University Hospitals of North Midlands NHS
NHS Trust

Achieving Sustainable Quality in Maternity Services

ASQUAM
Management of sepsis in pregnancy & the postpartum period including antimicrobial guidance

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Ratified by	Maternity Forum Sub-Group Obstetric Guideline Group
Reviewed by	Lead Midwife for Education & Development Consultant Obstetrician and Gynaecologist Quality and Risk Manager Obstetrics & Gynaecology

VERSION CONTROL SCHEDULE

Version	Date	Author	Comments
1	2008 – October	Sister L Dudley	New guideline
2	2011 – April	Sister L Dudley Midwife Miss R Indusekhar Consultant Obstetrician Mrs J Dunn – Clinical Governance Midwife	Reviewed as out of date
3	2017 - January	Elizabeth Pearson Lead Midwife for Education Development Dr Junny Chan Consultant Obstetrician and Gynaecologist	Reviewed as out of date
4	2020 - November	Sharon Bailey Lead Midwife for Development and Education Dr Chan Consultant Obstetrician and Gynaecologist Lynn Dudley, Quality & Risk Manager, Obstetrics and Gynaecology	Full review conducted ▪ Revision of maternity sepsis screening tool (in-patient and community) in collaboration with Haidee Simm, UHNM Sepsis Nurse Lead ▪ UK Sepsis Trust & PROMPT tool adapted for UHNM ▪ Added management of suspected sepsis in labour & flow chart as per NICE NG51 & NG121 ▪ Antimicrobial guidance updated by Jonathan Snape MRPharmS, IP Advanced Pharmacist Practitioner – ID & Antimicrobials and Dr Krishna Banavathi, Consultant Microbiologist

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1. INTRODUCTION

Sepsis is a leading cause of maternal mortality and morbidity globally and the UK. In addition, sepsis contributes to other common causes of maternal death, such as haemorrhage and thromboembolism. Maternal sepsis is also strongly associated with an increase in perinatal mortality and morbidity as a result of infection.

The Mothers and Babies: Reducing Risk through Audits and Confidential Enquiries across the UK (MBRRACE-UK, 2019), reported that 20 women died of sepsis between 2105 and 2017 (10 % of all maternal deaths).[1]

In a pregnant or postpartum woman, a single abnormal finding can be significant and warrants a thorough clinical assessment looking for signs of an infection (Saving Lives, Improving Mothers' Care 2014).[2]

Any obstetric woman with suspected sepsis will require urgent clinical review, multi-disciplinary care, prompt treatment and action. Failure to recognise sepsis early is a significant cause of preventable morbidity, resulting in delayed treatment and escalated care, which are critical if lives are to be saved

2. AIMS

This guideline had been developed to provide all healthcare professionals caring for pregnant and postpartum women (up to 6 weeks postnatal) with evidence based information relating to the early recognition, diagnosis and management of sepsis in order to prevent further deterioration and improve outcomes.

As healthcare professionals we should aim to:

- Prevent sepsis with the appropriate use of prophylactic antibiotics
- Recognise sepsis and treat promptly following the Sepsis Six pathway.

3. OBJECTIVES

To ensure that all healthcare professionals providing care to pregnant and post-natal women:

Receive guidance on prevention, recognition treatment and escalation of women presenting with signs of sepsis.
Have the knowledge base to provide education to our parents about the signs and symptoms of sepsis, especially in the home environment.

4. DEFINITIONS

Table 1 Sepsis definitions

	Definition
Sepsis[3]	Professional narrative definition of Sepsis[3]: 'Sepsis is characterised by a life-threatening organ dysfunction due to a dysregulated host response to infection.' Lay narrative 'Sepsis is a life threatening condition that arises when the bodies response to infection injuries its own tissues and organs'
Septic shock[3]	Definition of septic shock: Singer M et al ('Sepsis-3') 'Septic shock is a subset of sepsis where particularly profound circulatory, cellular and metabolic abnormalities substantially increase mortality.

5. RISK FACTORS & POTENTIAL CAUSES OF MATERNAL SEPSIS

Many women who present with sepsis will have no risk factors. Table 2 below revels pregnancy related and non-pregnant risk factors whilst table 3 lists potential causes of maternal sepsis.

Table 2 Risk factors for sepsis

Pregnancy related risk factors	Non pregnant risk factors
Primiparous	Smoking
Multiple pregnancy	Obesity
Cervical cerclage	Impaired glucose tolerance/diabetes
Amniocentesis and other invasive intrauterine procedures Cervical cerclage CVS	Anaemia
History of Group B Streptococcus (GBS) infection	Black and other ethnic minority
Prolonged rupture of membranes	Group A Streptococcus (GAS) infection in close contacts or family members
All forms of operative vaginal delivery	History of pyelonephritis/UTI
Caesarean section (CS) emergency carries a greater risk than an elective	Preterm prelabour rupture of membranes (PPROM)
Vaginal trauma, wound haematoma	History of pelvic infection/STI
Retained products of conception after miscarriage, termination of pregnancy	Had a febrile illness or were taking antibiotics in the two weeks prior to presentation
Retained products of conception	Immuno-compromised status/impaired immunity Steroid use Chemotherapy HIV
Mothers not immunised against influenza	Pre-existing medical problem (e.g., asthma, haematological, renal disorders, heart failure)
Indwelling lines, devices, broken skin	Working with or having young children

Table 3 Potential causes of maternal sepsis

Potential causes of maternal sepsis	
Pregnancy related	Non-pregnancy related
Chorioamnionitis following Retained products of conception Prolonged rupture of membranes Caesarean section Invasive procedures Postoperative causes Caesarean section Cervical suture Haematoma Spinal abscess following regional anaesthesia Amniocentesis Breast abscess or mastitis	Pneumonia Influenza Meningitis Appendicitis Pyelonephritis Cholecystitis Bowel perforation (more common with inflammatory bowel disease Cellulitis

6. PREVENTION OF SEPSIS

6.1 Antenatal

6.1.1 Influenza vaccination

MBRRACE-UK, (2014)[2], revealed that 1 in 11 maternal deaths were due to influenza infections. NHS England continues to recommend that all women who are pregnant during the influenza season, regardless of stage of pregnancy, should be offered the inactivated influenza vaccine.[4]

To avoid preventable deaths, the benefits of influenza vaccination to pregnant women should be promoted and pregnant women at any stage of pregnancy should be offered vaccination. At UHNM a patient group directive for influenza vaccination in pregnancy is operational. See appendix 1 Influenza in pregnancy.

6.1.2 Advice to at risk women

All women should be informed of the risks, signs and symptoms of infection and the need for them to seek early advice if they are concerned. Offer appropriate and clear advice on infection prevention and symptom identification in situations where women are at risk of sepsis e.g. premature rupture of membranes.[2]

The first signs of sepsis are usually a rise in temperature, heart rate and breathing. The woman may also feel unwell; have chills and flu-like symptoms abdominal pain and / or diarrhoea. Also see section 6.3.1 below.

6.1.3 Prophylactic antibiotics

Prophylactic antibiotics should be prescribed and administered for women at risk of sepsis e.g. PPROM, caesarean section, recurrent urinary tract infections. Please refer to antimicrobial guidance (appendix 6) and relevant ASQUAM guidelines.

6.1.4 Group A streptococcus

Many of the deaths from genital tract sepsis in the Confidential Enquires were caused by group A *Streptococcus* (GAS). The bacterium is commonly carried on the skin and nasal passages. It can cause localised upper respiratory tract infections (tonsillitis, pharyngitis) or skin infections (impetigo). Pregnant and postpartum women however can be vulnerable to invasive infection which can rapidly lead to an overwhelming sepsis.

Any GAS identified during pregnancy should be treated to avoid invasive GAS infection. The presence of three or four of the following signs suggests that a woman may have a bacterial infection and would benefit from antibiotics: tonsillar exudate, tender anterior cervical lymphadenopathy or lymphadenitis, fever and absence of cough.

Healthcare workers exposed to respiratory or infected wound secretions of women with confirmed GAS infection during or in the 7 days prior to an infection should be referred to Team Prevent and considered for antibiotic prophylaxis.

Close household contacts should be warned of the symptoms and signs of GAS infection and seek medical care should signs develop within 30 days of the index case. Routine antibiotic prophylaxis of close contacts is not recommended.

6.2 Intrapartum

6.2.1 Prophylactic antibiotics

Group B Streptococcus: Please refer to ASQUAM guideline for GBS prophylaxis.

6.2.2 Group A streptococcus (GAS)

Please refer to the guideline for the empiric treatment of the body system involved in the Microguide app. Empiric treatment should cover Group A streptococcus. If Group A Streptococcus is isolated this should be discussed with the Microbiologist who will advise on the choice of appropriate antibiotic therapy.
This will decrease the risk of invasive GAS infection. Neonatologists should be informed of any GAS finding in mother as it may have a significant impact on the neonate. Please see section 6.1.4 above.

6.2.3 Caesarean section

Intravenous antibiotic prophylaxis should be administered to all women; please refer to ASQUAM guideline Caesarean Section.

6.2.4 Vaginal delivery

Aseptic precautions should be observed for all operative vaginal deliveries. Please also refer to ASQUAM guideline: Perineal repair and repair of third and fourth degree tears if suturing of perineal trauma is required.

6.3 Postpartum

6.3.1 Good personal hygiene & advice to women

Provide all women with advice regarding avoiding contamination of the perineum by washing hands before and after using the lavatory or changing sanitary pads. It is especially necessary when the woman or her family or close contacts have a sore throat or upper respiratory tract infection.
All women should be informed of the risks, signs and symptoms of infection and the need for them to seek early advice if they are concerned.

6.3.2 Group A streptococcus

See point 6.2.2 intrapartum prevention of sepsis.

6.3.3 Postnatal temperature

Midwives and other healthcare professionals carrying out postnatal checks in the community should have a thermometer to enable them to check the temperature of women who are unwell.

6.3.4 Communication amongst health care teams

Upon discharge, direct handover to the community carers (GP, midwives and health visitors) of women requiring antibiotics during hospital stay is essential, so that appropriate follow-up visits may be arranged and the significance of developing symptoms recognised.

6.3.5 Prophylactic antibiotics

See relevant ASQUAM guidelines for: prophylactic antibiotics for third/fourth degree tears, manual removal of placenta and antimicrobial guidance (appendix 6).

7. RECOGNITION OF SEPSIS

The onset of life threatening sepsis in pregnancy or the puerperium can be insidious or may show extremely rapid clinical deterioration, particularly when it is as the result of a streptococcal infection.[5]

Repeated presentation to the general practitioner, or community midwife or alternatively, repeated self-referral to the obstetric triage or day care assessment unit should be considered a '**red flag'** and warrant a thorough assessment of the woman to investigate for signs of sepsis.[2]

UHNM has adopted (with minor amendments) the sepsis screening tools and action bundles for use in pregnancy and up to six weeks postpartum from PRactical Obstetric Multi-Professional Training (PROMPT UK, 2017)[5] and the UK Sepsis Trust Screening Tools (2020)[6] (appendix 2, 3 and 4 respectively).
The Maternal Sepsis Screening Tools allow us to assess, risk-stratify and manage suspected sepsis.

'Think Sepsis' at an early stage and use the Sepsis Screening Tool when presented with an unwell pregnant or recently pregnant woman or when the Modified Early Obstetric Warning Score (MEOWS) has triggered. At UHNM a MEOWS of ≥4 is a trigger to commence the sepsis screening tool (see ASQUAM guideline: MEOWS). Urgent Obstetric/Anaesthetic opinion must be sought when there is a concern.

Sepsis grab bag: familiarise yourself with the location of your 'sepsis grab bag' in the department you are working in.

K2 and the Sepsis Screening Tool: know where to locate the sepsis screening tool and sepsis six bundle actions in K2. Also know where to locate a hard copy of the sepsis screening tool and sepsis six bundle actions.

Triggers to commence the Sepsis Screening Tool

- A MEOWS of 4 or more
- The woman looks unwell
- There is a fetal tachycardia≥ 160 bpm
- Think could this woman have an infection?

Common infections include:

  - Chorioamnionitis/endometritis
  - Urinary tract infection
  - Wound infection
  - Influenza/pneumonia
  - Mastitis/breast abscess

- Complete the UHNM sepsis screening tool in full. Take all the appropriate observations and act on them.
- If **RED FLAG HIGH RISK OF** sepsis is identified, see section 8, management of **RED FLAG** sepsis.

RED FLAG - HIGH RISK CRITERIA (if one criterion is present-high risk):

- Respiratory rate ≥ 25
- SpO2 < 92 without O_2
- Heart rate >130
- Systolic BP ≤90
- Altered mental status/responds only to voice, pain or unresponsive
- Blood Lactate ≥2.0*
- Non blanching rash/mottled/cyanotic
- Urine < 0.5mL/kg/hr
- No urine for > 18 hours

- In the absence of any RED flags for sepsis, then the AMBER flag criteria should be used to further stratify the risk of sepsis.

- If one **AMBER FLAG - MODERATE RISK OF SESIS** is present:

AMBER FLAG - MODERATE RISK CRITERIA (if one criterion is present-MODERATE RISK):

- Respiratory rate 21-24
- Heart rate 100-130
- Systolic BP 91-100
- Temperature <36oC
- No urine output for 12-18 hours
- Fetal heart rate >160bpm/pathological CTG
- Prolonged ruptured membranes
- Recent invasive procedure in past 6 weeks
- Bleeding/wound infection/vaginal discharge/abdominal pain
- Close contact with Group A Strep
- Relatives concerned about mental/functional status
- Diabetes/gestational diabetes/ immune suppressed

Complete all the necessary blood tests detailed on the screening tool.
Request an immediate medical review (obstetrician, coordinator/shift leader, anaesthetist.

Manage as **RED FLAG SEPSIS** (section 8) if:

- Acute Kidney Injury (AKI)
- Lactate ≥2
- In the absence of AKI or above features, then clinical decision for antimicrobial treatment should be made within 3 hours.

- In the absence of any **RED FLAG (HIGH RISK)** or **AMBER FLAG (MODERATE RISK)** criteria, then the risk of sepsis is **LOW**.

LOW RISK CRITERIA (if all the criteria below are present-LOW RISK):

- Respiratory rate ≤20
- Heart rate <100
- Systolic BP >100
- Normal mental status
- Temperature 36-37.3oC
- Looks well
- Normal urine output

- Woman should be assessed and monitored using the MEOWS score (unless in labour as per clinical indication).

8. MANAGEMENT OF RED FLAG SEPSIS

Not all women with red flags will require the sepsis six bundle. A senior clinician may seek an alternative diagnosis and de-escalate care e.g. chronic renal disease or hypertension in pregnancy. Any differential diagnosis and or rationale for not commencing the sepsis six bundle must be clearly documented.

Crucial actions for women with **RED FLAG Sepsis** are:

- Early recognition
- Prompt investigation
- Prompt treatment particularly
  - Administration of intravenous antibiotics
  - Administration of intravenous fluids
  - Early involvement of experts & senior review is essential.

8.1 SEPSIS SIX BUNDLE: THE FIRST HOUR

Following completion of the UHNM sepsis screening tool and the identification of **RED FLAG HIGH RISK FOR SEPSIS** (appendix 2 in-patient sepsis screening tool and appendix 4 community/FMBU sepsis screening tool and sepsis bundle) continue with the actions in the sepsis six bundle, (appendix 3 and appendix 4). **Complete all actions within the hour** (see actions if woman in the community/FMBU). All women should be transferred to CDS for HDU care.

Remember - the actions in the sepsis six bundle are only the first stage of management.

ENSURE SENIOR CLINICIAN ATTENDS (SEPSIS SIX BUNDLE: ACTION 1)

In the event of **Red Flag Sepsis**, all 3 the following staff should immediately attend:

- Coordinating midwife
- Senior obstetric registrar (Reg 2)
- Obstetric anaesthetic registrar/RAC)

Early involvement from the following clinicians is crucial, it can save lives and limit morbidity:

- Consultant microbiologist
- Consultant haematologist
- Critical care consultant (via UHNM switch board; 79037 – senior co-ordinator critical care unit)
- Consider the critical care outreach team (bleep 78 108 or telephone 79043)

If the woman fails to respond within 1 hour of initial antibiotic and/or intravenous fluid resuscitation (see section 9. Deteriorating Woman with Sepsis):

- The on-call Consultant Obstetrician, Consultant Obstetric Anaesthetist (ITU Consultant for out of hours) should attend for decision regarding further supportive management +/- transfer to critical care unit.
- Immediate involvement of Critical Care Outreach Team (bleep 78 108)
- Advice from the Consultant Microbiologist should be urgently sought.

ADMINISTER OXYGEN (SEPSIS SIX BUNDLE: ACTION 2)

Monitor and maintain airway, breathing, circulation as your first priority.
Administer high flow oxygen by facemask with a reservoir bat at 15L/minute. Aim to keep oxygen saturations above 94%.
If the woman is at risk of carbon dioxide retention i.e. chronic obstructive pulmonary disease or Type 2 Respiratory Failure, aim for oxygen saturations of 88-92%.

OBTAIN IV ACCESS TAKE BLOODS (SEPSIS SIX BUNDLE: ACTION 3)

Secure intravenous access as soon as possible, blood samples should include those detailed in table 4.

Table 4 Blood samples to obtain for investigation

Blood samples to obtain for investigation	
Blood cultures **DO NOT DELAY THE ADMINISTRATION OF ANTIBIOTICS**	Peripheral sample Please see UHNM medical guidelines: collection of blood culture specimens and ANTT clinical practice framework frame work both available on the UHNM intranet If the woman has central venous catheter (CVC) or any central line, then a sample should be taken as well from these lines if suspected for infection.
Serum lactate Use the blood gas analyser on neonatal unit to obtain a serum lactate.	Women with severe sepsis or septic shock typically have a high serum lactate which may be secondary to anaerobic metabolism attributable to poor tissue perfusion. A lactate of ≥ 4 mmol/L indicates a poor prognosis & should trigger a referral to critical care. If the serum lactate is ≥ 4 mmol/L or there is suspected hypovolemia due to the sepsis administer an initial fluid challenge of 500 mL crystalloid in 15 minutes regardless of blood pressure. This fluid challenge is recommended because of the high risk of septic shock, (UK Sepsis Trust). If there is no improvement of the serum lactate with the Sepsis Six, the woman should be transferred to critical care for possible vasopressor support.
Full blood count	White blood cells (WBC) are commonly raised (more than 14 x 10^9/L) with a high neutrophil count in sepsis. However the WBC can also be low (less than 4 x 10^9/L).
Renal & liver function	Acute tubular necrosis may develop which can lead to renal failure with raised urea, creatinine, and potassium levels. The pro-inflammatory state of sepsis can also lead to hyper bilirubinaemia and jaundice.
C-reactive protein (CRP)	CRP is an inflammatory marker, commonly raised during infection. Monitoring the trend can be a useful guide a response to the treatment of infection.
Clotting studies	Disseminated intravascular coagulation (DIC) is a potential complication of sever sepsis. Take blood for activated partial thromboplastin time (APTT), prothrombin and fibrinogen. Communicate with the on-call haematologist if the investigation results are abnormal. The administration of platelets, fresh frozen plasma, & or cryoprecipitate /fibrinogen concentrate may be indicated.
Arterial blood gas (ABG)	An ABG is very useful in any woman who is unwell. It is likely to show acidaemia (arterial pH less than 7.35). This is typically a metabolic acidosis secondary to lactate production.

GIVE INTRAVENOUS ANTIBIOTICS (SEPSIS SIX BUNDLE: ACTION 4)

Administer immediate high dose broad-spectrum intravenous antibiotic therapy. See appendix 6 antimicrobial guidance. Consider the need for anti-retroviral medication.

DO NOT DELAY THE ADMINISTRATION OF ANTIBIOITCS WHILST WAITING FOR INVESTIGATION RESULTS.

If possible obtain blood cultures prior to the antibiotics being administered but these should not delay antibiotic administration.

Early involvement of the microbiologist is crucial.

GIVE INTRAVENOUS FLUIDS (SEPSIS SIX BUNDLE: ACTION 5)

An initial fluid challenge of 500 mL crystalloid in 15 minutes should be administered. The woman may require up to 30 mL/kg of intravenous fluids. This means a 70 kg woman with sepsis should receive 2 litres of intravenous crystalloid.

- If lactate ≥2mmol/L give 500mL stat.
- If hypotensive or lactate ≥ 4mmol/L can repeat boluses up to 30mL/kg (e.g. 2L for a 70 kg woman)

Extreme caution must be exercised in women with pre-eclampsia/suspected or confirmed heart failure. Liaise closely with the Consultant Obstetrician /Anaesthetist team and critical care.

MONITOR (SEPSIS SIX BUNDLE: ACTION 6)

This includes accurate measurement of the urine output.

Women with maternal sepsis can deteriorate rapidly. Extreme vigilance with observations and assessment is crucial.

Record all observations on a high dependency care chart & MEOWS in K2.
Commence the high dependency care (HDC) chart in the location where sepsis **RED FLAG** triggers are identified i.e. if identified on the wards then commence HDC chart prior to transfer to delivery suite.

If the woman is on the ward, transfer to delivery suite for the provision of high dependency care. Consider the need to transfer to critical care

Early advice from an infectious diseases physician or microbiologist should be sought; this is essential in instances where the woman fails to respond to the first-choice antibiotic.

Table 5 details the monitoring required in the management of maternal sepsis.

Table 5 Monitoring & observations in maternal sepsis

Monitoring & observations in maternal sepsis	
Monitor	**Frequency**
Respiratory rate Pulse rate Blood pressure Oxygen saturations	Every 15 minutes until stabilised and then every 30 minutes. Tailor according to treatment response
Temperature	At least 4 hourly
Urine output	Hourly by Foley's catheter & urometer
Blood samples ▪ Full Blood Count ▪ Urea & Electrolytes ▪ Liver Function Tests ▪ Serum lactate ▪ Bicarbonate ▪ Glucose ▪ Magnesium, phosphate & calcium	Every 4-12 hours dependent upon clinical situation
Fetal heart rate monitoring with a CTG if appropriate	

8.2 Further management of sepsis

- Continue with the observations detailed in table 6
- Serial lactates will assess a response to treatment.
- Stop non-steroidal medicines as these are contraindicated in sepsis.

8.2.1 Removing the source of the infection

- Identify the source of sepsis and remove as soon as the woman is stable.
- Perform a full 'top to toe' clinical examination with the aim of identifying the cause of the sepsis.
- Include a vaginal examination to exclude retained swab or tampon.
- Swabs or cultures listed below should be obtained from all potential sources of sepsis & sent for urgent microbiology investigation:
  - Vaginal & wound swabs
  - Urine culture
  - Throat swab
  - Stool sample
  - Sputum sample
  - Placental swab (if immediately postpartum)

  The results of all investigations must be followed up and antibiotic treatment altered accordingly

- Imaging may help to identify the source of infection
  - Chest X-ray
  - Abdominal ultrasound
  - CT of chest, abdomen pelvis
- Expedite delivery if there are signs of chorioamnionitis to aid resuscitation measures; liaise with the neonatologist.
- Retained products of conception: remove retained products as soon as the woman is stable.
- Closed-space infections need surgical drainage.
- In women with endometritis not responding to antibiotics, consider septic pelvic thrombosis.
- Necrotising fasciitis requires early surgical intervention with fasciotomy and aggressive antibiotic therapy.

8.2.2 Venous thromboembolism prophylaxis

- Deep vein thrombosis prophylaxis with low molecular weight heparin and the use of compression stockings should be considered.

9. DETERIORATING WOMAN WITH SEPSIS

If the woman fails to respond within 1 hour of initial antibiotic and/or intravenous fluid resuscitation (also see septic shock 9.1):

- The on-call Consultant Obstetrician, Consultant Obstetric Anaesthetist (ITU Consultant for out of hours) should attend for decision regarding further supportive management +/- transfer to critical care unit.
- Immediate involvement of Critical Care Outreach Team (bleep 78 108)
- Advice from the Consultant Microbiologist should be urgently sought.
- Consider other conditions mimicking sepsis especially when not responding to treatment. This includes:
  - Occult haemorrhage (concealed gastrointestinal bleeding)
  - Myocardial infarction
  - Adrenal insufficiency
  - Venous thrombosis.

9.1 Signs of septic shock

Sepsis and (despite adequate volume resuscitation) both of:

- Persistent hypotension requiring vasopressors to maintain Mean Arterial Pressure (MAP) greater than or equal to 65 mm Hg, and
- Lactate greater than or equal to 2 mmol/l (despite fluid resuscitation).

Pragmatically and usually as a trigger to call Critical Care, a woman who is hypotensive (Red Flag criterion, systolic blood pressure (SBP) <90 mmHg) AND who has a lactate greater than 2 mmol/l despite fluid resuscitation.

9.2 Multi-disciplinary team management of Septic Shock/Severe Sepsis

- Follow resuscitation measures of airway, breathing and circulation.
- Seek advice from Consultant Microbiologist and consider additional or alternative IV antibiotics.
- Repeat microbiological specimens and mark 'urgent'.
- MDT involvement as in section 9 above to arrange for the transfer of the woman to critical care.
  - Intensivists
  - Consultant Obstetrician
  - Delivery Suite Coordinator
  - Anaesthetists
  - Haematologists
  - Microbiologists
  - Infectious diseases
  - Outreach Team and Intensivists.

10. MANAGEMENT OF PYREXIA IN PREGNANCY AND POSTPARTUM PERIOD

Hyperthermia is no longer considered as a factor for sepsis screening (International Sepsis Guidance, 2016). Be guided by the clinical condition of the patient and Sepsis Six pathway to manage these women.

If woman has pyrexia: >37.5^{o}C on ONE occasion:

- Keep woman cool
- Administer 1g Paracetamol orally and repeat in 4- 6 hours if required
- Avoid dehydration
- Record temperature hourly on MEOWS chart until apyrexial.

If maternal temperature >38^{o}C ONCE or >37.5^{o}C on TWO occasions ONE hour apart:

- Commence external electronic fetal monitoring (if pregnant and appropriate gestation)
- Clinical assessment including possibility of infection/sepsis as per sepsis six screening/bundle pathway
- Send MSU/CSU, HVS/LVS and blood cultures.
- Empirical antibiotics should be commenced, (appendix 6).
  - In labour consider and cover for chorioamnionitis which is associated with neonatal morbidity and mortality (particularly during preterm labour <34 weeks gestation).
- Review antibiotics treatment with sterile site culture results and woman's clinical picture. Liaise with microbiologist if no obvious source of infection identified to consider de-escalation (stopping antibiotics).

11. INTRAPARTUM CARE FOR WOMEN WITH SUSPECTED SEPSIS

Women in labour with suspected sepsis should receive on-going multi-disciplinary review.[7]

- A Senior Obstetrician (Registrar 2 or above)
- A Senior Obstetric Anaesthetist (on-call anaesthetic registrar or above)
- A Senior Midwife (shift leader)
- A Delivery Suite Coordinator

If **RED FLAG** sepsis is triggered then there should be early involvement from the consultant team when indicated (see section 8)

Consider escalation to a critical care specialist if the woman has any of the following symptoms of organ dysfunction:

- Altered consciousness
- Hypotension (systolic blood pressure of less than 90mmHg)
- Reduced urine output (less than 0.5ml/kg/hour)
- Requirement for 40% oxygen therapy to maintain SaO_2 levels above 94%
- Tympanic temperature of less than 36°C

Staff are requested **NOT** to apply the maternal sepsis screening tool based on raised temperature alone; however, consider the following guidance, section 7 and 10:

Intrapartum temperature of 38°C with confirmed or suspected chorioamnionitis: this is considered to be a risk factor for sepsis.

Temperature below 36°C: A maternal sepsis screening tool should be commenced if there is a temperature of below 36°C as this can be an indication of organ dysfunction.

Baseline fetal tachycardia: If baseline fetal tachycardia ≥160/min with no other non-reassuring or abnormal feature on CTG.

- **Think "Could this be sepsis"?**
- Check maternal temperature and pulse
- MEOWS scores are not normally recorded in labour. If the woman looks or feels unwell perform a MEOWS score and if score is ≥ 4 commence the maternal sepsis screening tool and action accordingly.

12. COMMUNITY MIDWIFERY SEPSIS SCREENING AND SEPSIS BUNDLE ACTION TOOL

When a woman presents looking unwell **or** family or carer is very concerned **or** there is on-going deterioration.

Think **"Could this be sepsis?"**
Use the **community sepsis screening and sepsis bundle action tool** (appendix 4) to assess and risk-stratify suspected sepsis. This assessment tool is used for women (antenatal and/or up to 6 weeks postpartum) who are:
Seen in the community setting
Attending Free-Standing Midwifery Unit
In labour at Free-Standing Midwifery Unit

ACTION

Perform observations including:

- **Temperature**
- **Pulse**
- **BP**
- **Respiratory Rate**
- **SpO_2 if available**

If **any RED FLAG** is present, indicates **RED FLAG HIGH RISK sepsis**:

ACTIONS WOMAN WITH RED FLAG SEPSIS; HIGH RISK OF SEPSIS

- For women seen in community: Dial 999 and arrange blue light transfer, ensure pre-alert as "Red Flag Sepsis"
- For women in FMBU: Dial 01782 676666 requesting a time critical ambulance, ensure pre-alert as "Red Flag Sepsis"
- If available give O_2 to maintain saturations >94%
- Inform family
- Immediately inform Delivery Suite coordinator for transfer to Maternity HDU as 'Red Flag Sepsis'.
- Cannulate if skills and competencies allow
- Consider administration of IV fluids

In the absence of any **RED Flag**, then the **AMBER FLAG** criteria should be used to further stratify the risk of sepsis.

In the presence of any **AMBER FLAG** - **MODERATE RISK OF SEPSIS** criteria:

ACTIONS WOMAN AT MODEERATE RISK OF SEPSIS

- Women in community: community midwife to arrange same day assessment by GP or on MAU.
- Antenatal/postnatal women in FMBU: arrange transfer to Maternity Assessment Unit for same day assessment. Consider the administration of oxygen and IV fluids.
- For women in labour in FMBU with suspected sepsis, transfer to CDS at Royal Stoke.

In the absence of any **RED FLAG** or **AMBER FLAG** criteria, then the risk of sepsis is low. The woman should be assessed and monitored as per clinical indication. Agree and document ongoing management plan including observation frequency and planned second review.

13. ANTIMICROBIAL AND/OR ANTIVIRALTHERAPY

- **RED FLAG - HIGH RISK SEPSIS**: Administration of intravenous, site specific spectrum antibiotics is recommended within **one** hour of diagnosis of **RED FLAG** Sepsis. Broad spectrum antibiotics should be used if the source of infection is unknown.

- **AMBER FLAG** Antimicrobial prescribing decision should be made within 3 hours if any **AMBER FLAG** criteria are present in the absence of AKI.

- Antimicrobial prescribing regimes for specific infections. Refer to appendix 6 for current antimicrobial prescribing regimes. Remember to communicate with the Consultant Microbiologist.

- Influenza: If flu is suspected, then obtain nasal and throat swabs for viral testing and discuss with consultant microbiologist regarding appropriate empirical antiviral treatment (see section 6.1.1 and appendix 1).

  Antiviral therapy, including Oseltamivir (Tamiflu) and Zanamivir (Relenza) can be administered to non-immunised mothers with suspected or confirmed flu to inhibit viral replication and lessen the symptoms if started within 48 hours of onset of symptoms. Discuss with on-call microbiologist if flu in suspected and/or treatment is indicated.

- Infection prevention and control measures should be undertaken as per trust policy (see appendix 6).

14. MONITORING THE FETUS AND DELIVERY

- The effects of maternal sepsis on fetal wellbeing include the direct effect of infection in the fetus, the effect of maternal illness/shock and the effect of maternal treatment. The risk of neonatal encephalopathy and cerebral palsy is increased in the presence of intrauterine infection.

- Continuous CTG (if appropriate gestation) should be commenced for mothers who have **RED FLAG SEPSIS**.

- During the intrapartum period, continuous CTG is recommended in the presence of maternal pyrexia. Electronic fetal monitoring is however NOT a sensitive predictor for early onset neonatal sepsis.

- In a critically ill pregnant woman the birth of the baby may be considered if it would be beneficial to the mother or the baby or to both. A decision on the timing and mode of birth should be made by a Consultant Obstetrician following discussion with the woman if her condition allows and the Consultant Neonatologist

- If preterm delivery is anticipated, cautious consideration should be given to the use of antenatal corticosteroids for fetal lung maturity in a woman with sepsis. Consider the use of Magnesium Sulphate for neuro-protection (see ASQUAM guideline: Management of suspected pre-term labour (24-36^{+6} weeks).

- Epidural/spinal anaesthesia should be avoided in women with sepsis and a general anaesthetic will usually be required for caesarean section.

15. INFECTION PREVENTION AND NEONATAL ISSUES

- The woman should be isolated in a single room with en-suite facilities to reduce the risk of transmission of infection.

- A suspected or confirmed case of flu should be managed as per trust infection control policy (see Appendix 5)

- Babies born to a mother with sepsis should be assessed and managed as per UHNM neonatal guideline: Infection in first 72 hours of life.
  - Inform neonatal team if a mother is treated with antibiotics for suspected sepsis during labour or within 24 hr either side of birth
  - Maternal sepsis in pregnancy is a neonatal **RED FLAG** indication of early onset neonatal sepsis which requires administration of IV antibiotics to the baby within one hour of decision to treat. Close household contacts should be warned about the symptoms of GAS infection and told to seek medical attention should symptoms develop. Asymptomatic contacts may warrant prophylaxis. Liaise with the Consultant for Communicable Disease/Local Health Protection Unit for advice.

16. MONITORING AND AUDIT

The need to monitor/audit the standards set out below will be considered alongside other Directorate requirements and prioritised accordingly. The Directorate Clinical Audit programme is drafted by the Directorate Clinical auditor, in liaison with clinical staff, and approved by the Directorate.

Element to be monitored	Lead	Tool	Frequency	Reporting arrangements	Acting on recommendations and lead(s)	Change in practice and lessons to be shared
Guideline content	Guideline Co-ordinator	Guideline Review	Every three years	Maternity Forum Subgroup: Guideline Meeting	Required changes to practice will be identified and actioned with the release of the updated guideline.	Required changes to practice will be identified and actioned with the release of the updated guideline.
Clinical standards within guideline and the following will be considered: • Proportion of women: • With appropriate investigations carried out. • Receiving appropriate monitoring. • With documentation of involvement of Consultant Obstetricians, Consultant Anaesthetists, Consultant Microbiologists, Consultant Haematologists and Intensivists. • Receiving appropriate antimicrobial therapy.	Directorate Clinical Auditor	Clinical Audit	As required in relation to other Directorate priorities	Directorate Business, Performance and Clinical Governance Meeting	Required actions will be identified and completed in a specified timeframe as per the audit action plan.	Required changes to practice will be identified and actioned within a specific timeframe as per the audit action plan and, in addition, lessons will be shared with relevant stakeholders as per audit action plan.

17. REFERENCES

1. **Knight M, Bunch K, Tuffnell D, Shakespeare J, Kotnis R, Kenyon S, Kurinczuk JJ (Eds.) (2019)** on behalf of MBRRACE-UK. Saving Lives, Improving Mothers' Care - Lessons learned to inform maternity care from the UK and Ireland Confidential Enquiries into Maternal Deaths and Morbidity 2015-17. Oxford: National Perinatal Epidemiology Unit, University of Oxford 2019

2. **Churchill, D. Rodger, A. Clift J. and Tuffnell D** (2014) on behalf of the MBRRACE-UK Sepsis chapter writing group. Think Sepsis. In Knight M, Kenyon S, Brocklehurst P, Neilson J, Shakespeare J, Kurinczuk JJ (Eds.) on behalf of MBRRACE-UK. Saving Lives, Improving Mothers' Care - Lessons learned to inform future maternity care from the UK and Ireland Confidential Enquiries into Maternal Deaths and Morbidity
2009–12. Oxford: National Perinatal Epidemiology Unit, University of Oxford 2014: p27-43.

3. **Singer, M. Deutschman, C. Seymour, C et al (2016)** ('Sepsis-3') The Third International Consensus Definitions for Sepsis and Septic Shock (Sepsis-3)
JAMA. 2016;315(8):801-810. doi:10.1001/jama.2016.0287

4. **NHS England, (2019)** National Flu Programme.https://www.england.nhs.uk/wp-content/uploads/2019/03/annual-national-flu-programme-2019-to-2020-1.pdf

5. **Winter, C. Crofts, J. Draycott T and Muchtuta N (2017),** PROMPT Course Manual. Third Edition, Cambridge University Press

6. **UK Sepsis Trust** Screening Tools (2020) https://sepsistrust.org/
UK Sepsis Trust Screening and action tool for Community Midwives (2020)
UK Sepsis Trust Maternity inpatient screening Tool (2020)

7. **NICE, Medical disorders (2019)** NICE guideline 121www.nice.org.uk/guidance/ng121

Additional supporting information

The UK Sepsis Trust Manual 4th edition https://sepsistrust.org/sepsismanual/

UHNM Patient Group Directive PGD (2018) Influenza vaccine for pregnant women 2018 Available via UHNM intranet

NICE Guideline (2017) NG51. *Sepsis: recognition, diagnosis and early management*. Available from https://www.nice.org.uk/guidance/ng51

NICE Guideline (2019) 121 Intrapartum care for women with existing medical problems or obstetric complications and their babies

UHNM ASQUAM Guideline (2019) MEOWS

UHNM ASQUAM Guideline (2019) Suspected pre term labour

UHNM Infection Prevention Manual. An extract from Infection Prevention Manual; The Care of Patient with Suspected or confirmed Influenza Questions and Answers
http://uhnm/media/4873/38-influenza.pdf

RCOG (2012) Green-top Guideline 64a. *Bacterial sepsis in pregnancy*

MBRRACE Saving Lives, Improving Mothers Care December 2017.
https://www.npeu.ox.ac.uk/downloads/files/mbrrace-uk/reports/

Appendix 1 Influenza

FLU IMMUNISATION

- Pregnant women and their babies are at an elevated risk from the complications of flu, including prematurity and smaller birth size and weight. Flu is the most frequent single cause of death in pregnancy.

- A patient group directive is available via the UHNM Intranet

- Studies have demonstrated that flu vaccination may reduce the likelihood of prematurity and smaller infant size at birth associated with an influenza infection during pregnancy. Furthermore, a number of studies show that flu vaccination during pregnancy provides protection against flu in infants in the first few months of life.

- A review of studies on the safety of flu vaccine in pregnancy concluded that inactivated flu vaccine can be safely and effectively administered during any trimester of pregnancy and that no study to date has demonstrated an increased risk of either maternal complications or adverse fetal outcomes associated with inactivated influenza vaccine.

    - All pregnant women are recommended to receive the inactivated flu vaccination irrespective of the stage of their pregnancy.

    - The flu vaccines are administered in the community according to the Department of Health/Public Health England National Flu Immunisation Programme annually.

    - Community midwives should explain to pregnant women the benefits of flu vaccination and refer them to GP or community pharmacy for vaccination accordingly to local practice.

SUSPECTED INFLUENZA

Also refer to UHNM The care of patient with suspected or confirmed Influenza (an extract from Infection Prevention Manual Q&A V2 http://uhnm/media/4873/38-influenza.pdf

Influenza should be suspected if a woman has:

Fever ≥38°C or a history of fever

AND

Flu-like illness (two or more of the following symptoms: cough, sore throat, rhinorrhoea or joint pain; headache, vomiting or diarrhoea)

OR

Severe life-threatening illness suggestive of an infectious process.

Nasal and throat swabs:

- Nose and throat swabs should be taken and put into viral media and sent
- IMMEDIATELY to the microbiology lab. The laboratory will accept red/green topped virology swabs.
- Ring Microbiology to notify of urgent sample being sent.
- Samples from pregnant women will be prioritised by the laboratory.

Results for flu swabs will be available within 6 hours of the sample reaching the laboratory

- Results must be reviewed as soon as possible by a senior clinician to ensure prompt treatment.
- Urgent prophylaxis should be discussed with the Consultant Microbiologist.
- Consideration should be given if mother has had antenatal immunisation.

INFLUENZA INFECTION PREVENTION AND CONTROL MEASURES

Influenza Infection Prevention and Control Measures	Entry into isolation area but no patient contact	Close patient contact (less than 1 metre)	Aerosol-generating procedures (AGP)
Hand Hygiene	Yes	Yes	Yes
Disposable gloves	Yes, if decontaminating equipment or environment	Yes	Yes
Disposable plastic Apron	Yes, if decontaminating equipment or environment	Yes	Yes
Fluid repellent log sleeve gown	No	Yes, if extensive contamination of clothing anticipated	Yes, if extensive contamination of clothing anticipated
Surgical Mask	Yes	Yes	No FFP3 masks must be worn
FFP3 mask/respirator	No	No, unless in the same room as aerosol generating procedure taking place	Yes
Eye Protection	No	Risk assess for splashing to face	Yes

Guidance: Standard Infection control principles apply at all times

Aerosol Generating Procedures

Where possible, procedures that might generate an infectious aerosol, Aerosol Generating Procedures (AGPs), should be performed in closed, single-patient areas with minimal staff present. Potential AGPs include:

- Intubation and ventilation, extubation and related procedures, manual ventilation and open suctions
- Cardiopulmonary resuscitation,
- Bronchoscopy,
- Surgery and post-mortem procedures in which high speed devices are used
- Dental procedures

- Non-invasive ventilation (NIV), e.g. Bi-level Positive Airway Pressure Ventilation (BiPAP) and continuous Positive Airway Pressure Ventilation (CPAP)
- High-frequency oscillating ventilation (HFOV)
- Induction of sputum

Certain other procedures/ equipment may generate an aerosol from material other than patient secretions but are not considered to represent a significant infectious risk. Procedures in this category include

- Administration of humidified noxygen
- Administration of medication via nebulisation

Gloves and Aprons

Gloves and an apron should be worn during certain cleaning procedures. Gloves should be worn in accordance with standard infection control principles. If glove supplies become limited or come under pressure, this recommendation may need to be relaxed. Glove use should be prioritized for contact with blood and body fluids, invasive procedures and contact with sterile sites.

Gowns

Consider a gown in place of an apron if extensive soiling of clothing or contact of skin with blood or other body fluids is anticipated (e.g. during intubation or when caring for infants). If non-fluid repellent gowns are used, a plastic apron should be worn underneath.

Masks

Surgical masks (fluid repellent) are recommended for use at all times in cohorted areas. If mask supplies become limited or come under pressure, then their use should be limited to close contact with a symptomatic patient (within one metre).

FFP3 masks: Staff using them must have been instructed on the correct fitting, have undergone a fit test, in line with the HSE circular 282/28, and ensure they perform a fit check for each use

Eye Protection

Eye Protection is to be worn when there is a risk of blood, body fluids, excretions or secretions into the eyes. Surgical masks with integrated visors are also an option.

Appendix 2 UHNM Inpatient Maternal Sepsis Screening Tool

University Hospitals of North Midlands NHS
NHS Trust

UHNM Maternal In-patient Sepsis Screening Tool & Sepsis Six Bundle: Adapted from PROMPT & UK Sepsis Trust

1. Has MOEWS been triggered? MEOWS ≥4
2. Does the woman look unwell?
3. Is the fetal heart rate ≥ 160 bpm?
4. Could this woman have an infection?

Common infections include:

- Chorioamnionitis/endometritis
- Urinary tract infection
- Wound infection
- Influenza/pneumonia
- Mastitis/breast abscess
- Abdominal pain/distention

Patient ID

If YES to any of the above complete risk assessment

Red Flag -High Risk Criteria
Tick all those that apply

- Respiratory rate ≥ 25 ☐
- SpO2 < 92% without O_2 ☐
- Heart rate >130 ☐
- Systolic BP ≤90 ☐
- New to altered mental status/ responds only to voice, pain or unresponsive ☐
- Blood Lactate ≥2.0* ☐
- Non blanching rash/mottled/ Cyanotic/ashen ☐
- Urine < 0.5mL/kg/hr ☐
- No urine for >18 hours ☐

If ONE criterion present

Commence 'Sepsis Six' NOW

- Immediate obstetric review ST3 or higher
- Inform Consultant Obstetrician & Consultant Anaesthetist & ward shift leader
- Commence Maternal Critical Care Chart (ward or delivery suite
- Commence the SEPSIS SIX BUNDLE

Amber Flag - Moderate Risk Criteria
Tick all those that apply

- Respiratory rate 21-24 ☐
- Heart rate 100-129 or new dysrhythmia ☐
- Systolic BP 91-100 ☐
- Temperature <36°C ☐
- No urine output for 12-18 hours ☐
- Fetal heart rate >160bpm/ pathological CTG ☐
- Prolonged ruptured membranes ☐
- Recent invasive procedure in past 6 weeks ☐
- Bleeding/wound infection/offensive vaginal discharge/abdominal pain ☐
- Close contact with Group A Strep ☐
- Relatives concerned about mental/functional status ☐
- Diabetes/gestational diabetes/ immune suppressed ☐

If ONE criterion present

Send bloods:
FBC, lactate, CRP, U+Es, LFTs, clotting
OBSTETRIC REVIEW (ST3 or higher)
Within one hour
Consider 'Sepsis Six'

Review blood if lactate ≥2 or acute kidney injury present, follow HIGH risk pathway

Green Flag - Low Risk Criteria
Tick all those that apply

- Respiratory rate ≤20 ☐
- Heart rate <100 ☐
- Systolic BP >100 ☐
- Normal mental status ☐
- Temperature 36-37.3°C ☐
- Looks well ☐
- Normal urine output ☐

If ALL criterion present

LOW RISK OF SEPSIS

Review and monitor for improvement or deterioration

Consider obstetric needs and full clinical picture

*NB Lactate measurement may be transiently elevated during and immediately after normal labour and birth; if unsure, repeat sample

Completed by:
Name: Designation: Time: Date:

Appendix 3 UHNM Maternal Sepsis Six Bundle

University Hospitals of North Midlands NHS
NHS Trust

UHNM Maternal Sepsis Six Bundle: Adapted from PROMPT & UK Sepsis Trust

CALL FOR HELP and complete ALL 'SEPSIS SIX' ACTIONS within ONE HOUR | **Time zero:**

Action	Time completed & initials	Reason not done / variance/comments
1. ENSURE ALL 3 SENIOR CLINICIANS ATTEND ▪ Senior midwives (Shift leader) ▪ Obstetricians (Reg 2) ▪ Anaesthetists (obstetric anaesthetic registrar/RAC)		
2. ADMINISTER 100% OXYGEN ▪ 15 L/min via non-rebreathe mask ▪ Aim to keep saturations >94% ▪ If the woman is at risk of CO_2 retention i.e. chronic obstructive pulmonary disease or Type 2 Respiratory Failure, aim for oxygen saturations of 88-92%		
3. TAKE BLOODS: **BLOOD CULTURES but do not delay antibiotics** **CHECK SERUM LACTATE** ▪ If venous lactate raised, recheck with arterial sample ▪ Continue to check serial serum lactates to monitor response to treatment (& FBC, CRP, U+Es, LFTs, clotting, blood glucose) ▪ Discuss with critical care if lactate >2mmol/L despite fluid resuscitation ▪ Also high vaginal swab/throat swab/wound swab/breast milk swab/sputum sample/stool sample/MSU/CSU		
4. GIVE IV BROAD SPECTRUM ANTIBIOTICS (as Trust protocol) ▪ Administer urgently, consider allergies ▪ Aim to take blood culture first but do not delay antibiotics if cultures bottles not available ▪ Consider antivirals		
5. GIVE IV FLUID THERAPY ▪ If lactate ≥2mmol/L give 500mL stat ▪ If hypotensive or lactate ≥ 4mmol/L can repeat boluses up to 30mL/kg (e.g. 2L for a 70 kg woman) ▪ Extreme caution if woman has pre-eclampsia/cardiac failure either suspected or confirmed: discuss with consultant anaesthetist/obstetrician		
6. ACCURATE MEASUREMENT OF URINE OUTPUT ▪ Urinary catheter & hourly measurement ▪ Document fluid balance record		

If after 'Sepsis Six': systolic BP remains <90%mmHg, level of consciousness remains altered, respiratory rate >25, lactate not reducing (or was previously ≥4%mmol/L), refer IMMEDIATELY to Critical Care Team: Consultant via UHNM switch board or telephone 79037 – senior co-ordinator critical care unit - Critical Care Outreach Team (bleep 78 108)

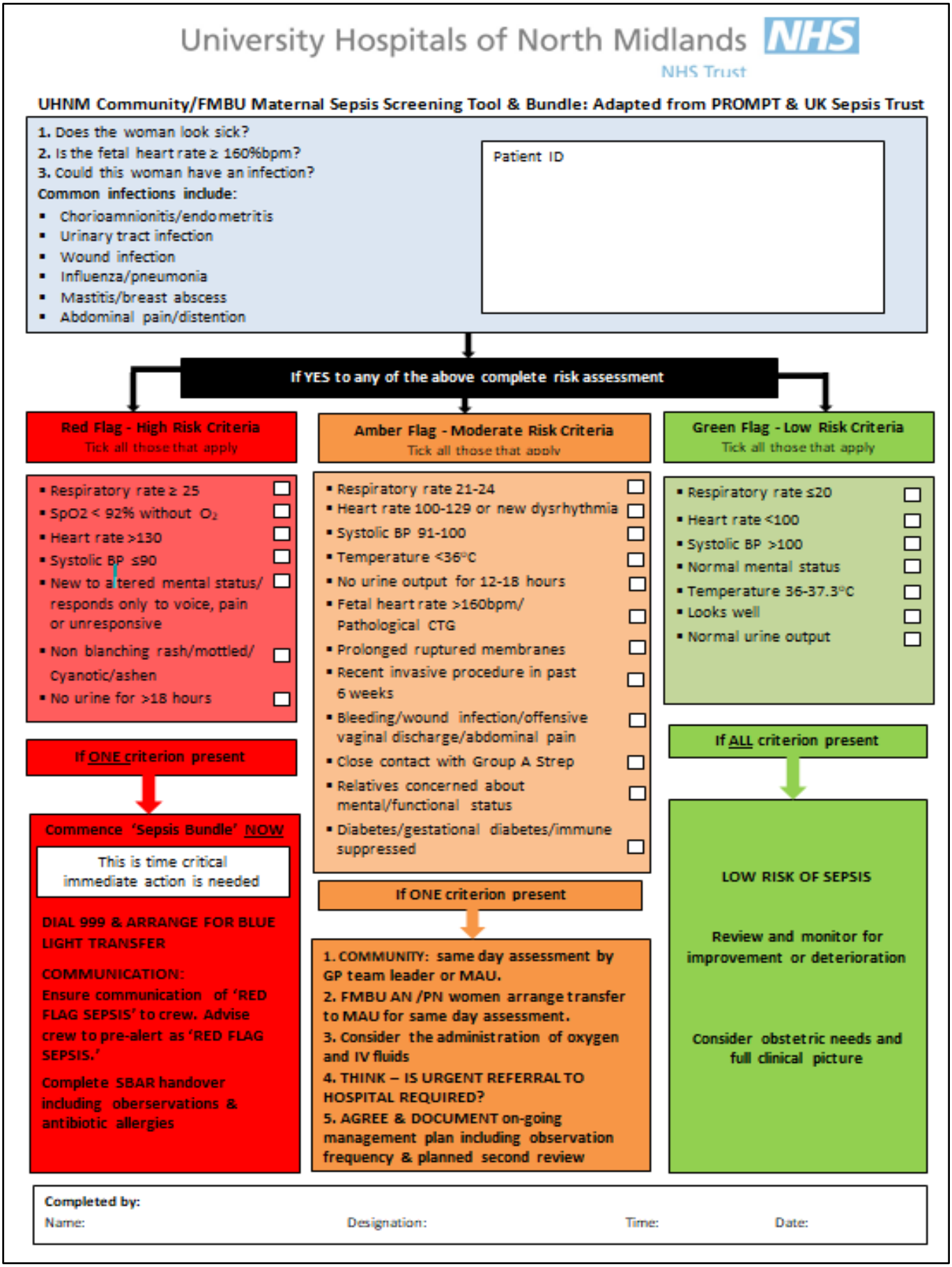
Also consider
▪ If antenatal – monitor fetal heart rate/commence CTG
▪ Remove the source of infection e.g. retained products, expedite birth
▪ Refer to Critical Care Team

Document actions taken:

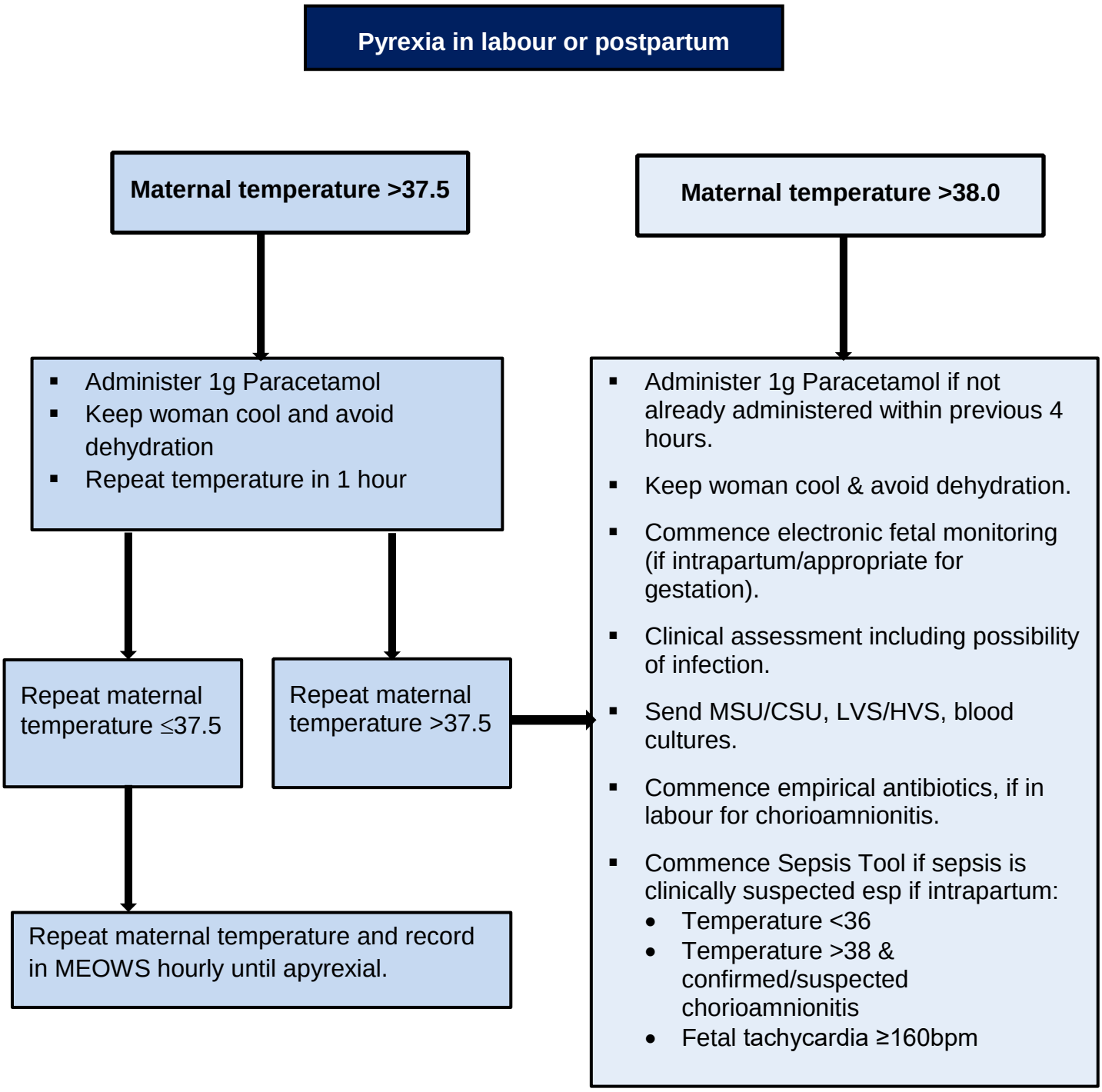
Maternal sepsis requires multi-professional team input from: (tick staff contacted)

Midwife coordinator	☐	Senior obstetric anaesthetist	☐	Intensive /critical care team	☐
Senior/consultant obstetrician	☐	Microbiologist	☐		

Appendix 4 UHNM Community & FMBU Maternal Sepsis Screening Tool & Bundle



Appendix 5 - Pyrexia in labour or postpartum



Appendix 6 - UHNM Antimicrobial guidance

Produced in association with the Antimicrobial Policy Committee August 2011
Last updated by Antimicrobial Stewardship Group: August 2018
Review date: **September 2020**

Chorioamnionitis

Infection	**Sepsis or chorioamnionitis**	
Specimen	Blood culture Urine culture Vaginal swab, cervical swab if appropriate Wound swab if wound infection suspected	
Likely Organisms	**Sepsis** *Streptococcus* group A and B *Escherichia coli*	**Chorioamnionitis** *Gardnerella vaginalis* Anaerobes *Streptococcus* spp *Listeria* spp
Treatment	**First line (including rash only to penicillin)**	**Alternative (if anaphylaxis to penicillin)**
	Cefuroxime 1.5 g IV 8 hrly **If chorioamnionitis suspected:** **Add** metronidazole 500 mg IV by infusion 8 hrly Microbiologist should be consulted after discussion with Obstetric Consultant in the following circumstances: • failure of antimicrobial treatment • in case of cephalosporin allergy • multiresistant organism cultured	Clindamycin 900 mg IV by infusion 8 hrly **plus** gentamicin IV* **multiple daily dosing regimen if pregnant** (use ideal body weight NOT actual pregnancy weight), **intermittent dosing regimen post-partum** (see Gentamicin Treatment Guideline for dosing and monitoring)
Duration	***Do not continue empirical gentamicin for more than 24 hr unless advised by Consultant Microbiologist** 7 – 10 days , depending on speed of recovery Convert IV to oral once apyrexial for 48 hr and stable	

Produced in association with the Antimicrobial Policy Committee August 2011
Last updated by Antimicrobial Stewardship Group: August 2018
Review date: September 2020

Post-partum endometritis or retained products of conception

Infection	Post-partum endometritis or retained products of conception
Specimen	Blood culture Intra-uterine tissue or pus sample if obtained in theatre **If late onset (> 2 days – 6 weeks):** Endocervical swab for *Chlamydia* PCR
Likely Organisms	Polymicrobial: Anaerobes *Streptococcus* spp *G. vaginalis*
Treatment	If endometritis is suspected: • Co-amoxiclav 1.2 g IV at induction. If penicillin allergy is rash only: cefuroxime 1.5 g IV at induction **plus** metronidazole 500 mg IV by infusion at induction • If anaphylaxis to penicillin or history of MRSA in preceding 12 months **or** if patient is transferred from care home/other hospital with current MRSA status unknown: contact Consultant Microbiologist • If patient has delivered - 24 hours IV and then orally and if remains febrile after 24 hours discuss with Consultant Microbiologist If *Chlamydia* positive, treat appropriately and have neonate monitored for signs of infection in first month
Duration	7 – 14 days, depending on speed of recovery Convert IV to oral once apyrexial for 48 hr and stable

Produced in association with the Antimicrobial Policy Committee August 2011
Last updated by Antimicrobial Stewardship Group: August 2018
Review date: September 2020

Post-operative wound infection and cellulitis

Infection	**Post-operative wound infection and cellulitis**	
Not severe	- systemically well with temperature 36 - 38°C - cellulitis not also involving the face or hand - not previously treated with adequate oral antimicrobials for the same complaint	
Severe	If any of the following present: - lesion spreading rapidly - systemic features e.g. temperature > 38°C or < 36°C, hypotension, tachycardia - cellulitis also involving the face or hand - progression despite adequate doses of appropriate oral antimicrobials - significant co morbidities e.g. asplenia, neutropenia, cirrhosis, immunocompromised, cardiac or renal failure, or pre-existing oedema	
Specimen	Aspirate of pus or swab if aspirate not possible Blood culture if pyrexial	
Likely Organisms	*Staphylococcus* spp *Streptococcus* spp Mixed aerobic and anaerobic flora in wounds on perineum or surgery on female genital tract	
Treatment	**Antimicrobials only required if evidence of active infection e.g.** - **pyrexia** - **enlarging ulcer** - **increasing pain** - **cellulitis**	
Severity	**First line**	**Alternative (penicillin allergy)**
Not severe and - **superficial infection** - **no cellulitis** - **apyrexial** - **normal WCC**	No antimicrobials, good wound care is paramount	
Not severe and antimicrobial treatment is indicated (see above)	Co-amoxiclav 625 mg orally 8 hrly	Clarithromycin 500 mg orally 12 hrly
Severe	Co-amoxiclav 1.2 g IV 8 hrly **If fails to respond:** **Add** gentamicin IV* **multiple daily dosing regimen if pregnant** (use ideal body weight NOT actual pregnancy weight), **intermittent dosing regimen post-partum** (see Gentamicin Treatment Guideline for dosing and monitoring)	Clindamycin 600 mg IV by infusion 8 hrly **plus** gentamicin IV* **multiple daily dosing regimen if pregnant** (use ideal body weight NOT actual pregnancy weight), **intermittent dosing regimen post-partum** (see Gentamicin Treatment Guideline for dosing and monitoring)
Duration	***Do not continue empirical gentamicin for more than 24 hr unless advised by Consultant Microbiologist** Convert IV to oral once apyrexial for 48 hr, stable and normal WCC Not severe: 5 days total Severe: 10 days total (including IV treatment)	

Produced in association with the Antimicrobial Policy Committee August 2011
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Mastitis

Infection	**Mastitis**	
Specimen	Aspirated pus, or swab if aspirated pus not available	
Likely Organisms	*Staphylococcus aureus*	
Treatment[1]	**No antimicrobials, unless any of the following present:** - **red cellulitic lumpy area of breast (usually wedge shaped)** - **pyrexia** - **raised WCC**	
	First line	**Alternative (penicillin allergy)**
	Flucloxacillin 1g orally 6 hrly: if significant improvement after 48 hrs reduce to 500mg orally 6hrly	Clarithromycin 500 mg orally 12 hrly
Tagged for MRSA[1]	Contact Consultant Microbiologist/ID	
Duration	5 days	

1. Check iPortal for IC alert under patient alerts. If iPortal is not available, then check the previous 12 months of Microbiology reports: if MRSA present then treat as tagged for MRSA; if CARB present then discuss with microbiologist for empirical treatment

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Review date: September 2020

Lower Urinary tract infection (Obstetrics)

Infection	**Urinary tract infection**
Specimen	Midstream specimen of urine
Likely Organisms	*Escherichia coli* *Proteus* spp *Klebsiella* spp *Enterobacter* spp
Treatment	Microbiologist should be consulted after discussion with Obstetric Consultant in the following circumstances: • failure of antimicrobial treatment • in case of cephalosporin allergy • multiresistant organism cultured **Women with asymptomatic bacteriuria confirmed by a second urine culture should be treated and have repeat urine culture at each antenatal visit until delivery. Check culture results for multi-resistant organisms**
	First line and alternatives
	Nitrofurantoin 100 mg MR capsule 12 hrly or 50mg capsule 6 hrly orally for 7 days (<36 weeks gestation) **or** trimethoprim 200 mg orally 12 hrly for 7 days (give folate if <12 weeks gestation, avoid if low folate status or on folate antagonist) Cefalexin 500 mg orally 8 hrly for 7days or according to sensitivities if available Amoxicillin (only if culture results available and susceptible) 500 mg orally 8 hrly for 7 days
	Symptomatic bacteriuria: same as above for 7 days **Given the risks of symptomatic bacteriuria in pregnancy, a urine culture should be performed 7 days after completion of antimicrobials as a test of cure** **Lower UTI:** Give a 7 day course of oral antimicrobials and change to appropriate antimicrobials once sensitivity result becomes available
	Prophylactic antimicrobial is indicated for the remainder of pregnancy and up to 6 weeks postpartum for women who had pyelonephritis or ≥3 episodes of CONFIRMED asymptomatic bacteriuria or UTI with evidence of renal scarring Prophylaxis: Trimethoprim 100-150 mg at night (>12 weeks gestation) **or** nitrofurantoin 50 mg at night (<36 weeks gestation) **or** cephalexin 250-500 mg at night Empirical antimicrobials to be used as first line are cefalexin 500 mg orally 8 hrly or co-amoxiclav 375 to 625 mg 8 hrly. Second line antimicrobials are trimethoprim 200 mg 12 hrly (>12 weeks gestation), nitrofurantoin 50-100mg 6 hrly (<36 weeks gestation) Change to appropriate antimicrobials once sensitivity result becomes available
	Pyelonephritis: Start IV cefuroxime 0.75-1.5 g or co-amoxiclav 1.2 g every 8 hrly. For patients who are allergic to these antimicrobial IV Aztreonam is the alternative. Change to appropriate antimicrobial when the sensitivity results are available. Continue IV antimicrobials for 24 hours after the patient is afebrile. Oral antimicrobials should then be continued, Total duration of antimicrobials is 7-10 days (this includes IV and oral). Consider prophylactic antimicrobials for the remainder of pregnancy

Produced in association with the Antimicrobial Policy Committee August 2011
Last updated by Antimicrobial Stewardship Group: 2018
Review date: 2020

Septic pelvic thrombophlebitis

Infection	**Septic pelvic thrombophlebitis**	
Specimen	Blood cultures	
Likely Organisms	Mostly unknown	
Treatment	**First line**	**Alternative (penicillin allergy)**
	Co-amoxiclav 1.2 g IV 8 hrly **plus** gentamicin IV* **multiple daily dosing regimen if pregnant** (use ideal body weight NOT actual pregnancy weight), **intermittent dosing regimen post-partum** (see Gentamicin Treatment Guideline for dosing and monitoring)	Clindamycin 900 mg IV by infusion 8 hrly **plus** gentamicin IV* **multiple daily dosing regimen if pregnant** (use ideal body weight NOT actual pregnancy weight), **intermittent dosing regimen post-partum** (see Gentamicin Treatment Guideline for dosing and monitoring)
Duration	***Do not continue empirical gentamicin for more than 24 hr unless advised by Consultant Microbiologist** 7 days Convert IV to oral once apyrexial for 24 hr, WCC is normal and patient responding Consider drug fever and stop antimicrobials if temperature persists in a patient who looks well and has a normal pelvic examination and WCC	

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