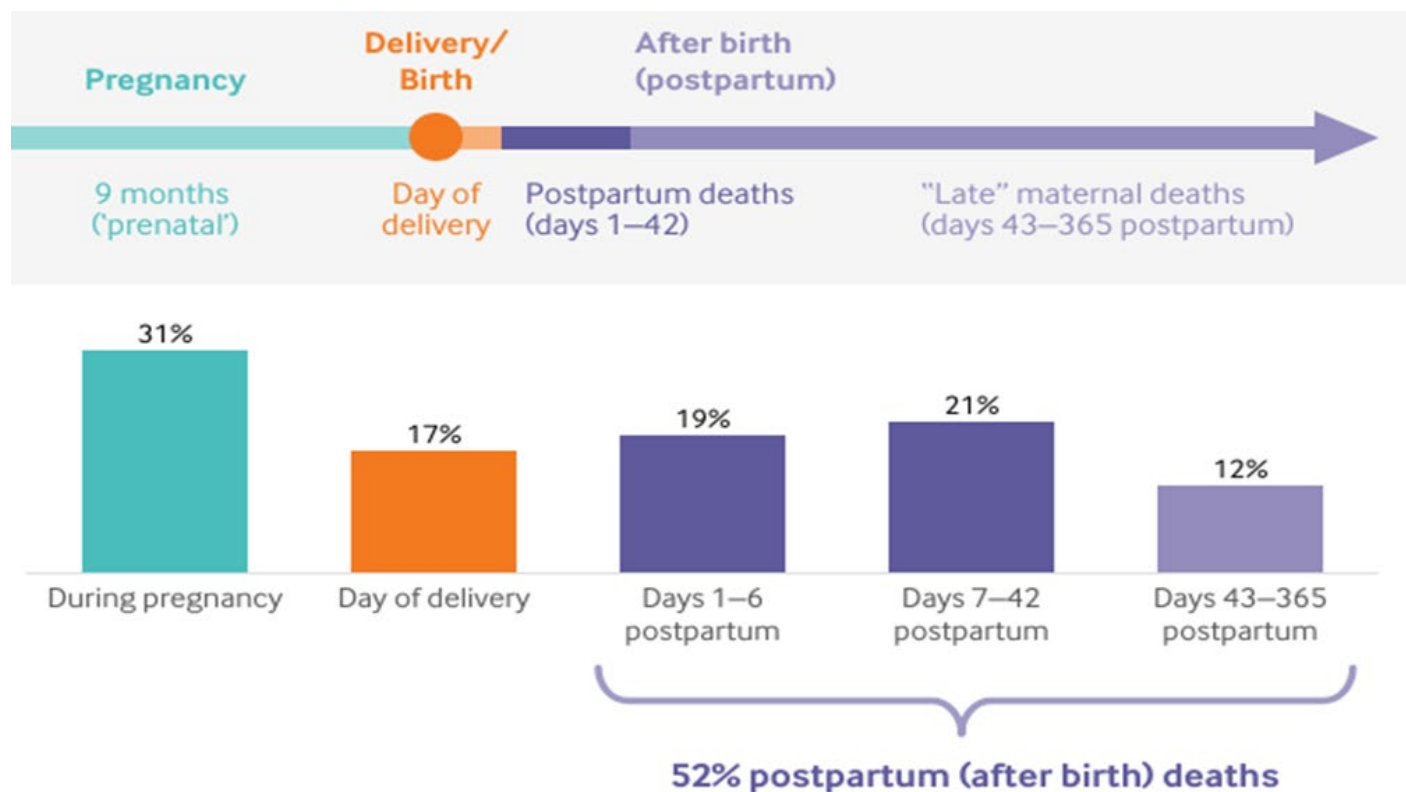
The Current State of Maternal Health &
Sepsis Contributions to Maternal
Morbidity & Mortality

Pregnancy-Related Maternal Deaths per 100,000 live births



Plotted from data in: Peterson et al, MMWR 68: 762-765, 2019
Hoyert et al., NVSS, Health e-Stats, March 2023
Fleszar et al, JAMA 330: 52-61, 2023 (July 3)
Graphic by Dr. Andy Combs (used with permission)

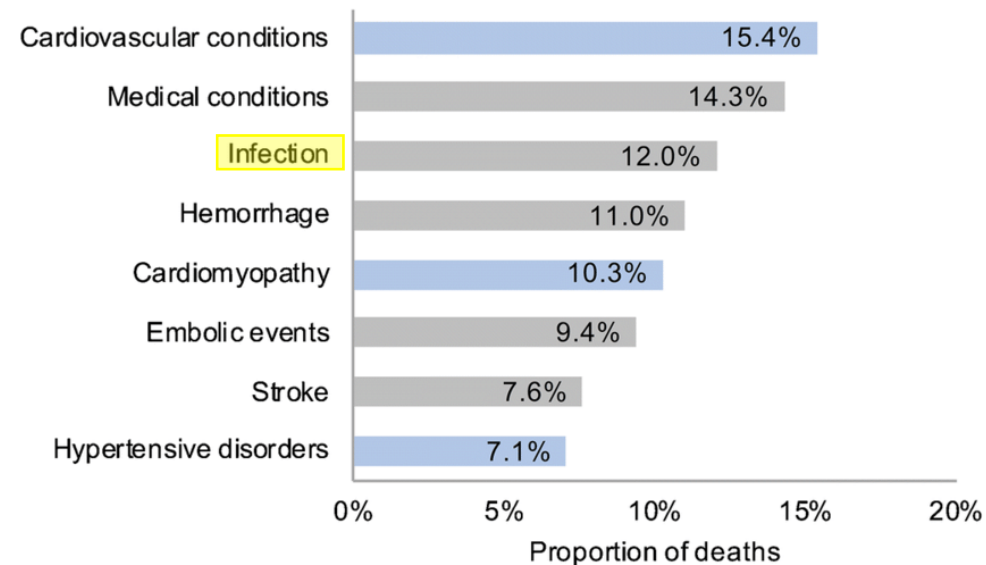
Timing & Causes of Pregnancy-Related Deaths



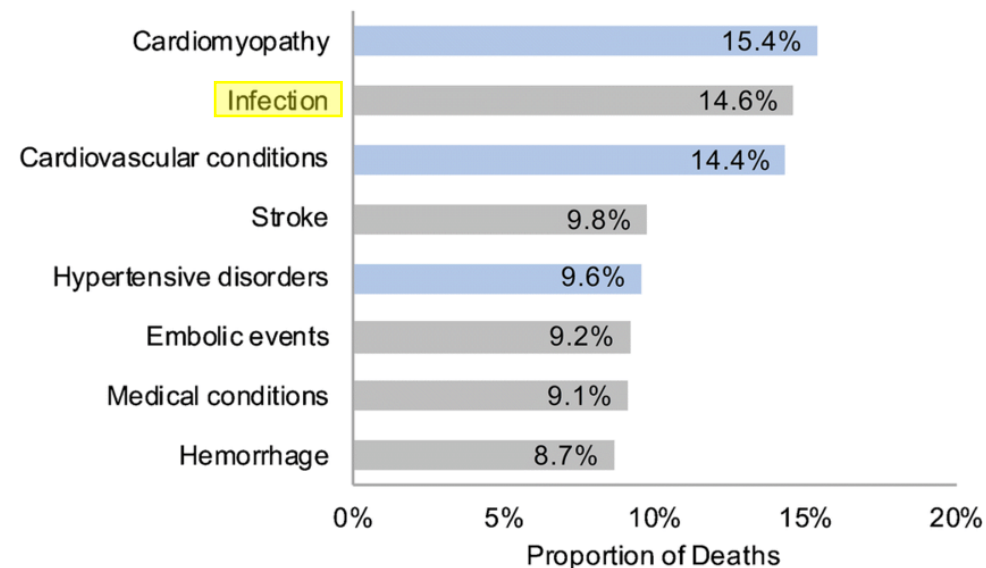
Left graphic: National Center for Health Statistics, National Statistics System, prepared by ABC

Right graphic: Fitzsimmons, et al. (2020). Differential Outcomes for African-American Women with Cardiovascular Complications of Pregnancy. Current Treatment Options in Cardiovascular Medicine. 22. 64. 10.1007/s11936-020-00863-5.

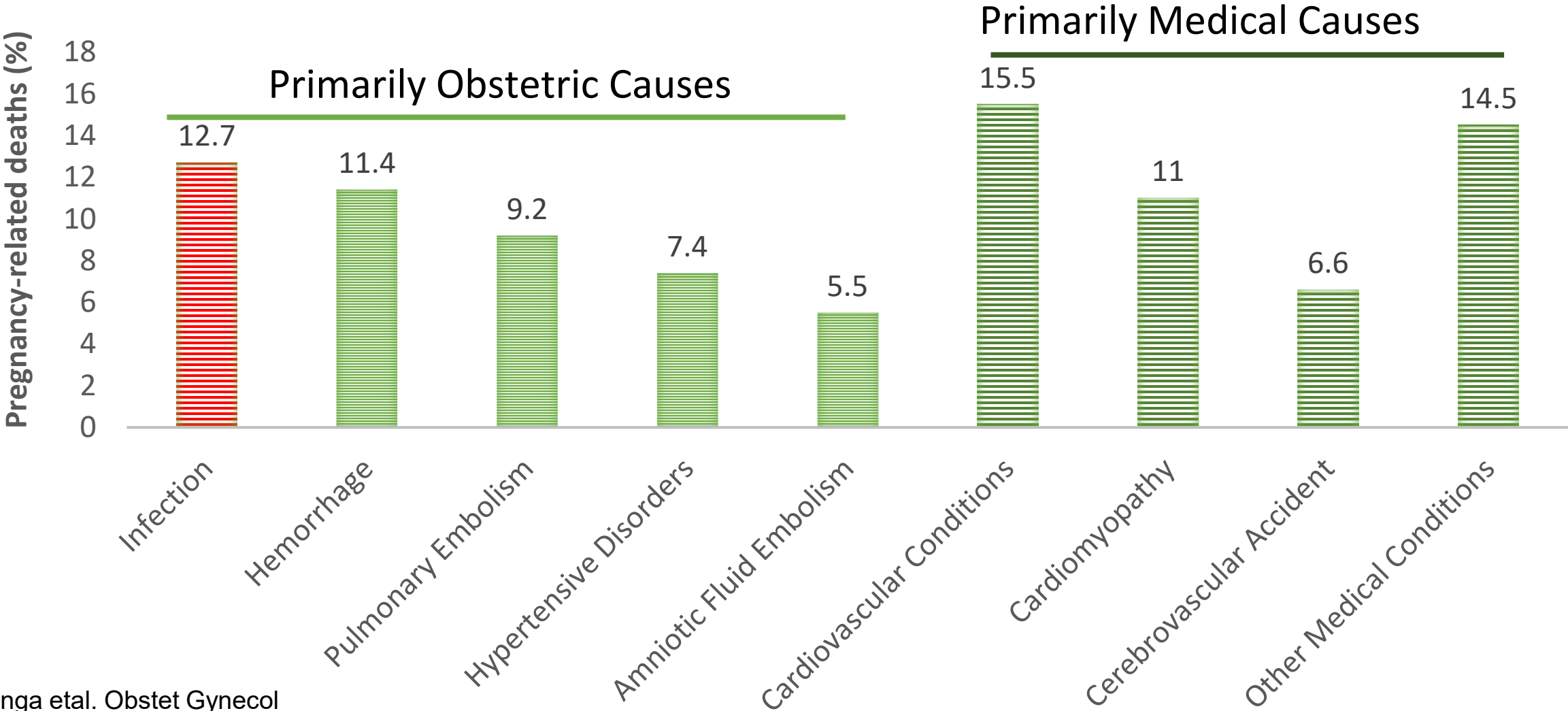
a All pregnancy-related deaths



b Postpartum pregnancy-related deaths



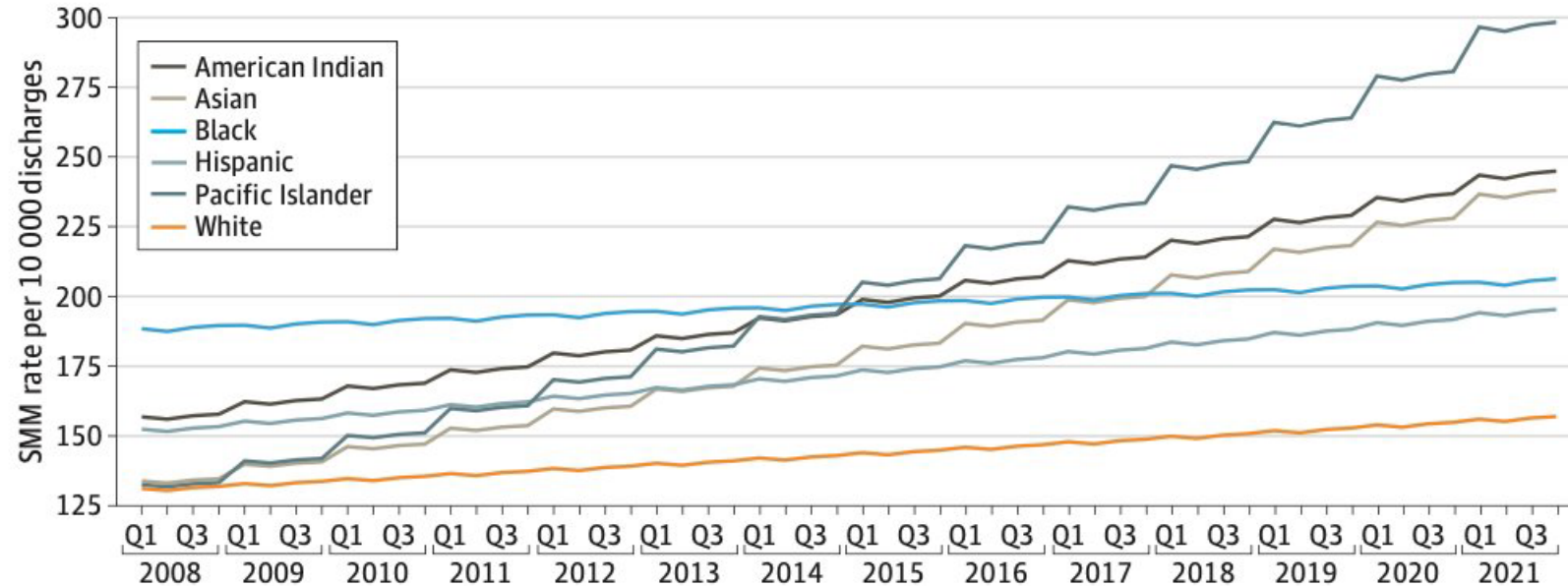
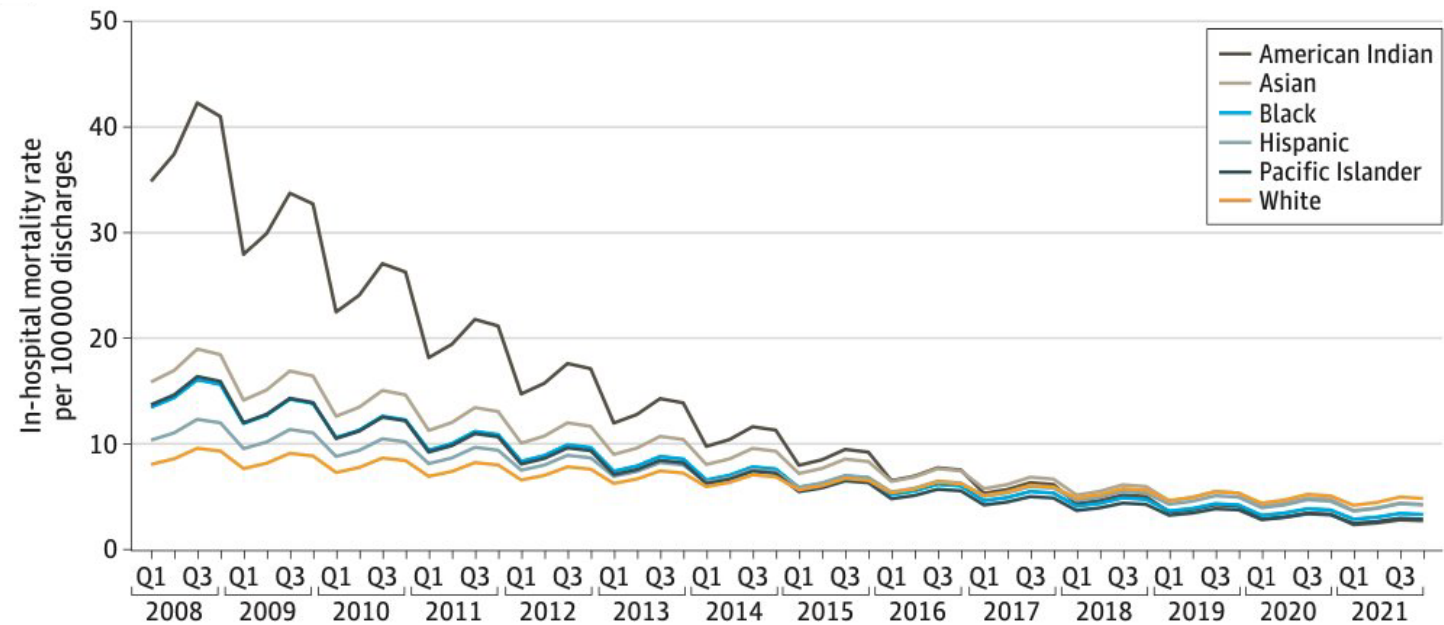
Cause-Specific Pregnancy-Related Mortality, US: 2011-2013



Creanga et al. Obstet Gynecol
2017 130:366-73

Adapted from CMQCC slide set “Improving Diagnosis and Treatment of Maternal Sepsis”

In-Hospital Maternal Mortality



Severe Maternal Morbidity

Data Source: Premier PINC AI Healthcare Database
 N = 11,628,438 (approx 20% of US births)
 Fink et al., JAMA Netw Open 6:e2317641, 2023 (June)

Maternal Sepsis Morbidity & Mortality

Sepsis occurs in about 0.04% of deliveries (~4 per 10k livebirths) and is a leading cause of maternal death

Despite a low frequency, the mortality of sepsis is high, ranging from 9-14%

Most cases (63%) of maternal death from sepsis are likely to have been preventable

For each maternal death from sepsis, there are 50 women who experience life-threatening morbidity from sepsis

Bauer et al. *Anesth Analg* (2013)
Hensley et al. *JAMA* (2019)
Kendle et al. *AJOG* (2019)

Risk Factors & Causes of Maternal Sepsis

Obstetric factors

- Amniocentesis, and other invasive intrauterine procedures
- Cervical suture
- Prolonged rupture of membranes
- Prolonged labour with multiple (>5) vaginal examinations
- Vaginal trauma
- Caesarean section
- Retained products of conception after miscarriage or delivery

Patient factors

- Obesity
- Impaired glucose tolerance/diabetes
- Impaired immunity
- Anaemia
- Vaginal discharge
- History of pelvic infection
- History of Group B streptococcal infection

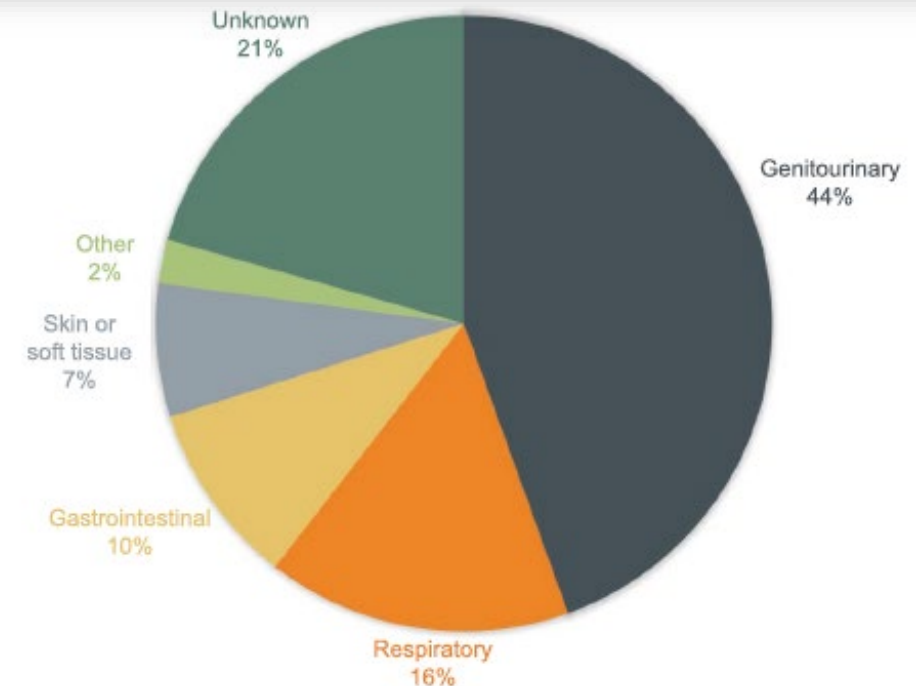
Lucas et al, Int J Obstet Anesth 2012

Shields et al, SMFM Consult Series "Maternal Sepsis"

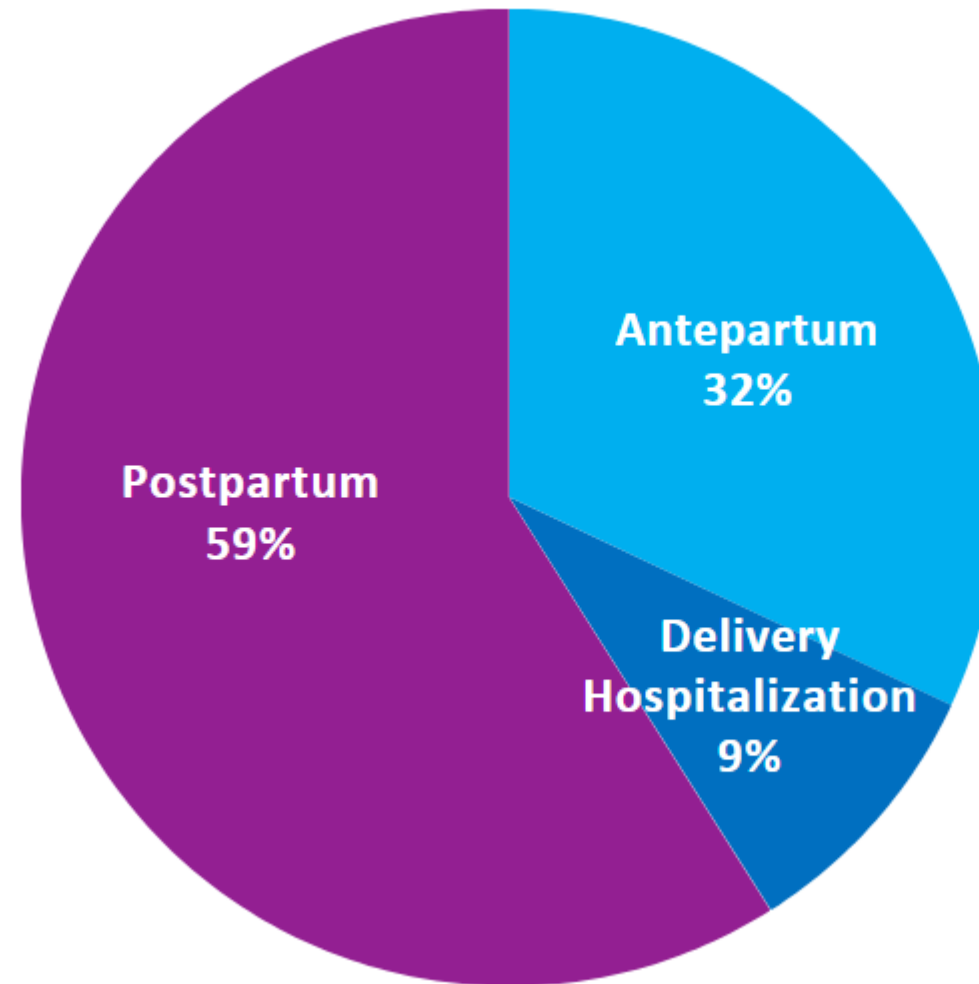
Hensley et al, JAMA 2019

Common sources of infection in sepsis

Sources	Antepartum	Postpartum
Obstetrical	Septic abortion	Endometritis
	Chorioamnionitis	Wound infection
Nonobstetrical	Urinary tract infection	Urinary tract infection
	Pneumonia	Pneumonia
	Appendicitis	Gastrointestinal



Temporal Relationship of Sepsis to Pregnancy Events

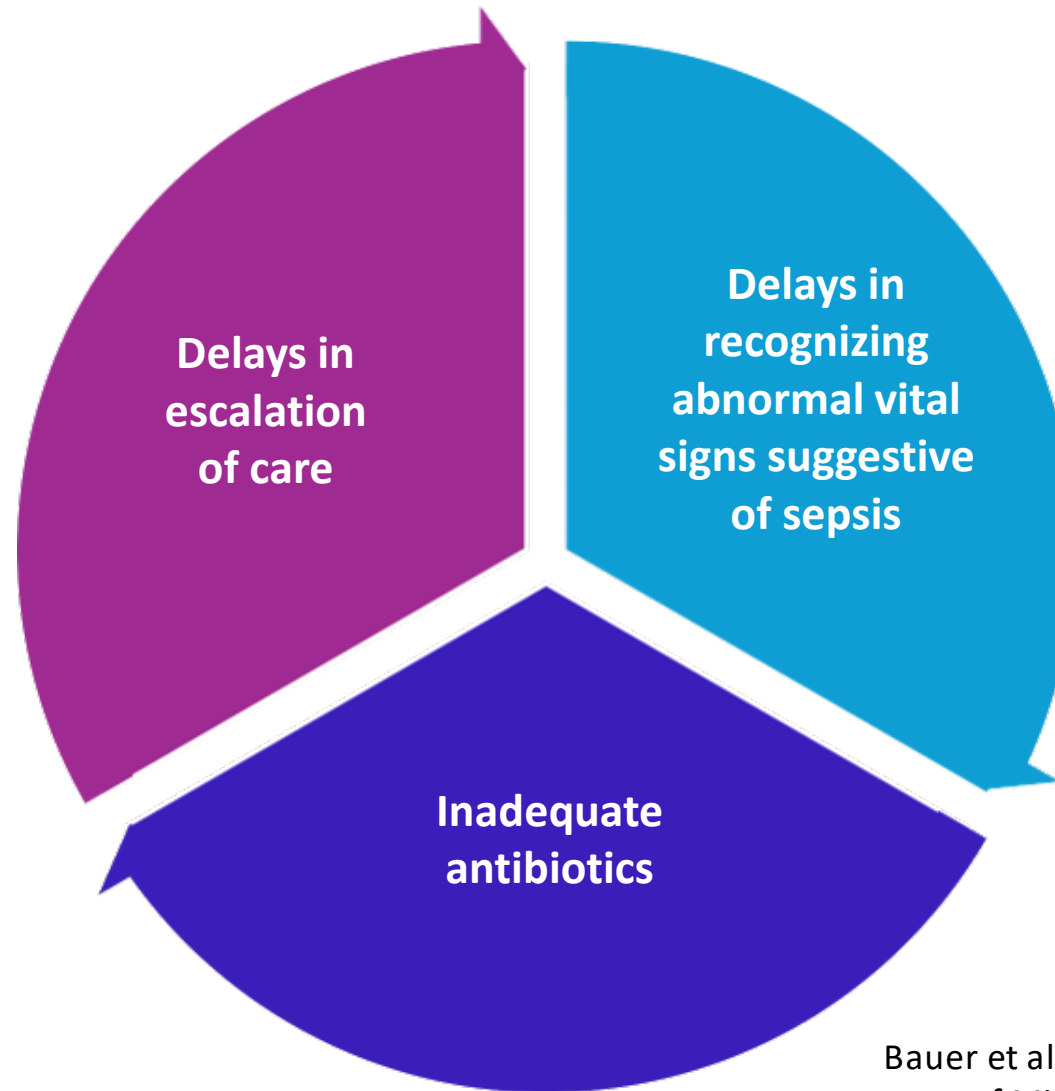


Bauer et al. Maternal Deaths Due to Sepsis in the State of Michigan, 1999- 2006. Obstet and Gynecol. 2015

Slide used with permission from Dr. Carey Eppes

Preventable Contributors to Sepsis Mortality

Michigan MMRC
Data 1999-2000

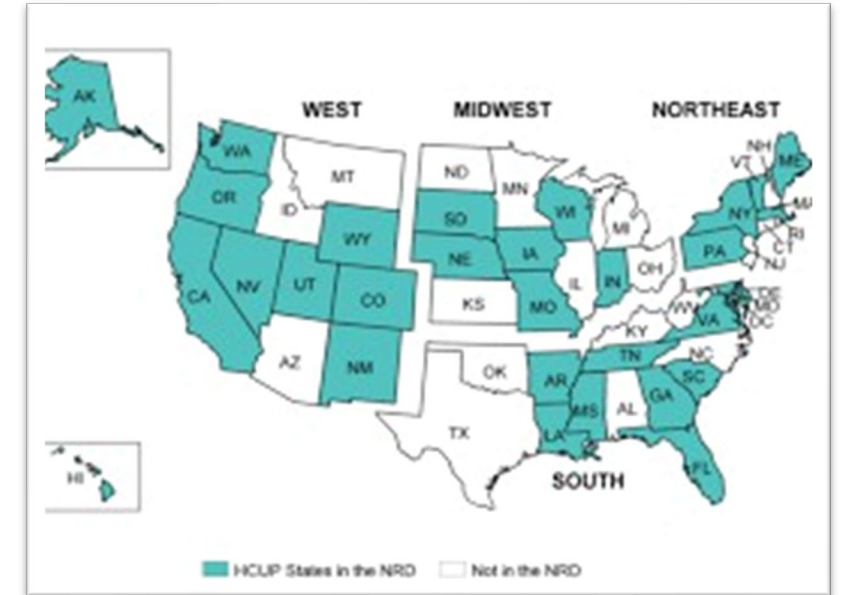


Bauer et al. Maternal Deaths Due to Sepsis in the State of Michigan, 1999- 2006. Obstet and Gynecol. 2015

Slide used with permission from Dr. Carey Eppes

Pregnancy-Related Readmission National Sepsis Data

- National Readmissions Database from 2013-2016
 - 5,957,678 eligible cases
 - 2,905 (0.038%) cases of sepsis
 - 49% during delivery hospitalization
 - 50% after delivery discharge
 - Readmission occurred on average 13.6 days after discharge
- 22% of maternal deaths related to sepsis in this cohort
 - 17% during delivery hospitalization
 - 38% after discharge



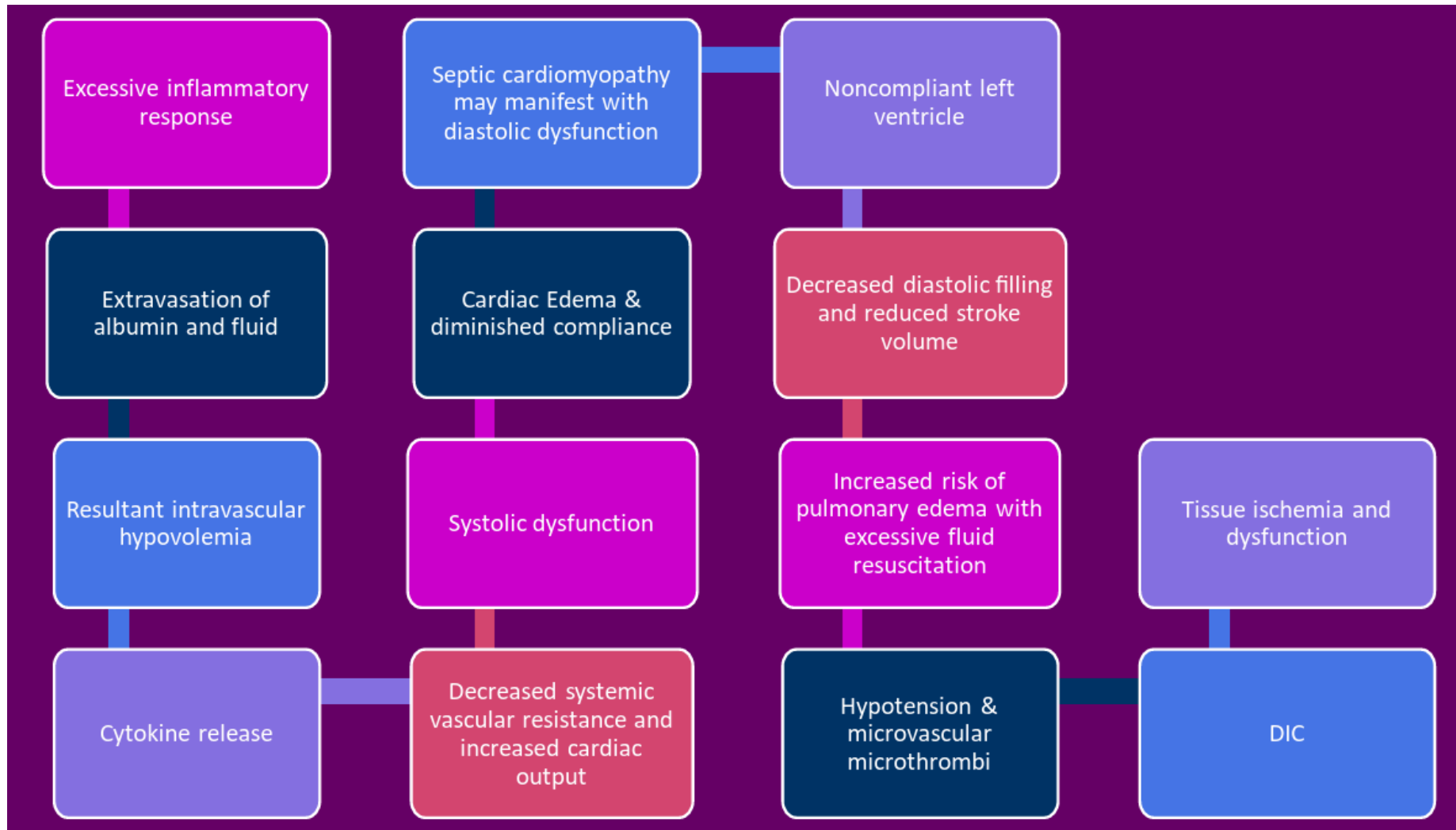
Hensley et al. Incidence of Maternal Sepsis and Sepsis-Related Maternal Deaths in the United States. JAMA 2019

Slide used with permission from Dr. Carey Eppes



Pathophysiology of Obstetric Sepsis: Adaptations that Predispose to Infection

Sepsis results from a dysregulated host response to infection resulting in organ damage



Shields et al, SMFM Consult Series "Maternal Sepsis"

Impact of Pregnancy Physiology on Sepsis Presentation

Pregnancy

Cardiovascular:

- ↓ Systemic vascular resistance (25–30%)
- ↓ Blood pressure
- ↑ Blood volume (40–45%)
- ↑ Heart rate (10–20 bpm)
- ↑ Cardiac output (40%)
- Aorto-caval compression

Respiratory:

- ↓ Pulmonary vascular resistance and plasma colloid pressure
- ↓ Residual volume
- ↓ Functional residual capacity
- ↑ Tidal volume
- ↑ Minute ventilation
- Compensated respiratory alkalosis

Renal:

- ↑ Renal plasma flow
- ↑ Glomerular filtration rate
- Renal collecting system dilatation

Coagulation

- ↑ Factors I, II, VII, VIII, IX, XII
- ↑ (x5) plasminogen activator inhibitors (PAI) I & II
- ↓ Protein S
- ↔ Anti-thrombin and Protein C

Sepsis

Cardiovascular:

- ↓ Systemic vascular resistance
- ↓ Blood pressure
- ↑ Heart rate
- Vasodilatation
- Myocardial depression

Respiratory:

- ↑ Pulmonary microvascular pressure and permeability
- Acute lung injury

Renal:

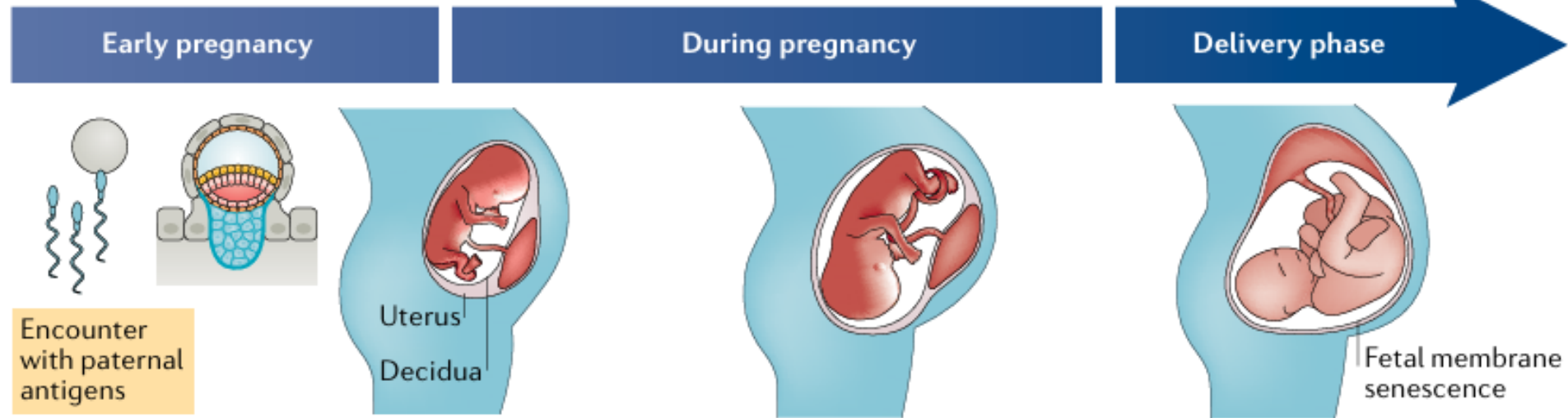
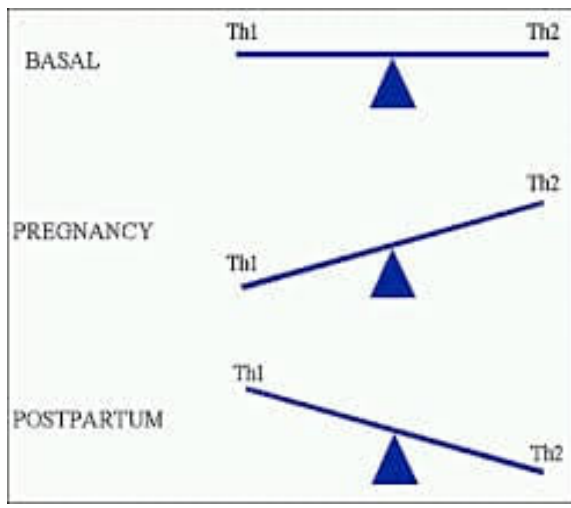
- Ischaemia
- Vasoconstriction
- Cytokine-mediated renal cell injury

Coagulation

- ↑ Procoagulant effects
- ↑ Thrombin production
- ↓ Activated Protein C
- Fibrinolysis (increased PAI I)

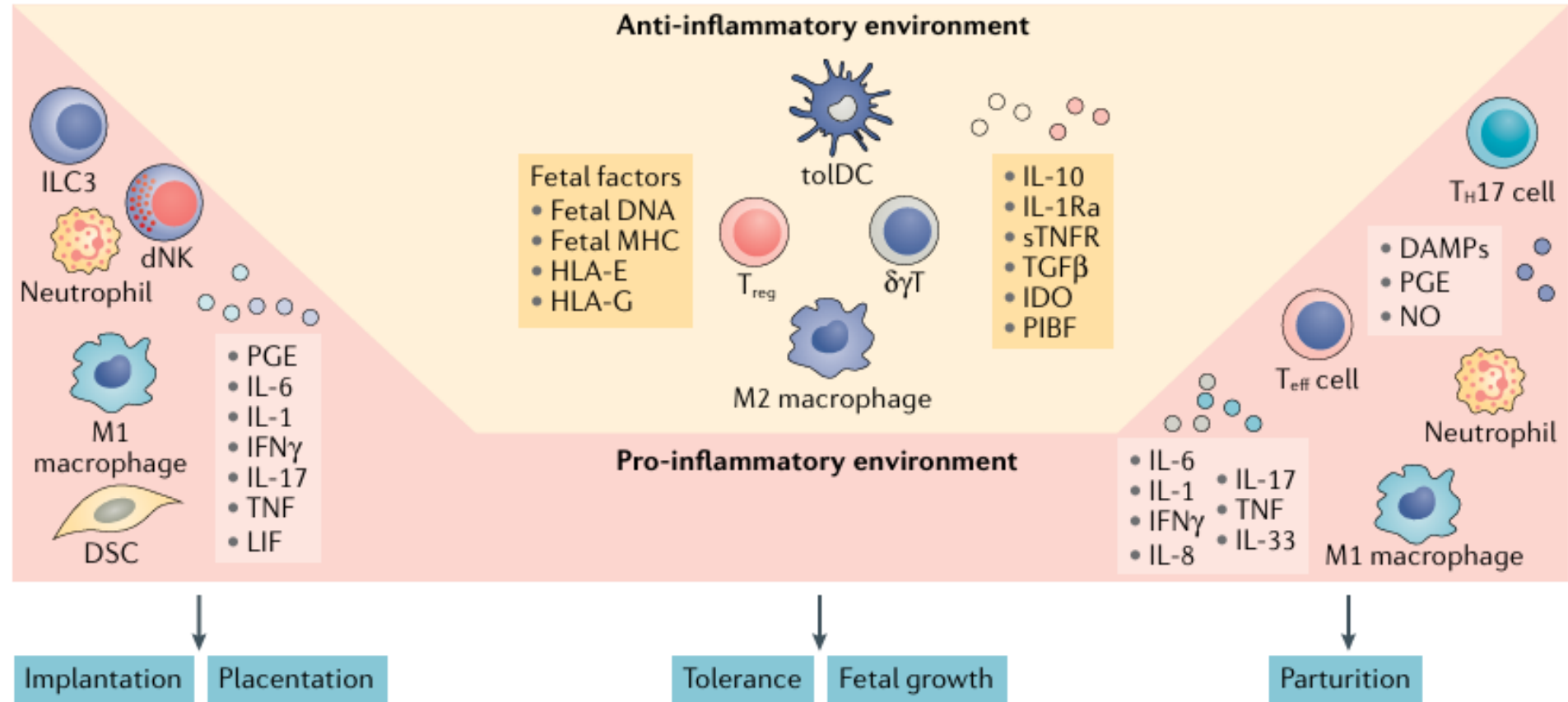


Greer et al, Maternal sepsis update. 2020.



Immune
Changes in
Pregnancy
=
Increased
Susceptibility
to Infection

Forger et al , Nature Reviews 2022
<https://www.drakibagreen.com/infertility/>



Cumulative effect

Cardiovascular

Rapid haemodynamic collapse

Respiratory

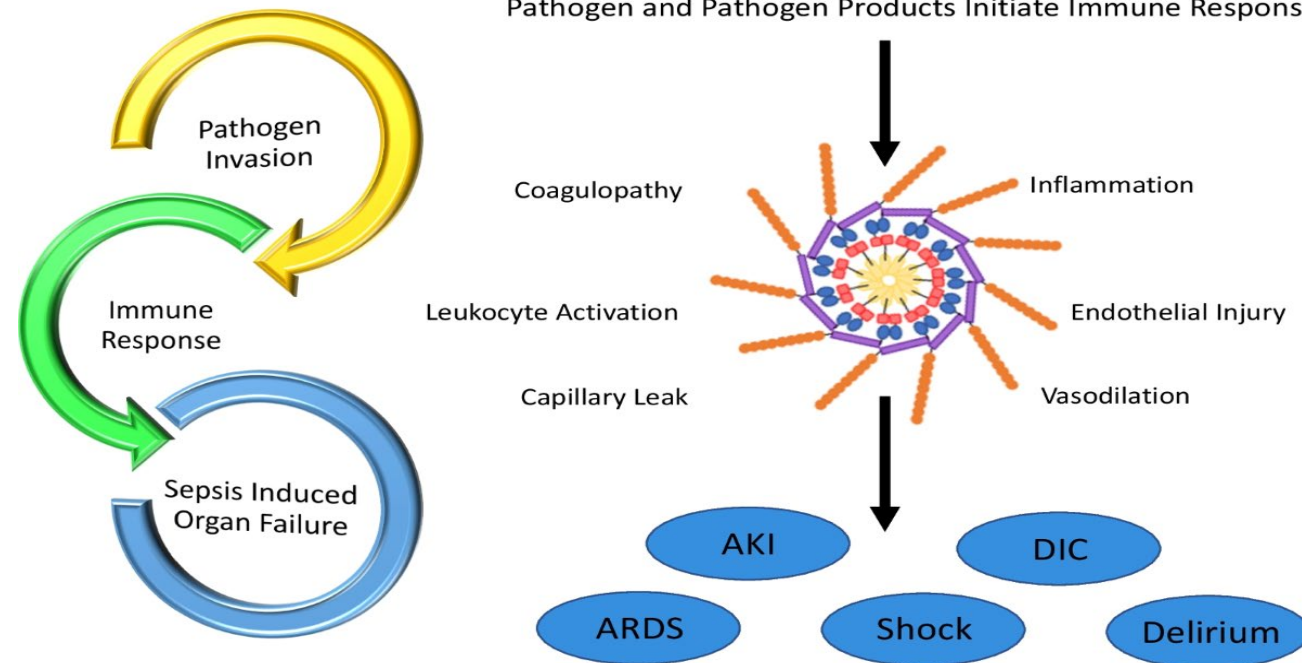
- Susceptibility to pulmonary oedema
- Rapid decrease in oxygenation
- Adult respiratory distress syndrome
- Decreased ability to compensate for metabolic acidosis

Renal

Acute kidney injury

Coagulation

- Increased microvascular thrombus formation
- Microcirculation dysregulation
- Tissue hypoperfusion
- End-organ dysfunction



Greer et al, Maternal sepsis update. 2020.
<https://ccforum.biomedcentral.com/articles/10.1186/s13054-023-04310-2>



Maternal Sepsis Screening Systems

Obstetric Sepsis Definition

“A life-threatening condition defined as an organ dysfunction caused by an infection during pregnancy, childbirth, post-abortion or the postpartum period (up to 42 days)”

TABLE 2

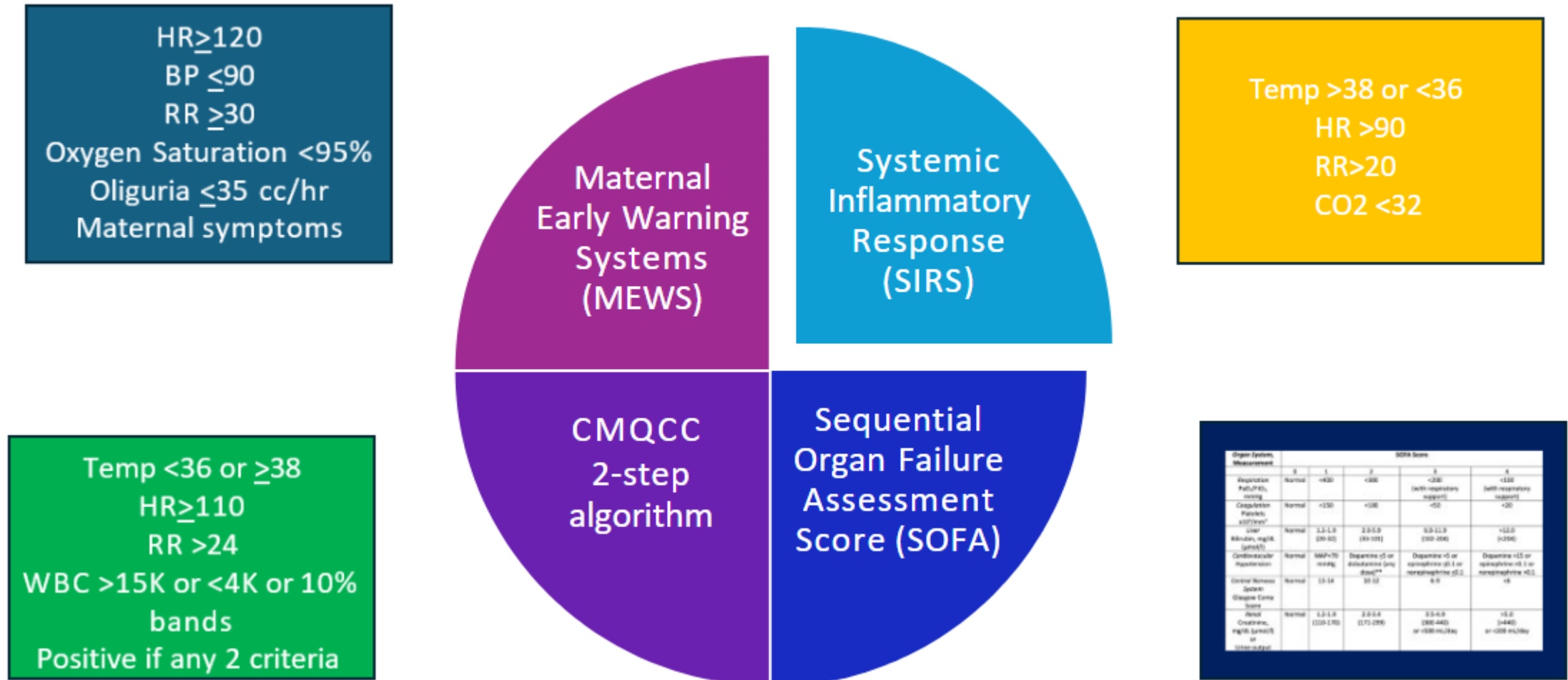
Definition of sepsis, 1991–2016

	Sepsis I-1991	Sepsis II-2001	Sepsis III-2016
Sepsis	Documented infection with 2 or more SIRS criteria	Unchanged	Life-threatening organ dysfunction caused by a dysregulated host response to infection
Severe sepsis	Sepsis associated with organ dysfunction, hypoperfusion, or hypotension	Unchanged	Abandoned
Septic shock	Sepsis with hypotension, despite adequate fluid resuscitation	Unchanged	Sepsis accompanied by profound circulatory and cellular or metabolic abnormalities related to substantially increased mortality

SIRS, systemic inflammatory response syndrome.

Escobar. Maternal sepsis. Am J Obstet Gynecol MFM. 2020.

Sepsis Screening Systems



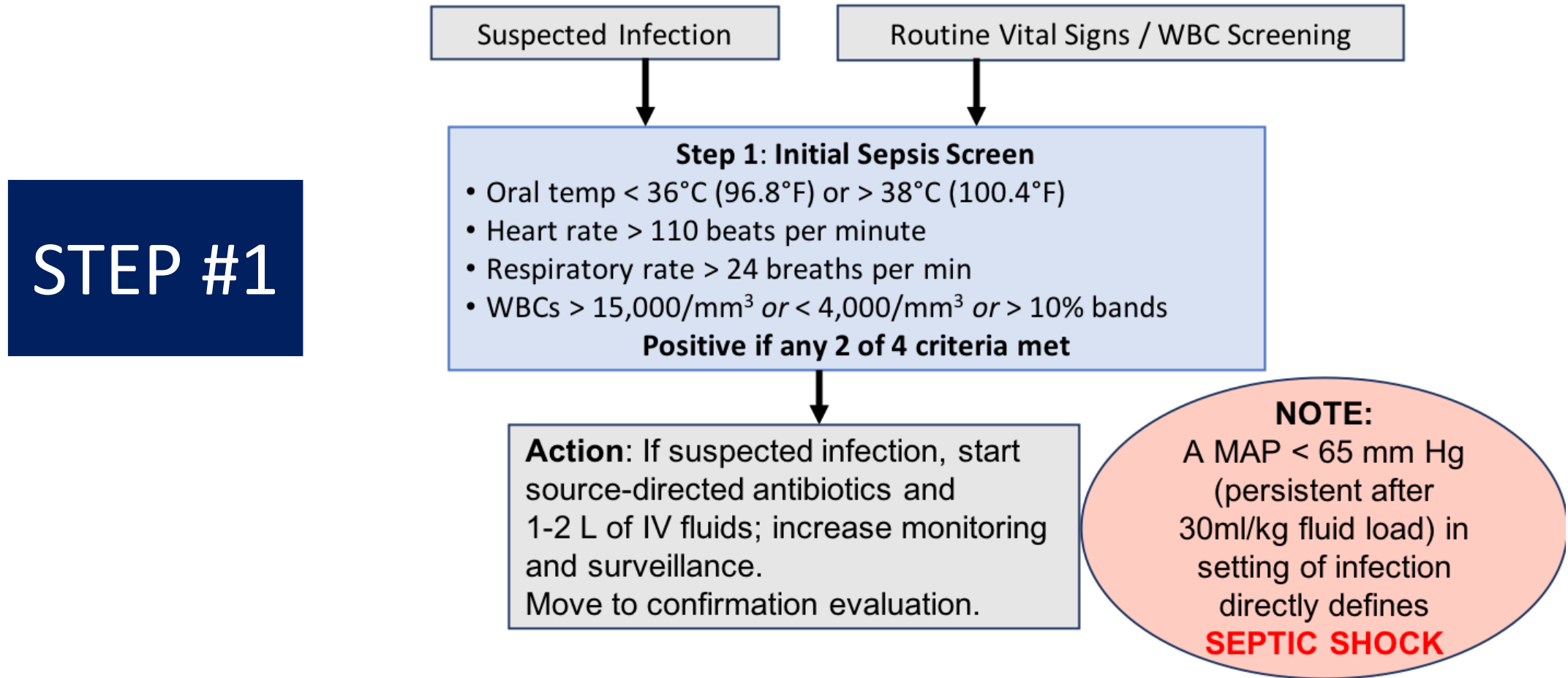
Organ System, Measurement	SOFA Score				
	0	1	2	3	4
Respiration P _a O ₂ /F _i O ₂ ratio	Normal	≥300	<300	<200 (with respiratory support)	<100 (with respiratory support)
Circulation Partial thromboplastin time (PTT)	Normal	≤1.5	>1.5	>2.0	>3.0
Renal Creatinine, mg/dL	Normal	1.2-1.9 (30-42)	2.0-2.9 (45-101)	3.0-11.9 (100-1000)	≥12.0 (≥1000)
Coagulation Prothrombin time (PT)	Normal	1.5-1.9 (30-42)	2.0-2.9 (45-101)	3.0-11.9 (100-1000)	≥12.0 (≥1000)
Central Nervous System Glasgow Coma Score	Normal	13-14	10-12	6-9	≤5
Liver Bilirubin, mg/dL	Normal	1.2-1.9 (100-1000)	2.0-2.9 (175-200)	3.0-11.9 (250-440) or >100 μmol/L	≥12.0 (≥1000) or >100 μmol/L

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California Maternal Quality Care Collaborative (CMQCC)

Maternal Sepsis Two-Step Approach

GOAL = Reduce false positives (avoid 'alarm fatigue') and prevent false negatives (avoid missing cases)



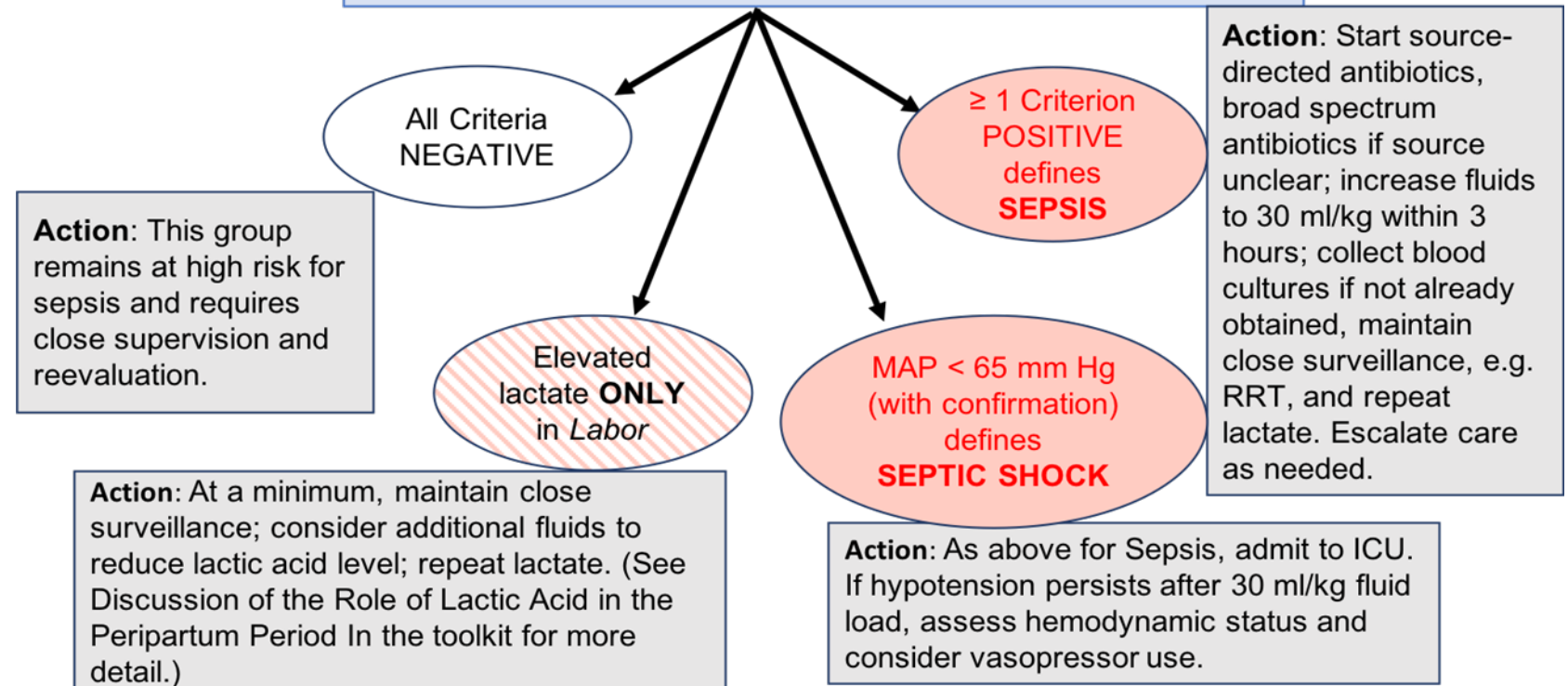
Gibbs R, et al. Improving Diagnosis and Treatment of Maternal Sepsis: A Quality Improvement Toolkit.

STEP #2

Step 2: Confirmation of Sepsis Evaluation

- Respiratory: New need for mechanical ventilation *or* PaO₂/FiO₂ < 300
- Coagulation: Platelets < 100 x 10⁹/L **or** INR > 1.5 *or* PTT > 60 secs
- Liver: Bilirubin > 2 mg/dL
- Cardiovascular: SBP < 85 mm Hg *or* MAP < 65 mm Hg **or** > 40 mm Hg decrease in SBP (after fluids)
- Renal: Creatinine ≥ 1.2 mg/dL **or** doubling of creatinine *or* urine output < 0.5 ml/kg/hr x 2 hrs
- Mental Status: Agitated, confused, **or** unresponsive
- Lactic Acid: > 2 mmol/L in absence of labor

Confirmed if 1 or more criteria met



Step 2: Criteria for End-Organ Injury

Measure of End Organ Injury	Criteria Positive if one (1) or more criteria are met
Respiratory function*	• Acute respiratory failure as evidenced by acute need for invasive or non-invasive mechanical ventilation, OR • $\text{PaO}_2/\text{FiO}_2 < 300$
Coagulation status	• Platelets $< 100 \times 10^9/\text{L}$, OR • International Normalized Ratio (INR) > 1.5, OR • Partial Thromboplastin Time (PTT) > 60 seconds
Liver function	• Bilirubin $> 2 \text{ mg/dL}$
Cardiovascular function	• Persistent hypotension after fluid administration: ○ $\text{SBP} < 85 \text{ mm Hg}$, OR ○ $\text{MAP} < 65 \text{ mm Hg}$, OR ○ $> 40 \text{ mm Hg}$ decrease in SBP
Renal function	• Creatinine $> 1.2 \text{ mg/dL}$, OR • Doubling of serum creatinine, OR • Urine output less 0.5 mL/kg/hour (for 2 hours)
Mental status assessment	• Agitation, confusion, or unresponsiveness
Lactic acid	• $> 2 \text{ mmol/L}$ in absence of labor (Lactic acid not used for diagnosis in labor, but remains important for treatment.)

Gibbs R, et al. Improving Diagnosis and Treatment of Maternal Sepsis: A Quality Improvement Toolkit.

Performance of Two-Step System for Diagnosis of Maternal Sepsis

(data extracted from clinical practice data sets, not formal research studies)

	OB Vital Signs Screen		Sepsis (End Organ Injury)		
Source	Population Screened	Screen Positive	Total with End Organ injury	Among Screen Positive (Sens)	Not Among Screen Positive (Spec)
Combined Systems*	14,752	199 (1.3%)	33 (16.6% of screen positives) (0.22% of all screened)	32 (97%)	1 (3%)

Notes: (1) **Initial screen positive rate is 1.3%**
 (2) Overall performance of the Two-Step System as shown above gives an approximate **sensitivity of 97%** and an approximate **specificity of 99%**

Data from Dignity Health and Sutter Health
 Slide taken from CMQCC Improving Diagnosis and Treatment of Maternal Sepsis slide set

* Data from Dignity Health and Sutter Health

Standardized Obstetric Sepsis Screening Tools Comparison

Performance of SIRS, modified MEWS and qSOFA criteria for diagnosing sepsis

Criteria	Sensitivity	Specificity
SIRS (any two): T < 36°C or > 38°C; WBC < 4 or > 12; HR > 90; RR > 20	0.93	0.63
Modified MEWS (any one): SBC < 90 mm Hg; HR > 120; RR > 30; neurological changes	0.82	0.87
qSOFA (any two): RR > 22; SBC < 100 mm Hg; neurological changes; RR > 22 and SBC < 100 mm HG	0.50	0.95

Gibbs R, et al. Improving Diagnosis and Treatment of Maternal Sepsis: A Quality Improvement Toolkit. Stanford, CA: California Maternal Quality Care Collaborative.

Obstetric Sepsis Screening Tool Performance

COHORT 1: Cases <i>excluding</i> Chorioamnionitis and Endometritis						
	Sepsis by Diagnosis Codes N=647			Sepsis with End Organ Injury by Diagnosis Codes N=228		
Screening System	Screen Positive Rate	Sensitivity (95% CI)	C statistic (95% CI)	Screen Positive Rate	Sensitivity (95% CI)	C statistic (95% CI)
CMQCC	6.9%	90.6% (88.1-92.7)	0.92 (0.91, 0.93)	9.2%	96.9% (93.8-98.8)	0.94 (0.92, 0.95)
SIRS	21.3%	96.9% 95.3-98.1	0.88 (0.87, 0.89)	23.9%	98.7% 96.2-99.7	0.87 (0.86, 0.89)
MEWC	38.3%	96.9% 95.3-98.1	0.79 (0.78, 0.80)	43.9%	98.2% 95.6-99.5	0.77 (0.75, 0.79)
UKOSS	9.6%	92.0% 89.6-93.9	0.91 (0.90, 0.92)	11.6%	96.1% 92.6-98.2	0.92 (0.91, 0.94)
MEWT (overall)	15.8%	79.9% 76.6-82.9	0.82 (0.80, 0.84)	19.8%	90.8% 86.3-94.2	0.85 (0.83, 0.88)

Main et al. Obstet and Gynecol 2024

Obstetric Sepsis Screening Tool Performance

COHORT 2: Chorioamnionitis and Endometritis Cases						
	Sepsis by Diagnosis Codes N=1049			Sepsis with End Organ Injury by Diagnosis Codes N=238		
Screening System	Screen Positive Rate	Sensitivity % (95%CI)	C statistic (95%CI)	Screen Positive Rate	Sensitivity % (95%CI)	C statistic (95%CI)
CMQCC	60.2%	93.6% 92.0-95.0	0.67 (0.66, 0.68)	60.2%	93.7% 89.8-96.4	0.67 (0.65, 0.68)
SIRS	86.6%	99.4% 98.8-99.8	0.56 (0.56, 0.57)	86.6%	99.2% 97.0-99.9	0.56 (0.56, 0.57)
MEWC	92.3%	97.7% 96.6-98.5	0.53 (0.52, 0.53)	92.3%	97.9% 95.2-99.3	0.53 (0.52, 0.54)
UKOSS	67.5%	95.2% 93.2-96.0	0.64 (0.63, 0.65)	67.5%	95.0% 91.4-97.4	0.64 (0.63, 0.65)
MEWT (Overall)	45.7%	78.5% 75.8-80.9	0.66 (0.65, 0.68)	45.7%	87.4% 82.5-91.3	0.71 (0.69, 0.73)

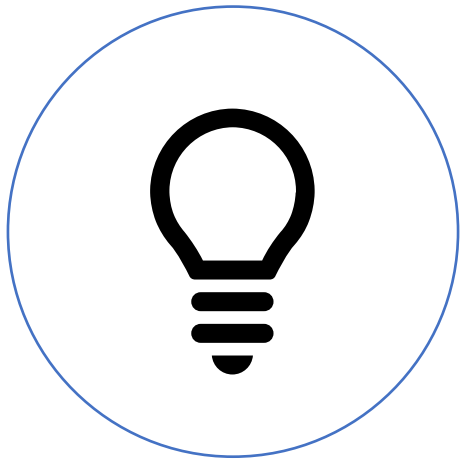
Main et al. Obstet and Gynecol 2024



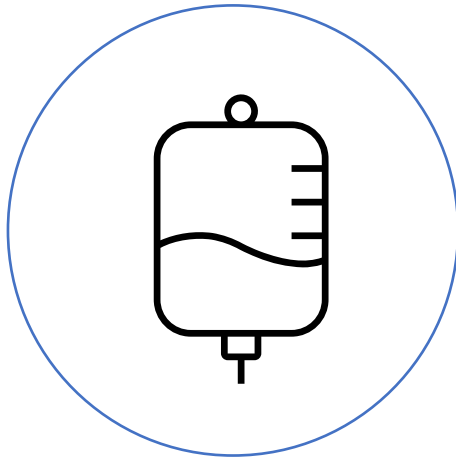
OB Specific Sepsis Escalation & Management Considerations

Tenants of Sepsis Care

NON-PREGNANT = PREGNANT



Recognize



Treat



Escalate Care

Sepsis Bundle

Measure Lactate Level

Obtain Blood Cultures

Antibiotic Therapy

Fluid Resuscitation

Vasopressor Therapy

Graphic from Castrodad-Rodríguez CA et al, Acad Pathol 2021

Management Principles for Obstetric Sepsis



Recognition is key

- Pearl 1. Always maintain a high index of suspicion for sepsis.
- Pearl 2. Implement a rapid bedside tool for detection of maternal deterioration



Move fast during the golden hour to save lives

- Pearl 3. Implement sepsis bundles to facilitate rapid escalation of care.
- Pearl 4. Laboratory and radiologic studies are keys to search for etiology and source control.
- Pearl 5. Know your “bugs,” their likely origin, and that group A streptococcus can kill quickly.
- Pearl 6. Choose antimicrobials tailored to the most likely diagnosis.
- Pearl 7. Fluid resuscitation should be initiated rapidly for patients with a blood lactate greater than 4 mmol/L or mean arterial pressure less than 65 mm Hg.



Beyond the golden hour

- Pearl 8. Escalation of care is critical to survival.
- Pearl 9. Once the patient is stabilized, get to the source of the problem.
- Pearl 10. Anticipate and prevent adverse pregnancy outcomes.

Rapid Assessment of Screen Positive Patients

Monitoring	Time Frame	Additional Considerations
Fetal monitoring	Continuous	Antepartum/intrapartum 
Pulse oximetry	Continuous	Until vital signs are normalized
Blood pressure (MAP)	Q 30 minutes from 'Time Zero'	Until lactate less than 2.0 mmol/L, then Q2 h for non-laboring patients*
Temperature	Q 30 minutes from 'Time Zero'	Until lactate less than 2.0 mmol/L, then Q2 h for non-laboring patients*
Urine output	Q 1 hour from 'Time Zero'	Foley catheter with urometer
Mental status	Continuous	Note agitation, confusion, or unresponsiveness

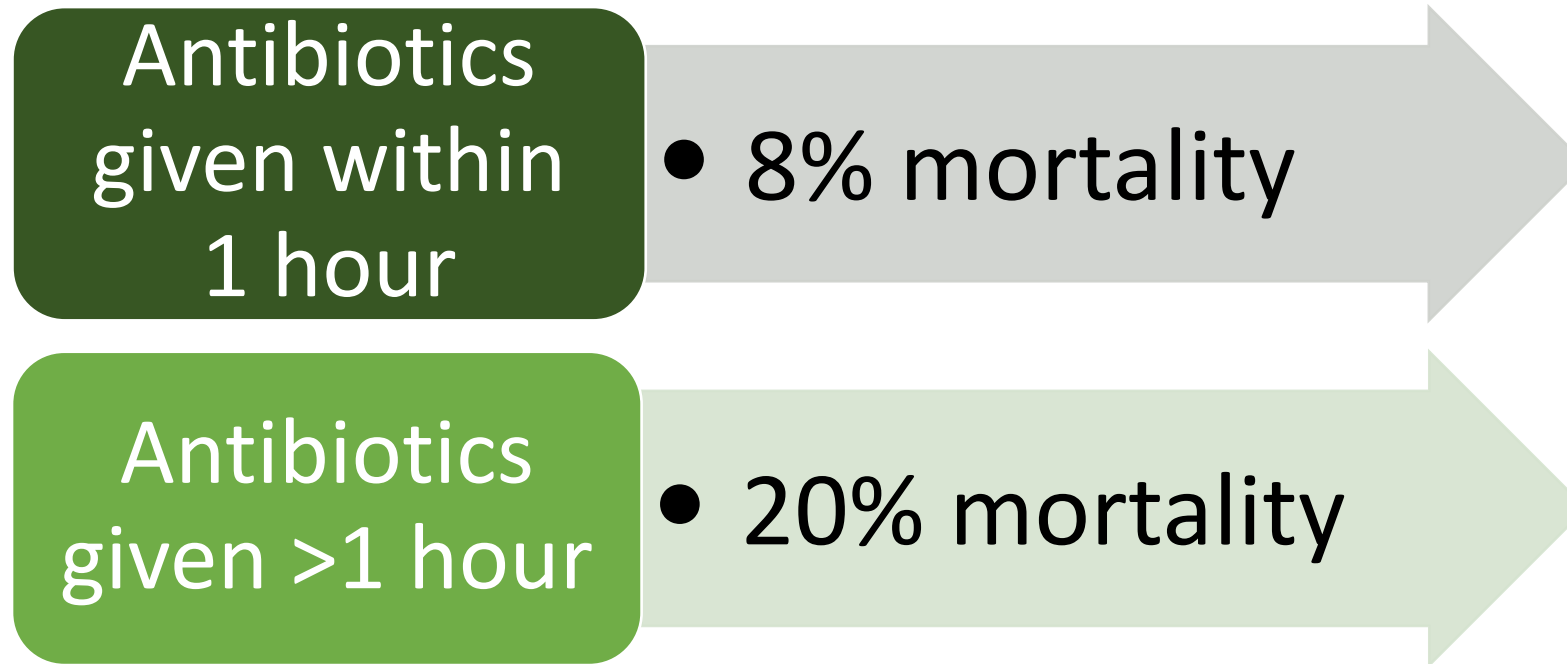
Time Zero = Positive Initial Sepsis Screen

Jones AE, Acad Emerg Med 2013
Table from CMQCC Sepsis Toolkit

Early Antibiotics in Maternal Sepsis

Early source directed antibiotics

If unclear source, broad-spectrum antibiotics recommended



Bauer ME *et al.* Anesth Analg 2019

Common Obstetric Regimens

Chorioamnionitis	Ampicillin plus gentamicin. ^c Add anaerobic coverage with clindamycin or metronidazole if cesarean delivery required.
Endomyometritis	Ampicillin, gentamicin, and metronidazole (or clindamycin)
	Alternatively may use cefotaxime or ceftriaxone plus metronidazole ^d
Urinary tract infections	Gentamicin with ampicillin

Group A Streptococcus (GAS)

Clinical criteria for strep toxic shock syndrome (STSS)

Hypotension

Multiorgan involvement characterized by two or more of:

- Renal impairment
- Coagulopathy
- Liver dysfunction
- Acute respiratory distress syndrome
- Erythematous macular rash (may desquamate)
- Soft tissue necrosis (e.g., necrotizing fasciitis, myositis, or gangrene)

- Likely the organism that is most commonly responsible for fatal maternal sepsis
- GAS can cause a range of infections, including endomyometritis, necrotizing fasciitis, and Streptococcal toxic shock syndrome (STSS)
- Common organism associated with retained products of conception underscoring the critical need to evacuate the uterus for source control
- Use clindamycin with β -lactams to inhibit exotoxin production

OB-Specific Clinical Caveats

- Ideal body weight (not actual body weight) should be used
- A more restrictive approach may be needed due to increased risk of pulmonary edema in pregnancy
- Balanced crystalloid solutions (LR) over chloride-rich solutions during resuscitation should be prioritized
- No evidence that albumin improves outcomes compared to crystalloids and is more costly

Surviving Sepsis Campaign: International Guidelines for Management of Sepsis and Septic Shock 2021

5. For patients with sepsis induced hypoperfusion or septic shock we **suggest** that at least 30 mL/kg of IV crystalloid fluid should be given within the first 3 hours of resuscitation.

Weak recommendation, low-quality evidence.

7. For adults with sepsis or septic shock, we **suggest** guiding resuscitation to decrease serum lactate in patients with elevated lactate level, over not using serum lactate.

Weak recommendation, low-quality evidence.

Fluid Resuscitation

Evans et al, Critical Care Med, 2021
Behnia et al, Semin Perinatol 2024

Role of Lactate



Gibbs R, et al. Improving Diagnosis and Treatment of Maternal Sepsis: A Quality Improvement Toolkit

Pregnancy complicates lactic acid interpretation

Labor can increase lactic acid in the absence of serious infection due anaerobic metabolism during prolonged physical exertion

In non-laboring patients, lactic acid value thresholds can be used with expected values ≤ 2 mmol/L

In labor OR within 1 hour of delivery, abnormal lactate threshold increases to >4 mmol/L

Drawing Cultures

Society of Critical Care Medicine recommends cultures be obtained PRIOR to starting antimicrobial therapy in patients with suspected sepsis and septic shock if it does not result in substantial delay in the start of antimicrobials

For chorioamnionitis/intraamniotic infection and endometritis, lower genital tract cultures are rarely performed because they may reflect primarily contaminating organisms

Patients initially diagnosed with chorioamnionitis/endometritis generally have negative blood cultures or a positive culture is reported after a recovered patient has been discharged

If patient show signs of end-organ injury or septic shock, blood cultures should be obtained if not already done, even if antibiotics have been initiated

CMQCC Sepsis Toolkit

Dellinger, Mitchell, Rhodes, et al. Int Care Med 2013

Escalation of Care

Criteria Considerations

- Hypotension (MAP < 65mm Hg) despite fluid resuscitation or need for administration of vasopressors
- Persistent hypoxia (SpO₂ < 92% on room air)
- Altered mental status (combativeness, confusion, disorientation)

Decision for transfer should be made in concert with multidisciplinary team (OB/MFM, ICU, nursing, anesthesia, RRT)

Transport of a critically ill mother should **NOT** be delayed due to inability to monitor the fetus

**STABILIZING THE MOTHER
WILL OFTEN STABILIZE THE
FETUS**

Gibbs R, et al. Improving Diagnosis and Treatment of Maternal Sepsis: A Quality Improvement Toolkit. Stanford, CA: California Maternal Quality Care Collaborative.

Additional Considerations for Pregnant Women with Sepsis

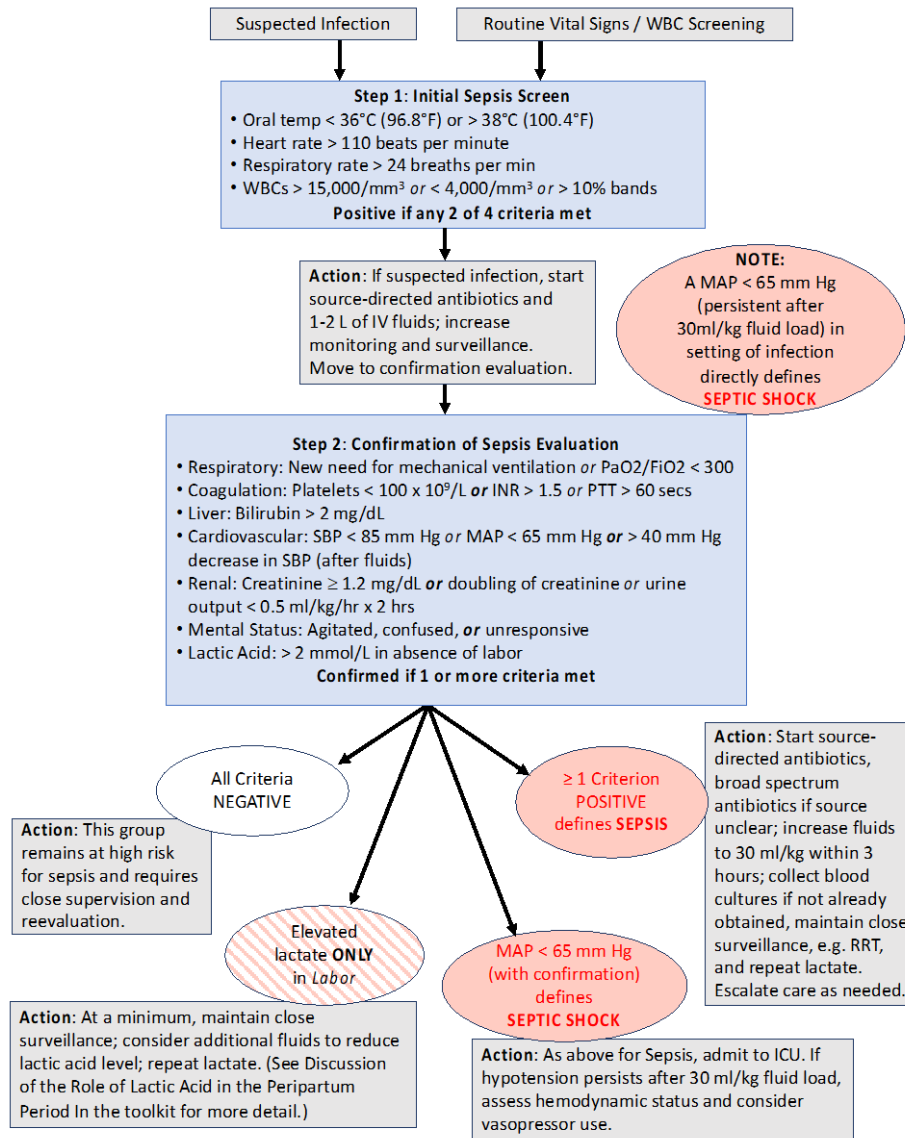
Vasopressors	Norepinephrine is the pressor of choice in pregnancy and used if MAP <65 mm Hg and if unresponsive to intravenous fluids
Inotrope	Dobutamine is recommended for myocardial dysfunction or hypoperfusion despite intravenous fluids and vasopressors as it increases cardiac output.
Glucose Control	Avoid hyperglycemia >180 mg
Maternal Temperature Control	Reduce fetal oxygen consumption and fetal tachycardia using acetaminophen and cooling blankets
Fetal lung maturity	Consider steroids for fetal lung maturity if 23-36* weeks of pregnancy
DVT prevention	Pharmacologic VTE prophylaxis and mechanical prophylaxis whenever possible

Gymafi-Bannerman et al, NEJM 2016



Strategies & Resources to Improve Sepsis Outcomes in Pregnant and Postpartum patients

CMQCC Maternal Sepsis Evaluation Flow Chart



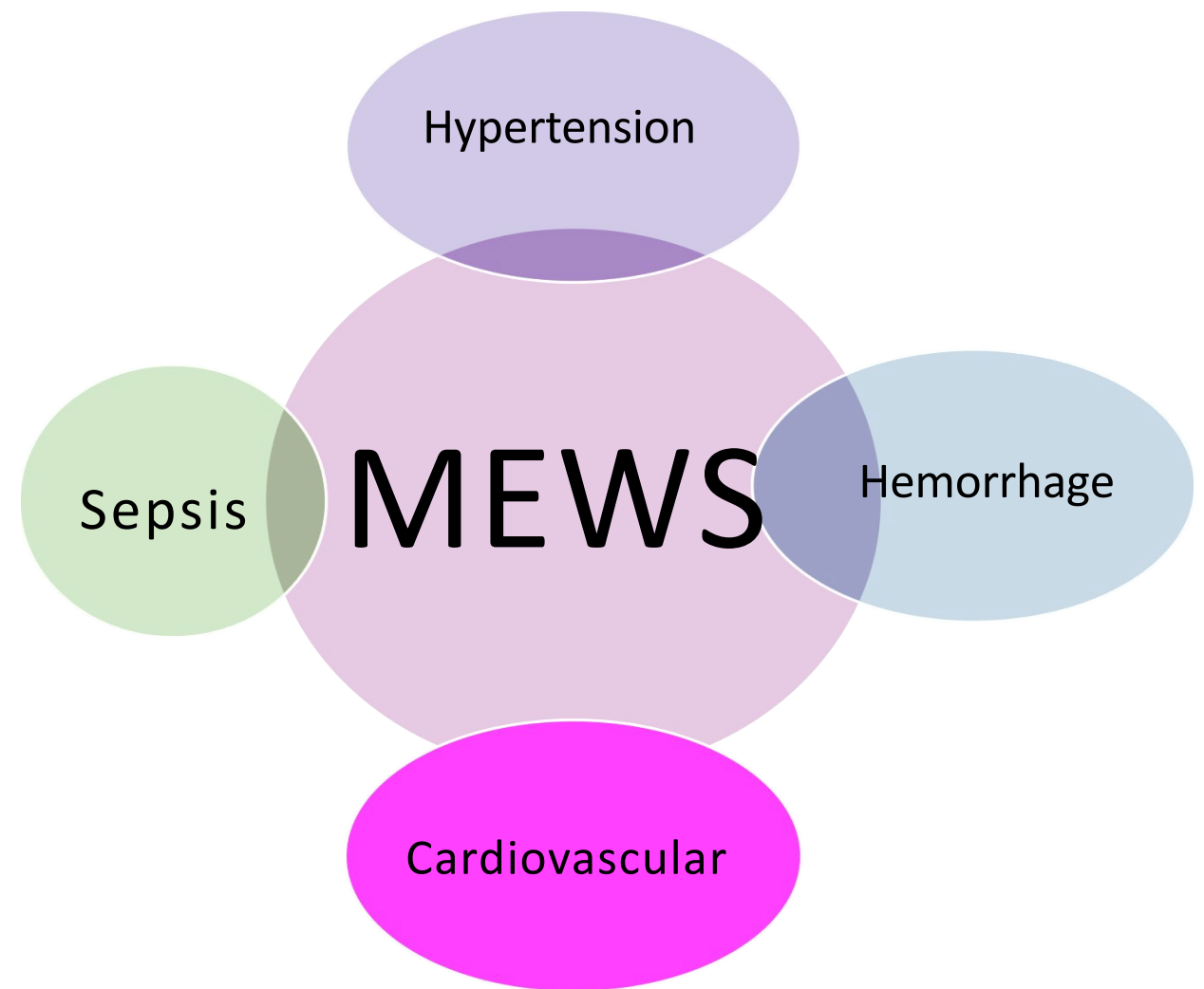
#1 Implement Pregnancy-Specific Rapid Bedside Assessment Tools

Avoid non-pregnant adult sepsis screening & assessment tools for obstetric patients

Although a two-step obstetric sepsis screening algorithm show increased sensitivity/specificity, consistent application is more important than the specific screen utilized

Build on any OB-specific assessment and screening tools already being successfully used

Consider integrated screening for other common obstetric morbidities that also contribute significantly to morbidity/mortality



- Systolic BP (mmHg) <90 or >160
- Diastolic BP (mmHg) >100
- Heart rate (bpm) <50 or >120
- Respiratory rate (bpm) <10 or >30
- Oxygen saturation (%) <95

#2 Integrate OB Sepsis with Overall Hospital Sepsis Work

SEP-1 Specifications Manual		CMQCC Obstetric Serious Infection Evaluation Flow Chart
Non-Pregnant Patients*	Pregnant 20 weeks through Day 3 Post-delivery Patients	Pregnant 20 weeks through Day 3 Post-delivery Patients
Oral Temperature > 38.3C or < 36.0C Heart rate: > 90 per minute Respiratory rate: > 20 per minute WBC > 12,000 or < 4,000 or > 10% bands	Oral Temperature > 38.0C or < 36.0C Heart rate: > 110 per minute Respiratory rate: > 24 per minute WBC > 15,000 or < 4,000 or > 10% bands	Oral Temperature > 38.0C or < 36.0C Heart rate: > 110 per minute Respiratory rate: > 24 per minute WBC > 15,000 or < 4,000 or > 10% bands

*Includes pregnant patients <20 weeks and after 3 days post-delivery

Improves quality reporting alignment, particularly to CMS SEP-1 measure

“Measuring Quality in the Care of OB Sepsis” chapter

Facilitates critical interdisciplinary collaboration, education and training with other services and units (ICU, ED, pharmacy, etc.)



Draeger et al. BMC Health Services Research 2025

#3 Develop System-Based Solutions

Utilize standard obstetric-specific or obstetric-tailored order sets

RX OB Sepsis Bundle OBSTETRIC [3048011755]
Version: 2015-Oct-27 (3048011736)

PATIENT CARE

Sepsis Monitoring

☒ Pulse oximetry nursing	STAT, CONTINUOUS Sepsis monitoring. Keep SaO2 above 95%
☒ Oxygen	STAT, CONTINUOUS Oxygen device: Other Specify: Non-rebreather mask. Keep SaO2 above: 95% Liters per minute: 15 FIO2: Sepsis monitoring
☐ Cardiac Continuous Monitoring	STAT, CONTINUOUS Sepsis monitoring
☐ Telemetry Monitoring Med/Surg	STAT, CONTINUOUS Travel to Tests: Off cardiac monitor May shower off telemetry: Yes Notify Provider if pulse/heart rate less than: 40 Notify Provider if pulse/heart rate greater than: 120 Notify Provider if: Third Degree Heart Block Notify Provider if: New Onset of Atrial Fibrillation/Atrial Flutter Notify Provider if: V-Fib or V-Tach greater than 10 beats Sepsis monitoring

LABORATORY

Close

PHARMACY RX OB Sepsis Bundle OBSTETRIC

Fluids

☒ Sepsis Bundle Fluid Bolus	Intravenous, 30 mL/kg, ONCE, For 1 Doses Infuse 1 L at a time as rapidly as possible until MAP greater than or equal to 65 mmHg, then 150 mL/hr.
☒ lactated ringers BOLUS	at 150 mL/hr, Intravenous, CONTINUOUS Start after LR bolus.
☒ lactated ringers infusion	CONTINUOUS
☐ 0.9% sodium chloride BOLUS	Intravenous, 30 mL/kg, ONCE, For 1 Doses Infuse 1 L at a time as rapidly as possible until MAP greater than or equal to 65 mmHg, then 150 mL/hr
☐ 0.9% sodium chloride infusion	at 150 mL/hr, Intravenous, CONTINUOUS Start after NS bolus.
☐ Patient does not need fluid bolus	CONTINUOUS PRN Patient does not need fluid bolus because ***
☐ Patient has already received fluid bolus of 30 mL/kg in the last hour	CONTINUOUS PRN Patient has already received fluid bolus of 30 mL/kg in the last hour.

Antibiotics (Single Response)
Barton, J., and Sibai, B., Severe Sepsis and Septic Shock in Pregnancy, Obstet Gynecol 2012;120:689-706 DOI: <http://10.1097/AOG.0b013e318263a52d>

☒ Sepsis Obstetric Bundle Antibiotics

☒ gentamicin (GARAMCYIN) intermittent infusion	2 mg/kg, Intravenous, ONCE, For 1 Doses Pharmacy to send dose STAT, then dosing per pharmacy. (Dosing indicating stat dose)
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Close

Example order sets from University of MN Health

Aminoglycoside “Grab-n-Go” Bags

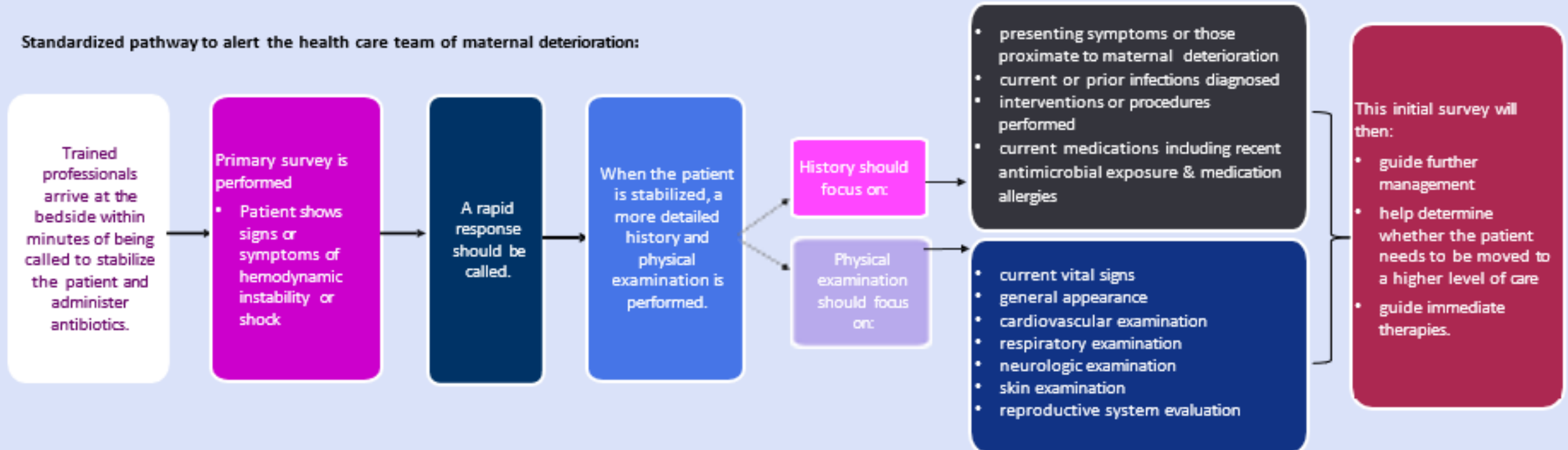
- Gentamicin (for cesarean prophylaxis)
 - The optimal doses for the most common patient weights were calculated based on two weight stratified categories (<120 kg and $\geq$ 120 kg) to make approximately 2 mg/kg dosing
 - Premixed 120 mg bags are stored refrigerated on the Labor unit
 - Patients with weights <120 kg receive 240 mg (2 bags), patients with weights $\geq$ 120 kg receive 360 mg (3 bags).

Automate dispensing or expedite availability of the most common antibiotics used in an obstetric population

Example from Lucille Packard/Stanford

Codify obstetric sepsis escalation criteria and process

Standardized pathway to alert the health care team of maternal deterioration:



Shields et al, Obstet Gynecol 2021
Graphic from Michelle Flanagan RN, Maternal Sepsis slide set

#4 Integrate standard OB patient/provider education & support



Provide ALL patients, family and providers education on maternal early maternal warning signs

<https://www.ahonn.org/education/post-birth-warning-signs-education-program/>
<https://saferbirth.org/aim-resources/aim-cornerstones/urgent-maternal-warning-signs-2/>

Tailor education, guidance, follow-up and support for post-sepsis OB patients

Guide for **Post-Discharge Care** After a Severe Maternal Event

Follow-Up Visits Arranged

- ☐ Follow up within 1-2 weeks of hospital discharge with obstetric care provider (OB)
- ☐ Identify key contact for immediate care and support as needed
- ☐ Arrange follow-up with primary care provider (PCP) or specialist(s) as appropriate
 - Many patients will need ongoing care up to 1 year to assess on going needs (especially mental health)
- ☐ Send Discharge Summary/Summary of Hospital Course to OB, PCP, and specialists
- ☐ Give Summary of Hospital Course to patient (see CMQCC Sepsis Toolkit for example)

Referrals (in-hospital or as outpatients)

- ☐ All patients with a Severe Maternal Event should have a referral to postpartum support group(s), either general or diagnosis specific (see resource list)
- ☐ Social Work—Medicaid or disability enrollment and transportation support as needed
- ☐ Lactation Consult—For support or suppression after major maternal illness or loss
- ☐ All patients with critical illness/ICU admission (for example: intubated, experiencing weakness) should have the following outpatient referrals placed on discharge¹
 - Occupational Therapy and Physical Therapy
 - Speech/Swallow evaluation (usually done post-extubation refer if ongoing difficulties)

Discharge Planning: Post Sepsis Syndrome—What Survivors Need to Know



What is sepsis? Sepsis is a complication caused by the body's overwhelming and life-threatening response to an infection, which can lead to tissue damage, organ failure, and death.

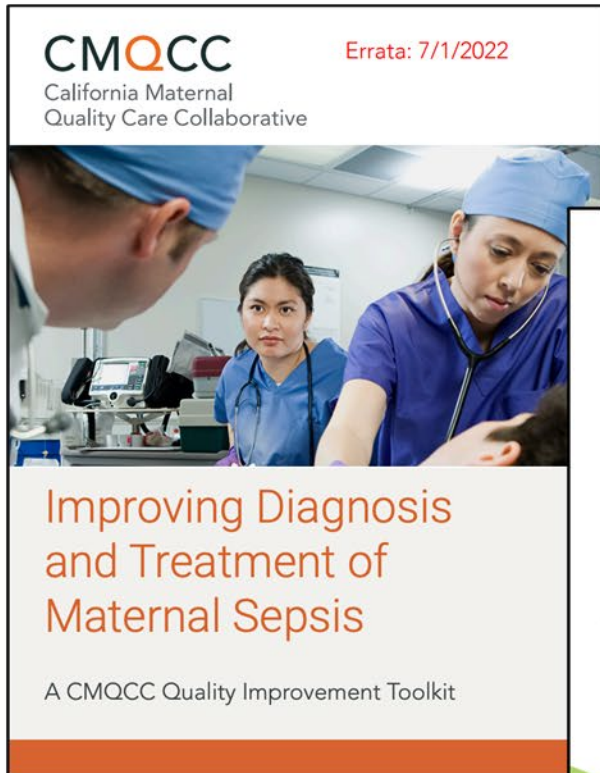
How will I feel when I get home?^{1,2}



You have been seriously ill, and your body and mind need time to get better. You may experience the following physical symptoms upon returning home:

- Weakness and fatigue
- Breathlessness
- Body pains or aches
- Difficulty moving around
- Difficulty sleeping
- Weight loss, lack of appetite, food not tasting normal
- Dry and itchy skin that may peel
- Brittle nails and hair
- Unsure of yourself
- Not caring about your appearance
- Wanting to be alone, avoiding friends and family
- Flashbacks, bad memories
- Confusing reality (e.g., not sure what is real and what isn't)
- Feeling anxious, more worried than usual
- Poor concentration
- Depressed, angry, unmotivated
- Frustration at not being able to do everyday tasks

Obstetric Sepsis Quality Improvement Resources



Consensus Statement

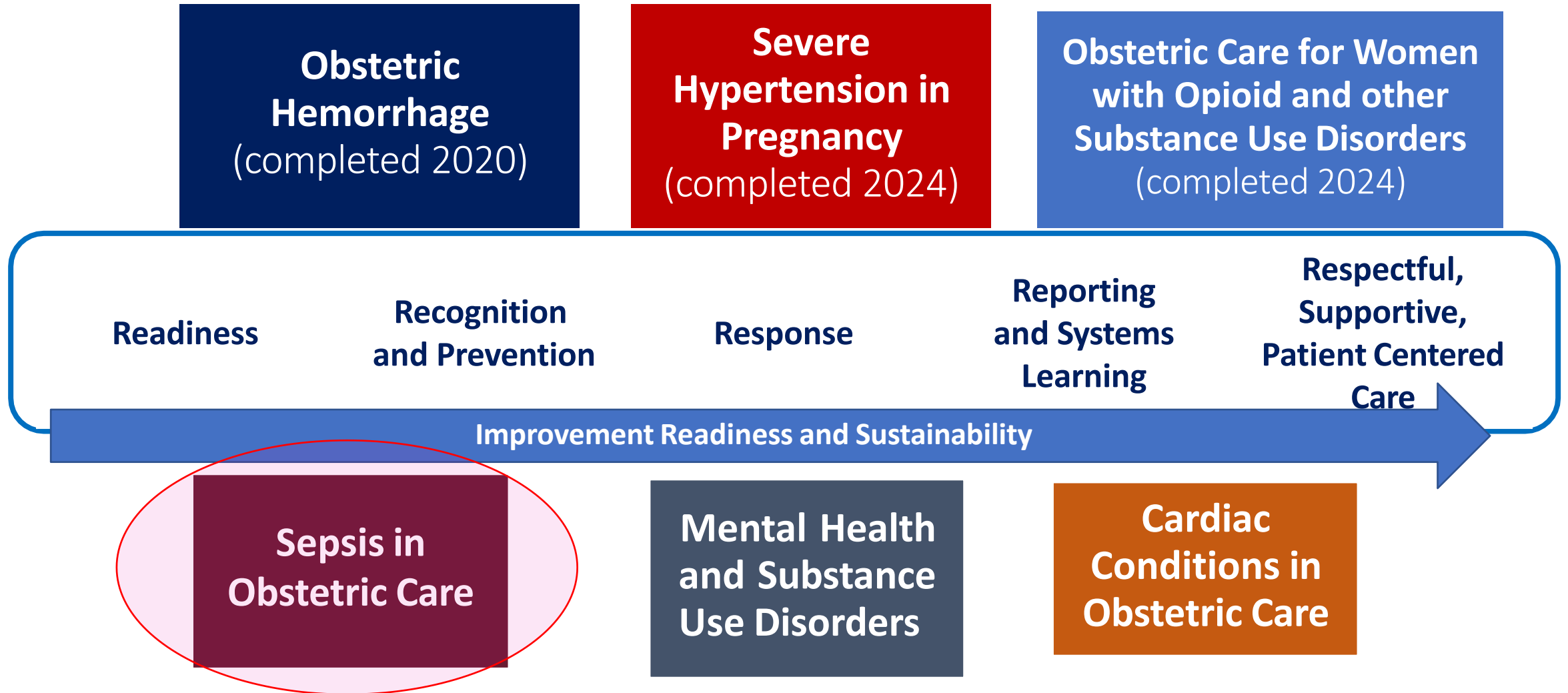
OPEN

Alliance for Innovation on Maternal Health Consensus Bundle on Sepsis in Obstetric Care

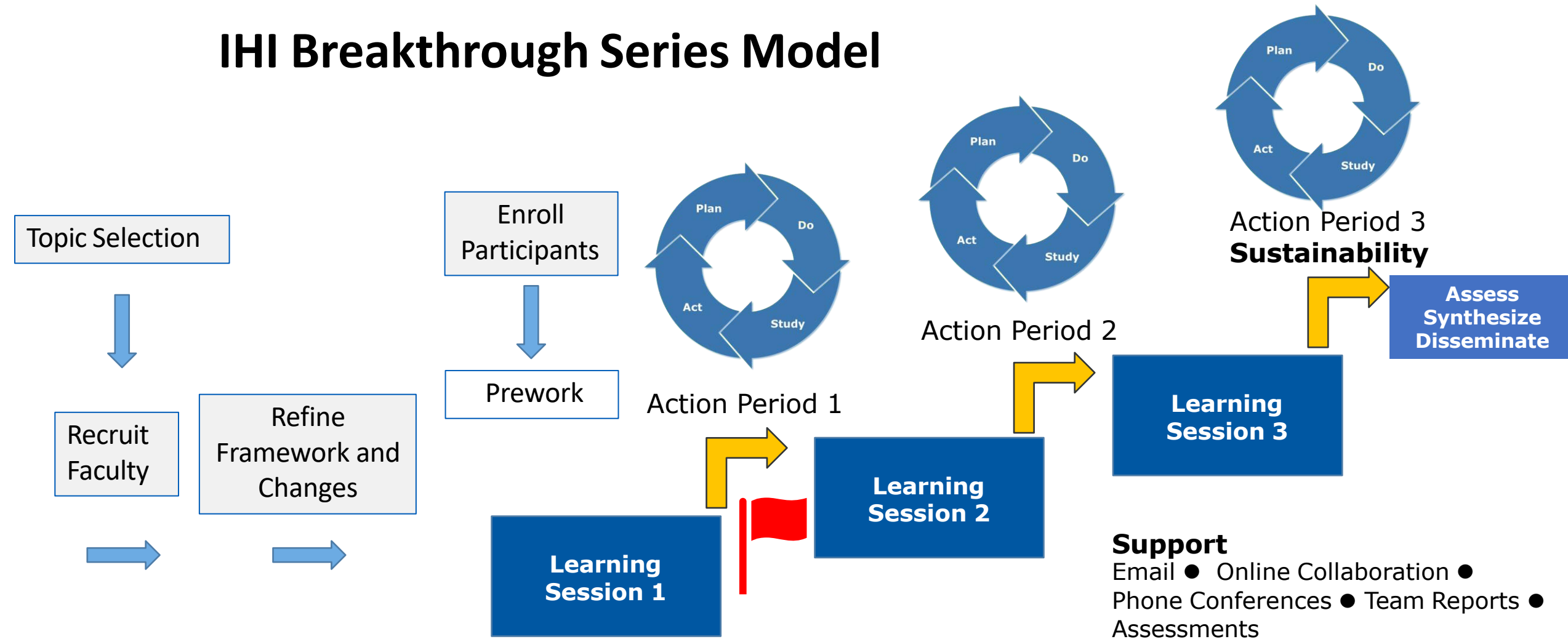
Melissa E. Bauer, DO, Catherine Albright, MD, MS, Malavika Prabhu, MD, R. Phillips Heine, MD, Chelsea Lennox, MPH, Christie Allen, MSN, RN, Carol Burke, MSN, APRN/CNS, April Chavez, MA, Brenna L. Hughes, MD, MS, Susan Kendig, MSN, JD, Maile Le Boeuf, BA, Elliott Main, MD, Tiffany Messerall, DNP, WHNP-BC, Luis D. Pacheco, MD, Laura Riley, MD, Rachel Solnick, MD, MS, Andrew Youmans, MSN, CNM, and Ronald Gibbs, MD

Obstet Gynecol. 2023 Sep 1;142(3):481-492.

TexasAIM Sepsis in Obstetric Care Collaborative



IHI Breakthrough Series Model



Sepsis in Obstetric Care Learning Collaborative

TexasAIM Sepsis Collaborative Road Map 2025-2026

Aim

Global Aim:

No pregnant or postpartum patient in Texas is harmed by preventable infection complications; and

- Sepsis- and sepsis-associated morbidity and mortality disparities are eliminated.

Collaborative Aim & Goals:

By August 2027:

- Reduce sepsis and sepsis with severe maternal comorbidity rates by 20 percent from baseline; and
- Reduce differences between highest and lowest geographic, racial/ethnic, and payor sepsis and sepsis severe maternal comorbidity rates by 10 percent from baseline.

Primary Drivers

1. Readiness

2. Recognition and Prevention

3. Response

4. Reporting and Systems Learning

5. Respectful, Supportive Patient Centered Care

TexasAIM Sepsis Change Package 1.0 June 2025

1

Slide used with permission from Sue Butts-Dion

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QUESTIONS?

