University Hospitals Plymouth NHS Trust

MATERNITY GUIDELINES

Sepsis, infection and prophylaxis in obstetric patients

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Introduction

The treatment of sepsis is challenging during pregnancy and the puerperium due to complex maternal and fetal physiology and may require ITU admission. Early detection, accurate diagnosis and aggressive treatment strategies are essential to improve outcomes and prevent mortality and morbidity.

In the last triennium (2014-2016) 19 of the 225 maternal deaths in the UK were due to pregnancy related infection or indirect sepsis such as influenza or pneumonia.

Women who are particularly high risk for sepsis includes the following (2):

-impaired immunity due to drugs or illness
-have diabetes or other comorbidities
-needed invasive procedures (e.g. caesarean, amniocentesis)
-had prolonged rupture of membranes
-have been in close contact with people with group A streptococcus
-have continued vaginal bleeding/discharge

Causes

Common causes include:

- Urinary tract infection, pyelonephritis
- Premature pre-labour rupture of the membranes, prolonged rupture of the membranes at term, chorioamionitis
- Puerperal sepsis (septic miscarriage, endometritis following delivery or termination)
- Wound infection
- Mastitis
- Pneumonia
- Influenza

Management

Sepsis

Use the sepsis proforma in all patients with suspected sepsis / where the MOEWS has triggered. See appendix 1.

Physiologically young women compensate well therefore signs and symptoms of sepsis occur late in the course of the illness. Early recognition is vital as aggressive resuscitation significantly improves survival. Treatment must firmly prioritise the mother since fetal compromise results mainly from maternal decompensation.

Intrapartum Pyrexia

Maternal pyrexia is defined as a temperature of ≥38°C on one occasion or ≥37.5°C on two occasions two hours apart. Intrapartum pyrexia constitutes high risk labour and should be transferred to Consultant led care and the high risk path way.

- Continuous electronic fetal monitoring should be used in presence of suspected chorioamnionitis, sepsis or maternal pyrexia. CTG changes should prompt a maternal assessment as it may be an early warning sign for derangements in maternal end organ systems. There is insufficient evidence regarding FBS sampling in the presence of maternal sepsis to guide clinical practice.
- Take two sets of blood cultures from separate venepuncture sites regardless of temperature to improve chances of isolating an organism. Urine culture and LVS/HVS should also be obtained. Consider the need for other investigations.
- IV antibiotics should be commenced following collection of blood cultures. Reduction of intrapartum fever with paracetamol may not only improve the fetal heart trace but also reduce the risk of neonatal encephalopathy.

In the presence of chorioamnionitis, antibiotics are administered and control the intrauterine infection but intra amniotic infection can only be considered cured after delivery of the infected products of conception. Intra amniotic infection cannot be cured without delivery. Prompt induction/augmentation of labour, where appropriate, is advised.
Chorioamnionitis leads to a higher risk of caesarean section, endometritis, wound infection, pelvic abscess and post-partum haemorrhage. The new born carries a greater risk of death, asphyxia, early onset sepsis, pneumonia, meningitis, IVH and long term disability. The risk to the fetus is even greater for premature infants.

Chorioamnionitis: In the absence of a confirmed or suspected collection, antibiotic treatment for chorioamnionitis / intra partum fever can stop 48 hours after the baby has been delivered[7] providing the patient has been afebrile for at least 24 hours, clinically improving, have normal observations and normalising markers. Antibiotics can be discontinued without the need for an oral switch.

Regional Anaesthetics

In the presence of intra-partum pyrexia or suspected infection, caution should be exercised when considering siting an epidural due to the potential for increased risk of epidural abscess. If any doubt exists then senior opinion should be sought. It may be reasonable to consider a spinal anaesthetic for delivery in theatre if maternal observations are reassuring. The risks/benefits will need to be considered on a case by case basis.
All discussions with the patient and senior clinicians should be documented, including the potential risks and benefits of each option.
Epidurals can, in some cases, cause maternal pyrexia, however this should be a diagnosis of exclusion and should not delay prompt administration of antibiotics

Antibiotic therapy

- Intravenous antibiotic therapy should be started as early as possible and within the first hour of recognition of septic shock and severe sepsis. Each hour of delay is associated with a measureable increase in mortality.
- Cultures should be obtained before starting antibiotics but should not delay antibiotic therapy
- In case of hepatic or renal impairment, advice must be sought from the critical-care team or a consultant physician.
- Blood cultures may often be negative and in polymicrobial infections only one infecting microbe may escape to the bloodstream. Negative cultures should not be the sole criterion for cessation of treatment or de-escalation to narrower spectrum or oral antibiotics.
- Use the Rx app for the most up to date choice of antibiotic: https://viewer.rx-guidelines.com/guide/1000000024 (see appendix 2)
- **Remember good prescribing practice:**
    - All patients on antibiotics should have a daily review and this should be documented in the medical notes – this should include the ongoing indication for antibiotics, the prescribing decision, choice of agent, route and planned duration/time for the next intended review. Antibiotics can be changed depending on culture results and response to treatment.
    - Review the Rx app STOPpeD section for further information.

Healthcare associated risk factors

Exposure to antibiotics is the single most important risk factor for multi-drug resistant (MDR) pathogens. Where this exposure is associated with in patient care the risk of MDR is further increased. Healthcare associated infection risk factors are surrogates for exposure to antibiotics and MDR pathogens and include:

- Onset of infection during current hospitalisation
- Recent exposure to inpatient hospital care e.g last 90 days
- Recent intensive outpatient medical therapies (adapted from American Thoracic Society)

    Haemodialysis
    Recent intensive exposure to healthcare environment e.g
    IV line infusions or wound care necessitating outpatient clinic care

Oracle: Pregnancy and neonatal enterocolitis[6]

The Oracle 1 trial suggested an association between preterm pre-labour exposure to co-amoxiclav and subsequent neonatal NEC[4].

Based on this it has been decided locally to avoid co-amoxiclav in pregnant women and use alternative agents.

In the postpartum period co-amoxiclav can be used but if an alternative e.g cefuroxime has been started prenatally then persist with this unless clinical/microbiological factors dictate otherwise.

If in doubt discuss with a senior colleague or contact the on call Microbiologist

Fluid balance in septic shock

- Septic shock is sepsis with hypotension that is refractory (non-responsive) to fluid resuscitation.
- Fluid overload may lead to fatal pulmonary or cerebral oedema.
- Clear, accurate documentation and careful monitoring of fluid balance is essential to avoid fluid overload in women who are unwell, especially when hourly urine output is low or renal function is impaired.
- The advice of an anaesthetist and the critical care team should be sought at an early stage.

Operative intervention

- Persistent or swinging pyrexia or failure to respond to the treatment may be the result of a persistent deeply seated focus of infection.
- TVS, Pelvic USS and MRI should be considered early to locate focus of infection. If surgery is needed to remove focus of infection, it should be carried out earlier rather than later and not as a last resort as it could be life-saving.
- Laparotomy for suspected intra-abdominal infection should involve a general surgeon.

Neonatal Sepsis

Bacterial sepsis is a major cause of morbidity and mortality in the new born. The incidence is higher in pre-term and low birth weight infants. The clinical presentation of sepsis in the new born can be non-specific with acute deterioration. When a neonate presents with sepsis Legionnaires disease should be considered when the birth was in water. Neonatal legionella is a rare diagnosis and the bacterium is inherently resistant to beta lactams (penicillins, cephalosporions and meropenem) and has recently been associated with heated home pools (the hot water is held at temperature for days to weeks pre partum). Septicaemia in the new born can kill within a few hours, even in a term infant.
All neonates should be reviewed by the neonatal team.
See neonatal guidelines for further information

Leadership and continuity of care

- When managing complex cases, it must be clear who is in charge of the women's care. This may not be the named consultant so the lead clinician should be agreed and clearly documented in the patient record.
- Anaesthetic and critical–care staff play a vital role in the management of sepsis and should be involved as early as possible particularly when there is circulatory or respiratory failure.

Record Keeping

It is expected that every episode of care be recorded clearly, in chronological order and as contemporaneously as possible by all healthcare professionals as per Hospital Trust Policy. This is in keeping with standards set by professional colleges, i.e. NMC and RCOG.
All entries must have the **date and time** together with **signature and printed name.**

Education

- There is a clear need to raise both the maternal and professional awareness about antenatal, intrapartum and puerperal sepsis, so that it can be prevented where possible, recognised quickly and managed effectively and immediately.
- As most of the cases are acquired in community, importance of good personal hygiene should be emphasised especially hand washing **before** and after using lavatory and changing sanitary towels.
- To seek advice early when the women or her family or close contacts have a sore throat or upper respiratory tract infection.
- AN advice to women re: general hand washing, care of child with a sore throat, etc.
  1. Staff awareness of sepsis to be incorporated on PROMPT day

Appendix 1

Obstetric Sepsis Screening Tool

Has MOEWS triggered and/or is infection suspected?

ALERT CRITERIA

- ☐ Unresponsive/only responsive to pain
- ☐ Systolic BP ≤90mmHg (or drop >40 from normal)
- ☐ Heart rate >130bpm
- ☐ Respiratory rate ≥25/min
- ☐ Needs O2 to keep SpO2 ≥92%
- ☐ Non blanching rash/cyanotic/mottled
- ☐ Anuric or oliguric for 18 hours
- ☐ Lactate ≥2mmol/l

If 1 or more criteria present ACT IMMEDIATELY

ACT

1. **Call** Obstetric Registrar 0311 and Anaesthetist 0399. Consider 2222 Obstetric Emergency depending on situation.
2. **Start Sepsis 6 Pathway** and complete within 1 hour.
3. **Alert** the Obstetric Consultant.

SIGNIFICANT CRITERIA

- ☐ Relatives concerned about mental state
- ☐ Acute deterioration in functional ability
- ☐ Heart rate 100-130bpm/new arrythmia
- ☐ Respiratory rate 21-24/min/breathing hard
- ☐ Systolic BP 91-100mmHg
- ☐ Temperature <36^{0}C
- ☐ Anuric for 12-18 hours
- ☐ Immunosuppressed/diabetes
- ☐ Invasive procedure in last 6 weeks
- ☐ Prolonged ROM
- ☐ Close contact with Group A Strep
- ☐ Bleeding/wound infection/vaginal discharge
- ☐ Non-reassuring CTG/fetal tachycardia

If 1 or more criteria present seek CLINICAL REVIEW

REVIEW

- **Urgent clinical review** by Obstetric SHO 0464 or Obstetric Registrar 0311.
- **Consider investigations** to make a definitive diagnosis. Should include VBG, FBC, U&E, clotting & blood cultures.

DECIDE & ACT

- **If decision is to start sepsis 6 pathway, ACT IMMEDIATELY**.
- Complete the pathway within 1 hour.
- **Request Anaesthetist** support 0399 and **alert the Obstetric Consultant**.

Please note: a separate pathway exists for isolated intra-partum pyrexia where observations are within normal limits.

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Obstetric Sepsis Care Bundle

Date of diagnosis of sepsis: DD/MM/YYYY **Time of diagnosis**: HH:MM	Time complete	Initials/ Name	Comments
1. Give high flow oxygen: Aim SpO_2 94% - 98%, unless otherwise directed. Reservoir mask at 10-15L/min.	HH:MM		
2. Take blood cultures and ensure IV access ☐ 16G cannula and blood cultures ☐ U&Es, LFTs, CRP, FBC, Coagulation screen, G&S	HH:MM		
3. Lactate – VBG Initial lactate result _____ If abnormal, repeat after fluid challenge _____ Consider ABG if hypoxic or lactate >4	HH:MM		
4a. Prescribe IV antibiotics, inc review date and indication • Check patient allergies and prescribe as per Trust guideline http://staffnet.plymouth.nhs.uk/Portals/1/Documents/Clinical%20Guidelines/Maternity/Sepsis,%20infection%20and%20prophylaxis%20in%20obstetric%20patients.pdf#page=9 • If unsure discuss with oncall Microbiologist. • **Consider** treatment of flu (Tamiflu) if indicated	HH:MM		
4b. Administer IV antibiotics within 1 hour of diagnosis	HH:MM		
5. Give IV fluids – discuss with seniors if PET ☐ 500ml Hartmann's stat (fluid challenge) and assess response ☐ May require up to 30ml/kg fluid resus	HH:MM		
6. Measure accurate urine output: ☐ Insert a urinary catheter ☐ Commence fluid chart and hourly urine output measurement.	HH:MM		

High Risk Factors

- **Systolic BP<90** (after initial fluid resus)
- **Urine output <0.5ml/kg/hr for 2 hrs**
- **Decrease in conscious level**
- **O_2 needed to keep SpO_2 ≥92%**
- **Lactate >4 mmol/L**

Is there any 1 high risk factor?

NO → Continue MOEWS every 30 minutes.

Reassess for high risk factors if condition changes.

YES → **THIS IS SEVERE SEPSIS!**

Call Consultant to attend within 60 minutes.

Seek Acute Care Team Support.

Consider ITU referral.

Source identification

- ☐ Vaginal swab, wound swab, throat swab & flu swab
- ☐ Urinalysis and MSU
- ☐ Unwell contacts
- ☐ Imaging – CXR, AXR, USS, CT
- ☐ Antenatal – CTG /foetal health wellbeing assessment
- ☐ Postnatal – swab baby and discuss with NNU

Appendix 2

Surgical antimicrobial prophylaxis/treatment in Obstetric Patients

Procedure	Antimicrobial, not penicillin allergic	Antimicrobial, mild penicillin allergy	Antimicrobial, severe penicillin allergy	Duration of treatment
Caesarean Section	Co-amoxiclav 1.2g IV	Cefuroxime 1.5g and Metronidazole 500mg IV	Teicoplanin 400mg, Metronidazole 500mg and Gentamicin 240mg IV	Pre-incision only
Manual Removal of placenta	Co-amoxiclav 1.2g IV	Cefuroxime 1.5g and Metronidazole 500mg IV	Teicoplanin 400mg, Metronidazole 500mg and Gentamicin 240mg iv	Pre-operative only
Group B Streptococcus IAP and preterm birth IAP	Benzylpenicillin 3g IV followed by 1.5g every 4 hours whilst in labour	Cefuroxime 1.5g followed by 750mg every 8 hours while in labour	Teicoplanin 600mg every 12 hours (max 4 doses)	Labour
Third degree tear	Co-amoxiclav 1.2g IV (oral switch Co-amoxiclav 625mg TDS)	Cefuroxime 1.5g and Metronidazole 500mg IV (oral switch Cephalexin 500mg TDS and Metronidazole 400mg TDS)	Teicoplanin 400mg, Metronidazole 500mg and Gentamicin 240mg IV (oral switch not possible. Requires individual consideration	Continue oral antibiotics for 3 days

			to continuing IV antibiotics – see perineal tear guideline)	
SMM	Metronidazole 1g PR stat, doxycycline 100mg BD for 7 days	S/A	S/A	7 days
Cervical cerclage	At the discretion of the operating team			
Intrapartum pyrexia (one temp ≥ 38.0C or 2 measurements ≥ 37.5C 2 hours apart	Cefuroxime 1.5g TDS, Metronidazole 500mg TDS	Cefuroxime 1.5g IV TDS, Metronidazole 500mg IV TDS	Clindamycin 900mg TDS, Gentamicin 5mg/kg	Review and aim to stop 48hr after delivery. In the clinically stable patient with no evidence of bacteraemia antibiotics should stop if afebrile, clinical improvement with improving pain and wcc normalising
Endometritis	Co-amoxiclav 1.2g IV or 625 mg PO TDS depending on presentation	Cefuroxime 1.5g IV TDS, Metronidazole 500mg TDS or oral Cefradine 1g QDS and Metronidazole 400mg TDS	Teicoplanin 400mg, Metronidazole 500mg and gentamicin 240mg IV or liaise with microbiology	In the clinically stable patient with no evidence of bacteraemia antibiotics should stop at 48hr if afebrile, clinical

				improvement with improving pain and wcc normalising
UTI (*)	Nitrofurantoin MR100mg BD (not after 36 weeks) or Cephalexin 500mg BD 7 days	Nitrofurantoin MR100mg BD (not after 36 weeks) Or Cephalexin 500mg BD 7 days	Nitrofurantoin MR 100mg BD (not after 36 weeks)	7 days Followed by a test of cure
UTI prophylaxis (**)	Nitrofurantoin MR 100mg OD or Cephalexin 250mg OD	Nitrofurantoin MR 100mg OD or Cephalexin 250mg OD	Nitrofurantoin MR 100mg OD	Stop Nitrofurantoin at 36 weeks. Stop Cephalexin in the early postpartum period.
Pyelonephritis	Consider Trimethoprim or Ertapenam with caution. Liaise with microbiology.	Consider Trimethoprim or Ertapenam with caution. Liaise with microbiology	Consider Trimethoprim or Ertapenam with caution. Liaise with microbiology	14 days

* Positive nitrites using dipstick may be sufficient to prompt commencement of empirical antimicrobial. Any treatment should be reviewed and changed depending on antimicrobial sensitivity. (9)

**UTI prophylaxis must be used only for patients with at least 2 confirmed symptomatic UTIs within the last 6 months, eradication of last UTI and consideration to latest organisms and sensitivities. It should not be used for persisting bacteriuria after treatment. Patient advice should be given regarding good hydration, emptying bladder before and after intercourse, frequent and complete bladder emptying and hygiene.

Appendix 3

From Trust guidelines on antimicrobial treatment guidelines

Safe	Avoid
Penicillins (see later for co-amoxiclav) Cephalosporins Erythromycin Nitrofurantoin (avoid from 36 weeks)	Tetracyclines Trimethoprim (Discuss with Microbiology if no alternative, do not give if folate deficient, taking folate antagonists or had treatment with Trimethoprim in the last year) Quinolones including Levofloxacin Metronidazole (probably safe in 2nd and third trimester, avoid high dose) Aminoglycosides (except in life threatening infection) Co-amoxiclav (associated with NEC in certain groups, local decision to avoid where possible – discuss with microbiology if no alternative)

Appendix 4: When to send an MSU in pregnancy[9]

Bacteriuria is the presence of bacteria in urine. In the absence of signs or symptoms of urinary tract infection this asymptomatic state *should* be treated in pregnancy when usually it is considered as normal.

Pregnancy is associated with physiological pyuria and treatment should not be used based on this alone.

The predictive values of urine dipsticking are useful in symptomatic disease in the non-pregnant but are not adequate for use in pregnancy. Urine culture is the standard for screening for ASB and diagnosis of symptomatic disease. Confirmatory MSU is required in ASB. Blind empirical therapy is not indicated in ASB ie wait for confirmation prior to treatment.

Symptoms to enquire about include:

- Dysuria
- Frequency
- Urgency
- Polyuria
- Supra-pubic tenderness
- Haematuria
- Flank pain

Presence of fever is suspicious for upper urinary tract involvement.

Urine from antenatal patients is to be sent in the following scenarios:

- The first antenatal visit to screen for asymptomatic bacteriuria (ASB). If present on 1st sample, repeat MSU and then commence treatment as necessary after the second sample has been analysed
- Suspected pyelonephritis
- Symptoms of UTI/pyelonephritis regardless of urinalysis
- Following treatment of ASB or symptomatic disease, culture one week after treatment and on all subsequent clinic visits

- Where the antenatal care plan notes that frequent MSU's are required (e.g. recurrent UTI, renal disease, persistent symptoms)

In the event that urine is dipped (do not dip looking specifically for bacteriuria) then send a sample for culture (investigation of ASB) only if nitrites are identified.

All urines should be reviewed at 24-48 hours and antibiotics changed or stopped accordingly.

Monitoring and Audit
Auditable standards:

Documentation and administration of antibiotics
Requirement and timing of blood cultures been taken

Reports to:
Clinical Effectiveness Committee – responsible for action plan and implementation of recommendations from audit

Frequency of audit: Annual

Responsible person: Senior midwife/Doctor

Cross references
Guidelines can now be found on the network share (drive) 'G:\DocumentLibrary\UHPT Clinical Guidelines\Maternity'.

Fetal wellbeing in labour.

Postnatal care and transfer of women and baby.

Maternity Hand Held Notes, Hospital Records and Record Keeping.

Guideline development within the maternity services SOP.

References

Specific (numbered in text)

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General background

RCOG green top guideline Sepsis in pregnancy Guideline 64
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Diagnosis of UTI, simple algorithim (www.gov.uk/government/uploads/system/uploads/attachment_data/file/345784/UTI_quick_ref_guidelines.pdf)
http://cks.nice.org.uk/urinary-tract-infection-lower-women#!scenario:4

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