



# Maternal Sepsis: Why Mothers Die and How We Can Prevent It

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# Disclosures



- *NIH/NICHD UG3 HD108053 (PI)*
  - Large-scale Implementation of Community Co-led Maternal Sepsis Care Practices to Reduce Morbidity and Mortality from Maternal Infection
- *IHI Change Package Physician Lead Consultant*
- *Editor for the California Maternal Quality Care Collaborative Maternal Sepsis Toolkit*
- *Chair ACOG/AIM Sepsis in Obstetric Care*

# Overview

- Definition
- Incidence
- Why do mothers die from sepsis?
  - Delay in recognition
  - Delay in appropriate treatment
  - Delay in escalation of care

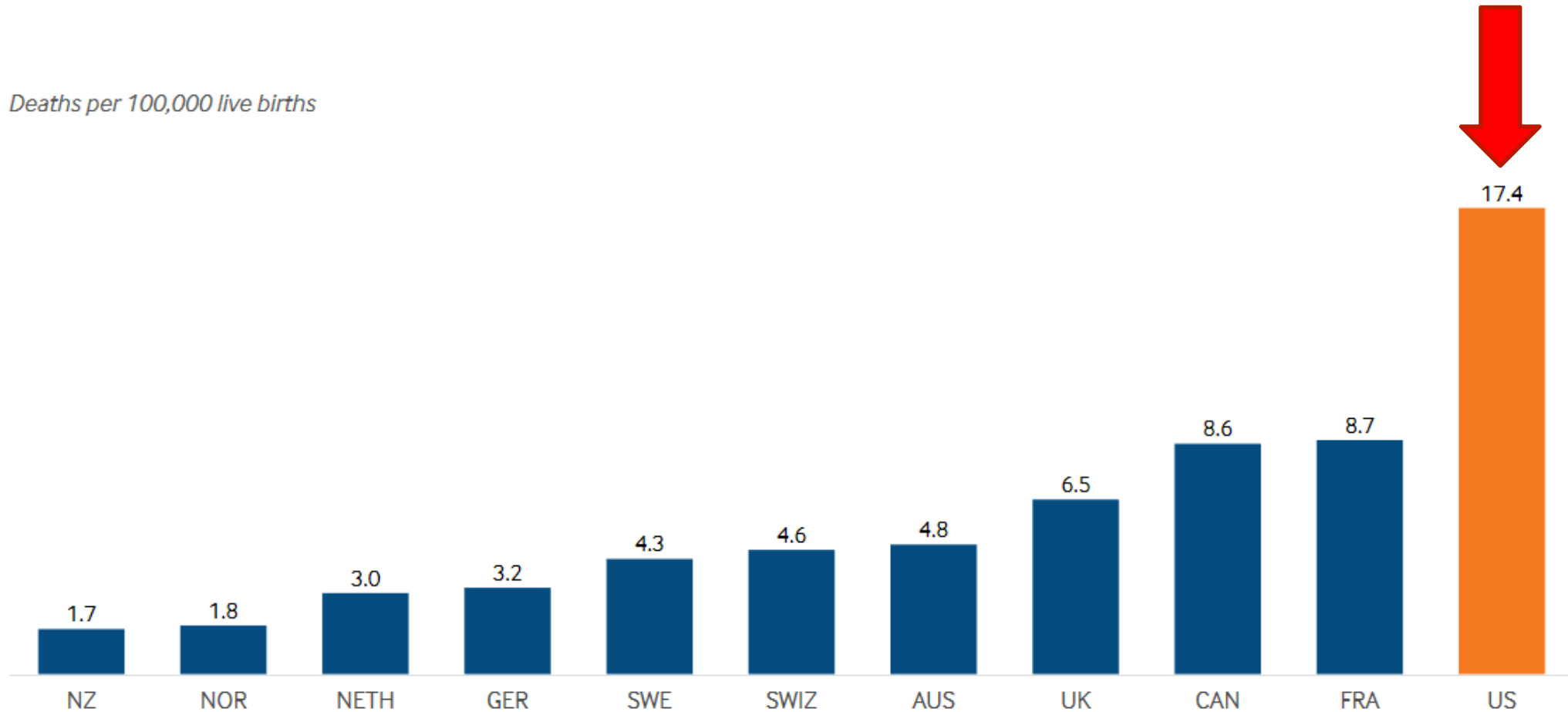
# April's Story



<https://www.youtube.com/watch?v=BLRAHpsVTHU&feature=youtu.be>

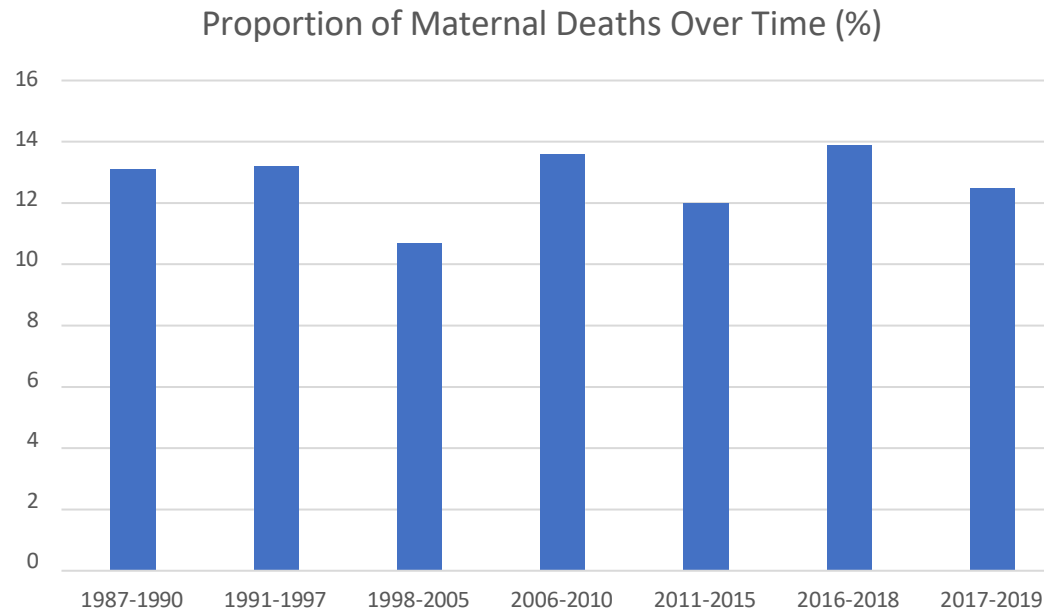
# Global Maternal Mortality Rates

*Deaths per 100,000 live births*



# Pregnancy-related deaths due to infection

- **2<sup>nd</sup>-4<sup>th</sup> leading cause of maternal death in US, 3<sup>rd</sup> globally**
- **No change in the proportion of deaths over time (1987-2019)**
  - Despite substantial improvement in mortality in the general population



# Towards a consensus definition of maternal sepsis: results of a systematic review and expert consultation



*Life-threatening condition defined as organ dysfunction resulting from infection during pregnancy, childbirth, post-abortion, or postpartum period (up to 42 days)*

# Incidence and Mortality

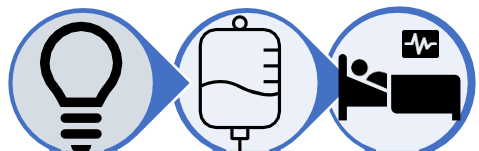
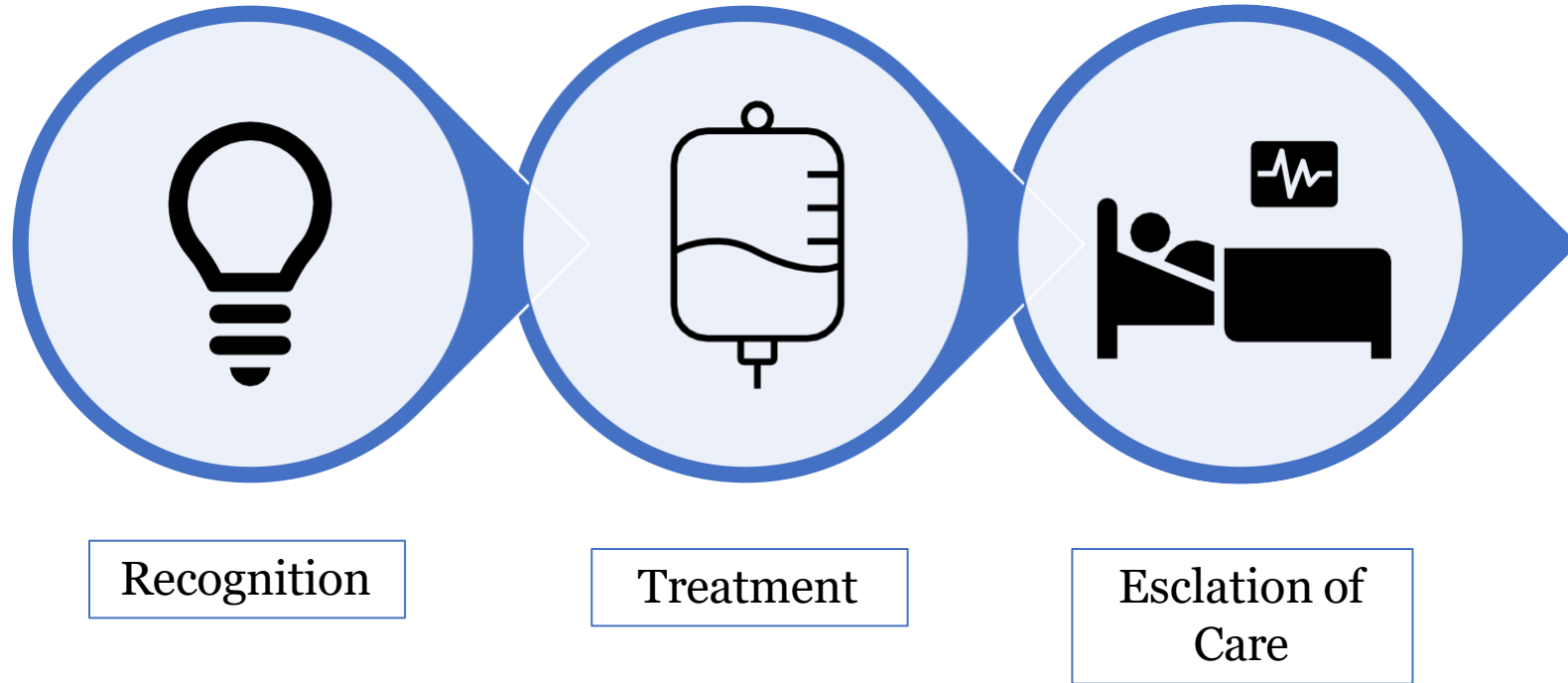
- *Varies due to case ascertainment and definitions*
- *Sepsis incidence*
  - Sepsis (1:1000, 1:2500, 1:4200, 1:10,000)
- *Mortality*
  - 9%, 10%, 14%



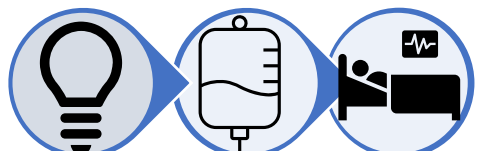
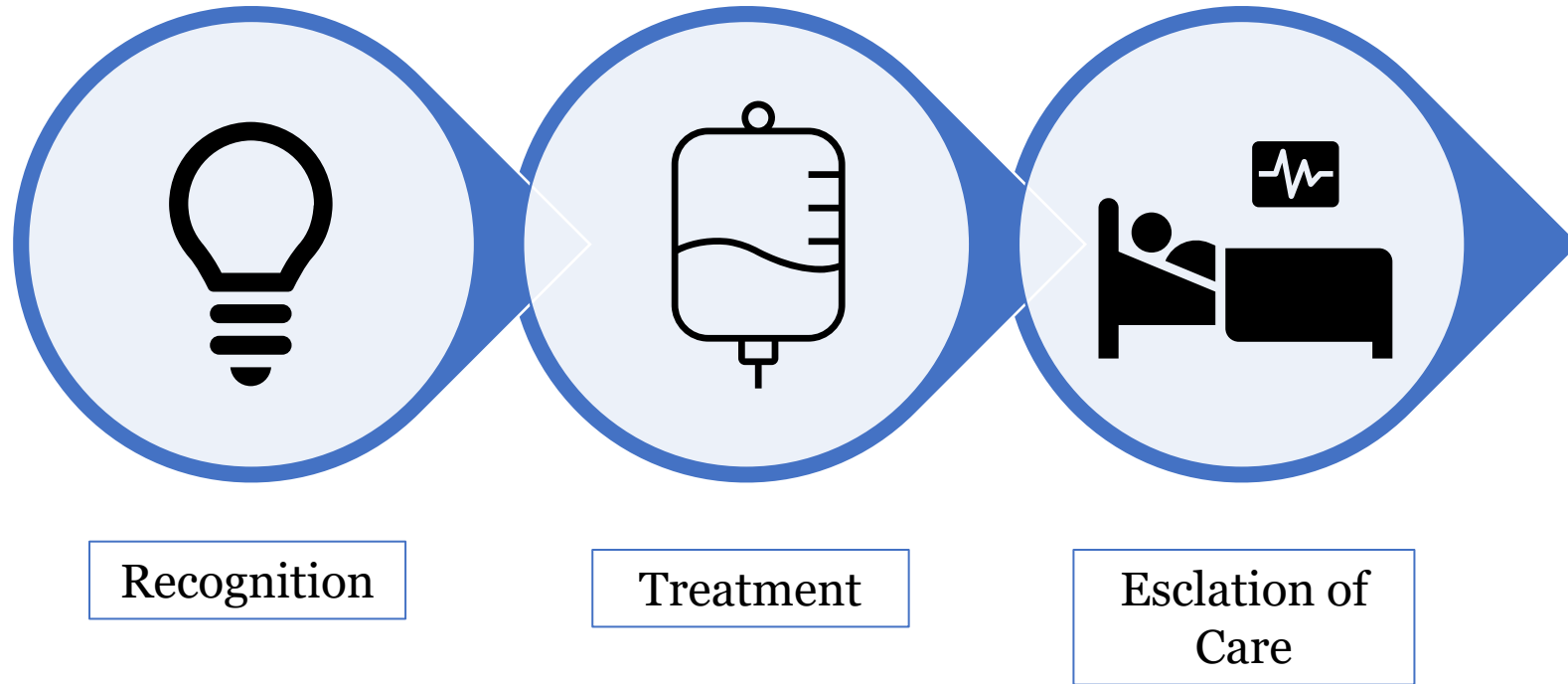
# Preventability

California	North Carolina	Michigan
39% Preventable	43% Preventable	73% Preventable

# Three Deadly Delays

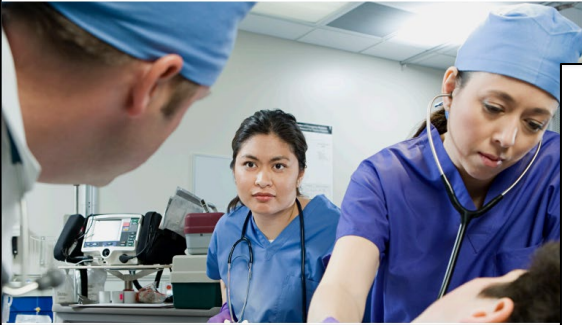


# Three Deadly Delays



# Sepsis Bundle and Toolkit

**CMQCC**  
California Maternal  
Quality Care Collaborative



**Improving Diagnosis  
and Treatment of  
Maternal Sepsis**

A CMQCC Quality Improvement Toolkit

To be updated in early  
2024



ALLIANCE FOR INNOVATION  
ON MATERNAL HEALTH

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Sepsis in Obstetric Care

2023

*Consensus Statement* OPEN

## Alliance for Innovation on Maternal Health

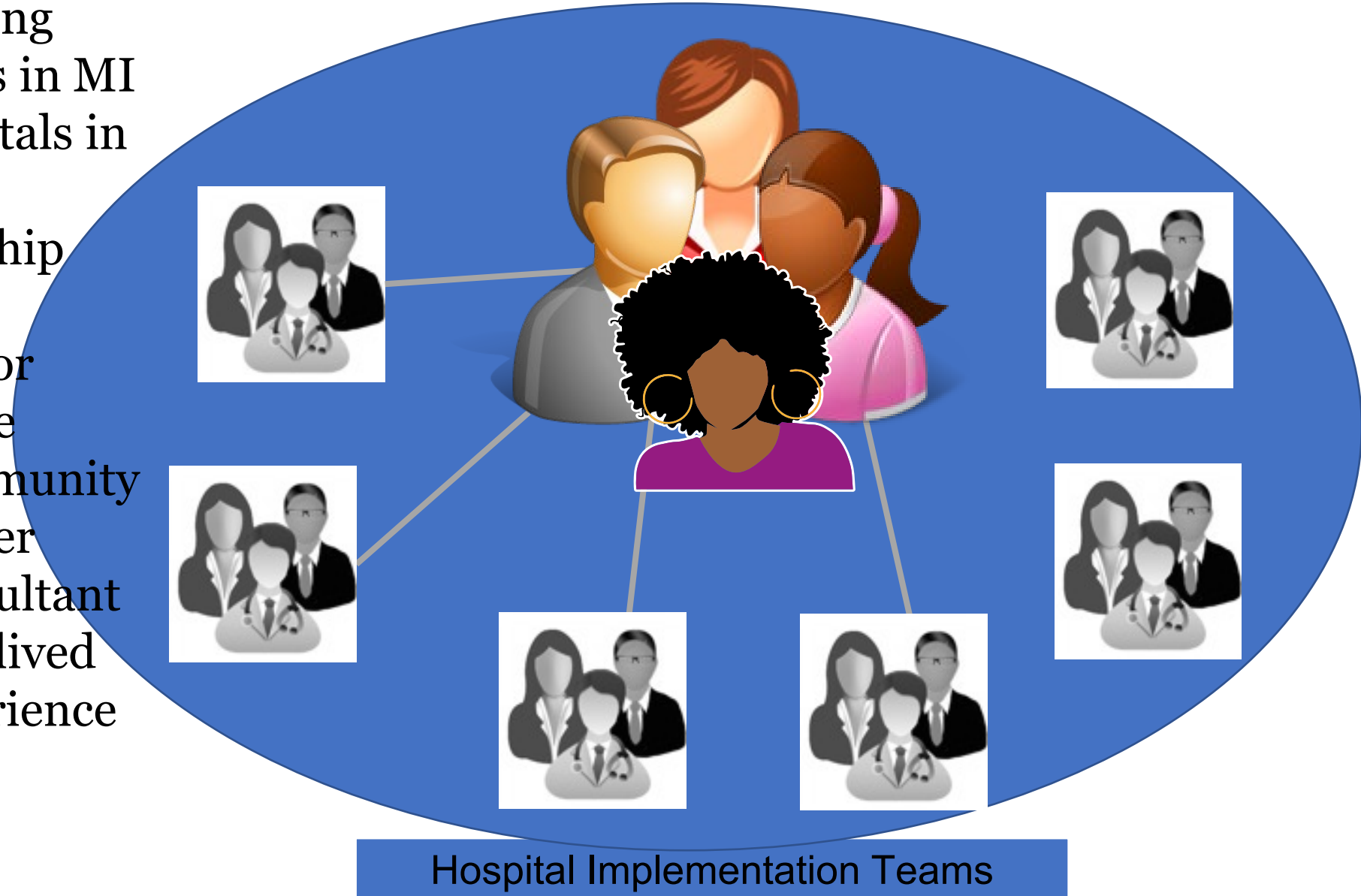
### *Consensus Bundle on Sepsis in Obstetric Care*

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

# Hospital Implementation

- 63 birthing hospitals in MI
- 66 hospitals in CA
- Mentorship teams
  - Doctor
  - Nurse
  - Community Leader
  - Consultant with lived experience



# Recognition



# Why is maternal sepsis different?

	Maternal Physiology	Sepsis
Heart rate	↑	↑
White blood cell count	↑	↓ ↑
Blood pressure	↓ ↑	↓
Lactic acid	↑	↑



# In-hospital Recognition Pearls

- Most patients do not have any risk factors
- No fever (or hypothermia)  $\neq$  No sepsis
- What is not in the chart can be most important





# Outside of the Hospital

- Over 50% of cases occur during postpartum readmission
- How can we also help the patient identify when to seek care?
- How can we help the patient be listened to and feel heard?



# Patient Barriers to Care

- 20 total interviews
  - 19 survivors with 8 support persons
  - 1 support person of a non-survivor
- Goals:
  - Identify barriers to care
  - Listen to patient's stories and lessons learned
  - Create solutions to address barriers



# Patients did not remember education about warning signs

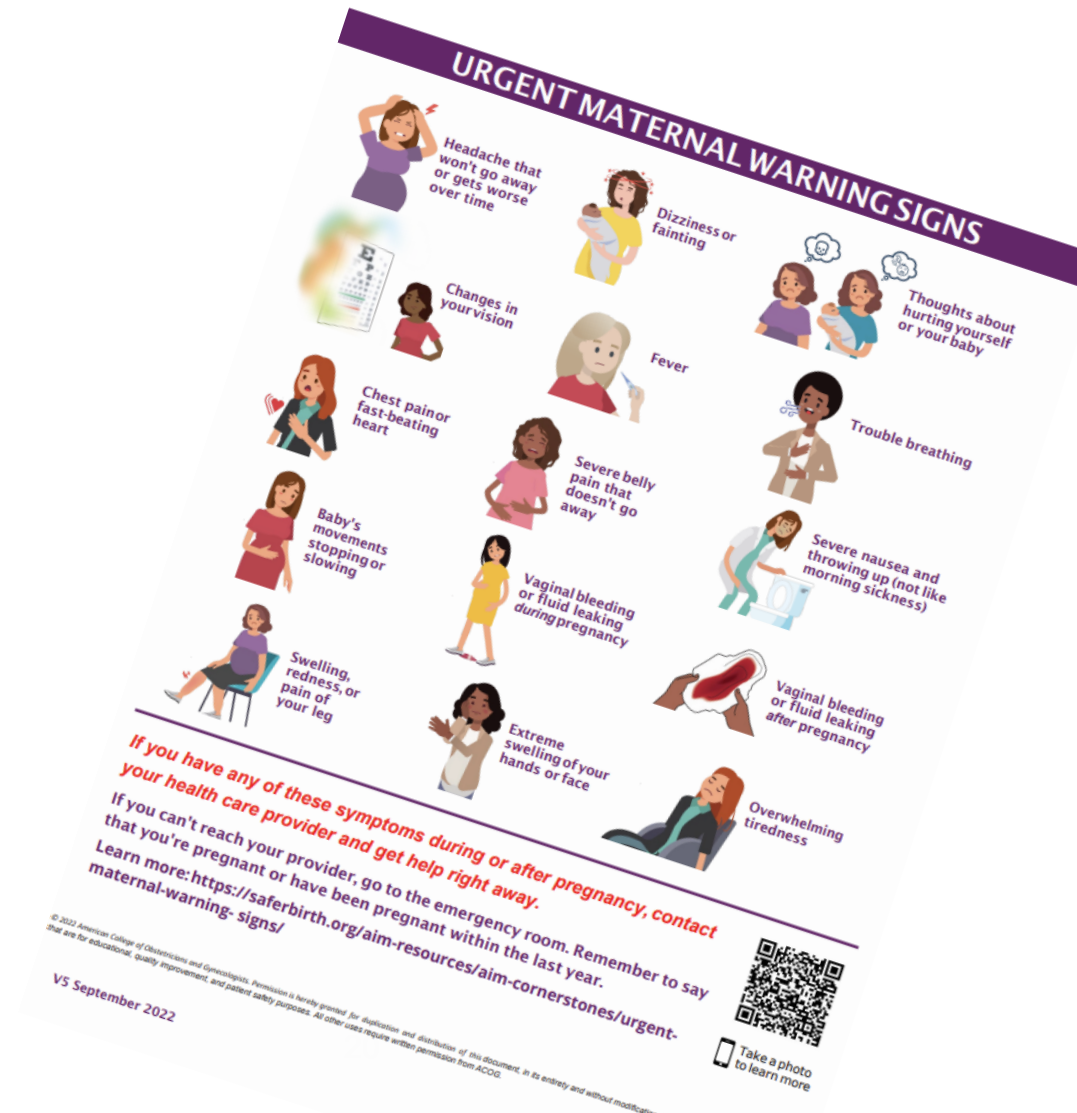
- *“I think if when they discharged me, if they had said be on the lookout for these symptoms, if you have any of them, call and check in. If they had taken five minutes to do that, I think it would’ve made a huge difference.”*



# Urgent Maternal Warning Signs

- AIM Cornerstone resource, originally developed by the Council for Patient Safety in Women's Health Care
- Translated into 28 languages
- Standardized patient education

[www.saferbirth.org/aim-resources/aim-cornerstones/urgent-maternal-warning-signs/](http://www.saferbirth.org/aim-resources/aim-cornerstones/urgent-maternal-warning-signs/)



# Phone Discharge Education


ADD RESOURCES TO YOUR DEVICE HOME SCREEN


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**For iPhone:**  
Scan QR Code on reverse side and choose:   
Scroll down until "Add to Home Screen" appears, click on:  Tap "Add"

**For Android:**  
Scan QR Code on reverse side and choose:   
Scroll down and tap on "Add to Home Screen" Tap "Add"



It will now appear on your home screen.

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PATIENT AND PROVIDER RESOURCES




**PATIENTS:**  
Urgent Maternal Warning Signs, Advocacy Language and Actions, and More!

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**PROVIDERS:**  
Warning Signs Follow Up Guide, Sepsis in Obstetrics Score Calculator, and More!

**URGENT MATERNAL WARNING SIGNS**



Headache that won't go away or gets worse over time



Dizziness or fainting



Changes in your vision



Fever



Chest pain or fast-beating heart



Severe belly pain that doesn't go away



Baby's movements stopping or slowing



Vaginal bleeding or fluid leaking during pregnancy



Swelling, redness, or pain of your leg



Extreme swelling of your hands or face

If you have any of these symptoms during or after pregnancy, contact your health care provider and get help right away



# Community Dissemination



# Patient advocacy

- *“I wish someone would've explained the signs and how to advocate for themselves. Like if you call and they tell you don't come, still go. Go. It's better to go instead of waiting because hours is the difference between dire circumstances and dire consequences.”*



# Co-Created with Community and Patients with Lived Experience



- Advocacy Language
- Advocacy Actions





# Advocacy Language

ADVOCACY LANGUAGE: List suggestions for language to provide patients (or their support person can say) who feel they are not being heard





## EXAMPLES OF ADVOCACY LANGUAGE

- > I am very concerned and do not feel like I am being heard. What are my next steps or alternative options?
- > This is really different for me. I have never felt this way in my life. For my benefit and my family's benefit I should be seen.
- > I understand that some of these symptoms may be normal for pregnancy or postpartum, but I am very concerned and need to be evaluated.
- > I have called a number of times and tried suggestions that have been provided, but I am not getting better.
- > Can you please refer me to someone who can help me? I'm really worried.
- > My doctor told me to call if I am experiencing X, Y, or Z. I am having X, Y, or Z. I would like to be seen.
- > I want to speak to someone else to make sure that I do not have a serious condition. Can you please refer me to someone who will help me? I am really worried.
- > I do not feel right, I am concerned that something bad is happening to me.



## ADVOCACY ACTION TIPS

- > Your concerns and feelings are valid, be persistent in getting the answers or care you need.
- > If you have a medical emergency, please dial 911 or go to the nearest emergency room.
- > Ask to speak to the charge nurse or patient relations if you are not being heard
- > If you are not getting the response you need, you can go to triage or the emergency room. You do not need permission from anyone to do so.
- > You can also go to a different hospital or urgent care facility if you are not receiving the care you need.
- > Consider having another person to accompany you to help advocate for you (support person, family member, doula, etc.)
- > Bring a list of your concerns you would like to be addressed.
- > Start your concern with the effect that it is having such as the following: "I am so tired I am unable to get out of bed"; "I am having so much pain I cannot sleep"; etc.



# Patient Concerns dismissed as normal

*“She’s dismissed there and throughout the whole stay whenever we brought these things up it was, ‘you just had a baby, everything’s okay. Don’t worry, you just had a baby,’ and that was the recurring theme throughout our stay.”*



# But if they had asked further...

*“I had no strength; I couldn’t even go to the kitchen to get a glass of water”*

*“I was so weak; I couldn’t stand up”*

*“I was short of breath after brushing my teeth and had to lie down on the bed”*



# Warning Signs: Questions to Ask

**WARNING SIGNS QUESTIONS TO ASK:**  
Please add questions to ask when patients call with one of these warning signs for assessment overall and specifically for "fever", "overwhelming tiredness", "severe belly pain that doesn't go away", "dizziness or fainting"

Im so sorry you are not feeling well. What else can you share with me about how you feel?

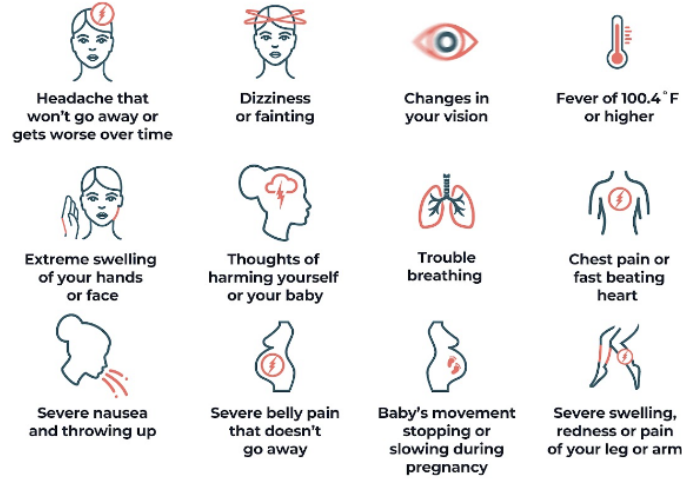
When a patient calls in, review this list to ask if any of the symptoms are present. If they are, ask when they started, are they constant, how long they last.

I would like to see you in person. Do you need assistance in getting a ride or child care?

Also ask what their temperature is in case it is low which can also be a problem. How does their current temperature compare to their normal temperature?

## Pregnant now or within the last year?

Get medical care right away if you experience any of the following symptoms:



These could be signs of very serious complications. If you can't reach a healthcare provider, go to the emergency room. Be sure to tell them you are pregnant or were pregnant within the last year.

Learn more at [www.cdc.gov/HearHer](http://www.cdc.gov/HearHer)



This list of urgent maternal warning signs was developed by the Council on Patient Safety in Women's Health Care.

If the patient states that they "don't feel right" and requests to be seen, they should be seen. Whether that be office or hospital triage.

Red flag if the patient's partner or family member is calling on behalf of the patient

Are you able to perform normal day-to-day functions?

Are there any barriers that are preventing you from coming in to physically be seen?

To providers: Believe the patient and listen to what they are saying

To providers: Clearly state "I'm Nurse Betty and here to help you today, let me start by listening to your concerns today, please tell me your name and DOB"

How much do your symptoms worry you?

How concerned about your symptoms from a 1-10.

What prompted you to call? Is this your 1st time reporting or calling?

How is this different from your baseline?





## BACKGROUND

These questions, tips, and red flags were created based on near-miss cases of patients who suffered severe maternal morbidity.

Many patients called in with symptoms but were met with reassurance that symptoms were typical of pregnancy or postpartum rather than follow up questions that would have identified severe illness to allow prompt treatment.



## FOLLOW UP QUESTIONS

These follow up questions are suggested to evaluate when patients call with symptoms of concern.

- > Please tell me in your own words what is wrong.
- > Is this your first time calling about this?
- > How long has this been going on?
- > Is it getting better, staying the same, or getting worse?
- > On a scale of 1 to 10 (worst) how bad is \_\_\_\_\_? (pain/tiredness/symptoms of concern)
- > Are you able to perform your normal day-to-day activities and take care of yourself?
- > Are you able to eat, drink, urinate, pass gas, have bowel movements?
- > Can you explain how this is limiting you?
- > What prompted you to call?
- > Have you had this before?
- > Can you explain how you are feeling and how this is different from your baseline?
- > Are there any barriers to coming in today?



## ACTION ITEMS

- > If the patient does not need assessment now, explain red flag warning signs when the patient should call back or come in for evaluation.
- > Express empathy and concern. Many patients reported feeling like a burden and not feeling heard and subsequently delayed calling and seeking care when symptoms worsened.
- > Keep track of a list of patients to reach back out to follow up on and encourage them to call back if not improving or getting worse.



## RED FLAGS (should prompt in-person evaluation)

- > Patient reaching out multiple times with concerns.
- > A support person calling on behalf of the patient with concerns.
- > Patient requests to be seen.
- > Symptoms that are worsening over time.
- > Patient unable to perform activities of daily living (climbing stairs, showering, brushing teeth, holding baby, etc.)
- > Signs of severe dehydration: inability to urinate, inability to make tears, abrupt stopping of milk production.
- > Severe pain.



# Treatment



# Antibiotics





# Importance of prompt antibiotic therapy In Pregnant Patients

- Antibiotics within one hour
  - 8% mortality
- Antibiotics after one hour
  - 20% mortality



# CMQCC Toolkit

**TABLE 9.** Proposed Empiric Antibiotic Coverage for Patients with Sepsis of Unknown Source (with End Organ Injury) or Septic Shock

<b>Antibiotic Choices</b> <i>Empiric coverage for sepsis of unknown source or for septic shock should include at least one antibiotic for Gram-negative and anaerobic coverage PLUS one for Gram-positive coverage</i>	<b>Duration</b>
<p><b>Gram-negative plus anaerobic coverage</b></p> <p>Piperacillin/tazobactam 3.375 g IV q8h (extended infusion) or 4.5 g IV q6h</p> <p><b>OR</b></p> <p>Meropenem 1 g IV q8h (if recent hospitalization or concern for MDRO organisms)</p> <p><b>OR</b></p> <p>Cefepime 1-2g IV q8h plus metronidazole 500 mg IV q8h</p> <p><b>OR</b></p> <p>Aztreonam 2 g IV q8h (for women with severe penicillin allergy)</p> <p>Plus metronidazole 500 mg IV q8h</p> <p><b>OR</b></p> <p>Aztreonam 2g IV q8h plus clindamycin 900 mg IV q8h</p> <p><b>PLUS</b></p> <p><b>Gram-positive coverage</b></p> <p>Vancomycin 15-20 mg/kg q8h-q12h (goal trough 15-20 mcg/mL)</p> <p><b>OR</b></p> <p>Linezolid 600 mg IV/PO q12h (for women with severe vancomycin allergy)</p>	<p>7-10 days is adequate for most infections</p>



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

## Recommendations

12. For adults with possible septic shock or a high likelihood for sepsis, we **recommend** administering antimicrobials immediately, ideally within one hour of recognition.

*Strong recommendation, low quality of evidence (septic shock)*

*Strong recommendation, very low quality of evidence (sepsis without shock)*



# Maternal Deaths Due to Sepsis in the State of Michigan, 1999–2006



*Only 13% (2/15) patients received appropriate initial antibiotics*

*After ICU or ID consult, 67% (10/15) were appropriate for clinical situation*

20% (3/15) did not live long enough for subsequent therapy

13% (2/15) appropriateness was unable to be determined



# Combination therapy

- *Clindamycin with  $\beta$ -lactams to inhibit exotoxin production*
  - Group A streptococcus (7-10% of cases)



# Systems-based solutions

- Automated dispensing system availability
- IV access
- Pharmacy
- Waiting for transport



# Fluid administration



# 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.*

## **Remarks:**

During acute resuscitation, serum lactate level should be interpreted considering the clinical context and other causes of elevated lactate.



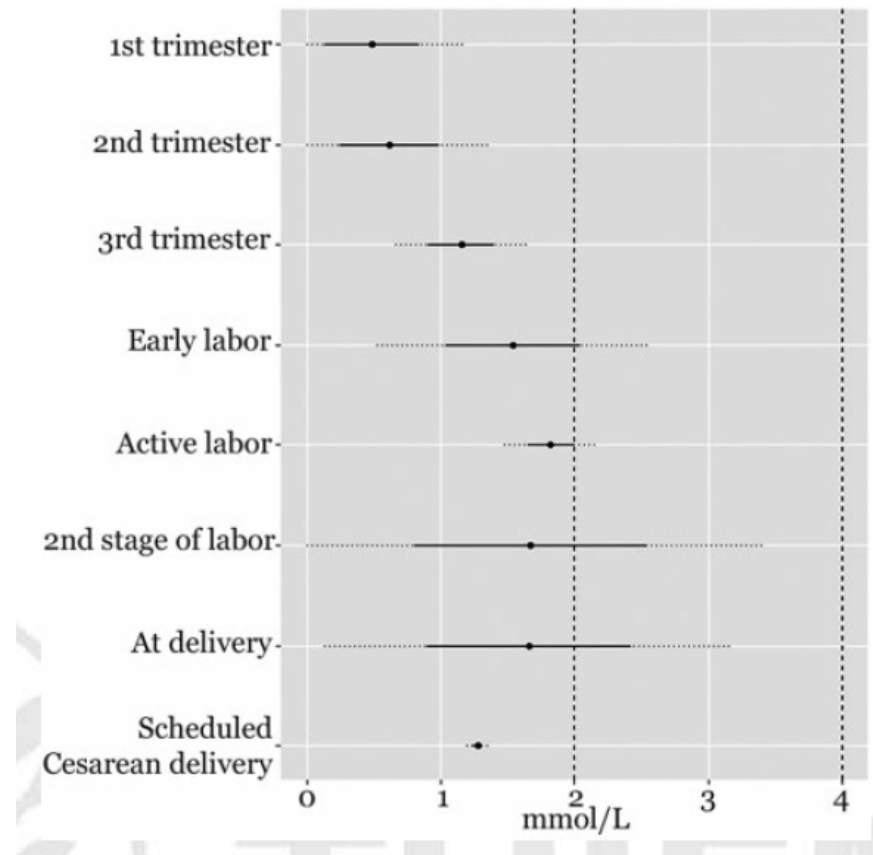


# Normal Range for Maternal Lactic Acid during Pregnancy and Labor: A Systematic Review and Meta-Analysis of Observational Studies

- 22 studies
- 1,193 patients
- 2,008 observations



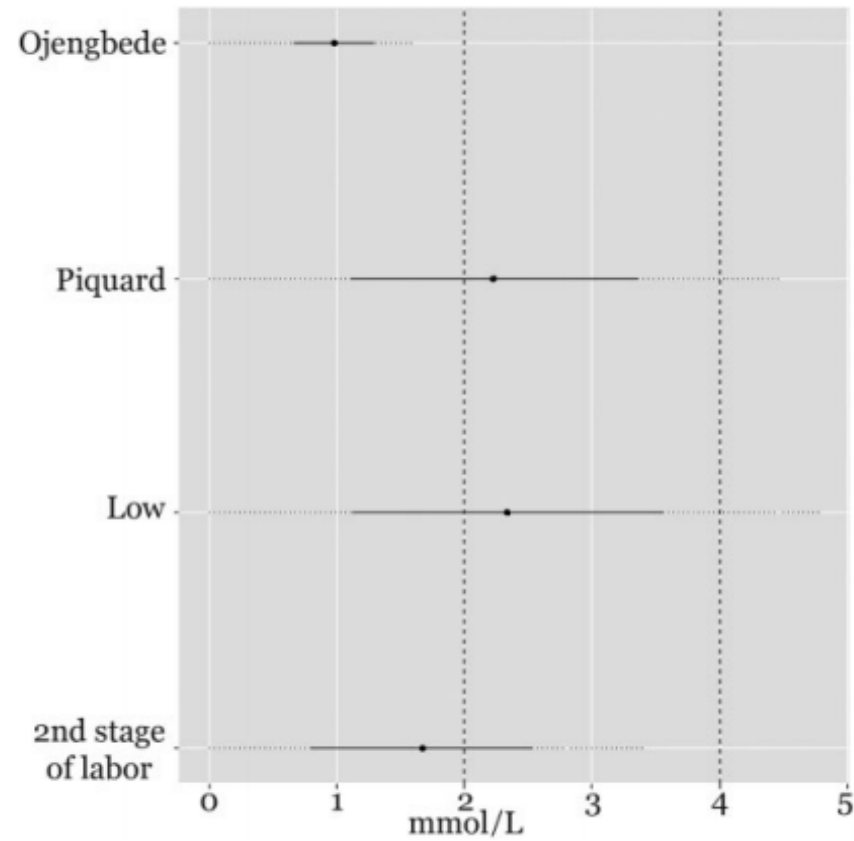
# During Pregnancy



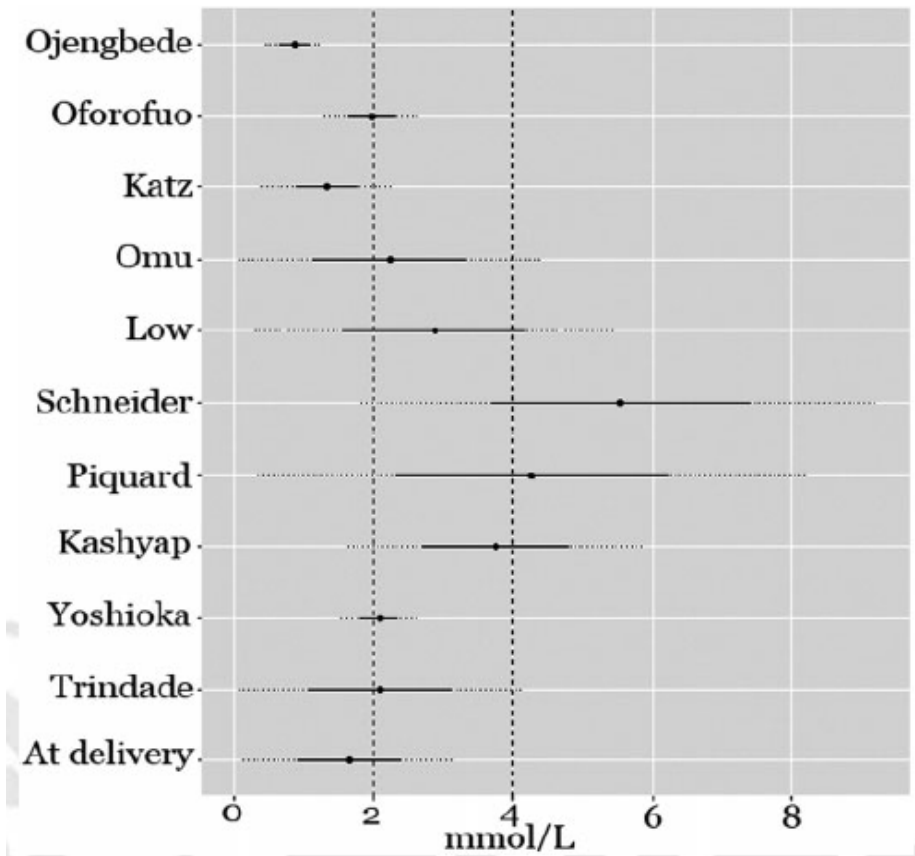
Outside of labor  
<2 mmol/L



# 2<sup>nd</sup> stage of Labor



# At Delivery



Should return back to  
< 2 mmol/L  
within 30- 60 minutes  
After delivery



# Escalation of Care



# Sepsis in Obstetrics Score

**FIGURE 1**  
**Sepsis in Obstetrics Score**

Variable	High abnormal range				Normal	Low abnormal range			
	+4	+3	+2	+1		+1	+2	+3	+4
Score					0				
Temperature (°C)	>40.9	39-40.9		38.5-38.9	36-38.4	34-35.9	32-33.9	30-31.9	<30
Systolic Blood Pressure (mmHg)					>90		70-90		<70
Heart Rate (beats per minute)	>179	150-179	130-149	120-129	≤119				
Respiratory Rate (breaths per minute)	>49	35-49		25-34	12-24	10-11	6-9		≤5
SpO <sub>2</sub> (%)					≥92%	90-91%		85-89%	<85%
White Blood Cell Count (/μL)	>39.9		25-39.9	17-24.9	5.7-16.9	3-5.6	1-2.9		<1
% Immature Neutrophils			≥10%		<10%				
Lactic Acid (mmol/L)			≥4		<4				

Scoring template for S.O.S., a sepsis scoring system designed specifically for obstetric patients.

S.O.S., Sepsis in Obstetrics Score; SpO<sub>2</sub>, blood oxygen saturation.

Albright. *The Sepsis in Obstetrics Score. Am J Obstet Gynecol* 2014.



# Sepsis Calculator

Sepsis Obstetrics Scoring System			
Temperature (Centigrade) (° C) 36 - 38.4 C ( 96.8 - 101.1 F) ▼	<input type="text"/>	SpO2% blood oxygen saturation ≥ 92% ▼	<input type="text"/>
Systolic blood pressure (mmHg) > 90 ▼	<input type="text"/>	White blood count uL 5.7 - 16.9 ▼	<input type="text"/>
Heart Rate (beats per minute) ≤ 119 ▼	<input type="text"/>	% Immature Neutrophils < 10% ▼	<input type="text"/>
Respiratory Rate (breaths per minute ) 12 - 24 ▼	<input type="text"/>	Lactic Acid (mmol/L) < 4 ▼	<input type="text"/>
Calculate Sepsis Obstetrics Score (S.O.S)		<input type="text"/>	





MICHIGAN ALLIANCE FOR INNOVATION  
ON MATERNAL HEALTH

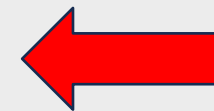
## Provider Materials

The materials below are designed to support medical professionals with educating patients about the leading signs and symptoms of severe maternal events that could lead to complications and/or death. Materials are available to help providers communicate with patients about their condition.

[Southeast Michigan Perinatal Quality Improvement Coalition \(SEMPQIC\)](#)

[Detroit Health Equity Education Resource](#)

[Escalation of care resource: Sepsis in Obstetrics Score Calculator](#)





# Action Items

- Recognition
  - Develop sepsis screening (prior lecture)
- Treatment
  - Work with pharmacy to obtain prompt antibiotics
  - Antibiotic selection
- Escalation of care
  - Have criteria for escalation of care

# Thank you

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- Twitter: @MelissaEBauer1