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# Acute care toolkit 15

## Managing acute medical problems in pregnancy Oct 2019

Over two-thirds of all maternal deaths in the UK are due to non-obstetric, medical problems in pregnancy and postpartum. This may be linked with increasing maternal age and obesity. This toolkit provides practical guidance on managing women with acute medical problems in pregnancy for hospital physicians and others who may be unfamiliar with the normal physiology of pregnancy and/or diseases that present in pregnancy.

### Who should read this toolkit?

**This toolkit is intended to be used widely, including by front-line NHS healthcare professionals and those involved in local and national planning and policy.**

## Summary of key recommendations/standards

- Named clinical lead from acute medicine to liaise with obstetrics
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- Contact details for emergency obstetrics on-call or midwife readily available to staff on the acute medical unit (AMU)
- All clinical staff receive ongoing education and training in the management of acute medical problems in pregnancy and the postpartum period (including use of MEOWS*)
- Escalation measures in place for the acute deterioration of a pregnant woman
- Local inpatient shared care pathways/services in place for pregnant women presenting with acute medical problems, including where they should be cared for
- Local clinical guidelines available for staff looking after pregnant women presenting with acute medical problems
- Joint inpatient medical and obstetric care for women with complex medical problems (such as inflammatory bowel disease, connective tissue diseases, cardiac disease) and acute medical problems where a decision may need to be taken regarding timing of delivery

* MEOWS is a scoring system specifically for pregnant women, similar to the NEWS2 score. Please refer to your local maternity-specific MEOWS chart; there is no nationally standardised chart for maternity.

## Background

Pregnant women can present to any acute hospital service at any time during their pregnancy or the postpartum period, which is up to 12 months post-delivery. Women may present with acute medical problems that need to be managed differently because of pregnancy, or may present with obstetric syndromes. Women aged over 40 years, those of a black ethnic background and those who have had *in vitro* fertilisation (IVF) resulting in the current pregnancy have a higher risk of morbidity and mortality.

Deaths occurring between 42 days and 1 year after the end of pregnancy are called late maternal deaths. Most of the women who die up to a year after pregnancy have had longstanding and multiple health conditions and lead socially complex lives. MBRRACE (Mothers and Babies: Reducing Risk through Audits and Confidential Enquiries) undertakes a confidential enquiry into every maternal death in the UK and Ireland; the most common medical causes of maternal death are cardiac disease, venous thromboembolism (VTE), neurological and psychiatric disorders. Suicide is a significant cause of postpartum mortality.[1]

## Safe practice

- All clinicians looking after pregnant women should make an entry in the woman's handheld notes, which may also be digital and found on an app on the mobile phone.
- Early involvement of experienced decision makers should take place if red flags are present.
- Women of childbearing age seen by acute medical services should be given the opportunity to discuss any pre-existing medical condition and how it could affect or be affected by a pregnancy.

'Challenges arise in managing two lives – the mother and the baby – often leading to a state of clinical inertia.'

# Clinical management

**All women of childbearing potential presenting with acute medical conditions should have a pregnancy test.**

## Physiology of pregnancy

Observations and laboratory measures have different ranges in pregnancy. Physiological monitoring of women who are pregnant and require acute assessment should use the Modified Early Obstetric Warning Signs (MEOWS) scoring and not the National Early Warning Score (NEWS2), which has not been validated in pregnancy. There is no nationally standardised MEOWS chart; therefore, all women should have their observations recorded on the locally agreed MEOWS chart.

**Table 1. Physiological changes and normal findings in pregnancy**

| Indicator | What's normal in pregnancy? |
|---|---|
| Heart rate | An increase of 10–20 beats per minute, particularly in third trimester |
| Blood pressure | Can decrease by 10–15 mmHg by 20 weeks, but returns to pre-pregnancy levels by term |
| Respiratory rate (RR) | Unaltered in pregnancy<br>If RR >20 breaths per minute, consider a pathological cause |
| Oxygen saturation | Unchanged throughout pregnancy |
| Temperature | Unchanged throughout pregnancy |
| Full blood count | Ranges altered in pregnancy:<br>Hb (105–140 g/L)<br>WBC (6–16 x$10^9$/L) |
| Renal function | Increased glomerular filtration rate<br>Creatinine falls in first and second trimesters<br>Normal urea reference range 2.5–4.0 mmol/L<br>Normal creatinine <77 µmol/L |
| Liver tests | Raised alkaline phosphatase up to three- to fourfold of pre-pregnancy level is normal during pregnancy |
| Troponin | Not elevated during normal pregnancy<br>May be elevated in pre-eclampsia, pulmonary embolism, myocarditis, arrhythmias and sepsis |

**Table 1. Physiological changes and normal findings in pregnancy (continued)**

| Indicator | What's normal in pregnancy? |
|---|---|
| D-dimer | Not recommended for use in pregnancy |
| Creatinine kinase | Normal range 5–40 IU/L, ie lower in pregnancy |
| Cholesterol | Up to five times elevated in pregnancy (therefore should not be checked routinely) |
| Thyroid function tests (TFTs) | Use local gestation-specific ranges |
| ECG | Sinus tachycardia<br>15° left axis deviation due to diaphragmatic elevation<br>T wave changes – commonly T wave inversion in lead III and aVF<br>Non-specific ST changes eg depression, small Q waves |
| Holter monitor | Supraventricular and ventricular ectopics are more common |
| Chest X-ray (CXR) | Prominent vascular markings, raised diaphragm due to gravid uterus, flattened left hemidiaphragm |
| Peak expiratory flow rate (PEFR) | Unchanged in pregnancy |
| Arterial blood gas | Mild, fully compensated respiratory alkalosis is normal during pregnancy |

## Radiological investigations in pregnancy

- The first-line radiological investigation in women with breathlessness or chest pain is a CXR. Radiation from a CXR is equivalent to a week's exposure to background radiation in London and is therefore safe throughout pregnancy.
- Ultrasound, CT scans of head and chest, and MRI are safe throughout pregnancy. **Gadolinium contrast should be avoided**.
- For women with suspected pulmonary embolism and a normal CXR, a perfusion lung scan should be requested in preference to CT pulmonary angiography (CTPA), because the radiation dose to maternal lung and breast tissue is lower.

'Recurrent presentations or readmission during pregnancy are red flags and should be discussed with the obstetric and medical team.'

## Common medications used in acute medical conditions, and their use in pregnancy

- Antibiotics: avoid trimethoprim and tetracyclines, all others safe
- Antiemetics: all safe
- Analgesia: paracetamol safe, NSAIDs safe **except in third trimester**
- Codeine/opiates: safe but **risk of withdrawal in baby with breastfeeding**
- Antihypertensive agents: **avoid ACE inhibitors (ACEIs) and angiotensin receptor blockers throughout pregnancy**, enalapril has been shown to be safe postpartum if breastfeeding. Evidence is lacking for other ACEIs in breastfeeding
- Antiarrhythmic agents: adenosine, β-blockers, flecainide and verapamil are all safe
- Anticoagulants: twice-daily dosing of low-molecular-weight heparins for VTE treatment in pregnancy, once daily postpartum. Warfarin is teratogenic, and only used in exceptional circumstances under expert supervision. It is safe in breastfeeding
- Direct oral anticoagulants (DOACS): There is insufficient evidence to support the use of DOACS in pregnancy and in breastfeeding
- Antiepileptic agents: **sodium valproate contraindicated**. For status epilepticus, intravenous benzodiazepines or levetiracetam safe
- Bronchodilators: all safe
- Steroids: all safe*

* Risk of gestational diabetes mellitus and pregnancy-induced hypertension and infections. If >7.5 mg per day prednisolone equivalent >3 weeks needs intrapartum steroid cover

## Case study

A woman attended the emergency department in her third trimester with breathlessness. She had a respiratory rate of 40 breaths per minute. As investigations for suspected pulmonary embolism were negative, she was discharged home with a diagnosis of presumed pneumonia. Neither an obstetrician nor a physician was asked to review her. Two days later she re-presented, acutely unwell with suspected cholecystitis and was admitted to the intensive care unit. She was not seen by an obstetrician for a further 36 hours. Her metastatic liver disease was diagnosed on a preoperative ultrasound scan.

**Modified from MBRRACE-UK, Nov 2018.**[1]

'Make a positive diagnosis; don't simply exclude a diagnosis.'

## Case study

A woman in her third trimester presented with severe interscapular pain, causing her to sit upright in a chair, and require repeated analgesia. Serial troponins and a perfusion scan were normal and she was discharged home. Approximately 36 hours later she collapsed with severe chest and abdominal pain, and had a cardiac arrest. She underwent a perimortem section. Autopsy showed aortic dissection. For this woman, once pulmonary embolism had been excluded no other diagnoses were considered. An echocardiogram or CT aorta at the time of presentation may have prevented her death, and this opportunity was missed.

**Modified from MBRRACE-UK, Dec 2016.**[1]

# Common clinical presentations of medical problems in pregnancy

## Chest pain

**Any cause of chest pain can occur at any gestation. Management is as for non-pregnant patients.**

**Table 2. Differential diagnosis of chest pain during pregnancy and the postpartum period**

| | First trimester | Second trimester | Third trimester | Postpartum |
|---|---|---|---|---|
| Aortic dissection | Can occur | Can occur | More common | Can occur |
| Pulmonary embolism | More common throughout pregnancy and the postpartum period<br>Highest risk occurs immediately postpartum<br>Incidence: 0.1–0.67 per 1,000 pregnancies<br>Mortality: 1.13 per 100,000 pregnancies | | | |
| Gastro-oesophageal reflux disease | More common throughout pregnancy and the postpartum period | | | |
| Acute coronary syndrome (ACS) | Three- to fourfold-increased risk of myocardial infarction in pregnancy and the postpartum period | | | |
| Pneumomediastinum | More common if protracted vomiting | Can occur | Most frequent in second stage of labour | Can occur |
| Biliary disease | Can occur throughout pregnancy and postpartum | | | |

Adapted from the 2018 European Society of Cardiology (ESC) Guidelines.[2]

**Red flags in a pregnant patient presenting with chest pain:**

- Pain requiring opioids
- Pain radiating to arm, shoulder, back or jaw
- Sudden-onset, tearing or exertional chest pain
- Associated with haemoptysis, breathlessness, syncope or abnormal neurology
- Abnormal observations

## Palpitations

Palpitations are a common physiological symptom during pregnancy. Differential diagnoses of palpitations other than an arrhythmia in pregnancy include:

- Physiological
- Hypovolaemic states
- Anaemia
- Thyrotoxicosis
- Sepsis
- Phaeochromocytoma
- Pulmonary embolism

Supraventricular tachycardias are common. Management is the same as outside of pregnancy. Vagotonic manoeuvres, adenosine, calcium channel blockers and β-blockers are safe. Direct-current cardioversion can be performed with fetal monitoring and anaesthetic input.

### Red flags in a pregnant patient presenting with palpitations:

- Palpitations in a woman with a family history of sudden cardiac death
- Palpitations in a woman who has structural heart disease or previous cardiac surgery
- Palpitations with syncope
- Palpitations with chest pain
- Persistent, severe tachycardia

### Red flags in a pregnant patient presenting with breathlessness:

- Sudden-onset breathlessness
- Orthopnoea
- Breathlessness with chest pain or syncope
- Respiratory rate >20 breaths per minute
- Oxygen saturation <94 % or falls to <94 % on exertion
- Breathlessness with associated tachycardia

## Breathlessness

Physiological breathlessness is a common symptom in pregnancy affecting up to 75% of women. Its onset can be in early pregnancy and it is not always due to the bulky uterus. Women with physiological breathlessness of pregnancy often describe an 'air hunger', which is worse at rest or talking and relieved by mild exertion. Peripartum cardiomyopathy can occur in the third trimester or postpartum; pre-existing and undiagnosed heart disease may deteriorate from the second trimester onwards.

**Table 3. Differential diagnosis of breathlessness in pregnancy and the postpartum period**

| | First trimester | Second trimester | Third trimester | Postpartum |
|---|---|---|---|---|
| Physiological breathlessness of pregnancy | Can occur | Can occur | More common | n/a |
| Anaemia | Can occur | Can occur | More common | More common |
| Asthma | Can occur throughout pregnancy and in the postpartum period | | | |
| Pulmonary embolism | Can occur throughout pregnancy and is most common in the postpartum period | | | |
| Dilated cardiomyopathy (DCM) | Rarely presents | May decompensate | Could be decompensated pre-existing DCM or peripartum cardiomyopathy (PPCM) | Could be decompensated pre-existing DCM or PPCM |
| Pneumonia | Can occur throughout pregnancy and postpartum | | | |
| Pneumothorax | Can occur | Can occur | Can occur | Most common after vaginal delivery |
| Hyperventilation | Can occur throughout pregnancy and postpartum | | | |

## Headache

Headaches are common in pregnancy. The challenge lies in distinguishing between primary headaches and potentially life-threatening causes.

Primary headaches are more common in the first trimester. Other causes are more common in the third trimester and postpartum period.

**Table 4. Differential diagnosis of headache during pregnancy and the postpartum period**

| | First trimester | Second trimester | Third trimester | Postpartum |
|---|---|---|---|---|
| Migraine | More common | Can occur | Can occur | More common |
| Cluster headache | More common | Can occur | Can occur | Can occur |
| Meningitis | Can occur throughout pregnancy and the postpartum period | | | |
| Pre-eclampsia | Does not present in first trimester | Can occur but not common | Most common | Can occur |
| Post-dural puncture headache | | | | Can occur up to 5 days after a regional anaesthetic procedure (spinal/epidural) |

**Table 4. Differential diagnosis of headache during pregnancy and the postpartum period (continued)**

| | First trimester | Second trimester | Third trimester | Postpartum |
|---|---|---|---|---|
| Cerebral vein thrombosis | Can occur | Can occur | More common | Can occur |
| Posterior reversible encephalopathy syndrome (PRES) | Very rare | Uncommon | Occurs in the presence of pre-eclampsia | |
| Reversible cerebral vasoconstriction syndrome (RCVS) | | | | Occurs postpartum |
| Stroke | Can occur | Can occur | More common | More common |
| Idiopathic intracranial hypertension | Can occur | Can occur | Can occur | Less common |
| Subarachnoid haemorrhage | Can occur | Can occur | More common | More common |

Clinical pointers:

- Posterior reversible encephalopathy syndrome (PRES) can present with headache in the third trimester. PRES is associated with headaches, seizures and cortical blindness, caused by vasogenic brain oedema.
- Reversible cerebral vasoconstriction syndrome (RCVS) only occurs postpartum and is associated with severe hypertension and recurrent thunderclap headaches. The hallmark of RCVS is multifocal segmental cerebral artery vasoconstriction on cerebral angiography.
- Cerebral vein thrombosis can be associated with pregnancy, most commonly in the third trimester and postpartum.

Management of headache is as for non-pregnant patients. Clinical pointers:

- Migraine: NSAIDS are safe to take up to 32 weeks' gestation
- Meningitis/encephalitis: *Streptococcus pneumoniae* and *Listeria monocytogenes* are more common during pregnancy
- Pre-eclampsia: blood pressure >140/90 mmHg and urinary protein : creatinine ratio (PCR) >50: **refer to obstetric team**
- Posterior reversible encephalopathy syndrome (PRES): treat hypertension, give intravenous magnesium sulphate as per NICE pre-eclampsia guidelines[3]
- Reversible cerebral vasoconstriction syndrome (RCVS): self-limiting condition in pregnancy. Treat with nimodipine. Resolves within 1–3 months of onset
- Idiopathic intracranial hypertension: can worsen as weight increases. Acetazolamide is safe in pregnancy
- Stroke: no contraindication to thrombolysis, thrombectomy or stenting during pregnancy for ischaemic stroke

'Those with a history of mental health problems such as postpartum psychosis and bipolar affective disorder are more likely to develop new symptoms during pregnancy.'

**Red flags in the history and examination of a pregnant patient presenting with headaches:**

- Sudden-onset headache / thunderclap or worst headache ever
- Headache that takes longer than usual to resolve or persists for more than 48 hours
- Has associated symptoms – fever, seizures, focal neurology, photophobia, diplopia
- Excessive use of opioids

## Psychiatric disorders

Pregnancy is a happy and fulfilling time for most, but this isn't the case for everyone. Take the opportunity to enquire after a woman's mental wellbeing when she presents to acute medical services during pregnancy and the postpartum period.

Mental illness can affect anyone, but those with a history of mental health problems such as postpartum psychosis and bipolar affective disorder are more likely to develop new symptoms during pregnancy and the postpartum period, even if they have been well for a number of years. Anxiety and depression are also common. Specialist perinatal psychiatric services have expertise in this area for women who experience symptoms during this time.

**Red flags in a pregnant or postpartum patient presenting with psychiatric symptoms and signs:**

- Recent significant change in mental state or emergence of new symptoms
- New thoughts or acts of violent self-harm
- New and persistent expressions of incompetence as a mother or estrangement from the baby

## Abnormal liver function tests in pregnancy

Consider the patient's medical history, previous pregnancy history and gestation of pregnancy when interpreting abnormal liver function tests in pregnancy.

**Table 5. Pregnancy-related causes of abnormal liver function tests**

| | First trimester | Second trimester | Third trimester | Postpartum |
|---|---|---|---|---|
| Hyperemesis gravidarum | Most common | Unusual | Unusual | Does not present postpartum |
| Acute fatty liver of pregnancy | Does not occur | Occurs rarely | Most common | Occurs rarely |
| HELLP* syndrome | Does not occur | Occurs rarely | Most common | Can occur |
| Intrahepatic cholestasis of pregnancy | Does not occur | Occurs rarely | Most common | Does not occur |

* HELLP = haemolysis, elevated liver enzymes and low platelet count

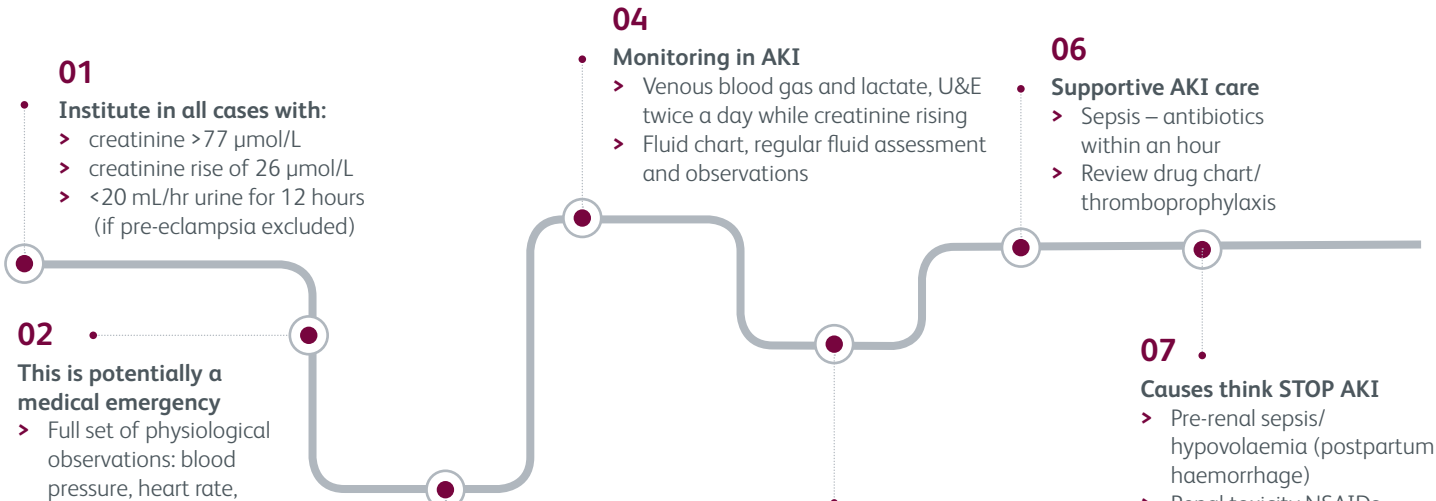
Clinical pointers:

- Hypertension and proteinuria: consider pre-eclampsia/HELLP
- Pruritus: consider intrahepatic cholestasis of pregnancy
- Nausea and vomiting in first trimester: consider hyperemesis gravidarum
- New medication: think of drug-induced liver injury
- Obstetric haemorrhage: think of ischaemic hepatitis

## Acute kidney injury (AKI)

International classifications of acute kidney injury (AKI) and eGFR are not validated in pregnancy. Diagnosis of AKI in pregnancy remains a challenge, due to limited evidence-based guidance. A creatinine >77 µmol/L should trigger investigations for AKI in pregnancy. However, most pregnant women do not have a pre-pregnancy or early pregnancy renal profile as a baseline; hence this may confound the diagnosis, as some may have pre-existing chronic kidney disease. AKI in pregnancy is more common in the third trimester and postpartum period.

**Figure 1. Obstetric AKI pathway. Adapted with permission from the London Acute Kidney Network.[4]**



**01**
**Institute in all cases with:**
- creatinine >77 µmol/L
- creatinine rise of 26 µmol/L
- <20 mL/hr urine for 12 hours (if pre-eclampsia excluded)

**02**
**This is potentially a medical emergency**
- Full set of physiological observations: blood pressure, heart rate, respiration rate, oxygen saturation, temperature
- Assess for signs of shock/hypoperfusion – low blood pressure, high heart rate, confusion, pale and cold skin
- Review history and past results if MEOWS triggering – high-flow oxygen, review senior / high-dependency unit / intensive care unit

**03**
**Fluid therapy in AKI**
- If hypovolaemic, give crystalloid 250 mL, followed by 125 mL/hr*. Reassess
- Catheterise if obstruction and measure hourly urine output

**04**
**Monitoring in AKI**
- Venous blood gas and lactate, U&E twice a day while creatinine rising
- Fluid chart, regular fluid assessment and observations

**05**
**Investigations in AKI**
- If proteinuria, URGENT spot PCR and/or urine microscopy (dysmorphic RBC, RBC cast)
- Ultrasound (obstruction)
- Liver profile – if low, platelets blood file (fragmented RBC/PLT), LDH, bilirubin, reticulocytes

**06**
**Supportive AKI care**
- Sepsis – antibiotics within an hour
- Review drug chart/ thromboprophylaxis

**07**
**Causes think STOP AKI**
- Pre-renal sepsis/ hypovolaemia (postpartum haemorrhage)
- Renal toxicity NSAIDs, pre-eclampsia, HELLP, HUS, TTP
- Post-renal obstruction or ureteric damage during delivery

*Caution with pre-eclampsia

**Further material available online**

Educational and quality improvement tools are available online at **www.rcplondon.ac.uk/act15**

## References


1 Mothers and babies: Reducing Risk through Audits and Confidential Enquiries across the UK (MBRRACE-UK). *Lessons learned to inform maternity care from the UK and Ireland Confidential Enquiries into Maternal Deaths and Morbidity 2014–16*. MBRRACE-UK, 2018. www.npeu.ox.ac.uk/mbrrace-uk/reports [Accessed 17 September 2019].

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## Acknowledgement


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## Further resources

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The acute care toolkit series can be accessed online at **www.rcplondon.ac.uk/act**


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