CASE STUDY 11
Sepsis
Maureen D. Raynor

Pre-requisites for the chapter: the reader should have an understanding of:

- Immunology/the inflammatory response including the body’s natural defence against infection.
- Normal haematological indices including the rationale for the routine blood investigations performed during pregnancy.
- The physiological changes in the major bodily systems during pregnancy and maternal physiological adaptation.
- Resuscitation – basic/advanced life support of adult and neonate.
- The differences between crystalloids and colloids as intravenous fluids.
- The MEOWS assessment chart.
- Value of SBAR as a communication tool in the interprofessional team.
- The public health role of the midwife in health education/promotion, especially the prevention of infection.

Pre-reading self-assessment
1. Define cardiac output and stroke volume.
2. What is meant by shock?
3. List the different types/causes of shock and compare and contrast their clinical features and management.
4. What is the inflammatory response?
5. Identify the different types of white blood cells (WBCs) and discuss their role in fighting infection.
6. Refer to the recognized international definition and classification relating to maternal deaths and define direct, indirect, coincidental and late death.

Recommended prior reading

(Continued overleaf)
CASE STUDY

Fiona is a 27-year-old primigravida and nursery school teacher. At 34 weeks gestation she contacted her community midwife complaining of a sore throat, feeling shivery and achy akin to ‘flu-like’ symptoms. She also reported nausea, vomiting, abdominal pain and generally feeling unwell. The midwife suspected sepsis on account of the symptoms Fiona described, and contacted the hospital. She arranged for Fiona to be transported via ambulance to be assessed and reviewed at the local consultant-led maternity unit. Fiona’s vital signs assessed by the midwife and paramedics prior to her admission to hospital were: pulse 90 bpm, BP 100/60, RR 16 breaths per min., T 35ºC; no urine specimen was obtained for urinalysis as she was unable to void.

Having been alerted in advance of Fiona’s admission (by the labour suite coordinating midwife) about the community midwife’s suspicion of sepsis, an experienced midwife, senior obstetrician and an anaesthetist were on stand-by. The neonatal team, theatre team and haematology department were also notified of Fiona’s imminent arrival.

Prior to arrival at hospital, Fiona’s condition quickly deteriorated as reflected by her vital signs recorded by the paramedics en route to hospital: BP 70/40 mmHg, pulse 116 bpm, RR 22 breaths per min., T 36.4ºC; no urine specimen was obtained for urinalysis as she was unable to void.

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Prior to arrival at hospital, Fiona’s condition quickly deteriorated as reflected by her vital signs recorded by the paramedics en route to hospital: BP 70/40 mmHg, pulse 116 bpm, RR 22 breaths per min., T 36.4ºC. Fearing haemodynamic instability, the paramedics commenced O₂ therapy, sited a peripheral IV cannula and commenced an infusion of crystalloids.

On arrival at hospital, a second IV cannula was sited; blood cultures and other swabs were taken for microbiology investigations. After excluding any known allergies from Fiona’s history, she received a stat dose of a broad spectrum IV antibiotic. A diagnosis of severe sepsis was later confirmed via laboratory investigations.

What is the meaning of sepsis, severe sepsis and septic shock?

Although imprecise, a universal definition of sepsis, severe sepsis and septic shock was established in 1991 and subsequently revised, having achieved international attention as a direct result of the evidence-based practice guidelines of the Surviving Sepsis Campaign (SSC: available at http://www.survivingsepsis.org) and discussed by Levy et al. (2010). Having an understanding of the classification of sepsis helps in the comprehension of its underlying pathophysiology, determining the severity of the condition and mobilizing standardized evidence-based treatment (Daniels and Nutbeam 2010). It is important to note, however, that due to ongoing research into sepsis, an international definition of the term continues to develop, just like the illness, which is best construed as a dynamic process representing a broad spectrum of an illness along a defined continuum.
Sepsis

Sepsis is a cunning, insidious and non-specific illness, best defined, according to Daniels and Nutbeam (2010), as a systemic inflammatory response syndrome (SIRS) precipitated by the presence of a new infection or if two or more clinical features of SIRS criteria exist. This definition is supported by Clutton-Brock (2011) who, writing on behalf of CMACE, states that sepsis simply means the presence of SIRS alongside an identifiable pathogenic microbial organism. The term is also used to describe an individual with or without organ dysfunction who presents with signs and symptoms suggestive of bacteraemia. Despite intensive efforts at prevention, early recognition and management, this rare, severe and complex clinical syndrome remains a challenge. Sepsis is still a life-threatening critical illness resulting in many fatalities within both maternity and critical care departments globally (Remick 2007; Clutton-Brock 2011).

Severe sepsis

This phase is a continuum of sepsis and the term used when there is major organ dysfunction (Galvagno 2003). There may be dysfunction of one organ or multiple organ dysfunction syndrome (MODS). This clinical state may be precipitated by several causes, namely:

- Tissue hypoperfusion or hypotension leading to serious consequences such as renal dysfunction (oliguria/anuria), metabolic acidosis and noticeable encephalopathy such as the acute alteration in mental state.
- Adult respiratory distress syndrome (ARDS) resulting in respiratory insufficiency and poor tissue oxygenation leading to hypoxia, ischaemia and metabolic acidosis.
- DIC as outlined previously in Case 5.

Septic shock

This is the most severe stage in the sepsis cascade; it arises from marked arterial hypotension that fails to respond to fluid resuscitation, necessitating the use of vasopressors. There is usually underlying organ dysfunction and clinical features of hypoperfusion and hypotension, as outlined in the definition for severe sepsis detailed by Galvagno (2003) who provides a simplified definition of the sepsis cascade (Figure 11.1).

To aid in the recognition of sepsis, Garrod et al. (2011) devised the following mnemonic:

\[ SIRS = 3 \text{Ts white with sugar} \]
- Temperature ( > 38 or < 36°C)
- Tachycardia ( > 90 bpm)
- Tachypnoea ( > 20 breaths per min.)
- White blood cell count ( < 4 \times 10^9 \text{cells/L or > 12} \times 10^9 \text{cells/L})
- Sugar – blood glucose ( > 7.7 mmol in the absence of diabetes mellitus)

Although sepsis is considered to represent three distinct stages as outlined above, the literature presents a conflicting view at times such as Nelson et al. (2009) who identify four main
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stages of sepsis (Table 11.1). However, in the UK, reflective of NICE (2007) guidelines on the care of the acutely ill patient, derangements in the physiology of Fiona should be given initial consideration in both community and hospital settings.

Check point
Sepsis is cunning and moves fast. Beware of sepsis – be aware of sepsis (Harper 2011).

Table 11.1 The four main stages of sepsis

<table>
<thead>
<tr>
<th>Stage</th>
<th>Indications</th>
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<tbody>
<tr>
<td>Stage 1 – SIRS</td>
<td>As the name suggests this is a systemic inflammation resulting from any major insult to the body, e.g. trauma caused from surgery such as LSCS or perineal wound, in which two or more of the vital signs outlined by Garrod et al. (2011) are present + elevated WBC count leading to leukocytosis, leucopenia and raised plasma C-reactive protein &gt; 2 SD above normal values. Clutton-Brock (2011) states that SIRS is confirmed if the WBC is &lt; 4 × 10⁹ cells/L or &gt; 12 × 10⁹ cells/L in non-pregnant women. Early recognition and rapid response to the treatment of sepsis at this initial stage will prevent severe sepsis/septic shock developing. CMACE (2010) highlights the importance of midwives and doctors providing women with health education information about the potential risk of sepsis and its prevention, especially if exposed to young children, family members or general members of the public suffering from sore throat/upper respiratory tract infection. Community-acquired beta-haemolytic Streptococcus and infections from group A Streptococcus pyogenes were found to play a significant part in the increased number of maternal deaths in the 2006–2008 confidential enquiries into maternal deaths triennial report (Harper 2011).</td>
</tr>
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</table>
Stage 2 – Sepsis

Sepsis is identified by the presence of two signs and symptoms outlined above in stage 1, along with suspected or diagnosed infection. The exact aetiology of the infection is not always identified. Thus in order to stave off MODS, there should be no delay in treatment once SIRS is suspected.

Midwives, whether working in the community or hospital setting, should not delay in liaising and referring the woman to the obstetric team at the local maternity consultant-led unit. Early hospitalization means appropriate broad spectrum antibiotic therapy can then be implemented while awaiting result of blood cultures. Proper measures will then be taken to closely monitor vital signs in order to detect signs of organ dysfunction or failure. Any delay in treatment will slow the treatment of sepsis. Harper (2011) states that initial blood culture might be negative, placing emphasis on the need to repeat these blood tests.

Stage 3 – Severe Sepsis

Severe sepsis occurs when a woman who meets the sepsis criteria detailed above develops features suggestive of organ dysfunction e.g. brain, heart, liver, lung, and kidneys.

This stage is confirmed if the woman develops one of the clinical features of organ dysfunction.

It is best to consider the effects of severe sepsis in a systematic way as outlined below:

• Insult to the brain will manifest as neurological changes affecting the woman’s mental state and level of consciousness. Cerebral alterations in the form of ischaemia, micro-abscesses, micro-thrombi or haemorrhage may lead to some signs of encephalopathy/alteration in mental state e.g. agitation, confusion, restlessness and possibly coma. Assessment of mental status to determine degree of arousal and responsiveness can be assessed using the AVPU method of assessment (see Cases 2 and 10).

• The pathophysiological changes in the CVS may result in a drop in systolic BP (< 90 mmHg), MAP < 65 mmHg, a fall in baseline BP > 30–40 mmHg. Mitchell and Whitehouse (2010) state that CVS changes are most critical. These combined with anuria and acute renal failure, are not uncommon and very testing indeed. However, haemodynamic stability can be achieved if the woman recovers and organ function returns to normal.

• Haematological alterations: reduced platelet count by up to 50% in a matter of days, acutely abnormal prothrombin time or PTT in the absence of any thromboprophylaxis. This may trigger the onset of DIC (Case 5).

• Hepatic/liver changes (hyperbilirubinaemia) – the pathophysiology of severe sepsis may signal an abnormal alteration in serum bilirubin levels > 4 mg/dL or 70 mmol/L and alkaline phosphatase level > 250 units per litre.

• Respiratory changes: Respiratory rate > 24 breaths per minute.

(Continued overleaf)
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Table 11.1  Continued

<table>
<thead>
<tr>
<th>Stage</th>
<th>Indications</th>
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|       | • Renal disruptions: oliguria/anuria, risk of fluid overload and electrolyte imbalance may occur + ↑ creatinine level of 0.5 mg/dL.  
|       | • Metabolic acidosis with serum lactate levels > 4 mmol/L as identified by the SSC/sepsis bundles (Dellinger et al. 2008). |

Once severe sepsis is recognized aggressive treatment in a high dependency/critical care area where there is highly trained and skilled staff in the management of life-threatening illnesses is crucial for the woman’s survival. Aided by CVP line, the modified MEOWS and SBAR tool, systems for assessing levels of consciousness such as the AVPU, and ABCDE assessment tools outlined in previous cases should be employed to assess, monitor, evaluate, record and communicate findings relating to vital signs within the interprofessional team. The woman will need oxygen therapy if her oxygen saturation levels fall + catheterization with hourly urine measurements calculated at 0.5 mL/kg/hour documented on the fluid balance/MEOWS chart. The anaesthetic team will guide much of the resuscitative and maintenance interventions implemented. This structured approach is crucial to the woman’s survival.

Stage 4 – Septic shock

Of all the four stages of sepsis, septic shock is the most critical, having the highest mortality rate. It is defined as severe sepsis with marked hypotension with systolic BP < 90 mmHg + the individual’s condition fails to respond to fluid resuscitation, indicative of marked organ dysfunction/failure.

This stage is extremely challenging to manage and the chance of survival is very slim. The aim of treatment should be prevention. Women who develop septic shock will need assisted ventilation and care in an intensive care unit informed by local and national guidelines such as sepsis resuscitation and management bundles (Dellinger et al. 2008).

How would you account for the epidemiology of sepsis?

Despite improvements in maternity care resulting in a significant decline in maternal morbidity and mortality over the course of several decades (Lewis and Drife 2004; Lewis 2007; CMACE 2011), sepsis remains a real threat in the childbearing context. As outlined by Fiona’s case, sepsis represents a wide spectrum of severity amounting to an urgent critical illness and challenging maternity emergency. Maternal physiological adaptation to pregnancy may mask the early onset of the illness until it reaches a critical stage where management becomes futile (Harper 2011). Not surprisingly, the increased mortality rate linked to sepsis makes it the leading cause of direct maternal deaths in the UK (CMACE 2011), at the time of writing. Although recent evidence signifies an increase in the incidence of sepsis as depicted by the trends in the 2006–2008 triennial report on maternal mortality in the UK (CMACE 2011), it is still an uncommon encounter in contemporary practice. Nonetheless, sepsis, when it does occur is a force to be reckoned with. It is associated with increased morbidity and costs (Linde-Zwirble and Angus 2004); the highest price paid may ultimately result in maternal demise. More generally, but equally troubling, is the estimation by Daniels et al. (2010) in their observational cohort study, that the escalating scale of sepsis in the UK in the wider population is likely to result in approximately 37,000 deaths annually.
What are the early warning signs of sepsis?

The early warning signs of sepsis that should trigger a rapid response are previously discussed in Table 11.1 but are summarized again in Box 11.1 to ensure vigilance in identification when assessing, monitoring, reporting and recording vital signs. Fiona presents with a number of worrying signs and symptoms that were not ignored.

**Box 11.1 Early warning signs of sepsis**

*Extremes of body temperature* i.e. hypothermia < 36°C or hyperthermia > 38.3°C accompanied by chills/rigours. There may also be noticeable skin changes such as development of a rash or skin feeling unusually warm/cold and clammy to touch.

*Disruption to the CVS* leading to tachycardia, hypotension and altered tissue perfusion.

*Altered respiration* as the woman has difficulty breathing with onset of shallow breaths or hyperventilation. Tachypnoea may manifest as a compensatory mechanism.

*Neurological changes* affecting the brain leading to lethargy, fatigue, general malaise/weakness at best, and to confusion and subsequently coma at worst, especially if sepsis is not recognized and treated early.

(International Sepsis Forum 2003; Sepsis Alliance 2010; Clutton-Brock 2011; Harper 2011)

What are the common sources of sepsis during pregnancy?

These are listed in Box 11.2; it is important to remember that any risk factor for infection will escalate the dangers for a pregnant woman such as Fiona, who is already immunocompromised as a result of her pregnant state. The midwife should be conversant with factors that impact on cellular and humoral immunity such as comorbidities or underlying medical disorders, e.g. diabetes mellitus, human immunodeficiency virus, renal disease and surgical wounds, as well as women receiving therapeutic interventions (e.g. corticosteroid therapy). Iatrogenic factors that are associated with nosocomial infection should also be considered, e.g. CVP lines, endotracheal tubes and urinary catheters all disturb mucosal and cutaneous integrity.

**Box 11.2 Common sources of sepsis during pregnancy**

Pyelonephritis
Chorioamnionitis
Upper respiratory tract infections
Septic abortion
Renal calculi
Pancreatitis
Cholecystitis
Postpartum infections associated with surgical operations, i.e. caesarean section or episiotomy wound/incision and complex perineal trauma such as 3rd or 4th degree tear.

(Sheffield 2004; Guinn et al. 2007)
What are the causative organisms commonly associated with sepsis?

Infection may be associated with Gram-positive or Gram-negative bacteria, fungi or viruses (Box 11.3). Gram-positive bacteria such as *Streptococcus pneumoniae*, Group A *Streptococcus* (GAS) and *Staphylococcus aureus* are more commonly associated with sepsis than Gram-negative microbes such as *E. coli* and *Klebsiella*. A community-acquired infection such as GAS is particularly pervasive (CMACE 2010).

**Box 11.3 Causative organisms associated with sepsis**

- Beta-haemolytic streptococcus/group A *Streptococcus pyogenes* (GAS)
- *Haemophilus influenzae*
- *Staphylococcus aureus*
- Methicillin-resistant *Staphylococcus aureus* (MRSA)
- *Streptococcus pneumoniae*
- *Morganella morganii*
- *Escherichia coli* (*E. coli*)
- *Pseudomonas aeruginosa*
- *Klebsiella*
- *Clostridium sordelli*
- *Clostridium difficile*
- *Clostridium septicum*

(Harrison et al. 2006)

It is important to note that GAS, a community-acquired infection, has played a significant part in the rise in maternal mortality associated with sepsis. This organism is a particular threat during the winter months and is a common cause of sore throat in young children. The spread of the organism is by direct contact or droplet transmission and approximately 5–30 per cent of the general population are carriers, with GAS being transported on the skin or throat (Harper 2011).

A differential diagnosis should be considered in all critical illness. There may be several explanations for Fiona’s illness; what are they?

Although severe sepsis is confirmed in Fiona’s case, her initial signs and symptoms are relatively non-specific. Though tachycardic and tachypnoeic, she is neither hypothermic nor pyrexial. Therefore, her clinical features could be due to a host of causes. ‘Flu-like’ symptoms are an indication of infection, whether bacterial or viral in nature or related to another inflammatory process. Nausea and vomiting with abdominal pain could be related to a problem with the GI tract or renal system. For these reasons it is important to rule out other causes (Box 11.4).
Underlying co-morbidities will have a profound effect on sepsis, not least because pre-existing medical disorders might be further impacted by the onset of a SIRS process. Such individuals, according to Blomqvist (2011), are associated with a higher mortality rate.

Fiona works as a nursery school teacher. Being pregnant means that she would be susceptible to contracting any upper respiratory tract infections passed on by the young children in her care, making her vulnerable to acquiring sepsis. Laboratory and bedside investigations will assist with confirming the diagnosis.

Box 11.4 Differential diagnosis

- Influenza
- Pneumonia
- Acute pancreatitis
- Acute gastroenteritis
- Pyelonephritis or other acute urinary tract infection
- Acute appendicitis
- Acute cholecystitis.

What is the pathophysiology of sepsis?

The pathophysiology of sepsis is complex, conflicting and poorly understood. Some of the changes that disrupt normal physiology are previously discussed in Table 11.1. Popular theories partly explain the course of the illness but are still interpreted as ill-defined and inconsistent in relation to the part played by each individual factor in the sepsis cascade. Consequently, it is suggested that multiple derangements exist in sepsis involving a variety of bodily organs (Daniels 2009; Mitchell and Whitehouse 2010).

The response an individual makes to the onset of sepsis is partly genetic and largely biphasic in nature (Saade 2004; Blomqvist 2011). The marked SIRS overwhelms the immune system causing the release of proteins likened to ‘a cytokine storm’ (Clutton-Brock 2011: 174). Ultimately this may lead to a destructive cascade, including MODS or organ failure plus untimely death. Hence the need for prompt recognition, timely referral coupled with early and efficacious management (Saade 2004; Remick 2007; Dellinger et al. 2008).

The stages of sepsis, as detailed in Table 11.1, are best presented as a continuum; to do otherwise, Daniels (2009) and Daniels and Nutbeam (2010) suggest, is tantamount to being over-simplistic. The flow diagram outlined in Figure 11.2 provides a basic overview of sepsis.

Sepsis is an enigma. Inflammation is the body’s normal default response to infection. Well adults are usually equipped with an arsenal of defence to ward off threats against invading microorganisms. With sepsis, this early physiological response to infection is lost, culminating in a systemic and inappropriate inflammatory reaction which is both of overwhelming proportions and detrimental to the individual’s immune system (Hotchkiss and Karl 2003; Russell 2006; Daniels 2009).

The resulting SIRS leads to neutrophils, monocytes, macrophages and platelets binding to endothelial cells. Endothelial cells are chiefly responsible for selective permeability to
ensure vaso-regulation and act as an anticoagulant interface. Marked phagocytosis occurs, and the combination with leucocytes leads to further release of cytokines and increased vasoconstriction or vasodilatation (Saade 2004).

The pathogenesis of sepsis results in marked capillary permeability or ‘leaky’ vessels (due to the endothelial damage) and an activated coagulation cascade. These changes lead to mitochondrial disruption in the cells, cell damage and development of micro-thrombi. Cytokines also aid in the stimulation of the liver plus an increase in the production of C-reactive protein (Clutton-Brock 2011).

In summary, sepsis results in altered cardiovascular function due to the development of ‘leaky’ capillaries leading to reduced blood flow. The presence of any bacterial infection in the blood is known as bacteraemia, becoming septicaemia when the presence of the bacteria in the bloodstream actively multiplies at an alarming rate, escalating to a state that totally debilitates the individual resulting in septic shock (Daniels 2009; Nelson et al. 2009).

What are the main principles of care in the management of sepsis?

Expeditious management of Fiona should be premised on the key resuscitation and management sepsis care bundles as outlined by the Sepsis Alliance (2010), Levy et al. (2010) and Dellinger et al. (2008). Implementation of the Surviving Sepsis Campaign (SSC) recommendations allows the interprofessional team involved in the management of sepsis to

Figure 11.2 Overview of sepsis syndrome
standardize their approach to care, following the sequence, timing and goals spelt out by each care bundle. In the first six hours, energy should be focused on goal-directed therapy, where a variety of approaches to management will be necessary to meet Fiona’s needs as ‘one size does not fit all’ (Figure 11.3). Implementation of early goal-directed therapy is associated with a reduction in MODS and mortality (Russell 2006; Guinn et al. 2007; Townsend et al. 2008; Trzeciak et al. 2008). The Sepsis Alliance (2010) define a ‘bundle’ as a group of simple, realistic, pragmatic and uniformed approaches to the treatment/management of a given disease. The individual element of each bundle is founded on the best evidence-based practices available. Thus the SSC care bundles are the epitome of the evidence-based principles or recommendations that can be universally instituted and, when implemented together, may result in maximum outcomes better than if implemented individually (Daniels et al. 2010). Individual hospitals can customize the recommendations in the formulation of local clinical guidelines.

Figure 11.3 Main management goals of sepsis

Interprofessional team approach to the management of sepsis/septic shock

Systematic approach to care as outlined in the SSC care bundles

Early recognition and referral + implementation of an aggressive approach to IV antibiotic therapy

Early isolation/identification of the source of the sepsis

Haemodynamic stabilization/resuscitation thromboprophylaxis if in the absence of DIC/coagulopathy

Pharmacological management including fluid therapy (crystalloids and colloids), aided by CVP monitoring, vasopressors/corticosteroids if severely haemodynamically compromised

Blood cultures, urine sample and other swabs

Tight glycaemic control (bedside + laboratory test)

Drotrecogin alpha systematic approach such as that premised on the SSC care bundles if woman is gravely ill

Ensuring women with respiratory compromise, i.e. ARDS receive appropriate ventilator management via the anaesthetic team
Early identification/assessment/referral

Early identification/assessment/referral are a crucial part of management in the critically ill to identify the problem. Early identification is paramount as it determines the need for referral, which then triggers speed, extent and urgency of treatment. The challenge, however, as highlighted in the 2006–2008 triennial report on maternal mortality in the UK (CMACE 2011) is that young, healthy pregnant women, such as Fiona, have considerable physiological reserves that may conceal the early warning signs of critical illness, not least sepsis. Assessment plays an important role in decision making as to which element of the sepsis bundles in conjunction with other appropriate interventions will be specifically mobilized to care for Fiona. Careful assessment, monitoring and evaluation of the efficacy of each intervention are necessary to determine the success at each stage.

As stated previously, the ABCDE and AVPU methods of assessment, documented in other cases of the book, are useful in assessing, monitoring, recording and reporting Fiona’s vital signs and neurological condition.

The sheer scale and gravity of sepsis must never be underestimated. Nelson et al. (2009) place emphasis on the onset and progression of this critical illness, stating that its subtleties and nuances may be underplayed at the health professional’s peril. The onset of sepsis may very well be subtle in its initial stages, but its escalation is known to be rapid and often deadly without due recognition, swift referral and prompt treatment. To highlight the enormity of the problem CMACE (2010: 1) issued an advance briefing to doctors and midwives in the UK with the following warning:

Sepsis in pregnancy is often insidious in onset but can progress very rapidly. In the postpartum period the risk of serious sepsis should not be overlooked, particularly in the earlier gestations. Early recognition, urgent transfer to hospital and prompt, aggressive treatment is necessary to save lives. Whilst presentation may be atypical, tachypnoea, neutropenia and hypothermia are ominous signs. Diarrhoea is a common symptom of pelvic sepsis and the combination of abdominal and absent fetal heart rate may signify sepsis rather than placental abruption.

Galvagno and Camann (2009) outline the challenge to early recognition of sepsis and management of the critically ill pregnant woman. This is partly because the physiological changes during pregnancy predispose the woman to a number of critical conditions such as VTE episodes, which may complicate the picture and make diagnosis difficult. This highlights the importance of skilful and intelligent management of all women who present with any deviation from normality during pregnancy, labour and the postpartum period.

In summary, the main aim of management is early goal-directed therapy, the majority of which can be achieved via high level care in the maternity unit to stabilize Fiona prior to expediting birth to continue maternal treatment and any subsequent transfer to critical care/ITU, should the need arise.

What is the midwife’s role in the management of sepsis?

The midwife has a significant role to play as a key member of the interprofessional team in the recognition, reporting and management of any critical illness arising in midwifery practice.
The chapter on sepsis by Harper (2011: 85) in the triennial report from CMACE on maternal deaths in the UK (CMACE 2011) emphasizes that midwives and doctors involved in maternity care have a duty to ‘be aware of sepsis – beware of sepsis’. This means the midwife must always have a high index of suspicion when caring for any woman such as Fiona, who presents with abdominal pain, sore throat, ‘flu-like’ symptoms, diarrhoea, vomiting or extremes of body temperature. The midwife also needs to be equipped with an arsenal of skills in her vigilance to recognize early signs of infection during pregnancy, labour or puerperium, e.g. mastitis, offensive vaginal discharge/liquor, lochia, or, at birth, an unexpectedly compromised baby.

The midwife should obtain a full and detailed history, document and refer deviations from normality to the obstetrician (NMC 2004), as well as take appropriate swabs for microbiology investigation from areas such as the genital tract, perineum, ear, throat and skin as per local guidelines. A urine sample should also be obtained and sent for laboratory analysis to isolate possible pathogens responsible for any underlying infection. This can be done at the time of insertion of the urinary catheter to obtain hourly urine measures.

Any pregnant woman postpartum with a LSCS or perineal wound, who cares for young children, is at risk of developing upper respiratory tract infections especially during the winter months, as previously mentioned, due to GAS infection (CMACE 2010). The midwife is best placed to provide health education information about the risk of such infections and the preventative measures to take to avoid cross-infection from hand to mouth. Verbal and written information to convey the message to women, partner and close family members on the dangers of GAS and other microbial infection during pregnancy and the speed by which they can become systemic should be provided (CMACE 2011).

Midwives should ensure care is woman-centred, individualized, dignified, kind, respectful and sensitive to the socio-cultural and psychological needs of both Fiona and her significant others, such as partner and family. Psychosocial support for the relatives to help ameliorate any ensuing stress/anxiety associated with the early goal-directed therapy of the resuscitation and management bundles of the SSC and the technological interventions should not be overlooked.

The signs and symptoms of sepsis are well worth highlighting antenatally in order that women can report early onset of any infection or seek advice, should they have any concerns. Women should be assessed for any signs of urinary tract infections (UTIs), pre-term pre-labour rupture of the membranes (PPROM), and infection of the upper respiratory tract or other sources. Midwives are in repeated contact with childbearing women during the antepartum, labour and postpartum periods and have ample opportunity to detect ensuing infection and initiate a rapid response via referral to the medical team.

The assessment, monitoring and recording of vital signs once sepsis is suspected are a core part of care. Any of the features outlined in Table 11.1 and Figure 11.1 must be reported and acted on promptly. Particular attention should be paid to:

- temperature
- pulse
- blood pressure
- respiration
- hourly urine measurements
- any change to mental/neurological status
- FHR pattern.
Record keeping

All serial values of blood tests/laboratory investigations must be charted in a systematic way. The importance of clear unambiguous documentation when assessing, recording and communicating findings relating to vital signs, cannot be over-emphasized. Instead of stating urine output is average or reduced, or blood sugar (BS) high or low, quantify the findings by specifying the amount of urine measured or the exact measurement of the BS. The MEOWS chart should be used to document all vital signs with no omissions. Any exclusion of important findings such as BP, temperature, RR, BS, oxygen saturation levels and urine measurements could be significant, signalling the difference between life and death (Nelson et al. 2009).

Check point

Know the various clinical features of sepsis as the condition does not always result in pyrexia. Women who develop severe sepsis could be hypothermic.

In this case, the onset of sepsis was detected speedily and the swift and intelligent response of the midwife in communicating her suspicions to other key members of the interprofessional team helped save Fiona’s life. This is not the case for all women as reported by CMACE (Harper 2011). Sepsis remains a rare occurrence in maternity care in developed countries. Due to its infrequency, it should feature prominently in maternity emergencies skills and drills training for all midwives, doctors and allied health professionals involved in maternity care.

Summary of key points

- Sepsis-related maternal mortality is rare, complex and a significant challenge in contemporary practice. For these reasons it is important to ‘be aware of sepsis – beware of sepsis’ (Harper 2011).
- Sepsis moves fast and is potentially fatal. Infection does not always result in pyrexia. Women who develop severe sepsis may have a lowered body temperature. Deviation in this vital sign should not be ignored. The mnemonic identified by Garrod et al. (2011) should act as a useful aide-mémoire.
- In order to save mothers’ lives, prompt recognition/diagnosis, coupled with rapid response and aggressive treatment, are the cornerstones of successful management to arrest the sepsis cascade and prevent rapid progression to septic shock.
- The care/management of pregnant women with septic shock is still evolving.
- Use of the SBAR tool and the MEOWS chart will facilitate timely communication with obstetricians, anaesthetists and other key members of the medical team.
- Hyper-vigilance by midwives in record keeping helps to prevent omissions in documentation of vital signs.
• The midwife has a duty of care to ensure the woman’s holistic needs are met. This includes psychosocial support for the woman’s partner/relatives to help ameliorate the stress/anxiety associated with medical management and the technological interventions.

• The midwife’s professional responsibilities include accurate record keeping and reporting of any deviation or subtle changes in vital signs.

• Good team working and collaboration within the interprofessional team will result in effective care, which will signal the difference between life and death.

REFERENCES


Trzeciak, S., McCoy, J.V., Dellinger, P., Arnold, R.C., Rizzuto, M., Abate, N.L., Shapiro, N.I., Parrillo, J.E., Hollenburg, S.M. on behalf of the Microcirculatory Alterations in Resuscitation and Shock (MARS) Investigators (2008) Early increases in microcirculatory perfusion...
protocol-directed resuscitation are associated with reduced multi-organ failure at 24 hours in

**ANNOTATED FURTHER READING**


A useful review of rhAPC or Drotrecogin alfa (activated) in the treatment of severe sepsis.


Raises some key points that are transferable to midwifery practice.

Dependency Care*. Chichester: Wiley-Blackwell.

Provides a useful overview of the context of high dependency care.

**USEFUL WEBSITES**

http://www.aagbi.org  The Association of Anaesthetists of Great Britain and Ireland

http://www.aboutsepsis.com  About Sepsis (this website is aimed at health care profession-
als, who need to register online in order to use the site)

http://www.advanceinsepsis.com  Advances in Sepsis

http://www.alert-course.com  ALERT system of assessment

http://www.esicm.org  European Society of Intensive Care Medicine

http://www.nice.org.uk  National Institute for Health and Clinical Excellence

http://www.npeu.ox.ac.uk  National Perinatal Epidemiology Unit (from 1 April 2011
NPEU takes over the role of the former CMACE)

http://www.rcog.org.uk  Royal College of Obstetricians and Gynaecologists

http://www.sccm.org  Society of Critical Care Medicine

http://www.sepsisalliance.org  Sepsis Alliance

http://www.sepsisforum.org  International Sepsis Forum

http://www.sisna.org  Surgical Infection Society

http://www.survivingsepsis.org  Surviving Sepsis Campaign (use this link to access the surviving
sepsis care bundles for resuscitation and management)