Policy Title	Policy Number	Policy Issuer	Replacement of Policy Number
Management of Maternal Sepsis	Version 1	Deputy Ministry for Therapeutic Services	-----
Policy Classification	**Issue Date**	**Effective Date**	**Date of Next Revision**
☐ orporate Policy (General) ☐ Inter-department Policy ■ Department Policy	**3/11/2025**	**4/11/2025**	**2/11/2027**

1. Purpose

The purpose of a policy is to provide clear, evidence-based guidelines for healthcare professionals. This ensures the prompt diagnosis and effective management of sepsis in pregnant and postnatal women, aiming to reduce maternal morbidity and mortality. The policy emphasizes the importance of early detection and timely intervention to improve outcomes for both mothers and their babies

2. Defintions

- **SOFA:** Sequential Organ Failure Assessment (Appendix 1)
- **QSOFA:** quick Sequential Organ Failure Assessment.
- **WHO:** World Health Organization
- **World Health Organization Maternal sepsis definition:** A life-threatening condition defined as organ dysfunction resulting from infection during pregnancy, childbirth, post-abortion, or postpartum period (up to 42 days). *(Statement on Maternal Sepsis, WHO, 2017).*

Comments :

- Sepsis during pregnancy and the puerperium (i.e. until 6 weeks postnatally) remains one of the leading direct cause of maternal death world wide .
- Sepsis is a medical emergency and the first hour of diagnosis is crucial in achieving a successful outcome. Each hour of delay in administering broad spectrum intravenous antibiotic is associated with a measurable increase in maternal mortality.
- Sepsis is the body's overwhelming and life-threatening response to infection that can lead to tissue damage, organ failure and death. Signs of severe sepsis in peripartum women, particularly with group A streptococcal infection should be regarded as an obstetric emergency.
- Symptoms of sepsis may be less distinctive than in the non-pregnant population and are not necessarily present in all cases; therefore, a high index of suspicion is necessary.
- Bacteraemia can progress rapidly to severe sepsis.
- All recently delivered women should be informed of the signs and symptoms of Sepsis

Risk factors for maternal sepsis in pregnancy and the puerperium

- Obesity
- Impaired glucose tolerance/diabetes
- Impaired immunity/immunosuppressant medication
- Anaemia
- Offensive Vaginal discharge
- History of pelvic infection
- History of group B streptococcal infection
- Amniocentesis and other invasive procedures
- Cervical cerclage
- Prolonged spontaneous rupture of membranes
- Vaginal trauma, caesarean section, wound hematoma
- Retained products of conception
- Group A streptococcus infection in close contacts/family members
- Black or other minority ethnic group origin

Table 1.Leading causes of maternal sepsis:

Antepartum	Intrapartum/Immediate Postpartum	Post-discharge
Septic abortion	Chorioamnionitis/intraamniotic infection	Pneumonia/influenza
Chorioamnionitis/ intraamniotic infection	Endometritis	Pyelonephritis
Pneumonia/influenza	Pneumonia/influenza	Wound Infection/ necrotizing fasciitis
Pyelonephritis	Pyelonephritis	Mastitis
Appendicitis	Wound Infection/ necrotizing fasciitis	Mastitis Cholecystitis

3. Equpiment/Material/Form(s)

3.1 Monitoring Devices

- **Blood Pressure Monitors:** To regularly check for hypotension.
- **Pulse Oximeters:** To monitor oxygen saturation levels.
- **ECG Machines:** To detect any cardiac abnormalities.
- **Temperature Probes:** To monitor body temperature.

3.2 Diagnostic Tools:

- **Blood Culture Bottles:** For identifying the causative organism.
- **Lactate Monitors:** To measure serum lactate levels.
- **Urine Analysis Kits:** For detecting urinary tract infections.
- **Ultrasound Machines:** For assessing internal infections.

3.3 Therapeutic Equipment:

- **IV Cannulas and Infusion Pumps:** For administering fluids and medications.
- **Vasopressors:** For managing septic shock.
- **Ventilators:** For respiratory support if needed.
- **Antibiotic Delivery Systems:** For timely administration of broad-spectrum antibiotics.

3.4 Materials:

- **Antibiotics:** A range of broad-spectrum antibiotics to cover potential pathogens.
- **IV Fluids:** Crystalloids and colloids for fluid resuscitation.
- **Sterile Dressings and Drapes:** To maintain aseptic conditions.
- **Personal Protective Equipment (PPE):** Gloves, masks, gowns, and eye protection for healthcare workers.
- **Medical Records and Documentation Tools:** MOEWS FORM For accurate recording of patient data and treatment plans.

4 Policy Statment

- clinicians should consider the diagnosis of sepsis in pregnant or postpartum patients .
- unexplained end-organ damage in the presence of a suspected or confirmed infectious process, regardless of the presence of fever.
- Sepsis and septic shock in pregnancy must be considered medical emergencies and that treatment and resuscitation should begin immediately
- Clinicans should avoid a single screening tool for detection of maternal sepsis.
- Evaluation for infectious causes in pregnant or postpartum patients in whom sepsis is Suspected or identified should include appropriate microbiologic cultures, including blood ,before starting antimicrobial therapy,as long as there are no substantial delays in starting antibiotics.
- A serum lactate level should be obtained in pregnant or postpartum patients in whom sepsis is suspected or identified.
- In pregnant or postpartum patients with septic shock or a high likely hood of sepsis, administration of Empiric broad-spectrum antimicrobial therapy should be started , ideally within 1h of recognition.
- Early intravenous administration (within the first 3h) of 1to 2L of balanced crystalloid solutions in sepsis complicated by hypotension or suspected organ hypoperfusion.
- Norepinephrine as the first-line vasopressor during pregnancy and the postpartum period with septic shock.
- Intravenous corticosteroids to be used in pregnant or postpartum patients with septic shock who continue to require vasopressor therapy.
- Because of an increased risk of VTE in sepsis and septic shock, the use of pharmacologicVTE Prophylaxis in pregnant and postpartum patients in septic shock.
- Initiating insulin therapy at a glucose level >180mg/dL in critically ill pregnant patients with sepsis is recommended .

- If a uterine source for sepsis is suspected or confirmed, prompt delivery or evacuation of uterine contents is recommended to achieve source control, regardless of gestational age.

5 Procedures

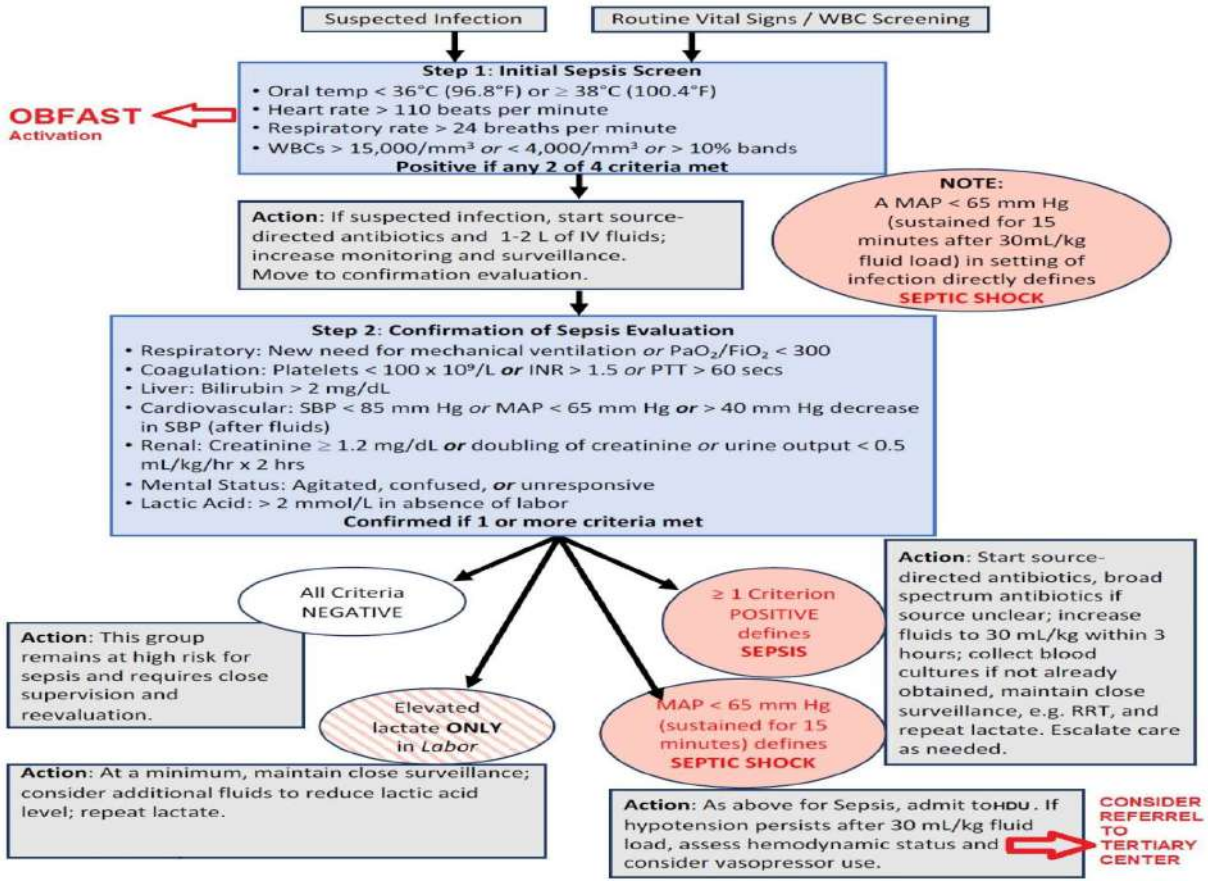
5.1 Maternal sepsis screening and diagnosis:

5.1.1 Two-Step Approach to Screening:

5.1.1.1 **Step 1: Initial Sepsis Screen (See Box 1):**

- In the setting of suspected infection, a mean arterial pressure (MAP) < 65 mm Hg is sufficient to initiate the sepsis protocol even if other sepsis screening criteria are not met.
- A screen is considered positive if two or more values meet the criteria listed in **Box 1.** A white blood cell (WBC) count that has been obtained within 24 hours can be used for the initial screen.
- A sustained maternal heart rate> 130 beats per minute is especially concerning for current or future end organ injury from sepsis.

FIGURE 1. Maternal Sepsis Evaluation Flow Chart



- Maternal corticosteroid administration often increases the WBC count, but the suspicion for infection should not be discounted without further evaluation. WBC cell values peak 24 hours after administration of corticosteroids for fetal lung maturity.

- Screening criteria parameters should be continued through all stages of labor and continued until the patient is discharged from the hospital. Vital signs should not be taken during contractions to avoid obtaining transient aberrant values.

BOX 1. Initial Sepsis Screen

Step 1: Initial Sepsis Screen for All Patients with Suspected Infection (POSITIVE if two (2) or more criteria are met)
• Oral temperature< 36°C (96.8°F) or 38°C (100.4°F) • Heart rate> 110 beats per minute and sustained for 15 minutes • Respiratory rate> 24 breaths per minute and sustained for 15 minutes • White blood cell count> 15pOO/rn_m3 or< 4,000/mm3 or> 10% immature neutrophils\bands)

5.1.2 Step 2: Confirmation of Sepsis

BOX 2. Confirmation of Sepsis

Step 2: Confirmation of Sepsis Test to Evaluate End Organ Injury
Laboratory values
• Complete blood count (including% immature neutrophils [bands], platelets) • Coagulation status (prothrombin time/international normalized ratio/partial thromboplastin time) • Comprehensive metabolic panel (specifically include bilirubin, creatinine) • Venous lactic acid
***Bedside* assessment**
• Urine output (place Foley catheter with urometer) • Pulse oximetry • Mental status assessment

5.1.3 Role of Lactic Acid in the Peri-partum Period

- In pregnant women with a positive initial sepsis screen and suspected infection who are not in labor, a lactic acid level> 2 mmol/L confirms a diagnosis of sepsis.
- Women in labor with a positive initial sepsis screen, but negative confirmation of sepsis (lacking criteria for end organ injury) who have an elevated lactic acid level, we recommend close surveillance, repeated bedside evaluation for additional fluids, and repeating evaluation of lactic acid over time.
- here are special considerations for the blood draw technique to obtain a valid lactic acid result:
  - Inaccurate lactic acid results may occur as a result of a difficult blood draw, prolonged tourniquet time, or prolonged transport times to the laboratory.
  - These issues can cause an elevated lactic acid level in the specimen. As a result, a woman might unnecessarily receive escalation of care.

- For lab testing, a gray-top tube or a venous/arterial blood gas syringe should be used.
- Hemolysis during the blood draw can raise lactic acid levels proportionally and techniques to minimize hemolysis during specimen collection should be utilized.
- The lactic acid sample should be first in a multiple vial collection, placed immediately on ice, delivered quickly to the laboratory, and the analysis should be performed within 20-30 minutes for the most accurate results.

5.2 Assessment and Treatment of Maternal Sepsis:

5.2.1 The Surviving Sepsis Campaign recommends the following:

- Act quickly upon recognition of sepsis and septic shock.
- Minimize time to treatment. Sepsis is a medical emergency.
- Monitor closely for response or lack of response to interventions.
- Communicate sepsis status during bedside care and handoff.

TABLE 2. Assessment and Monitoring Recommendations Following a Positive Step 1 Initial Sepsis Screen The ongoing assessment recommendations are based on Time Zero'. Once the patient triggers a positive initial sepsis screen, Time Zero' will start.

Monitoring	Time Frame	Additional Considerations
Fetal monitoring	Continuous	Antepartum/intrapartum
Pulse oximetry	Continuous	Until vital signs are normalized
Blood pressure (MAP)	Q30 minutes from 'Time Zero'	Until lactate less than 2.0 mmol/L, then 02 h for non-laboring patients*
Temperature	Q30 minutes from 'Time Zero'	Until lactate less than 2.0 mmol/L, then 02 h for non-laboring patients*
Urine output	Q1 hour from 'Time Zero'	Foley catheter with urometer
Mental status	Continuous	Note agitation, confusion, or unresponsiveness

5.2.2 Cultures

- Blood cultures be drawn when sepsis is confirmed (see Maternal Sepsis Evaluation Flow Chart), even if antibiotic therapy has been initiated.
- Blood cultures should be drawn within three hours following a diagnosis of sepsis with organ dysfunction.

5.2.3 Fluid Management

- Patients with sepsis or septic shock have low circulating intravascular volume. It is vital to optimize circulating volume, improve cardiac output (blood pressure), and tissue perfusion.

- Resuscitation from sepsis-induced hypoperfusion include at least 30 mL/kg of intravenous crystalloid fluid within three hours of recognition of sepsis.
- Surviving Sepsis Campaign (2018) recommends that following initial fluid resuscitation and additional fluid administration should be guided by frequent reassessment of hemodynamic status.
- Tissue perfusion can be assessed after aggressive fluid resuscitation, including BP, heart rate response, urine output, transthoracic echocardiogram, central venous pressure (CVP), or central venous oxygen saturation (ScvO2) measurement, pulse pressure variation, and lactate clearance/normalization.
- Care of maternal sepsis requires a multidisciplinary team.
- Table 3 provides special recommendations that are specific to pregnancy that can easily be overlooked in the HDU setting.

TABLE 3. Additional Considerations for Pregnant Women with Sepsis

Consideration	Comment
Vasopressors	Norepinephrineis recommended in pregnancy and used if MAP < 65 mm Hg if unresponsive to intravenous fluids.
Inotrope	Dobutamine is recommended for myocardial dysfunction or hypoperfusion despite intravenous fluids and
Glucose control	Avoid hyperglycemia > 180 mg/dl.
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 prophylaxis	Lower leg sequential compression devices while on bed rest.

5.2.4 Communication and Teamwork Tools

- Critical aspect of care for a patient with sepsis should be clear and direct communication.
- Effective communication techniques will enhance perinatal patient outcomes.

5.2.5 Escalation of Care Coordination

- Clinically unstable obstetric patients (pregnant or postpartum) at risk for rapid deterioration are usually transferred to a higher level of care.
- **The decision to transfer an obstetric patient to a higher level of care should be made by a multidisciplinary team, including the obstetrician, anesthesiologist, nurse, the HDU critical care physician, and, if appropriate, the neonatologist/ paediatrician**

BOX 4. Criteria for Consideration of Transfer to a Higher Level of Care

Criteria Considerations
• Hypotension (MAP< 65mm Hg) despite fluid resuscitation or need for administration of vasopressors • Persistent hypoxia (Sp02 < 92% on room air) Altered mental status (combativeness, confusion, disorientation) • Altered mental status (combativeness, confusion, disorientation)

- If the transfer to higher level of care necessitates transfer to a different hospital, the woman must be stabilized prior to transport.
- If delivery is imminent, it may be safer to 'shelter in place' and transfer after delivery.
- Safe transport of a critically ill pregnant or postpartum patient to a different hospital requires continuous cardiac monitoring, pulse oximetry, venous access, and assessment of vital signs.
- The recommendation is not to delay transport of a critically ill pregnant woman because of inability to monitor the fetus; stabilizing the mother will stabilize the fetus.
- If the transfer of a pregnant or postpartum patient occurs within the hospital, it is important that the patient is accompanied by the appropriate team members, which may include the obstetrician, anesthesiologist, and nurse, as well as the equipment necessary for monitoring the mother and fetus.
- Decisions for fetal monitoring can be individualized based on the mother's condition.
- For pregnant women, the timing and mode of delivery should be planned, communicated to all team members, and continuously updated and reviewed in team meetings.
- In these circumstances, assessment and communication among essential personnel should include specialists in critical care, obstetrics and/or maternal-fetal medicine, anesthesiology, as well as nursing coverage for peri-partum and HDU care.
- Preparation for birth, either vaginal or cesarean, should be taken into consideration inclusive of need for equipment for delivery, neonatal resuscitation and/ or postpartum needs (e.g. breast pump set up).

5.2.6 Distinguishing Chorioamnionitis/Intraamniotic Infection from Sepsis

- As noted in the introduction (Table 1), chorioamnionitis/intraamniotic infection is a leading cause of maternal sepsis.
- Chorioamnionitis/intraamniotic infection is common, developing in approximately 4% of labors.
- Approximately 20% to 25% of cases of maternal sepsis may be attributable to chorioamnionitis/intraamniotic infection.
- In 2017, The American College of Obstetricians and Gynecologists recommended the following categorization: isolated maternal fever, suspected intraamniotic infection, and confirmed intraamniotic infection (Table 4).

TABLE 4. Criteria to Recognize Intraamniotic Infection and Sepsis

Isolated Maternal Fever	Suspected Intraamniotic Infection	Confirmed Intraamniotic Infection	Criteria for Sepsis (Two-Step Approach: Initial Screen Positive Plus End Organ Injury)
A single oral temperature of 39.0°C (102.2°F) or greater **OR** Oral temperature of 38.0-38.9°C (100.4-102.02°F) that persists when the temperature is repeated after 30 minutes	Maternal fever of ≥ 39.0°C (102.2°F) OR 38-38.9°C (100.4-102.02°F), *plus one additional clinical risk factor:* • Maternal leukocytosis • Purulent cervical drainage • Fetal tachycardia	Positive amniotic fluid test result (gram stain, glucose level, or culture results consistent with infection) **OR** Placental pathology with histologic evidence of infection or inflammation	*2 of the following:* • Temp ≥ 38.0°C (100.4°F) • Pulse > 110 • Respiratory rate > 24 • WBC > 15,000 *PLUS evidence of end organ injury:* • Respiratory • Coagulation • Liver • Cardiovascular • Renal • Mental status

- 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 and using the least invasive approach possible.
- In the 48-72 hours following initial antibiotic administration, it is often recommended that the antibiotic regimen be narrowed as culture information becomes available and the patient stabilizes.
- In contrast to pyelonephritis or pneumonia, which are usually caused by a single organism, it is important to recognize that many pelvic infections are polymicrobial, involving aerobes (which are usually identified in the laboratory within 24-72 hours) and anaerobes (which may be difficult to culture and take several more days to identify in most clinical microbiology laboratories).
- Empiric antibiotic choices should be guided by the local antibiogram (a document produced by microbiology laboratories that lists the percentages of specific bacterial isolates tested at that lab that are sensitive to an array of antibiotics).
- In general, patients who have recently been hospitalized, or who have been recently exposed to antibiotics are at risk of being infected with multi-drug resistant organisms (MDRO), such as methicillin-resistant Staphylococcus aureus (MRSA) and extended spectrum beta-lactamase producing (ESBL) organisms.
- In patients at high risk, it is important to choose broad spectrum agents that are active against these pathogens (e.g. vancomycin and a carbapenem).
- Pain medications, such as ibuprofen and acetaminophen, can mask a fever and fever can be the result of multiple non-infectious causes (for example, venous thromboembolic disease and atelectasis).
- Fever should not be used as a sole criterion for deciding to administer antibiotics.

Group A Streptococcus (GAS) Infections

- Group A Streptococcus (GAS) *(Streptococcus pyogenes),* is an organism commonly responsible for fatal maternal sepsis.

- Group A Streptococcus can cause a range of infections from such Endomyometritis, fulminant endomyonecrosis, necrotizing fasciitis, and Streptococcal toxic shock syndrome.
- **Box 5 lists the clinical criteria for Streptococcal toxic shock syndrome**
- Antibiotic therapy for severe GAS infections and Streptococcal toxic shock syndrome includes combination therapy with high dose penicillin and clindamycin.
- If a patient is allergic to penicillin, she should receive vancomycin (or daptomycin) plus clindamycin.
- Early surgical intervention (wound debridement, vulvar debridement, hysterectomy or a combination of these) for source control is critically important for necrotizing fasciitis.
- Cultures should be obtained at the time of debridement.

BOX 5. Clinical Criteria for Streptococcal Toxic Shock Syndrome in Adults

Clinical criteria for streptococcal toxic shock syndrome in adults
• **Hypotension**
• **Multiorgan involvement characterized by two or more of the following:** - Renal impairment - creatinine ≥ 2mg/dL or in patients with preexisting renal disease ≥ 2 times elevation above baseline. - Coagulopathy - Platelets ≤ 100,000/mm 3 or disseminated intravascular coagulation, defined by prolonged clotting times, low fibrinogen level, and the presence of fibrin degradation products. - Liver involvement - Alanine aminotransferase, aspartate aminotransferase, or total bilirubin levels ≥ 2 times the upper limit of normal or patients with pre-existing liver disease, ≥ 2 times elevation over baseline. - Acute respiratory distress syndrome - Erythematous macular rash, may desquamate - Soft tissue necrosis (e.g., necrotizing fasciitis, myositis, or gangrene)

- For patients who have had a recent hospitalization or are known to be colonized with MDRO, vancomycin, and meropenem can be chosen.
- When using vancomycin, consider a loading dose of 25-30 mg/kg in critically ill patients.
- For patients unable to tolerate vancomycin or linezolid, consider daptomycin 8-10 mg/kg for gram-positive coverage.
- *Note daptomycin is not acceptable for treatment of pneumonia.*
- For patients at high risk of Candidemia infection (e.g. on total parenteral nutrition, has central venous catheter, or received recent broad spectrum antibiotics), add empiric echinocandin, such as caspofungin 70 mg IV xl followed by 50 mg IV daily.
- Patients with sepsis may be too ill for concern about drug safety in breastfeeding to be a priority.
- Severe allergies to beta-lactams are defined as anaphylaxis, angioedema, bronchospasm/ hives within 60 minutes of a dose, a penicillin-induced Stevens Johnson Syndrome, or Toxic Epidermal Necrolysis. Without one of these complications from penicillin, the risk of an allergic reaction to a cephalosporin is approximately 1:1000.
- Doses recommended in this table are based on normal renal function.

TABLE 5. Proposed Empiric Antibiotic Coverage for Patients with Sepsis of Unknown Source (with End Organ Injury) or Septic Shock.

Antibiotic Choices 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	Duration
Gram-negative plus anaerobic coverage Piperacillin/tazobactam 3.375 g IV q8h (extended infusion) or 4.5 g IV q6h **OR** Meropenem 1 g IV q8h (if recent hospitalization or concern for MDRO organisms) **OR** Cefepime 1-2g IV q8h plus metronidazole 500 mg IV q8h **OR** Aztreonam 2 g IV q8h (for women with severe penicillin allergy) Plus metronidazole 500 mg IV q8h **OR** Aztreonam 2g IV 48h plus clindamycin 900 mg IV q8h **PLUS** **Gram-positive coverage** Vancomycin 15-20 mg/kg q8h-q12h (goal trough 15-20 mcg/mL) **OR** Linezolid 600 mg IV/PO q12h (for women with severe vancomycin allergy)	7-10 days is adequate for most infections

TABLE 6. Proposed Antibiotic Dosing and Duration for Sepsis and Specific Infectious Conditions

Condition	Antibiotic Choices	Duration	Notes
Chorioamnionitis / intraamniotic infection (Plante, et al 2019, ACOG, Castor, 2008)	Ampicillin 2 g IV q6h PLUS Gentamicin 2 mg/kg IV load, then 5 mg/kg every 24h	Use is generally limited to the peripartum period. Duration of therapy is unclear, but there are some recommendations to continue until patient is afebrile for 24h.	For post-cesarean delivery: One additional dose of the chosen regimen is indicated. Add clindamycin 900 mg IV or metronidazole 500 mg IV for at least one additional dose. For post-vaginal delivery: No additional antibiotic doses are required. If additional doses of antibiotics are given, clindamycin is not indicated. If prior colonization or infection with MDRO, use a carbapenem (such as ertapenem). Cefoxitin has less activity against Group B Streptococci than cefazolin, penicillin, ampicillin or vancomycin.
	Alternate regimens: (Based on local antibiotic resistance patterns) Ampicillin-sulbactam 3 g IV q6h OR Piperacillin-tazobactam 3.375 g IV q6h OR Cefoxitin 2 g IV q8h OR Ertapenem 1 g IV q24h		
Chorioamnionitis/intraamniotic infection (penicillin allergy)	Mild penicillin allergy: Cefazolin 2 g IV q8h PLUS Gentamicin 2 mg/kg IV load, then 5 mg/kg every 24h For severe penicillin allergy: Clindamycin 900 mg IV q8h OR Vancomycin - per institution protocol, goal trough 15-20 PLUS		

Endomyometritis (Plante et al 2019, ACOG)	Clindamycin 900 mg IV q8h (or metronidazole 500 mg IV q8h) **PLUS** Gentamicin 5 mg/kg IV q24h **PLUS** Ampicillin 2 g IV q6h **OR** Ampicillin-sulbactam 3 g IV q6h **PLUS** Gentamicin 5 mg/kg IV q24h	Use 2-3 days; (expect improvement in 2-3 days in 90%.)	Consider MRSA coverage in patients with concomitant or recent surgical site infection.
Septic abortion/ retained products of conception (Tulandi and Al-fozan 2019; Wiesenfeld 2019; Workowski et al 2015)	Cefoxitin 2 g IV q6h OR Cefotetan 2 g IV q12h PLUS Doxycycline 100 mg PO (or IV) q12h OR Clindamycin 900 mg IV q8h PLUS Gentamicin 3 to 5 mg/kg IV daily	IV antibiotics should be given until the patient has improved and been afebrile for 48h, then followed by oral antibiotics to complete a 10 -14 day course.	Bioavailability of oral doxycycline is 100%.
Acute pyelonephritis, empiric therapy (Hooton and Gupta 2019) If concern for MDRO	Ceftriaxone 2 g IV q24h OR Cefepime 2 g IV q12h OR For severe penicillin allergy: Aztreonam 1 g IV q8h Ertapenem 1 g IV q24h Meropenem 1 g IV q8h	V antibiotics should be given until significant clinical improvement, then followed by an appropriate oral agent to complete 10-14 days total antibiotic therapy. As above, although there may be no oral option for MDRO	
Hospital-acquired complicated intra-abdominal infection (Solomkin et al 2010) A complicated intra-abdominal infection signifies an infection that extends beyond the hollow viscus of	Piperacillin/tazobactam 3.375 gVI q8h (extended infusion) or 4.5 gVI q6h fi not extended infusion OR Ertapenem 1gVI q24h OR Meropenem 1gVI q8h	Use 4-7 days fi adequate source control.	Drainage (percutaneous or surgical) is key to managing intra-abdominal infections, and early consultation of interventionalradiology

origin into the peritoneal space and is associated with either abscess formation or peritonitis. A hospital-associated complicated intra-abdominal infection typically occurs after a surgical procedure or a bowel perforation in a hospitalized patient.			or surgery is mandatory. Empiric MRSA coverage is not routinely recommended. Consider in patients withcolonized MRSA or who are at risk due to prior treatment failure and significant antibiotic exposure. Antifungaltherapy is recommended if Candida is grown from intra-abdominal cultures in severe community-acquired or healthcare-associated infection.
Pelvic abscess (Solomkin et al 201O; Wiesenfeld 2019) Pelvic abscess can be an infectious complication of surgery (e.g.,hysterectomy, cesarean delivery, induced abortion) or theresult of infectious processes (e.g., pelvic inflammatory disease. inflammatory bowel disease, diverticulitis). The source may be gastrointestinal(e.g. bowel perforation) or genitourinary (e.g. pelvic inflammatory disease).	For GI source: Useregimen for complicated intra-abdominal infection. For GU source: Use regimen for septic abortion/retained products of conception.		Early imaging and surgical or interventional radiology consultation for source control is important in managing pelvic abscess.

Necrotizing skin and soft tissue infection(severe,concern for necrotizing fasciitis)	Piperacillin/tazobactam 3.375 g IV q8h(extended infusion) or 4.5 g IV q6h if not extended infusion **PLUS** Empiric therapy: Vancomycin per institutional protocol **PLUS** Clindamycin 900mg IV q8h	Use in 7-14 days	Source control: Early surgical consultation mandatory in any patient in whom thereis concern for necrotizing skin and soft tissue infection.
Necrotizing skin and soft tissue infection (Stevens et al 2014) Known pathogens (monomicrobial)	Group A Streptococcus *(S. pyogenes)* ***OR*** *Clostridium species (including C. perfringens andC. sordellil)* Penicillin 4 million U IV q4h **PLUS** Clindamycin 900mg IV q8h		
Community-acquiredpneumonia (Mandell et al 2007)	Ceftriaxone 2 g IV daily OR Ampicillin-sulbactam 3 g IV q6h PLUS Azithromycin 500 mg IV/PO daily PLUS Oseltamivir 75mg PO BID (during influenza season)	Use 5--7days. Patient should be afebrile for 48- 72h without oxygen requirement before stopping antibiotics. Use 5 days.	CDC guidelines are updated annually and are available at www.cdc.gov/flu/ professionals/index.htm Influenza season is generally October through March (but can go through May).

5.3.2 Source Control

- IF patients have no improvement with initial resuscitation with antibiotics/fluids.
- Patients with identified sources of infection that are amenable to percutaneous drainage should:
    a. Undergo consultation with interventional radiology and assessment for possible drainage.
    b. Consider consultation with infectious disease if appropriate.
- Patients with identified sources of infection requiring surgery should undergo consultation with:

a) Gynecologic surgeon for procedures, such as dilatation and curettage for retained products, hysterectomy for necrotizing GAS uterine infection, and drainage of pelvic/ perinea! abscess not amenable to percutaneous drainage by interventional radiology.
b) General surgeon for procedures such as drainage of abdominal abscess, appendectomy, cholecystectomy, or debridement for necrotizing fasciitis. Early surgical consultation is strongly recommended for any concerns regarding necrotizing skin and soft tissue infections.

- Patients with identified sources of infection that are too small or not amenable to percutaneous drainage, patients with undetected sources, or patients with refractory fevers despite antibiotics and supportive measures:

a) Consider consultation with infectious disease or maternal fetal medicine.
b) Also consider imaging studies to detect occult abscess or other infections.

TABLE 7. Imaging: Recommendations for Identifying Specific Sources of Infection

Suspected Infection source	Antepartum Imaging	Postpartum Imaging
Appendicitis (Williams and Shaw, 2007; Duke et al 2016; Burke et al 2015)	Graded compression ultrasonography is first choice. Sensitivity is 67-100%, specificity 83-96%. MRI of the pelvis should be performed if ultrasound is inconclusive. Sensitivity is 94-97%, specificity 97-99%. If MRI is not available, then CT scan can be performed if ultrasound is inconclusive.	Perform CT Scan
Cesarean delivery wound infection/surgical site infection (SSI) (CDC, Jan 2018)	N/A	Superficial lncisional SSI: No imaging needed because it is generally diagnosed on exam with culture and opening of the incision. Consider ultrasound. Deep lncisional SSI:Perform CT scan and ultrasound. Organ/space SSI:Perform CT scan and ultrasound unless endomyometritis,

		which is usually diagnosed and treated clinically.
Cholecystitis	Right upper quadrant (RUQ) ultrasound is the most reliable modality for cholecystitis and cholelithiasis. Magnetic resonance cholangiopancreatography (MRCP) may be helpful in cases of choledocholithiasis when ultrasound is not diagnostic. Hepatobiliary iminodiacetic acid (HIDA) scan, while safe, canhelp todetermine obstruction in cholecystitis but is rarely needed.	Perform RUQ ultrasound. MRCP. and HIDA scan, which involves a radioactive tracer.
Chorioamnionitis/intraamniotic infection Endomyometritis (ACOG CO 712)	Primarily diagnosed clinically	Primarily diagnosed clinically
Bacteremia/endocarditis	Diagnose using blood cultures paired with risk factors and symptoms (i.e.Duke's criteria) with imaging diagnosis by transthoracic echocardiogram (TTE) with sensitivity 75%. If patient is able to tolerate sedation, transesophageal echocardiogram (TEE) has better valve visualization with sensitivity 95%.	Perform TTE and TEE (transesophageal echocardiogram).
Mastitis/breast abscess	Perform ultrasound with guided drainage for abscess.	Perform ultrasound with guided drainage for abscess.
Necrotizing skin and soft tissue infection	Primarily diagnosed clinically	Primarily diagnosed clinically
Pelvic abscess (Fouks et al. 2018)	Perform ultrasound.	Ultrasound isusually the first line choice for diagnosis due to cost and no radiation exposure. It is the best modality to demonstrate thepelvic organs with sensitivity for tube-ovarian abscess (TOA) 75--82%.

		Perform CT scan with IV and oral contrast with sensitivity for TOA 78·100%. Drainage recommended for abscess size 7 cm.
Pneumonia	Chest x-ray remains the gold standard when diagnosis suspected (i.e. shortness of breath, cough, fever, tachypnea, hypoxia). CT-chest (low dose CTcomparable withstandard dose CT) is generally reserved for suspected Pulmonary Embolism with adjustments made from craniocaudal sections to avoid exposure to gravid uterus.	Perform chest x-ray and CT-chest.
Renal abscess/ urogenital tract (Meyrier, 2017)	Perform ultrasound, MRI, and CT scan with contrast only if necessary.	Perform CT scan with contrast.
Retained products of conception/ septic abortion	Perform ultrasound	Perform ultrasound
Septic pelvic thrombophlebitis (Chen, 2018)	N/A	Perform CT scan with contrast OR magnetic resonance venography with gadolinium. Ultrasound is not as useful. Interpret imaging findings with caution and in combination with clinical signs and symptoms since pelvic vein thrombosis is also highly prevalent in asymptomatic postpartum individuals, (20/30 women after spontaneous vaginal delivery in one study).

5.4 Obstetric Considerations in the Case of Maternal Sepsis

- The timing of delivery in a patient who is septic should be individualized, taking into consideration gestational age and maternal-fetal status.
- In a patient with clinical signs and/or symptoms consistent with a diagnosis of sepsis or septic shock, avoidance of neuraxial procedures should be strongly considered in the risk assessment.

Indications for Delivery

a) The Society for Maternal-Fetal Medicine (SMFM) concludes sepsis by itself "is not an immediate indication for delivery (except in cases of chorioamnionitis/intraamniotic infection)."
b) The timing of delivery in a pregnant woman who is septic should be individualized, taking into consideration gestational age and maternal-fetal status.
c) Because improving maternal hemodynamics often improves fetal status, cesarean delivery is usually reserved for supervening obstetric indications after the woman is stabilized by instituting appropriate supportive and antibiotic therapy.
d) When chorioamnionitis/intraamniotic infection is the source of infection in sepsis, delivery is indicated with the mode of delivery (cesarean vs. vaginal) and exact timing determined by maternal and fetal condition.
e) The SMFM says "corticosteroids for fetal lung maturity are not contraindicated" in sepsis.

5.5 Anesthetic Considerations

- In patients with bacteremia, there is thought to be a theoretical increased risk of meningitis or spinal epidural abscess with neuraxial procedures due to seeding of the meninges, subarachnoid, or epidural space.
- It is ultimately the decision of the anesthesiologist whether or not to perform neuraxial procedures.

5.6 Screen positive patients

- In a patient with confirmed or suspected bacteremia, a thorough assessment should be performed, including a history, physical exam, and review of laboratory values.
- As previously covered, it is not uncommon for pregnant women to have elevated WBC counts or lactic acid as a result of the labor process itself.

5.7 Sepsis/septic shock

- In a patient with clinical signs and/or symptoms consistent with a diagnosis of sepsis or septic shock, avoidance of neuraxial procedures should be strongly considered in the risk assessment.
- The physiologic status of the patient with sepsis or septic shock is compromised and the cardiovascular effects of a neuraxial block technique may cause further detriment in an already critical clinical situation, with high potential for maternal (and fetal) morbidity and mortality.

5.8 Discharge Education

- Every woman and at least one support person should receive discharge instructions on the danger signs of sepsis.
- Instructions at every point of care should include ways to decrease infection risk, such as frequent hand washing.
- For women who have had sepsis, follow-up contact should be made within 3-4 days after discharge.

BOX 6. Sample Discharge Instructions

Box 6: Sample Instructions in Every Care Delivery Setting (Include these points in your standard discharge instructions in every delivery care setting)
• Contact a healthcare provider if you have: • A temperature of 38°C (100.4°F) or higher • An incision that is not healing (episiotomy, perinea! laceration, or cesarean birth) • Increasing pain at any incision site • Increased redness, drainage, or pus of any incision or laceration • Foul smelling bleeding or discharge from vagina or incision • Pain unrelieved by discharge medication

6 Responsiblity

- All obstetricians should diagnose and manage the patient.
- MFM: To share in the management as needed.
- Internal Medicine: To share in the management as needed.
- Infection Control: To share in the management as needed.
- Intensivist: Should share in the management of the patient.
- Anesthesiologist: Should share in the management of the patient.
- Pharmacist: To provide drugs
- Nursing Staff: Follow orders, monitor the patient and administer drugs

7 References

- Sepsis during pregnancy and the puerperium. Society for Maternal-Fetal Medicine (SMFM). Am J Obstet Gynecol 2019.
- Surviving Sepsis Campaign: International Guidelines for Management of Sepsis and Septic Shock. Society of Critical Care MedicineMarch 2017 • Volume 45 • Number 3
- The Surviving Sepsis Campaign Bundle: 2018 Update by the Society of Critical Care Medicine and the European Society of Intensive Medicine
- Obstetric Triage and Emergency Care Protocols. Second Edition. Copyright © 2017 Springer Publishing Company, LLC
- Statement on Maternal Sepsis. WHO 2017

8 Appendix:

Appendix 1 :Sequential Organ Failure Assessment score

TABLE 1
Sequential Organ Failure Assessment score[18]

Organ system	Score 0	1	2	3	4
Respiratory					
PaO_2/F_iO_2	≥400 mm Hg (53.3 kPa)	<400 mm Hg (53.3 kPa)	<300 mm Hg (40 kPa)	<200 mm Hg (26.7 kPa) with respiratory support	<100 mm Hg (13.3 kPa) with respiratory support
Coagulation					
Platelets	≥150×10^3/μL	<150	<100	<50	<20
Hepatic					
Bilirubin	<1.2 mg/dL (20 μmol/L)	1.2–1.9 mg/dL (20–32 μmol/L)	2.0–5.9 mg/dL (33–101 μmol/L)	6.0–11.9 mg/dL (102–204 μmol/L)	>12 mg/dL (204 μmol/L)
Cardiovascular					
MAP	≥70 mm Hg	<70	Dopamine <5 μg/kg/min, or any dose of dobutamine	Dopamine 5.1–15 μg/kg/min, or epinephrine ≤0.1 μg/kg/min, or norepinephrine ≤0.1 μg/kg/min	Dopamine >15, or epinephrine >0.1, or norepinephrine>0.1
Central nervous system: Glasgow Coma Scale score	15	13–14	10–12	6–9	<6
Renal	Serum creatinine <1.2 mg/dL (110 μmol/L)	Serum creatinine 1.2–1.9 mg/dL (110–170 μmol/L)	Serum creatinine 2.0–3.4 mg/dL (171–299 μmol/L)	Serum creatinine 3.5–4.9 mg/dL (300–440 μmol/L) OR Urine output <500 mL/d	Serum creatinine >5.0 mg/dL (440 μmol/L) OR Urine output < 200 mL/d

F_iO_2, fraction of inspired oxygen; *MAP*, mean arterial pressure; *PaO_2*, partial pressure of oxygen.

Reproduced, with permission, from Vincent et al.[18]

Society for Maternal-Fetal Medicine. Maternal sepsis. Am J Obstet Gynecol 2023.

Appendix 2 : Organ damage caused by sepsis:

TABLE 2
Organ damage caused by sepsis

System	Description of damage
Central nervous system	Altered mental status
Cardiovascular system	Hypotension from vasodilation and third-spacing; myocardial dysfunction
Pulmonary system	ARDS
Gastrointestinal system	Paralytic ileus
Hepatic system	Hepatic failure or abnormal transaminases
Urinary system	Oliguria or acute kidney injury
Hematologic system	Thrombocytopenia or disseminated intravascular coagulopathy
Endocrine system	Adrenal dysfunction and increased insulin resistance

ARDS, acute respiratory distress syndrome.
Society for Maternal-Fetal Medicine. Maternal sepsis. Am J Obstet Gynecol 2023.

Appendix 3:Standardized sepsis work-up:

Sepsis Work-Up: Initiate as soon as possible (with therapy commencing **within 1 hour** of suspected sepsis diagnosis):

Physical Assessment:

- Mental status
- Temperature
- Respiratory rate
- Oxygen saturation
- Blood pressure
- Heart rate
- Urine output

Targeted **imaging studies** to aid in diagnosis

Lab Assessment:

- Cultures x 2 – blood, urine, sputum, placental, etc., as clinically indicated
- CBC
- CMP
- Coagulation profile
- Lactate

وزارة الصحة
Ministry of Health

Policy Title	Policy Number	Policy Issuer	Replacement of Policy Number
Management of Maternal Sepsis	Version 1	Deputy Ministry for Therapeutic Services	----
Policy Classification	**Issue Date**	**Effective Date**	**Date of Next Revision**
☐ Corporate Policy (General) ☐ Inter-department Policy ☐ Department Policy	3/11/2025	4/11/2025	2/11/2027

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