Maternal Sepsis 2.0

Definition

	ACOG (2019)	WHO (2017)	RCOG (2012)
(Maternal) Sepsis	Life-threatening organ dysfunction caused by a dysregulated host response to infection	Life-threatening organ dysfunction resulting from infection during pregnancy, childbirth, post-abortion, or postpartum period	Infection plus systemic manifestation of infection
Septic shock	Need for vasopressor support to maintain MAP > 65mmHg with a lactate level > 2mmol/L despite adequate fluid resuscitation	-	Persistence of hypo-perfusion despite adequate fluid replacement therapy

Cumulative effects of physiological changes and sepsis

PREGNANCY PHYSIOLOGY	SEPSIS
Cardiovascular	
↓ SVR (25-30%)	↓ SVR
↓ Blood pressure	↓ Blood pressure
↑ Blood volume (40-45%)	
↑ Heart rate (10-20 bpm)	↑ Heart rate
↑ Cardiac output (40%)	Vasodilatation
Aorto-caval compression	Myocardial depression
Respiratory	
↓ Pulmonary vascular resistance and plasma colloid pressure	↑ Pulmonary microvascular pressure and permeability
↓ Residual volume	Acute lung injury
↓ Functional residual capacity	
↑ Tidal volume	
↑ Minute ventilation	
Compensated respiratory alkalosis	
Renal	

↑ Renal plasma flow	Ischaemia
↑ Glomerular filtration rate	Vasocontriction
Renal collecting system dilatation	Cytokine-mediated renal cell injury
Coagulation	
↑ Factors I, II, VII, VIII, IX, XII	↑ Pro-coagulant effects
↑ (x5) plasminogen activator inhibitors I&II	↑ Thrombin production
↓ Protein S	↓ Activated Protein C
Anti-thrombin and Protein C unchanged	Fibrinolysis (increased PAI I)

Cumulative effects of physiological changes and sepsis

Cardiovascular	Respiratory	Renal	Coagulation
Rapid haemodynamic collapse	Susceptibility to pulmonary oedema Rapid decrease in oxygenation ARDS Decreased ability to compensate for metabolic acidosis	Acute kidney injury	Increased microvascular thrombus formation Microcirculation dysregulation End-organ dysfunction

Etiology of sepsis

Obstetric population	Non-obstetric population
• Chorioamnionitis/endometritis • Septic abortion • Pelvic inflammatory disease • Wound infection • Urinary tract infection • Pneumonia • Gastrointestinal infection • Skin/soft tissue infection (incl. breasts, injection sites, drip sites)	• Pneumonia • Urinary tract infection • Gastrointestinal infection • Skin / soft tissue infection • Blood stream infection • Bone and joint infection • Cardiovascular infection • Eye/ear/nose/throat infection

Diagnosis of sepsis

Diagnose puerperal infection of the genital tract occurring at any time from rupture of membranes or labour up to 42 days postpartum, with 2 or more of the following symptoms:

- Pelvic pain
- Fever (38.5^{o} C or higher on any occasion)
- Abnormal vaginal discharge or pus
- Abnormal smell/foul smell
- Delay in the rate of involution of uterus (<2cm/day during the first 8 days.)

Risk factors for puerperal infection of the genital tract

- Preterm Prelabour rupture of membranes (PPROM)
- Emergency Caesarean section
- Poor nutritional state including anaemia
- Prolonged labour (> 12 hours active phase)
- > 5 vaginal examinations during labour
- Prolonged ROM, especially Prelabour ROM
- Operative delivery
- Manual removal of placenta
- Dis-impacting of fetal head during Caesarean delivery
- HIV, with detectable viral load
- BMI >40 kg/m^2
- Comorbidities such as diabetes

Tools to diagnose sepsis (infection with organ dysfunction)

- Sequential Organ Failure Assessment (SOFA) Score
- Quick Sequential Organ Failure Assessment Score (qSOFA)
- **omSOFA – Obstetrically modified SOFA**

Warning systems used

- Modified Obstetric Early Warning Scoring Systems (MOEWS)
- **Sepsis in Obstetrics Score**

Table 1: Obstetrically modified SOFA score

System parameter	Score		
	0	**1**	**2**
Respiration			
PaO2/FiO2	≥ 400	300 to <400	< 300
Coagulation			
Platelets (x 10^6/l)	≥ 150	100 – 150	< 100
Liver			
Bilirubin (µmol/l)	≤ 20	20 – 32	> 32
Cardiovascular			
MAP (mmHg)	≥ 70	< 70	Vasopressors required
Central nervous system	Alert	Rousable by voice	Rousable by pain
Renal			
Creatinine (µmol/l)	≤9 0	91 - 120	> 120

Table 2: Obstetrically Modified qSOFA Score

Parameter	Score	
	0	1
SBP (mmHg)	≥ 90	< 90
Respiratory rate (per minute)	< 25	≥ 25
Altered mentation	Alert	Not alert

A score ≥ 2 is associated with an increased risk of mortality

Table 3: Sepsis in Obstetrics Score (SOS)

Variable	Value								
Score	**+4**	**+3**	**+2**	**+1**	**0 (normal)**	**+1**	**+2**	**+3**	**+4**
Temp °C	> 40.9	39 – 40.9		38.5 – 38.9	36 – 38.4	34 – 35.9	32 – 33.9	30 – 31.9	< 30
SBP					> 90		70 - 90		< 70
HR	> 179	150 - 179	130 - 149	120 - 129	≤ 119				
RR	> 49	35 - 49		25 – 34	12 - 24	10 - 11	6 - 9		≤ 5
SpO2 (%)					≥ 92	90 - 91		85 - 89	< 85
Leucocyte 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			≤ 4 mmol/l		< 4 mmol/l				

A SOS score ≥ 6 is associated with an increased risk for admission to intensive care

Sepsis Prevention during pregnancy

- Screening for asymptomatic bacteriuria
- Antibiotic prophylaxis during all caesarean sections
- Antibiotics after operative vaginal delivery
- Do not wipe out uterus at caesarean section

Management of maternal sepsis - Top 10 pearls

Recognition is key

1. Always maintain a **high index of suspicion for sepsis** – consider risk factors as above
2. Implement a **rapid bedside tool for detection of maternal deterioration** – pay particular attention to SPB (should not drop below 90 and not by more than 40

mmHg), MAP (should be above 70 mmHg), excretion (should be > 0.5 ml/kg/h), altered mental state (GCS < 14/15), decreased capillary refill or mottling, use of accessory respiratory muscles, RR > 24/min, cyanosis, SaO2 (should be > 90%), jaundice, petechiae, bruising

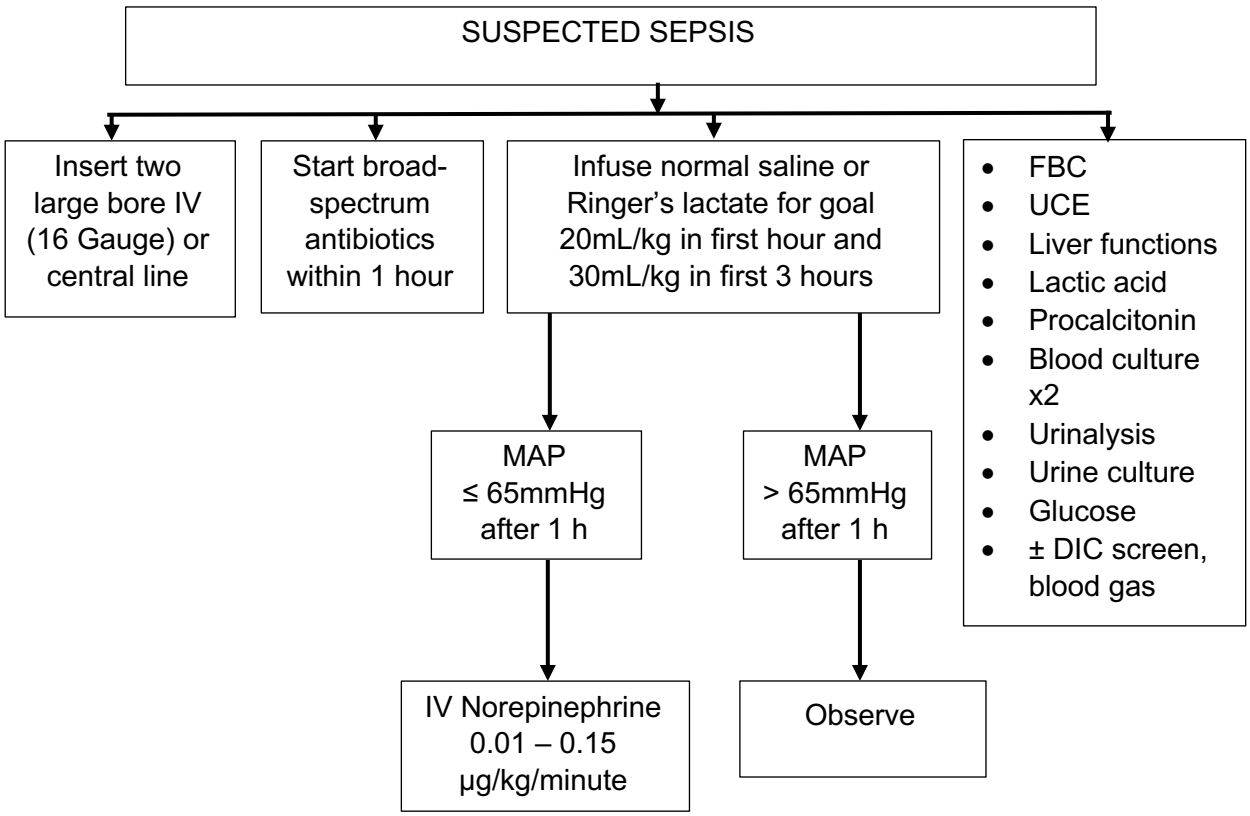
Move fast during the golden hour to save lives

3. **Implement sepsis bundles to facilitate rapid escalation of care**
4. **Laboratory and radiologic studies** are key to search for etiology and source control
5. **Know your "bugs",** their likely origin (consider tetanus toxoid if possible exposure)
6. **Choose antimicrobials** tailored to the most likely diagnosis (take blood/urine culture/pus swab before starting antibiotics, adjust AB choice based on results)
7. **Fluid resuscitation** should be initiated rapidly for patients with a blood lactate greater than 4mmol/L or MAP < 65 mmHg

Beyond the golden hour

8. **Escalation of care** is critical to survival
9. Once the patient is stabilized, **get to the source** of the problem
10. Anticipate and prevent **adverse pregnancy outcomes** (inform paediatrician of maternal infection)

Figure 1: Maternal sepsis bundle – for quick implementation during the golden hour



If the patient is not responding to resuscitation, or there is no improvement after 48 hours of therapy, then a laparotomy and possible hysterectomy must be considered.

If the patient clinically improves but continues to have a fever for more than 5 days, then consider septic thrombophlebitis (91% of cases follow caesarean section).
Treatment is antibiotics and unfractionated Heparin

- Give loading dose 5000 IU
- Thereafter give infusion at 1000 IU/hour
- Do APTT 6 hours after starting therapy
- Adjust infusion dose between 1000 and 2000 IU/hour
- Aim to keep APTT at 1.5 to 2 times the control value
- Continue Heparin until patient is fever free for 24 hours.

Recommended reading

1. Stephens AJ, Chauhan SP, Barton JR, Sibai BM. Maternal sepsis: A review of national and international guidelines. Am J Perinatol 2021. DOI https://doi.org/10.1055/s-0041-1736382
2. Greer O, Shah NM, Johnson M. Maternal sepsis update: current management and controversies. The Obstet& Gynecol 2020; 22: 45-55.

Authorship

These guidelines were drafted by a clinical team from Mediclinic and were reviewed by a panel of experts from SASOG and the BetterObs clinical team in 2019 and revised by the Scientific committee of BetterObs in 2022. All attempts were made to ensure that the guidance provided is clinically safe, locally relevant and in line with current global and South African best practise. Succinctness was considered more important than comprehensiveness.

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