Vaginal discharge

May be physiological or due to atrophic vaginitis, infections including STIs, cervical and endometrial carcinoma, a variety of fistulae, and FBs.

Physiological

A creamy/white discharge is normal. Variation in its consistency and amount occurs with puberty, pregnancy, OCP use, ovulation, and immediately prior to menstruation.

Atrophic vaginitis

A profuse, sometimes bloody, yellow discharge may result from vaginal epithelial thinning due to ↓ oestrogen levels associated with the menopause. This responds well to local topical or oral oestrogens, most appropriately prescribed by the patient's GP.

'Thrush'

Candida albicans is a common vaginal infection. A white discharge accompanies a red, painful vulvovaginitis. It occurs in pregnancy, after or whilst taking a course of oral antibiotics, as well as with HIV and diabetes—check for glycosuria. Treatment options include clotrimazole pessaries, oral fluconazole, and topical application of live yoghurt. Advise for GP follow-up of any continuing symptoms or recurrent episodes.

Bacterial vaginosis

Caused by a variety of organisms, including *Gardnerella vaginalis*. Classically produces a yellow brown offensive ('fishy') discharge. Refer to the GP/GU clinic to consider oral metronidazole.

Other infections

Refer patients suspected of the following STIs to the GU clinic, and advise abstinence from sexual contact in the meantime:

- *Neisseria gonorrhoeae* may be asymptomatic and causes urethritis (dysuria), cervicitis (classically a green vaginal discharge), or pelvic inflammatory disease (PID—see ➲ Gynaecological pain, pp. 588–9).
- *Trichomonas vaginalis* infection results in a smelly, profuse yellow discharge and a 'cherry red' cervix.
- *Chlamydia trachomatis* causes chronic cervicitis, reactive arthritis, and PID. It may be asymptomatic. ~50% also have gonorrhoea.
- *Syphilis* causes painless genital ulceration ('chancre').

Cervical and endometrial carcinoma

Classically presenting with bleeding between periods, these may cause discharge (see ➲ Vaginal bleeding, pp. 590–1). Refer to a gynaecologist.

Fistulae

Colovaginal fistulae may follow diverticulitis or locally invasive colorectal carcinoma. Other fistulae (including vesicovaginal and ureterovaginal) may occur after pelvic surgery. Refer for admission and investigation, ideally to the team that performed the original surgery. Fistulae are sometimes the first presentation of a carcinoma.

Foreign bodies

Tampons, condoms, and various other items may be 'lost' or forgotten about in the vagina. Removal with forceps under direct vision should cure the offensive vaginal discharge. If a condom has been removed, ascertain whether or not post-coital contraception is required (see ➲ Contraceptive problems, pp. 584–5). Consider hepatitis B/HIV prophylaxis and GU referral for STI screen, depending upon the circumstances.

Vaginal tampons (particularly highly absorbent ones which have been left *in situ* for many hours) are associated with 'toxic shock syndrome' (see ➲ Toxic shock syndrome, p. 583). Discuss with a paediatrician/gynaecologist if any girl under 16y presents with a vaginal FB—GA may be required to remove it.

Occasionally patients with mental health problems present having deliberately inserted a FB into the vagina—take care if the FB is sharp-edged (eg broken glass). Take a psychiatric history and involve the psychiatry team.

Toxic shock syndrome

Tampons used during menstruation have been implicated in many cases of 'toxic shock syndrome'. First described in 1978, it is caused by exotoxin produced by *Staphylococcus aureus* (usually TSS toxin 1) or occasionally *Streptococcus*. Multi-organ failure may follow.

Features High fever, headache, vomiting, diarrhoea, myalgia, altered conscious level, hypotension, and a widespread erythematous macular rash (with subsequent desquamation 1 week later, especially of the palms and soles). There may also be abnormal vaginal bleeding or discharge.

Examination Look for clinical evidence of shock. Perform abdominal, bimanual, and speculum examinations—remove any tampon which remains in the vagina.

Diagnosis This is based upon clinical findings. Recent menstruation and the above features should prompt suspicion.

Investigations Includes vaginal examination. U&E, LFTs, clotting screen, FBC, blood lactate, blood cultures and vaginal swabs, ECG, and CXR.

Treatment Manage the patient in the resuscitation room. If due to a tampon, remove it. Follow guidelines for severe sepsis (see ➲ Sepsis, pp. 62–3 and ➲ Shock, pp. 64–5). Obtain venous access: give broad-spectrum IV antibiotics and start crystalloid. If hypotension is refractory, involve the ICU to consider measuring CVP, placing an arterial line, and starting inotropic support.

Contraceptive problems

Missed pill

Exact advice depends on the type of OCP the patient takes (combined, combined low-dose oestrogen, or progesterone-only). Refer to the NHS website (https://www.nhs.uk) which gives specific advice for each type of (missed) pill—consider printing this out and give it to the patient. The following is a summary.

Missed combined pill

- One missed pill: take it straightaway and continue taking the pack as usual. Emergency contraception is usually not required.
- Two or more missed pills: take one (missed) pill immediately and continue the pack as usual. Use additional contraception for 7 days. If there has been any unprotected sex in the past 7 days, then emergency contraception is likely to be required.

Progesterone-only pill

- If the pill is <3hr late (12hr if taking desogestrel), take it as soon as possible, then take the next one as normal. The patient is protected against pregnancy.
- If the pill is >3hr late (>12hr if taking desogestrel), take it as soon as possible, then take the next one as normal. The patient is not protected against pregnancy—advise her to use additional contraception for 2 days. Unprotected sex during this time may require emergency contraception.

If a woman vomits within 2hr of taking any OCP, advise her to take another pill as soon as she is able to.

If a woman has diarrhoea, the OCP will only be less effective if there is severe diarrhoea for >24hr.

Emergency contraception

Women may attend the ED requesting emergency contraception (sometimes known as 'post-coital contraception') after:

- Isolated unprotected sexual intercourse.
- Burst or lost condom.
- Missed OCP.
- Complete or partial expulsion of intrauterine contraceptive device (IUD).
- Rape.

In the UK, pharmacists can sell the progesterone-only emergency contraception without prescription. This may be the preferred option if the patient presents within 72hr of unprotected intercourse, but it can be given up to 120hr. The risk of pregnancy following unprotected intercourse is greatest during 5 days around ovulation but exists at other times also. Patients given post-coital contraception require assessment and treatment, including counselling and follow-up—usually this will be with the GP and/or family planning clinic. Options include levonorgestrel, ulipristal, and insertion of IUD (see Intrauterine contraceptive device, p. 585).

General advice for emergency oral contraception

- Exclude contraindications.
- Advise the patient to return if she vomits shortly after taking the medication—give a replacement dose if vomiting occurs within 2hr of taking it.
- Explain that there is a chance of failure.
- Arrange follow-up (usually with the GP) in 3 weeks to confirm that menstruation has occurred.
- Advise alternative contraception (eg condoms) in the meantime and discuss future contraception plans.
- Discuss (± signpost to) potential use of IUD.
- Document exactly what advice has been given.

Levonorgestrel (previously called 'the morning-after pill')

This is most effective if given within 72hr of intercourse (95% effective if taken <12hr, 58% effective at 72hr). After appropriate checks (as above), give levonorgestrel 1.5mg (Levonelle-2®).

Ulipristal acetate

This progesterone receptor modulator must be taken within 120hr of intercourse (95% effective if taken <12hr, ~95% effective at 120hr).

Note: hormonal emergency contraception is less effective if the patient is already taking enzyme-inducing drugs—take specialist advice. Options include an IUD or ↑ dose of levonorgestrel to 3mg (see *BNF*). After appropriate checks (as above), give ulipristal acetate 30mg (ellaOne®).

Intrauterine contraceptive device (IUD)

This is particularly useful for patients who wish to use IUD long-term and/or for those presenting between 3 and 5 days after unprotected intercourse. Failure is very rare. Insertion is uncomfortable and requires appropriate training—refer to the sexual health team or GP. Exercise caution when considering use of an IUD for a patient at high risk of STI or with symptoms.

Prescribing to patients on OCP

Both progestogen-only oral contraceptives and (combined) OCP may fail if enzyme-inducing drugs are prescribed. These include: rifampicin, rifabutin, carbamazepine, phenytoin, topiramate, griseofulvin, phenobarbital, and primidone. Patients need alternative or additional contraception if these drugs are started.

Antibiotics and the OCP

(Refer to *BNF*.) Latest guidance advises that the only antibiotics that are thought to interact with hormonal contraception are rifampicin-like antibiotics. Rifampicin and rifabutin are such potent enzyme-inducing drugs that contraceptive precautions need to continue for at least 4 weeks, even after a short course of rifabutin or rifampicin (eg as used for prophylaxis of meningococcal infection).

Genital injury, assault, and female genital mutilation

The history may be misleading. Combine a high index of suspicion with a full examination to exclude significant injury.

Blunt genital injury may result from falls astride. Most resultant vulval haematomas settle with rest and ice packs. Refer very large haematomas for evacuation in theatre.

Penetrating injury may follow assault, FB insertion, or migration/perforation of an IUD (particularly during insertion). Abdominal pain associated with a vaginal wound may be due to peritonitis. Obtain venous access, an erect chest X-ray (for free gas), an abdominal X-ray (for FB), and group and save; give antibiotics and refer. Refer other vaginal tears without peritonitis for exploration and repair.

Rape and sexual assault

Rape is defined in the UK as vaginal, anal, or oral penetration by the penis without consent. Rape and other sexual assaults are believed to be grossly under-reported. Those who do report it have special requirements. Privacy is essential—ideally, in a specially equipped room devoted to assessment of women who have been sexually assaulted. Ensure that a ♀ member of staff is present throughout. Document findings legibly and meticulously. Established protocols allow prompt and thorough investigation and treatment. Usually, ED staff provide emergency treatment and resuscitation, but most of the other aspects, including collection of forensic evidence, are managed by a forensic physician (police surgeon), ideally in a specialized Sexual Assault Referral Centre. Sometimes, women initially decline police involvement—full assessment and documentation may prove useful if there is a change of mind.

History

Establish the type, date, time, and place of the assault. Ask what occurred (vaginal/anal penetration, oral sexual activity, other injuries). Ask about contraception use, and enquire about last menstrual period (LMP). Find out what is known about the assailant(s) and their risk of HIV and hepatitis B. In particular, are they injecting drug users, do they originate from sub-Saharan Africa, and are they homosexual?

Examination

Look for evidence of vaginal, oral, or anal injury (the forensic physician will take swabs). Record any other injuries such as bites, bruising, or skin wounds (photographs of non-genital injuries may be useful—taken by the police with the patient's consent).

Investigations

Obtain written informed consent. The police will be keen to retain clothing, loose hairs, fingernail clippings, and tampons for evidence. Similarly, the forensic physician will take appropriate swabs (vaginal, oral, anal). Perform a pregnancy test. Take and store blood for future DNA and viral testing.

Treatment

- Resuscitate as necessary. Refer urgently the 1% of patients who have significant genital injuries (eg vaginal tears) requiring surgical intervention.
- Consider the need for emergency (post-coital) contraception (see ➲ Emergency contraception, pp. 584–5).
- If the patient is not immunized, give hepatitis B immunoglobulin and start an accelerated active immunization course (see ➲ Needlestick injury, p. 425).
- Assess the risk of HIV. If the assailant is known to have HIV or is from an at-risk group, discuss the risk of disease transmission with the patient and consider the need for post-exposure prophylaxis (see ➲ Needlestick injury, p. 425).
- Assess tetanus vaccine requirements.
- Arrange follow-up to exclude STI. Consider antibiotic prophylaxis against STI if the patient is unlikely to attend follow-up—liaise with the GU team.
- Provide initial counselling and ensure a safe place to stay (a social worker may arrange this).
- Arrange future counselling. Inform the patient about independent local advice available (eg Rape Crisis Centre).
- Ascertain from the patient if she wishes her GP to be informed.

Telephone advice

Women may telephone the ED for advice after being raped. Advise them to inform the police immediately and then to attend the police station or the ED. Discourage them from washing, changing clothes, using a toilet, or brushing teeth before being examined.

Female genital mutilation

Around 137,000 women in the UK are affected by the illegal practice of female genital mutilation (FGM), sometimes known as 'female circumcision'. The term refers to procedures that are performed with the intention of causing injury or alterations to female genital organs for non-medical reasons. Consider FGM if a woman presents with a genital injury. All FGM data are now recorded nationally. Recently updated legislation sets out some important principles (see 🔗 https://www.rcog.org.uk/globalassets/documents/guidelines/gtg-53-fgm.pdf):

- FGM is illegal unless it is a planned surgical operation.
- It is illegal to arrange or assist in arranging a UK resident to be taken overseas for the purpose of FGM.
- It is illegal for those with parental responsibility to fail to protect a girl from FGM.
- If FGM is confirmed in a girl under the age of 18y, it is mandatory to report to the police.

The patient may present with bleeding, infection, or urinary retention.

Clearly document findings and refer to the gynaecology team. Involve the safeguarding team and social services if the patient is a child.

Gynaecological pain

Gynaecological disorders with abdominal pain may be difficult to distinguish from other disorders. Obtain a full history of the pain—sudden onset of severe colicky pain follows ovarian torsion and acute vascular events; more insidious onset and continuous pain occur in infection and inflammation. Radiation of the pain into the back or legs suggests a gynaecological origin. Other clues in the history include coexisting symptoms of vaginal discharge, vaginal bleeding, or missed LMP.

Abdominal and pelvic pain in early pregnancy may be due to ectopic pregnancy or threatened miscarriage (see ➲ Miscarriage, pp. 598–9)—both occur in patients who do not realize that they are pregnant or who deny the possibility of pregnancy due to embarrassment. Perform a urine pregnancy test on every woman of child-bearing age who presents with abdominal pain.

Pain related to the menstrual cycle

Consider first—could any associated vaginal bleeding be from an ectopic pregnancy or a threatened miscarriage?

Physiological dysmenorrhoea Pain regularly preceding menstruation and peaking on the first day of a period may be physiological. Suggest NSAID and refer to the GP.

Endometriosis Growth of functional endometrial tissue in the pelvis outside the uterus may produce cysts and adhesions. Patients often present aged ~30y with dysmenorrhoea and menstrual problems, infertility, and dyspareunia. Symptoms are usually chronic and recurrent in a cyclical fashion and are appropriately followed up by the GP. Occasionally, an endometrial cyst (endometrioma) may rupture and bleed severely into the pelvis, presenting in a similar fashion to a ruptured ectopic pregnancy. Resuscitate for hypovolaemia, and refer urgently for admission and a transvaginal USS ± diagnostic laparoscopy.

Rupture of a corpus luteum cyst This occurs premenstrually but may also cause significant haemorrhage, requiring resuscitation and referral.

Mittelschmerz Mid-cycle extrusion of an ovum from a follicular cyst can cause abdominal pain, which seldom requires admission or any investigation.

Uterine problems

Perforation Seen especially in the presence of recent IUD/IUS insertion. This is diagnosed on transvaginal USS or X-ray if USS is not available. All intrauterine contraceptives can be detected on X-ray.

Fibroids ('leiomyomas') May undergo torsion (sudden, severe colicky pain with a tender uterus) or may infarct ('red degeneration'), particularly during pregnancy. Provide analgesia and refer such suspected problems for specialist investigation.

Ovarian problems

Torsion Causes sudden-onset, sharp unilateral pain and usually involves an already enlarged ovary (cyst, neoplasm, endometrioma). There may be tenderness on abdominal and PV examination. Clinical diagnosis is difficult—if suspected, refer for transvaginal USS with Doppler to assess for ovarian blood supply and free fluid. Provide analgesia as required. Note that torsion can sometimes be partial and managed conservatively, but definitive management is with laparoscopy—let the specialist decide.

Bleeding into an ovarian cyst May present similarly and requires investigation if the patient is unstable or has pain which is not controlled.

Pelvic inflammatory disease

This term includes infection which has spread from the external genitalia to the cervix (cervicitis) to the uterus (endometritis), Fallopian tubes (salpingitis), ovaries (oophoritis), or adjacent peritoneum (peritonitis). Severity ranges from chronic low-grade infection (with relatively mild symptoms) to acute infection (with severe symptoms) which may result in abscess formation.

Causes 90% are sexually transmitted—sexually active women aged 15–20y are at particular risk. Most of the remaining 10% follow pregnancy terminations or dilatation and curettage. Note that women undergoing surgical termination of pregnancy are now routinely given prophylactic antibiotics for pelvic infection.

Organisms *Chlamydia trachomatis* is the most common cause, with an estimated 50% having a concomitant *Neisseria gonorrhoeae* infection. *Mycoplasma hominis* and *Ureaplasma urealyticum* may also be responsible.

Features Bilateral lower abdominal tenderness, vaginal discharge, fever >38°C, abnormal vaginal bleeding, deep dyspareunia, cervical motion tenderness, and adnexal tenderness all point to PID.

Management

- *Shocked patients*: resuscitate with IV fluids. Check urinalysis and send high vaginal swab and cervical swab, and blood for FBC, CRP, clotting, and group and save. Try to arrange an urgent transvaginal USS. Refer and start antibiotics (eg ceftriaxone 2g od IV, metronidazole 500mg tds IV, and doxycycline 100mg bd PO).
- *Stable (not shocked) patients*: if PID is suspected, but the patient is stable and well, discharge (after taking swabs) on oral antibiotics (eg ofloxacin 400mg bd PO plus metronidazole 400mg bd PO for 14 days) and refer to the GP for follow-up. If there are any signs of sepsis, refer to the gynaecology team for inpatient management.

If pregnant, discuss the antibiotic regime with an obstetrician.

Sequelae Ectopic pregnancy (five times ↑ risk) or infertility—therefore, adopt a low threshold for empirical treatment (see http://www.rcog.org.uk).

Vaginal bleeding

(See ➲ Vaginal bleeding in pregnancy, pp. 596–7.)

Triage ahead patients with severe bleeding or evidence of hypovolaemia. Resuscitate first (O_2, cross-match, and obtain Rh status, start IV fluids) and ask questions later. Most patients with vaginal bleeding, however, do not require resuscitation. Take a careful menstrual history and ask about associated symptoms. Attempt to assess the amount of bleeding. Interpreting a patient's description is notoriously difficult, but useful pointers are clots and the rate of tampon/towel use. Always consider pregnancy—remember that a ruptured ectopic pregnancy can present before a period is missed (see ➲ Ectopic pregnancy, pp. 600–1). Ask about medications—menorrhagia is not uncommon in women who have recently started taking an anticoagulant for other pathology.

Examine for evidence of hypovolaemia and abdominal masses/tenderness. Depending on circumstances, speculum and bimanual vaginal examinations may be required—local policy determines who performs this.

Menorrhagia

Dysfunctional uterine bleeding This is a diagnosis of exclusion. Heavy and/or irregular periods without obvious pelvic pathology may result from hormonal imbalance. It is particularly common at menarche. Most settle without treatment or with simple measures (eg tranexamic acid 1g PO qds plus mefenamic acid 500mg PO tds after food). Refer to the GP, unless bleeding is very heavy, in which case refer to the gynaecology team.

Uterine fibroids (leiomyomas) Benign growths of the uterine cavity (usually smooth muscle, but sometimes containing fibrous tissue) often cause menorrhagia. They may present with a painful complication such as torsion or infarction; these are more common in pregnancy—refer.

Other causes

- *Endometriosis*, in which endometrial-like tissue is found outside the uterine cavity, is commonly associated with pain and bleeding problems.
- *PID*—see ➲ Pelvic inflammatory disease, p. 589.
- *IUD/IUS*—recent insertion can cause erratic and heavy bleeding, but most women are encouraged to leave the IUD/IUS *in situ* for at least 6 months.
- *Hypothyroidism* is believed to cause menorrhagia as a consequence of dysfunctional uterine bleeding.
- *Coagulation problems*—including von Willebrand's or recent oral anticoagulation.

Bleeding unrelated to pregnancy or periods

Trauma The history may be elusive.

Postoperative

Bleeding is a risk of any operation. Resuscitate and refer.

Hormonal contraception problems

Endometrial hyperplasia may cause unscheduled bleeding. Exclude vaginal/cervical lesions and refer to the GP for review.

Cervical ectropion (erosion)

Occurs due to changes in the epithelium of the cervical canal. It may produce a mucoid discharge with a small amount of post-coital or intermenstrual bleeding. The cervix appears red. Arrange/obtain a cervical smear if due and arrange follow-up.

Cervical polyp

These are mostly benign but can cause post-coital or intermenstrual bleeding. Refer to the gynaecologist.

Cervical cancer

90% are squamous carcinoma. Strongly associated with human papillomavirus (mainly HPV 16 and 18). Suspect in anyone presenting with post-coital or intermenstrual bleeding. Always ask about smear tests—whether and when she has had them, and if she has ever had an abnormal result and/or been referred to the gynaecology team.

Speculum examination reveals nodules, ulcers, or erosions, which may bleed to touch. Advanced disease may present with pyometra, ureteric obstruction, or retrovaginal fistula. Arrange urgent gynaecology review for any patient with an abnormal-looking cervix.

Uterine carcinoma

Mostly adenocarcinoma, >90% of cases are in women aged over 50y. Risk factors include obesity, nulliparity, and late menopause. Classically presents with post-menopausal bleeding, but otherwise normal examination. Arrange urgent assessment for transvaginal USS and diagnostic pipelle biopsy with the gynaecologist.

The pregnant patient

Pregnant patients presenting with emergency problems create understandable anxiety. There are two patients—one may be suffering unseen. Maintaining fetal oxygenation is crucial—call the obstetrician (or gynaecologist) early (depending on gestation).

Terminology

The 40 weeks of pregnancy are divided into three trimesters. Traditionally, problems in the first trimester (weeks 1–12) are considered 'gynaecological' and are managed by gynaecologists, and weeks 22–40 by obstetricians.

- *Gravidity* = total number of pregnancies (eg a woman in first pregnancy is a 'primigravida').
- *Parity* = number of pregnancies after 24 weeks + number before (eg a woman who has had one child and two spontaneous miscarriages is described as 1 + 2; gravidity = 3).
- *Miscarriage* is fetal death before 24 weeks; stillbirth is fetal death after 24 weeks.

Important aspects of history taking

Given the sensitive nature of questions which need to be asked, privacy and confidentiality are of utmost importance. Do not assume that the person with the patient is the partner, nor that the partner is the biological father of the baby. In addition to standard questions, establish:

- Gravidity and parity.
- Whether the pregnancy was natural or assisted (relevant as patients with assisted conception are at higher risk of antenatal complications).
- The expected date of delivery (calculated from LMP or by checking their dating scan).
- What was found at the dating scan (between 8 and 12 weeks) and anomaly scan (~20 weeks).
- Results of antenatal blood tests, particularly Rh status.
- If the patient is multiparous (has had a previous pregnancy), were there any previous antenatal, intrapartum, or postnatal complications.
- Any social concerns, including domestic violence and/or FGM.

Diagnostic imaging in pregnancy

Try to avoid X-rays and CT scans. Excessive radiation exposure risks congenital malformation, growth retardation, and neoplasia. However, do not withhold necessary X-rays in life-threatening illness. Most head, neck, and extremity X-rays can be obtained without fetal risk by appropriate lead screening. When requesting X-rays, ensure the radiographer is aware the patient is pregnant. USS has not been shown to have adverse effects. If in doubt, discuss imaging requests with a radiologist.

'All pregnant women attending (accident and) emergency departments with anything other than minor complaints should be seen quickly and in conjunction with an obstetrician or senior midwife.' (See https://www.rcog.org.uk)

Progression of pregnancy

(See also Fig. 13.2.)

Peristalsis and ciliary action carry the fertilized ovum to the uterus, which it reaches as a blastocyst ~5 days after ovulation. The blastocyst implants in the endometrium—the inner part forms the embryo, and the outer part the membranes and the placenta. Trophoblastic tissue produces human chorionic gonadotrophin (HCG), (peaks in the first trimester) acting on the corpus luteum, enabling it to release progesterone and maintain the pregnancy. This is essential until around 12 weeks' gestation when the placenta takes over hormonal control, producing several hormones, including oestrogen and progesterone. Levels of HCG then ↓, whereas oestrogen and progesterone ↑.

Symptoms of pregnancy

Amenorrhoea, breast tenderness and fullness, polyuria, tiredness, nausea (appear by ~6 weeks). Vomiting is common, occasionally severe enough to cause dehydration and weight loss ('hyperemesis gravidarum'—see ➲ Hyperemesis gravidarum, p. 595).

Signs of pregnancy

Not obvious in early pregnancy—uterine enlargement (see Fig. 13.2), breast changes.

Pregnancy testing

See ➲ Pregnancy testing, p. 597.

Maternal physiological changes

Cardiorespiratory

Cardiac output ↑ by 30%, peripheral vascular resistance ↓, and BP (especially diastolic) ↓ by 10–20mmHg during the first and second trimesters but tends to return to the pre-pregnancy level in the third trimester. Systolic flow murmurs are common. Water retention occurs, which can cause ankle oedema and carpal tunnel syndrome. Tidal volume ↑ and the patient may feel breathless, but the RR does not change.

Haemodynamics

Blood volume ↑ by 30%, plasma volume ↑ by 45%, and Hb ↓ slightly due to the dilutional effect of an ↑ circulatory volume. Platelets ↓, but their function is maintained. Pregnancy is a hypercoagulable state, with most clotting factors ↑ (especially fibrinogen), but clotting times remain unchanged. ↑ pressure in the pelvis may result in varicose veins and haemorrhoids.

Gastrointestinal and urinary tracts

↓ tone of lower oesophageal sphincter predisposes to heartburn; ↓ gut motility can cause constipation. There is a significant ↑ in alkaline phosphatase (maximal in the third trimester) as it is produced by the placenta. Kidney size ↑ by 1cm in length from early pregnancy, with marked dilatation of the renal pelvis until 6 weeks post-partum.

Other changes

- Backache is common and skin pigmentation changes are often seen (eg melasma).
- Platelets, ESR, cholesterol, and fibrinogen ↑; albumin ↓.

(See Table 13.1 for normal values in pregnant and non-pregnant women.)

Prescribing in pregnancy

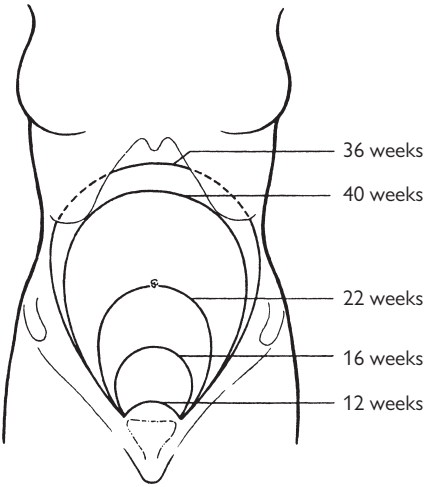


Fig. 13.2 Uterine size in pregnancy.

Table 13.1 Normal values in pregnant and non-pregnant women

Value	Non-pregnant	Pregnant
Haematocrit	0.37–0.47	0.32–0.41
Haemoglobin (g/L)	115–160	110–150
WCC (/L)	$4.0–11.0 \times 10^9$	$5.0–16.0 \times 10^9$
Platelets (/L)	$150–400 \times 10^9$	$134–400 \times 10^9$
ESR (mm/hr)	(age in years + 10)/2	44–114
Fibrinogen (g/L)	2–4	4–6
Albumin (g/L)	35–50	28–40
Urea (mmol/L)	2.5–6.7	1.6–6.0
Creatinine (mmol/L)	<110	38–90
pCO_2 (kPa)	4.5–6.0 (34–46mmHg)	3.6–4.2 (27–32mmHg)
pO_2 (kPa)	>10.6 (>80.6mmHg)	>10.6 (>80.6mmHg)
HCO_3^- (mmol/L)	24–28	18–23

Consult the *BNF* before prescribing drugs in pregnancy or during breast-feeding. The following are generally considered safe in pregnancy: penicillin, cephalosporins, nystatin, paracetamol, chlorphenamine, and cimetidine.

Avoid: trimethoprim, tetracyclines, streptomycin, warfarin, thiazides, and sodium valproate.

Hyperemesis gravidarum

Background

Nausea and vomiting in early pregnancy can be normal and are found in ~70% of pregnancies.

Excessive vomiting causing medical problems, in the form of hyperemesis gravidarum, is relatively rare, affecting ~1 in 1000 pregnancies.

At-risk groups are women with a multiple pregnancy or molar pregnancy (due to excessive β-HCG production).

Clinical features

Persistent vomiting in early pregnancy may be accompanied by dehydration, weight loss, electrolyte disturbances, and/or behavioural changes. Occasionally, vomiting results in haematemesis (Mallory–Weiss tear—see ➲ Upper gastrointestinal bleeding, pp. 126–7).

Investigations

- Check urine pregnancy test.
- Send blood for FBC, U&E, LFTs, and β-HCG. Note that TFTs can be misleading in hyperemesis—at high levels, β-HCG can stimulate TSH receptors to cause a hyperthyroid picture.
- Transvaginal USS performed under the direction of the specialist team excludes multiple or molar pregnancies (if the patient has not already had this test in this pregnancy).

Management

- If the patient is not tolerating oral fluids, keep her nil by mouth, gain venous access, and start IV replacement therapy.
- Give IV or IM antiemetics (cyclizine or prochlorperazine are first choices). Second-line options include PO or IM metoclopramide.
- Refer to the gynaecology team for longer-term management (which may include IV hydrocortisone and/or high dose folic acid and thiamine). Red flag signs are: impaired renal function, severe electrolyte disturbance, cognitive impairment or neurological symptoms consistent with Wernicke's encephalopathy or central pontine myelinolysis, and suicidal ideation. Research suggests that the presence of ketonuria does not necessarily correlate with the severity of hyperemesis gravidarum.

Complications

Maternal risks include renal and liver failure, hyponatraemia, hyperkalaemia, and Wernicke's encephalopathy secondary to thiamine deficiency. There is also a risk to mental health from persistent symptoms.

The fetus is theoretically at risk of intrauterine growth retardation.

Vaginal bleeding in pregnancy

Vaginal bleeding in pregnancy causes understandable maternal distress. The likely underlying cause varies according to the stage of pregnancy.

Table 13.2 Causes of vaginal bleeding in pregnancy

	Pregnancy-related		Non-pregnancy-related
First trimester	Miscarriage	At any stage	Infection
	Ectopic pregnancy		Vaginal ulcers
	Trophoblastic disease		Vaginal inflammation
	Placental implantation		Cervical erosions
	Chorionic haematoma		Cervical polyps
			Coagulation disorders
			Trauma
Second trimester	Miscarriage		
	Trophoblastic disease		
	Placental abruption		
	Placenta praevia		
Third trimester	Placental abruption		
	Placenta praevia		
	'Show' of pregnancy		
	Vasa praevia		

Anti-D immunoglobulin

A Rh –ve mother exposed to Rh +ve fetal blood during pregnancy may develop antibodies. These IgG antibodies may cross the placenta during subsequent pregnancies and cause Rh haemolytic disease of the (Rh +ve) newborn. The production of maternal antibodies may be prevented by appropriate use of anti-D Ig. Consider this every time that there is possible feto-maternal bleeding (ruptured ectopic pregnancy, spontaneous abortion, trauma, antepartum haemorrhage, labour, and delivery). Guidelines have been produced for the use of anti-D Ig (see https://www.rcog.org.uk). Check the Rh and antibody status of all women with bleeding in pregnancy. If a patient is <12 weeks, only give anti-D Ig (250U IM) to those who are Rh –ve and non-sensitized and have an ectopic pregnancy or uterine evacuation. If the patient is >12 weeks, give anti-D Ig to all women with bleeding (250U if <20 weeks; 500U if >20 weeks). Perform a Kleihauer test—this will give an indication of the extent of any feto-maternal haemorrhage; the blood transfusion service and/or obstetrician will advise.

Approach to vaginal bleeding in early pregnancy

Pregnancy testing

Even if the patient denies pregnancy and there is no history of amenorrhoea, consider pregnancy. Most pregnancy tests look for β-HCG produced by the developing trophoblast. Serum β-HCG levels rapidly ↑ in the first trimester, so that pregnancy may be confirmed by serum tests within days of implantation and remain +ve until 20 weeks (and for 7–14 days post-miscarriage). Urine tests have improved considerably in recent years, but do not rely upon them to definitely exclude pregnancy. Transvaginal USS demonstrates most pregnancies by 5 weeks' gestation.

Miscarriage or implantation bleeding—when to refer

Many women attend the ED with bleeding in early pregnancy. Assume that bleeding in early pregnancy is from a miscarriage until proved otherwise. Try to establish the extent of the blood loss—this will guide management. Find out if the patient has had a scan in this pregnancy, as this can help to rule out trophoblastic disease and ectopic pregnancy. In some pregnancies, the woman may have been told after a scan that the pregnancy is likely to fail.

Bleeding in early pregnancy can occur normally when the embryo implants to the uterine wall at ~7–8weeks ('implantation bleed'). If the patient has normal vital signs, with a normal Hb and no abdominal pain, consider sending them home with a referral to the local early pregnancy unit for a review in the next 24hr. If the patient is unstable and has abdominal pain or continuing bleeding, then resuscitate as appropriate and refer to the gynaecology team.

When to perform a speculum examination

A patient with altered vital signs and ongoing bleeding is at risk of developing cervical shock. Cervical shock presents as hypotension with reflex bradycardia due to the products of conception passing partially through, and becoming stuck in, an open cervical os. In this case, perform a speculum examination in the ED as soon as IV access has been obtained. Removing the products usually resolves the shock. Ensure that the speculum examination is performed in a private examination room with a chaperone present. Once the speculum is inserted into the vagina, aim to visualize the whole cervix. Use sterile gauze on the end of sponge-holding forceps to swab away any blood in the vagina to see if there is active bleeding. If products are seen in the os, remove them with the sponge-holding forceps, then refer to the gynaecology team.

Disposal of fetal products of conception

The Human Tissue Authority has issued guidance for England, Wales, and Northern Ireland (there is different guidance in Scotland) on the disposal of products of conception of any pregnancy tissue prior to 24 completed weeks (see https://www.hta.gov.uk).

Women have options regarding the disposal of their pregnancy remains, including cremation, burial, or incineration. Liaise with the gynaecology team for advice.

Miscarriage

Terminology

Use the term 'miscarriage' (not 'spontaneous abortion') with patients. Both refer to fetal loss before 24 weeks. *Spontaneous miscarriage* is common and affects >20% of pregnancies. *Threatened miscarriage* refers to vaginal bleeding through a closed cervical os; 50% proceed to miscarry. If the cervix dilates or products of conception are passed, miscarriage is inevitable. *Inevitable miscarriage* becomes *complete miscarriage* if all products are passed (as confirmed by transvaginal USS). Retained products of conception is an *incomplete miscarriage* which may become infected, causing a *septic miscarriage*. Alternatively, products may be retained as a *missed miscarriage*, which carries a risk of DIC.

Aetiology

Mothers may feel guilty, but the causes are largely beyond their control. Risk factors include:

- Chromosomal anomalies (>50%).
- First pregnancy, maternal disease, and age >30y.
- Uterine abnormalities.
- Drugs (especially teratogens such as isotretinoin).
- Cervical incompetence, immunological factors, and trauma.

Approach

Establish the gestation. Think—is this a ruptured ectopic pregnancy? Vaginal bleeding in spontaneous miscarriage ranges from spotting to flooding. Severe bleeding with hypovolaemia may occur in inevitable miscarriage. Abdominal pain is associated with a lower chance of fetal survival. Any pain with threatened miscarriage tends to be light and crampy. Severe pain and bleeding with hypotension and bradycardia implies 'cervical shock' (see ➲ When to perform a speculum examination, p. 597). Vaginal examination provides other important clues—look for cervical dilatation (the external os of a multigravida usually accepts a fingertip) and products in the os. Cervical tenderness suggests an alternative diagnosis (ectopic pregnancy, septic miscarriage, or PID).

Investigations

Transvaginal USS may exclude ectopic pregnancy and indicate fetal viability—local policy determines who performs this. Urine pregnancy tests remain +ve for several days/weeks after fetal death. Check Rh status and baseline serum β-HCG. Cross-match and obtain FBC if shocked.

Treatment

Resuscitate if significant pain or haemorrhage, and refer urgently. If cervical shock is present, remove products of conception from the cervical os using sponge forceps. If severe bleeding continues, give ergometrine 500mcg IM. Unfortunately, no intervention appears to alter fetal survival in threatened miscarriage. Patients with light bleeding, no abdominal pain, and a closed os (threatened miscarriage) may be allowed home after USS and gynaecology review. Reassure, emphasize that it is not her fault, and advise bed rest and abstinence from sexual intercourse until gynaecology follow-up in 2 days. Provide Rh anti-D Ig 250U IM if Rh –ve and non-immune.

Septic miscarriage

Sepsis may follow spontaneous, surgically induced, or 'backstreet' abortion.

Organisms *Staphylococcus aureus, Clostridium welchii, Bacteroides, Escherichia coli*, streptococci, *Clostridium sordelli*.

Features Vaginal bleeding, offensive discharge, ↑ T°, ↓ BP, uterine tenderness, cervical excitation, peritonitis. Note that pyrexia is not invariable—particularly with *C. sordelli* which can result in a severe infection with high mortality.

Obtain FBC, clotting screen, blood cultures, blood lactate, vaginal swabs, cross-match, Rh status, erect CXR (to look for free gas).

Resuscitate With IV fluids, give co-amoxiclav 1.2g IV; follow the severe sepsis guidelines (see ➲ Sepsis, pp. 62–3 and ➲ Shock, pp. 64–5), and refer urgently. Monitor urine output and consider central and arterial lines.

Missed miscarriage

Very occasionally presents several weeks or months after fetal death with no expected features of pregnancy, a negative pregnancy test and DIC. Resuscitate, and involve senior obstetrician and haematologist.

Recurrent miscarriage

If a patient has had three or more consecutive spontaneous miscarriages in the first trimester with the same biological father, then her GP will arrange referral for fertility investigations.

Retained products of conception

This relatively common gynaecological problem classically presents, following conservative or medical management of miscarriage, but can also occur after normal delivery or surgical management of miscarriage. Women often present with persistent bleeding and a positive pregnancy test (due to the presence of trophoblastic tissue retained in the uterus).

Features Vaginal bleeding ongoing for ≥3 weeks post-delivery, offensive discharge, ↑ T°, ↓ BP, uterine tenderness, cervical excitation, +ve pregnancy test.

Obtain FBC, group and save including Rh status. If there are signs of sepsis, then also take blood for U&E, CRP, and clotting screen.

Management Most women are managed in an outpatient setting, with involvement of the gynaecology team—a transvaginal USS will confirm the diagnosis and help to determine management. Most patients are treated by surgical evacuation of retained products of conception, although some may be managed conservatively or medically.

Start oral antibiotics (co-amoxiclav 625mg tds is safe in breastfeeding) if there is clinical concern about an infection. If there is evidence of sepsis from infected retained products, resuscitate and start IV antibiotics (eg co-amoxiclav 1.2g IV tds), and refer for inpatient treatment.

Ectopic pregnancy

Gestational sac implantation outside the uterus is the main differential diagnosis for any pregnant woman with abdominal pain who has not had a scan to confirm an intrauterine pregnancy. Its incidence has ↑ and now occurs in 1–2% of all pregnancies in the UK. 96% implant in the Fallopian tube, 2% in the interstitial part of the uterus, 1.5% intra-abdominally, and the remainder in the ovary, previous scars, or cervix. The risk of heterotopic pregnancy (combined intrauterine and ectopic pregnancy) is ~1 in 4000.

Importance

Ectopic pregnancy is the most common cause of maternal mortality in the first trimester. The diagnosis is frequently missed. Consider it in any young woman presenting with abdominal pain or vaginal bleeding, especially when combined with an episode of syncope.

Although many women with an ectopic pregnancy can be reviewed by the gynaecology team in a timely manner, a proportion are at risk of deterioration and need emergency surgery.

Risk factors

These include anything which delays or limits normal transit of the fertilized ovum to the uterus: PID, pelvic surgery/adhesions, previous ectopic, endometriosis, assisted fertilization, IUD/IUS, progesterone-only pill, congenital anatomical variants, and ovarian and uterine cysts/tumours. Note that although pregnancy is unusual after tubal ligation, when it does occur, there is a relatively high chance (~1 in 6) of it being an ectopic pregnancy.

Pathology

Implantation of a gestational sac in the Fallopian tube may have three results:

- Extrusion (tubal abortion) into the peritoneal cavity.
- Spontaneous involution of pregnancy.
- Rupture through the tube, causing pain and bleeding.

Implantation in a uterine horn is particularly dangerous—pregnancy may reach 10–14 weeks before rupture. Exceptionally, intraperitoneal pregnancies may proceed almost to term.

Symptoms

Ectopic pregnancy may present with sudden, severe lower abdominal pain with collapse or fainting and vaginal bleeding. There is usually (but not always) a history of amenorrhoea. Haemorrhage may cause shoulder tip pain (from blood irritating the diaphragm) and features of hypovolaemia. Nausea and vomiting are common.

Many patients have more chronic symptoms, with recurrent abdominal pain and slight irregular vaginal bleeding, which may be fresh or dark (like 'prune juice'). Pain may have continued for >1 week before presentation, occasionally as long as 4 weeks. The pain may be worse on defecation. Some patients have no vaginal bleeding.

Enquire about symptoms of pregnancy (eg breast tenderness) and possible risk factors for ectopic pregnancy.

Signs

Look for hypovolaemic shock, and if present, ensure that volume replacement accompanies full assessment. Abdominal tenderness is variable, ranging from mild to severe with peritonism. Cullen's sign (discoloration around the umbilicus) is of historical interest only. Bimanual vaginal examination reveals tender adnexae, and sometimes a mass, but may be better deferred to a specialist. Speculum inspection may show vaginal bleeding.

Investigations

Must not delay resuscitation and referral.

Pregnancy test This is almost always +ve, but serum β-HCG levels are usually lower than expected for normal pregnancy.

Transabdominal USS This is useful if it demonstrates an intrauterine pregnancy, free fluid in the pouch of Douglas, and/or an adnexal mass. Frequently, it is inconclusive. Transvaginal USS is the gold standard for pelvic imaging.

Differential diagnosis

- *Threatened miscarriage*: bleeding is usually more severe and can present with cervical shock (see ➲ Miscarriage, pp. 598–9).
- *Ruptured corpus luteum cyst*: the corpus luteum supports pregnancy for the first 6–8 weeks. Rupture causes sudden peritoneal irritation but rarely bleeds significantly.
- *PID* (see ➲ Pelvic inflammatory disease, p. 589): note that ectopic pregnancy can cause mild pyrexia and a raised WCC, which may easily be misinterpreted as evidence of pelvic infection.
- *Trophoblastic disease* (see ➲ Vaginal bleeding in later pregnancy, pp. 602–3).
- *Acute appendicitis* (see ➲ Acute appendicitis, p. 523).

Treatment

Give O_2 as required; insert two large (12 or 14G) venous cannulae, and cross-match 6U of blood. Request Rh and antibody status—anti-D Ig may be needed (see ➲ Anti-D immunoglobulin, p. 596). Resuscitate initially with crystalloid IV fluids as necessary. Keep the patient nil by mouth. If ectopic pregnancy is suspected, refer urgently to the gynaecology team since sudden deterioration may occur. Significant haemorrhage requires urgent surgery. Alert the anaesthetist and theatre team early.

Patients who are not haemodynamically compromised are sometimes treated medically (eg with methotrexate), rather than with surgery.

Vaginal bleeding in later pregnancy

Vaginal bleeding in the second or third trimester may indicate serious illness which threatens the life of both fetus and mother—refer urgently to the obstetrician. See Table 13.2 for causes of bleeding in pregnancy. Note that *antepartum haemorrhage* is defined as bleeding from the genital tract in pregnancy of ≥24 weeks' gestation, before the onset of labour.

Key points

- Do not perform a speculum or digital examination until placenta praevia has been ruled out.
- Attempt to estimate the amount of bleeding (remembering concealed abruption).
- Try to establish if a fetal heart can be heard.
- Remember non-pregnancy causes of bleeding.
- Refer early to the obstetric team.

Gestational trophoblastic disease

Occasionally, a fertilized ovum may form abnormal trophoblastic tissue, but no fetus. The pathological spectrum ranges from benign hydatidiform mole to invasive choriocarcinoma. Choriocarcinoma is relatively rare, affecting ~1 in 40,000 pregnancies. Trophoblastic disease is often diagnosed at the dating scan (at around 8 weeks).

Presentation Usually vaginal bleeding at 12–16 weeks, with passage of tissue, which may resemble frogspawn. Often accompanying abdominal pain and sometimes pre-eclampsia or eclampsia. The uterus may be much larger than expected for dates. DIC may occur.

Investigations USS shows 'snowstorm' and no fetus. Serum HCG is grossly ↑. Note β-HCG can be ↑ in multiple pregnancies.

Management Obtain venous access and blood for serum β-HCG, FBC, group and save; give IV fluids/resuscitation, and refer to gynaecology.

Placental abruption

Premature separation of the normally situated placenta affects ~1% of pregnancies. It causes haemorrhage which may risk the fetus, depending on the extent of placental involvement and rapidity of separation.

Risk factors Pre-eclampsia, previous abruption, trauma (see ➲ Trauma in pregnancy, pp. 612–13), smoking, ↑ parity, cocaine.

Presentation In 80% of cases, there is some vaginal bleeding ('revealed haemorrhage'), but occasionally bleeding is limited to the confines of the uterus ('concealed haemorrhage'). In either case, there may be much more utero-placental bleeding than is immediately apparent. There may be abdominal pain and tenderness or back pain. Placental abruption may precipitate labour. A large bleed can cause DIC and fetal demise.

Placenta praevia

The placenta is situated wholly or partly over the lower uterine segment and cervical os in ~1% of pregnancies. If a patient has a low-lying placenta at her anomaly scan (~20 weeks), a third trimester scan will be arranged by the obstetric team to assess the placental site prior to the onset of labour. Delivery is likely to be by Caesarean section if the placental edge is <2mm from the internal os. Major placenta praevia is defined as when the placenta overlies the os.

Risk factors Mother aged >35y, high parity, previous placenta praevia, twins, uterine abnormalities (including previous Caesarean section).

Presentation Most present with bright red, painless vaginal bleeding in the third trimester; 15% present in labour.

Vasa praevia

Rarely, an abnormal fetal blood vessel may be attached to the membranes over the internal os, below the presenting fetal part.

Risk factors Multiple pregnancy, low-lying placenta, *in vitro* (IVF) pregnancy.

Presentation Often presents following rupture of membranes with massive vaginal bleeding, which may cause fetal exsanguination.

Management of antepartum haemorrhage

- Call an obstetrician immediately and admit to hospital.
- Give O_2 and keep nil by mouth.
- Obtain venous access (two large-bore cannulae), and resuscitate with IV fluids as necessary.
- Send blood for U&E, FBC, blood glucose, cross-match, Rh and antibody status, Kleihauer test, and clotting screen.
- Monitor the fetus (cardiotocography or Doppler).
- USS locates the placenta, demonstrates the fetus, and may show concealed haemorrhage.
- Give anti-D Ig as advised by the blood transfusion service if Rh –ve (see ➲ Vaginal bleeding in pregnancy, pp. 596–7).

Intrapartum bleeding

Heavy bleeding in labour is most commonly due to intrapartum abruption, placental problems, or uterine rupture. Secure venous access, resuscitate, and get expert help (obstetrician, anaesthetist, neonatologist).

Post-partum haemorrhage

Primary post-partum bleeding >500mL from the genital tract within 24hr of delivery is usually due to uterine atony or genital tract trauma, but can be caused by retained products of conception or a coagulopathy.

Secondary post-partum bleeding Defined as occuring between 24hr and 6 weeks post-partum. It is most commonly due to infection (endometritis) or retained products of conception. Resuscitate as necessary and get expert help (obstetrician, anaesthetist). If there is any suspicion of sepsis, start IV antibiotics (eg co-amoxiclav 1.2g tds).

Abdominal pain in pregnancy

Approach

Attempting to deduce the cause of abdominal pain can ordinarily be quite difficult—in pregnancy, it is even more so. Some possible underlying diseases may be causing unseen fetal distress and can produce rapid maternal deterioration. Therefore, triage ahead, contact the obstetrician, and resuscitate vigorously. Initial investigations usually include BMG, urinalysis, blood tests (including β-HCG in early pregnancy), and USS. Vaginal bleeding accompanying abdominal pain implies a gynaecological or obstetric problem. Remember, however, that the reverse is not necessarily true—a ruptured ectopic pregnancy and concealed haemorrhage in placental abruption may present without vaginal bleeding. In later pregnancy, even if there is doubt as to whether the principal problem is obstetric or not, involve the obstetrician at an early stage.

Pregnancy-related causes of abdominal pain

The following are considered elsewhere:

- Ectopic pregnancy (see ➲ Ectopic pregnancy, pp. 600–1).
- Miscarriage (see ➲ Miscarriage, pp. 598–9)
- 'Red degeneration' of a fibroid (see ➲ Uterine problems, p. 588).
- Gestational trophoblastic disease (see ➲ Vaginal bleeding in later pregnancy, pp. 602–3).
- Placental abruption (see ➲ Vaginal bleeding in later pregnancy, pp. 602–3).
- Onset of labour (see ➲ Emergency normal delivery, pp. 608–9).

Torsion, rupture, or haemorrhage into an ovarian cyst

This may involve the corpus luteum of pregnancy or a pre-existing cyst. Sudden-onset lower abdominal pain results. Transvaginal or abdominal USS may demonstrate the problem. Refer to the obstetrician—management depends on cyst size, nature, and clinical state (typically as an outpatient if the cyst is <5cm and the patient is stable with minimal pain).

Acute polyhydramnios

Excessive amniotic fluid may complicate pregnancy involving uni-ovular twins or a singleton pregnancy. Pain and vomiting are accompanied by a large abdomen for gestation and an unusually mobile fetus. Refer to obstetrics (who will check for fetal abnormality, infections, including CMV, or fetal macrosomia).

Pre-eclampsia

Abdominal pain (particularly right upper quadrant pain) in pregnancy may reflect pre-eclampsia (see ➲ Medical complications of pregnancy, pp. 606–7). Check BP and urinalysis and refer urgently.

Obstetric cholestasis

Abdominal pain (particularly epigastric or right hypochondrial) in pregnancy can reflect obstetric cholestasis, especially if associated with pruritus, but no rash. Check BP, urinalysis, and bloods (FBC, LFTs, bile acids, clotting), and refer urgently to an obstetrician.

Non-obstetric causes of abdominal pain

Urinary tract infection/pyelonephritis

UTI is relatively common in pregnancy due to urinary stasis. Women are at particular risk if they have had previous UTI. Abdominal/loin pain and pyrexia with rigors indicate acute pyelonephritis. Send MSU, FBC, and blood cultures, and refer for IV antibiotics. Treat patients with mild UTI or cystitis without evidence of pyelonephritis with oral antibiotics (eg cefalexin 500mg PO tds), and arrange GP follow-up when the MSU result will be available. When prescribing antibiotics in pregnancy, take care to avoid those drugs which are contraindicated (eg trimethoprim, tetracyclines—see *BNF*).

Acute appendicitis

Presentation in early pregnancy may be as classically described but can be confused with ectopic pregnancy or rupture/torsion of an ovarian cyst. In later pregnancy, the point of maximal tenderness in acute appendicitis rises towards the right hypochondrium. Check BMG, serum amylase, and urinalysis. Give analgesia and refer if suspected. Remember that it is normal to have a slightly raised WCC in pregnancy, but not a raised CRP.

Gallstones

Pain from gallstones not infrequently presents for the first time in pregnancy due to ↑ stasis. The presentation of biliary colic and cholecystitis is similar to that in the non-pregnant patient (see ➲ Biliary tract problems, p. 526). USS reveals stones and associated pathology. Give analgesia and refer (usually to the general surgeons, with involvement of the obstetrician)—if possible, the patient will be treated conservatively initially and operated on in the postnatal period if necessary.

Acute pancreatitis

This is usually related to gallstones. There is a significant risk to mother and fetus. Presentation and treatment are as described on ➲ Acute pancreatitis, pp. 524–5. Involve both surgical and obstetric teams.

Perforated peptic ulcer

If suspected, obtain erect CXR with a lead shield for the fetus. Resuscitate and refer to the surgical team (see ➲ Peptic ulcer disease, p. 527).

Intestinal obstruction

Often follows adhesions from previous surgery. The diagnosis may not be immediately obvious—pain, vomiting, and constipation may be initially attributed to pregnancy. These symptoms, together with abdominal tenderness and high-pitched bowel sounds, suggest the diagnosis. An abdominal X-ray will confirm it, but this should only be requested by a specialist.

Medical complications of pregnancy

Pre-eclampsia

This poorly understood vasospastic utero-placental disorder affects ~5% of pregnancies. It results in widespread systemic disturbance involving the liver, the kidneys, and the coagulation and cardiovascular systems. Placental infarcts may occur and compromise the fetus.

Pre-eclampsia is diagnosed as two or more of: hypertension (>140/90), proteinuria, and oedema.

Variant presentation: haemolysis, elevated LFTs, low platelets (the 'HELLP syndrome').

Risk factors Previous pre-eclampsia, aged <18y or >40y, multiple pregnancy, ↑ BMI, primiparity, pre-existing medical problems (such as hypertension), diabetes, or renal disease.

Symptoms Frontal headache, right upper quadrant abdominal pain, visual disturbance, oedema, nausea and vomiting.

Management

- Refer all patients with BP >140/90mmHg or proteinuria and oedema.
- Obtain FBC, U&E, LFTs, uric acid, clotting screen, ECG, and fetal monitoring.
- Restrict fluids to a total of 80mL/hr or 1mL/kg/hr (because of the risk of pulmonary oedema).

Progression to eclampsia (see ➲ Eclampsia, p. 611) is heralded by: confusion, headache, tremor, twitching, and ↑ reflexes. Visual disturbance and/or abdominal pain may occur.

Diabetes mellitus

Pregnancy encourages hyperglycaemia. Women are screened for gestational diabetes in pregnancy—risk factors include previous gestational diabetes, a family history of diabetes, BMI >30kg/m^2, and a previous baby with macrosomia.

Type 1 diabetes in pregnancy may be more difficult to control and is associated with an ↑ insulin requirement. DKA occurs relatively easily (see ➲ Hyperglycaemic crises, pp. 160–1).

Disseminated intravascular coagulation

DIC may complicate a variety of obstetric problems: placental abruption, intrauterine death, missed abortion, amniotic fluid embolism, eclampsia, sepsis, and trophoblastic disease.

Clinical picture Widespread haemorrhage and microvascular occlusion.

Obtain FBC, cross-match, clotting screen, fibrin degradation products, fibrinogen, U&E, and LFTs.

Treatment Resuscitate with O_2, IV fluids (according to CVP), blood transfusion, and FFP. Refer urgently and consider urgent delivery and treatment of underlying disease. Involve the haematologist.

Thromboembolic disease

VTE is one of the leading causes of maternal mortality.

Risk factors Caesarean section, previous DVT/PE, thrombophilia, family history of DVT/PE, and bed rest.

Diagnosis Clinical probability scoring for DVT or PE is difficult as all derived scores exclude pregnant women. Therefore, use imaging, rather than relying upon clinical probability assessment, combined with D-dimer (as levels ↑ during pregnancy).

DVT in pregnancy Presents similarly to that in a non-pregnant woman, with unilateral leg swelling and tenderness (see ➲ Deep vein thrombosis, pp. 122–3). USS is the safest initial investigation for DVT. Remember that to exclude DVT with USS requires either one normal complete scan (calf, popliteal fossa, and thigh) or two normal thigh and popliteal scans, 1 week apart (see ➲ Deep vein thrombosis, pp. 122–3).

PE in pregnancy Presents with pain or dyspnoea (see ➲ Pulmonary embolism, pp. 124–5). Unfortunately, these are not infrequent symptoms during pregnancy. A normal SpO_2 on air will not exclude PE. Investigation for PE starts with *bilateral leg USS* (no risk to fetus). If these are normal, request CXR (with lead shield covering the abdomen) and V/Q scan or CTPA (see ➲ Pulmonary embolism, pp. 124–5). A CXR may identify other diagnoses, eg pneumothorax.

Management of DVT/PE During investigation for DVT or PE, commence treatment with LMWH. Liaise with the obstetric team, as the dose of LMWH is often different in pregnancy.

Thrombolysis has been used successfully in peri-arrest pregnant women with a clear clinical picture of PE. If the patient is not in peri-arrest, always endeavour to obtain diagnostic imaging, given the risk that thrombolysis poses to the fetus.

Warfarin is teratogenic in the first trimester and may cause fetal or placental bleeding in later pregnancy, so avoid it in pregnancy. Note that rarely, in special circumstances, warfarin is prescribed by experts in pregnancy—see *BNF*.

Other problems

Women with pre-existing medical conditions such as epilepsy or thyroid or cardiac disease are usually managed from pre-conception and have clear plans from the maternal medicine team (found in their pregnancy notes).

If a pregnant woman with complex medical history presents to the ED, contact the obstetric team (who may have easy access to relevant maternity records).

Thyrotoxicosis presents not infrequently in pregnancy. Pre-existing heart disease worsens as blood volume and cardiac output ↑—involve a specialist early. Although rare, consider aortic dissection in any pregnant patient with unexplained severe chest, back, or neck pain (see ➲ Aortic dissection, pp. 96–7).

Emergency normal delivery

Sometimes even the best laid plans for controlled delivery on the labour ward go awry and patients present in an advanced stage of labour and deliver in the ED. This is most likely in very rapid ('precipitate') labour.

Labour

At onset of labour, painless and irregular (Braxton Hicks) contractions are replaced by painful uterine contractions, with cervical dilatation (>3cm) ± 'show' (mucus/blood discharge). There may be rupture of membranes.

Presentation

In the ED, only 'OA' (occiput anterior) vertex presentations are likely to proceed so fast that delivery occurs before specialist help arrives.

Stages of labour

First Onset of labour until cervix is fully dilated (10cm). Usually lasts >6hr. The upper part or 'segment' of the uterus contracts, and the lower segment (including the cervix) dilates. Contractions ↑ in frequency (every 2min) and duration (last 1min). The head starts to descend.

Second Full dilatation until the baby is born. Should last <3hr in primigravida, and <2hr in multigravida. Contraction of the upper segment, abdominal muscles, and diaphragm cause the head to descend, then to rotate (usually to lie OA). An overwhelming desire to push helps expel the baby.

Third The placenta and membranes deliver and the uterus contracts.

Assessment of a patient in labour

Check pulse and BP, and palpate the abdomen. Listen for fetal heart sounds with a fetal stethoscope or Doppler probe (rate should be 110–160/min). Gently examine the perineum. Do not fully examine the vagina unless the head is crowning and birth is imminent. Instead, transfer to the labour ward.

Management of delivery

(See Fig. 13.3.)

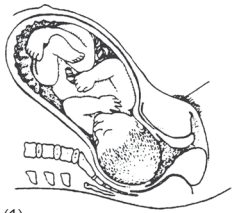
- Call obstetric/neonatology/anaesthetic help, and encourage the partner to stay.
- Don sterile gloves; stand on the patient's right, and offer Entonox®.
- As the head crowns, discourage bearing down—advise rapid shallow breaths.
- Use the left hand to control head escaping (to prevent perineal tearing).
- Press gently forwards, with the right thumb and fingers on either side of the anus.
- Once the head is delivered, allow it to extend.
- Feel for the cord around the neck—slip it over the head or, if impossible, clamp and divide.
- Allow the anterior shoulder to deliver first (with mother pushing if needed).
- Deliver the baby; wrap him/her up, and resuscitate as necessary.

Management of the cord

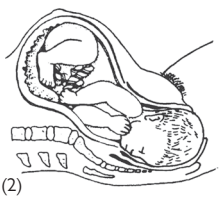
Once the baby cries and cord pulsation ceases, hold the baby level with the mother and clamp the cord twice (15cm from the umbilicus). Divide between clamps. Place a plastic Hollister crushing clamp 1–2cm from the umbilicus and cut 1cm distally. Check that two normal arteries and one vein are present in the cord.

Management of the third stage

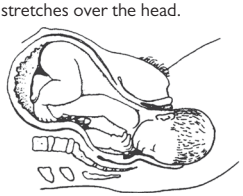
After the cord is cut, give oxytocin 5U IM plus ergometrine (Syntometrine®) 500mcg IM, unless there has been any maternal hypertension at any stage, in which case omit ergometrine (contraindicated due to risk of maternal stroke). A few minutes after delivery, regular contractions begin again, causing the placenta to detach. The cord may move down, accompanied by a small gush of blood. The Brandt–Andrews technique helps removal—pull gently down on the cord whilst exerting upward pressure on the uterus (preventing inversion). Give Rh anti-D Ig if Rh –ve (see ➲ Vaginal bleeding in pregnancy, pp. 596–7).



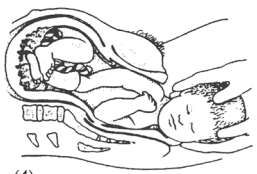
(1)
First stage of labour. The cervix dilates. After full dilatation, the head flexes further and descends further into the pelvis.



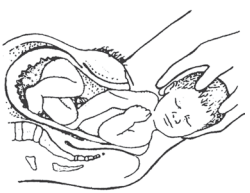
(2)
During early second stage, the head rotates at the level of the ischial spine, so the occiput lies in the anterior part of the pelvis. In late second stage, the head broaches the vulval ring (crowning) and the perineum stretches over the head.



(3)
The head is born. The shoulders still lie transversely in the mid pelvis.



(4)
Birth of the anterior shoulder. The shoulders rotate to lie in the antero-posterior diameter of the pelvic outlet. The head rotates externally. Downward and backward traction of the head by the birth attendant aids delivery of the anterior shoulder.



(5)
Birth of the posterior shoulder is aided by lifting the head upwards whilst maintaining traction.

Fig. 13.3 Management of delivery.

Obstetric emergencies

Emergencies around the time of delivery are a very definite domain of the obstetric team—involve them as soon as possible. The following emergencies are included for the sake of completeness and to cover the instance of an obstetrician not being immediately available.

Imminent perineal tear

The risk of perineal tearing may be minimized by controlled delivery. An extensive tear risks the integrity of the external (or even internal) anal sphincter. If a tear is imminent, perform an episiotomy (see Fig. 13.4). Infiltrate 10–20mL of 1% lidocaine postero-laterally from the posterior fourchette. Cut the perineal tissues postero-laterally, using straight scissors with blunt points (see Fig. 13.4), avoiding large veins. After delivery, carefully examine the episiotomy wound, which needs to be closed in layers using absorbable (usually continuous) sutures.

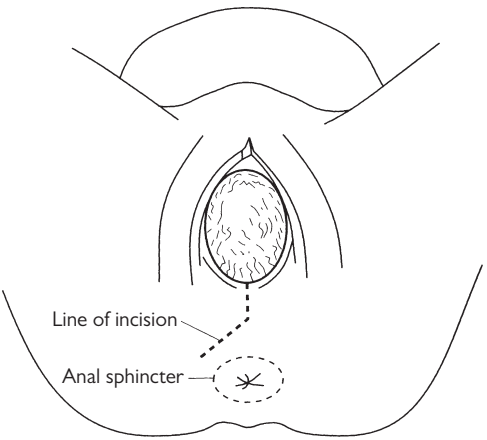


Fig. 13.4 Performing an episiotomy.

Cord prolapse

The situation where the umbilical cord lies below ('prolapsed') the presenting part of the fetus is an obstetric emergency demanding urgent attention and an emergency Caesarean section. Untreated, it can result in cord compression and vasospasm, which can risk the life of the fetus.

Management

Whilst waiting for the obstetric team, minimize handling of the cord (this causes further vasospasm and fetal compromise). Place the woman on all fours in a knee-to-chest position, with her head against the bed and her back up in the air. Try to carefully reduce the cord into the vagina, and keep it in place with a warm swab to prevent further expulsion.

Meconium-stained liquor

(See ➲ CPR of the newborn, pp. 660–1.)

Difficulty in delivering the shoulders (shoulder dystocia)

After delivery of the head, the shoulders usually rotate to lie in an AP direction, so the first one can be delivered anteriorly. Failure of this rotation is known as shoulder dystocia.

Maternal complications Post-partum haemorrhage, genital tract trauma.

Fetal complications Hypoxia, intracranial haemorrhage, fracture, brachial plexus injury.

Management Request emergency obstetric help. Place the woman's legs into the McRobert's position (hyperflex the hips, so the knees are up towards the woman's ears); apply gentle suprapubic pressure in order to rotate the shoulder (having first established which side the fetal back is on). If these measures fail, then the obstetric team will attempt internal manoeuvres to deliver an arm/shoulder (eg hooking a finger into the axilla of the anterior shoulder of the fetus to bring it down).

Eclampsia

(See also ➲ Pre-eclampsia, p. 606.)

Eclampsia is defined as the onset of fits with pre-eclampsia after 20 weeks' gestation. It is a serious condition, with maternal mortality of 2% and perinatal mortality of 15%.

Management

(See 🖱 http://www.rcog.org.uk)

- If there is evidence of impending eclampsia or the patient starts to fit—call the obstetrician and anaesthetist.
- Check BMG.
- Control the airway.
- Consider moving the patient into the left lateral position.
- Give magnesium sulfate 4g slowly IV over 10min, followed by maintenance magnesium sulfate 1g/hr IVI for 24hr.
- Treat recurrent fits with further magnesium sulfate 2g IV over 10min.
- Follow local advice regarding control of hypertension (eg labetalol 10mg slow IV bolus, followed by an IVI, starting at 1–2mg/min, ↑ as required).
- Urgent delivery is a priority in eclampsia (if the woman is still pregnant) both for mother and fetus.

Trauma in pregnancy

Background

The principal causes are similar to those in the non-pregnant woman: road traffic collisions, falls, and assaults. Contrary to popular opinion, the use of seat belts does ↓ the risk of serious injury in pregnancy. The 'lap' belt should lie over the anterior superior iliac spines.

Anatomical considerations

The following are worthy of consideration:

- As the uterus enlarges, it rises out of the pelvis with the bladder—both are at ↑ risk of injury.
- The size of the uterus and stretching of the peritoneum make abdominal assessment difficult.
- The bony pelvis is less prone to fracture, but retroperitoneal haemorrhage may be torrential due to ↑ vascularity.
- The pregnant uterus may obstruct the inferior vena cava, causing supine hypotension and ↑ bleeding from lower limb wounds.
- The diaphragm is higher in pregnancy.
- The pituitary doubles in size and is at risk of infarction in untreated hypovolaemic shock.

Physiological considerations

Pregnancy is associated with dramatic changes in physiology:

- Pregnant patients may tolerate up to 35% loss of blood volume before manifesting classic signs of hypovolaemic shock, largely at the risk of the utero-placental circulation.
- ↓ functional residual capacity and ↑ O_2 requirement result in hypoxia developing more quickly.
- There is an ↑ risk of regurgitation of gastric contents.
- Coagulation may be deranged or rapidly become so.

Injuries to the uterus, placenta, and fetus

Fetal injury Both blunt and penetrating trauma may damage the fetus. It is, however, more likely to suffer as a result of maternal hypoxia/hypovolaemia or placental abruption.

Placental abruption Deceleration forces in blunt trauma may shear the inelastic placenta from the elastic uterus. Haemorrhage (maternal and fetal) may be significant and result in DIC. This may present with vaginal bleeding (much may be concealed internally), uterine tenderness, or fetal distress.

Uterine rupture This is relatively uncommon. Major rupture causes severe bleeding. The uterus and fetus may be felt separately.

Amniotic fluid embolism Rare and carries a poor prognosis. Presents with sudden collapse, dyspnoea, ↓ BP, fitting, and bleeding (from DIC).

Approach to the injured pregnant patient

Follow that outlined in ➲ Major trauma, pp. 329–407, with additional specific points.

History

Determine gestation and any problems in this and previous pregnancies.

Examination

- Involve an obstetrician early—examine the vagina for bleeding or rupture of membranes.
- Palpate for fundal height (mark the skin), abdominal tenderness, and uterine contractions.
- Listen for fetal heart sounds and the rate using a fetal stethoscope (Pinard) or Doppler probe.
- Remember that head injury may mimic eclampsia, and vice versa.

Investigations

- Check BMG, coagulation screen, Rh/antibody status, and Kleihauer test.
- Consider CVP monitoring (remembering CVP is lower in pregnancy).
- Monitor the fetal heart (cardiotocograph)—the rate should be 110–160/min.
- USS investigates fetal viability, placental injury, gestational age, and free peritoneal fluid.
- Do not withhold essential X-rays and CTs, but do consider early USS to look for free intra-abdominal fluid and fetal viability. Seek senior advice. Remember that the greatest risks from X-rays to the fetus are in early pregnancy. In later pregnancy, risks to the fetus may be outweighed by failure to identify injuries by not obtaining X-rays.
- DPL has been superseded by USS (FAST scan) (see ➲ Focussed assessment with sonography for trauma (FAST) scan, p. 355).

Treatment

- Give O_2 and summon senior obstetric, ICU, and surgical help early.
- If chest drains are required, insert 1–2 intercostal spaces higher than usual.
- Decompress the inferior vena cava by manually displacing the uterus to the left or by using a 15° right lateral (Cardiff) wedge (or where possible, tilt the trolley/bed), or if neck injury has been excluded, by nursing in the left lateral position.
- Treat fluid losses with aggressive IV fluid replacement.
- An NG tube ↓ the risk of regurgitation and aspiration.
- Remember tetanus prophylaxis (see ➲ Tetanus prophylaxis, p. 424).
- Consider anti-D Ig if the patient is Rh –ve.
- Even if there is no overt maternal injury, refer for fetal monitoring for 4hr.
- Abdominal tenderness, hypovolaemia, or fetal distress may require urgent laparotomy.
- If the patient has a cardiac arrest, perform an emergency Caesarean section if the patient is >24 weeks pregnant and 5min have elapsed without output (see ➲ Cardiac arrest in pregnancy, pp. 614–15).

Cardiac arrest in pregnancy

Rate

Estimated in late pregnancy at ~1 in 30,000.

Causes

- *Obstetric*: massive obstetric haemorrhage, sepsis, pre-eclampsia/eclampsia, cardiac failure (from cardiomyopathy of pregnancy), amniotic fluid embolism.
- *Medical/surgical*: stroke, PE, anaesthetic problems and drug reactions, underlying heart disease. IHD is rarely implicated—the underlying rhythm is more commonly PEA than VF—unfortunately, this is reflected in the poor prognosis.

Remember the following physiological factors

- The airway is difficult to control (large breasts, full dentition, neck oedema, and obesity). Ventilation may be difficult, and intubation technically challenging.
- ↑ aspiration risk (↓ lower oesophageal pressure, ↑ intragastric pressure); therefore, securing a definitive airway early is essential.
- ↑ O_2 requirements, yet harder to ventilate (↓ chest compliance).
- Chest compression is awkward (flared ribs, raised diaphragm, obesity, breast hypertrophy).
- Gravid uterus >20 weeks compresses the inferior vena cava, ↓ venous return.
- There are two patients: mother and fetus.

Approach to resuscitation

Follow the resuscitation guidelines for managing adult cardiac arrest (see ➲ Cardiac arrest, p. 48). The special situation of pregnancy means some additional points apply. If there is advanced warning, think ahead. In addition to the usual team needed for airway control, IV access, and chest compressions, organize:

- An anaesthetist for the airway, an obstetrician to perform a Caesarean section, and a neonatologist to resuscitate the baby.
- The neonatal resuscitation equipment (overhead warmer, suction, airway equipment, and O_2).
- A member of staff to apply cricoid pressure at the beginning of resuscitation and until the airway is secured.
- A member of staff to manually displace the uterus to the left (a Cardiff wedge is not helpful in this situation).

It may take time for help to arrive and there may be no warning prior to patient arrival. In the meantime:

- Call the obstetrician, neonatologist, and ED consultant immediately.
- Apply cricoid pressure (Sellick manoeuvre) at the beginning of resuscitation and until the airway is secured.
- Try to secure the airway with a cuffed tracheal tube at an early stage.
- Decompress the inferior vena cava by manual displacement of the uterus to the left.
- Consider and treat the cause (remember that hypovolaemic shock from unseen haemorrhage may respond to a large IV fluid challenge).
- If there is no return of spontaneous circulation within 5min, perform a Caesarean section (if the patient is >24 weeks pregnant).

Emergency Caesarean section

Rationale

After several minutes of maternal cardiac arrest, the best chance of survival for the fetus is to be removed from the now hostile hypoxic environment of the uterus. A Caesarean section also benefits the mother by decompressing the inferior vena cava, resulting in ↑ venous return. It has not yet been established whether it is beneficial to deliver a fetus before 24 weeks—there are less obvious haemodynamic benefits (and minimal aortocaval compression at this time).

Procedure

- Continue closed chest compression and ventilation throughout the procedure.
- Make a midline skin incision from the pubic symphysis to the epigastrium (level of the fundus of the uterus).
- Carefully dissect through the anterior abdominal wall and peritoneum, taking care to avoid the bladder or bowel.
- Incise the underlying uterus vertically, starting 6cm above the bladder peritoneal reflection. Continue the uterine incision upwards to the fundus, through an anteriorly placed placenta if necessary. Speed is essential.
- Deliver the baby, holding his/her head down and below the level of the mother's abdomen.
- Clamp and cut the umbilical cord.
- Resuscitate the baby (see ➲ Resuscitation of the newborn, p. 658).
- Close the uterus and abdominal wall to avoid hypovolaemia.

Post-partum problems

Physiology of the puerperium

Within 24hr of delivery, uterine involution results in the fundus being level with the umbilicus. By 2 weeks, the uterus should be impalpable. Uterine discharge ('lochia') gradually ↓ but may last up to 6 weeks. An initially bloody discharge becomes yellow within 2 weeks. The external cervical os gradually closes, so that after 1 week, it no longer accepts a finger. Speculum examination now reveals the typical parous os (see Fig. 13.1).

Post-partum haemorrhage

(See ➲ Post-partum haemorrhage, p. 603.)

Pyrexia

Treat according to the underlying cause, which includes: pelvic infection (see below), UTI, mastitis, DVT, retained products of conception (see ➲ Retained products of conception, p. 599), and other causes unrelated to pregnancy or delivery.

Pelvic infection

Involves a significant threat—may be complicated by septicaemia, necrotizing fasciitis, DIC, or septic PE. There is an ↑ risk with: surgical procedures in labour, prolonged membrane rupture, internal fetal monitoring, and repeated examinations.

Features Uterine tenderness and subinvolution, pyrexia, offensive lochia, peritonitis.

Send Vaginal swabs for culture, FBC, group and save, clotting screen, and blood cultures.

Resuscitate with O_2 and IV fluids, and refer. For septic shock, follow severe sepsis guidelines; give IV co-amoxiclav (1.2g) and IV metronidazole (500mg); monitor CVP, and consider inotropes and ventilation.

Infected episiotomy wound

Refer to obstetrician.

Mastitis and breast abscess

Mastitis is commonly due to *Staphylococcus* or *Streptococcus*. Send milk for culture, and commence oral antibiotics (eg co-amoxiclav 625mg PO tds). Instruct the patient to continue to breastfeed from both breasts. Arrange GP follow-up.

Refer patients with abscesses for surgical review.

Psychiatric illness

Rapid hormonal swings are responsible for elation being frequently replaced by tearfulness and anxiety ('fourth day blues'). Less commonly (0.5% pregnancies), puerperal psychosis occurs. Those with a previous psychotic illness are at particular risk and should be known to the maternity teams. Exclude sepsis, and refer for psychiatric help. The patient may need to be compulsorily detained (see ➲ Compulsory hospitalization, p. 644).

Thromboembolic disease

A major cause of maternal mortality throughout pregnancy and the puerperium. Adopt a high index of suspicion, and refer for investigation (see ➲ Pulmonary embolism, pp. 124–5).

Chapter 14

Psychiatry

Approach to psychiatric problems

Psychiatric presentations comprise ~1–2% of ED new attendances. These patients are sometimes considered unwelcome because they are seen as complex, heavy consumers of staff time and energy, and not infrequently exhibit aggressive and/or disturbed behaviour. A careful systematic approach to patients presenting with psychiatric emergencies produces an accurate diagnosis in most cases. If this is not possible, the information gained will at least assist referral to the appropriate service, allowing management of the problem.

Liaison psychiatry service

Most EDs have close links with liaison psychiatrists and specialist psychiatric nurses. These individuals are often embedded in the department, working both in and out of hours. They are expert at managing a variety of psychiatric problems, including overdose and physical self-harm.

Potential points of conflict

The ED is not the ideal environment for the assessment of potential psychiatric illness. Bear the following in mind:

- The vast majority of aggressive, violent, or bizarrely behaving patients in the ED are not suffering from a formal psychiatric illness. Many require input from the police, rather than psychiatric services.
- Admission is not mandatory simply because a psychiatric illness has been diagnosed.
- The presence of alcohol or drug intoxication makes assessment of mental state very difficult and, in many cases, impossible—do not assume that this, in itself, reflects an acute psychiatric problem.
- Acute alcohol withdrawal is a medical emergency, with significant mortality—refer to the medical team, not to the psychiatric service.
- Delirium (acute confusional state—see ➲ Acute confusional state (delirium), pp. 140–1) is usually organic, rather than psychiatric, in origin; investigate with this in mind.
- An emergency Section form must be signed by the examining doctor, but this does not have to be a psychiatrist.

Similarly, *psychiatric staff within the ED* need to consider the following:

- EDs are under pressure to manage large numbers of patients in a timely fashion, so it may be difficult for ED staff to spend large amounts of time with any single patient.
- Overcrowding and unavailability of appropriate interview facilities may make it necessary to compromise patient privacy, rather than the safety of staff.
- A psychiatric referral can be appropriate in a patient who has consumed alcohol, if there is a significant psychiatric history ('dual diagnosis' or 'co-occurring disorders').

General approach to psychiatric problems

Adopt the same approach of history taking and examination as with other general medical problems. Do not dismiss psychiatric patients as 'mad, and therefore, the psychiatrist can sort them out'—this can result in misdiagnosis and inappropriate referral.

Glossary of psychiatric terms

Concrete thinking Impairment of abstract or symbolic thinking (eg interpretation of proverbs, explanation of similes).

Delirium An organic syndrome characterized by rapid-onset global disturbance of cognition and disturbed consciousness.

Delusion A firm, usually false, belief unshakeable by logical argument or contrary experiences and which is out of keeping with the patient's social or cultural norms.

Flight of ideas Thoughts rapidly cycled, linked by chains of ideas or verbal associations or sounds resulting in disjointed or, in extreme cases, incomprehensible speech.

Hallucination A false perception not due to a sensory distortion or misinterpretation, but which occurs at the same time as real perceptions. Hallucinations can occur in each of the sensory modalities. Auditory hallucinations are most commonly associated with psychiatric illness. Visual and other hallucinatory phenomena suggest organic aetiology.

Ideas of reference A feeling that others are talking about, or looking at, the patient for some reason. Insight is usually retained, which is not the case in delusions of reference.

Obsession Recurrent, persistent, and intrusive thoughts, impulses, or mental images that the individual usually tries to resist, finds unpleasant, and recognizes as senseless.

Passivity An experience of being under external control either physically, emotionally, or intellectually. Suggests schizophrenia.

Perseveration Repetition of an idea, thought, speech, or an action beyond the point of relevance (eg giving the answer of an initial question in response to subsequent unrelated questions). Usually caused by organic brain disease.

Pressure of speech Rapid or hurried speech, often occurs with flight of ideas.

Psychosis Extreme disorders of thinking and perception, often involving delusions and hallucinations, with loss of insight.

Thought blocking A feature of schizophrenia in which a train of thought stops abruptly and, following a pause, a new line of conversation begins.

Thought broadcasting More than simply feeling others can read personal thoughts. An experience of thoughts spilling out beyond personal control or that thoughts are being relayed from external sources.

Thought insertion Thoughts that are not the patient's own are put in their mind from outside.

Thought withdrawal The feeling that thoughts have been removed or stolen by an external influence.

The psychiatric interview

Interview usually follows initial clinical contact at triage (see ➲ Australian Mental Triage Scale, p. 628), which will have established the basic background to the presentation. In addition, triage notes will include an initial assessment of the level of distress of the patient and record the appearance of the patient/clothes worn in case they leave the department and need to be searched for.

Setting and safety

Conduct the interview in a quiet, relatively private, and specially designed setting. Most EDs have specific consultation rooms (with an alarm, two doors that open out/both ways, safe comfy furniture which cannot be used as a weapon/missile, and no ligature points). Whatever the state of the department, never allow the need for privacy to compromise staff safety! Make sure other staff are easily available and can be summoned *immediately* if necessary. If this is not possible, either conduct the interview within the main ED (in a cubicle or side-room) and/or ensure that other staff are present during the interview. During the interview, position yourself between the patient and the exit.

Approach in the initial interview

- Listen supportively and obtain a history of the presenting problem.
- Assess the mental state, emotions, and attitudes of the patient—with particular reference to potential risk (to themselves or others).
- Make a formulation (identify key factors of the illness, list probable causes, consider why the patient became ill, and plan treatment).

Initial history Take a rapid, thorough history, concentrating upon the following:

- What is the presenting complaint?
- What factors have caused the patient to present here and now?
- Is there a past history of psychiatric illness or medication?
- What does the patient want (advice, treatment, or admission)?
- Are the patient's wishes appropriate?

Ethnic minorities

Be aware of the different communities living in the area, and remain sensitive to their needs. Assessment of mental health problems needs to take into account the relevant cultural and religious issues.

Language It can be a real challenge to assess the mental health of patients who do not speak English. Consider the following solutions:

- Assessment may be performed by an ED or mental health professional who speaks the patient's language (the ideal result).
- A health professional from another discipline may act as interpreter.
- An interpreter who is not a health professional but who is trained in mental health issues may be used.

Do not use children as interpreters for patients with mental health problems. Similarly, try not to rely upon family members to interpret.

Taking a full psychiatric history

The main components of a psychiatric history are described below. A detailed psychiatric history is often taken in the ED by the psychiatry liaison service, rather than ED doctors.

Presenting complaint List the principal complaints, and try to detail the course and severity of each. Ask about the effect of each problem on the person's life and work. Carefully determine how he came to be referred or why he presented here and now. When was he last well?

Past psychiatric history Ask about previous psychiatric or physical illness, hospital admissions (particularly if compulsory), and any outpatient contact (eg community psychiatric nurse), day hospital, day centres, or crisis intervention groups. Record psychiatric or other medications.

Personal and family history Obtain an outline of the patient's life history: birth, childhood, circumstances of upbringing (including parental relationships—marital disharmony, separation, violence, adoption, single parent, brought up by a grandparent, etc.). Ask about education, academic achievements, and relationships with family or friends. Ask if there has been any recent bereavement and what effect this has had.

Work history Is the patient employed? If not, ask about any previous jobs. Ask about the impact of any loss, change, or failure in work on the patient's life or mental status, and conversely determine if psychiatric or other illness has had any effect on employment.

Sexual/marital history Gently enquire about relationships and sexual experiences only where relevant. This may reveal important information about the patient's personality and relationships to others. It may form a major part of the presenting complaint (eg recent ending or change in a relationship or a history of sexual abuse). A more detailed account of sexual aberration or fantasy may be required in a forensic examination.

Substance misuse Try to estimate alcohol, tobacco, drug, or other substance misuse by the patient. Although it may be difficult to obtain accurate information, do not assume that patients always underestimate their consumption of such substances.

Forensic history Record any previous criminal charges, convictions, or contact with the police, including the dates on which they occurred. Ask if the patient has any present charges or court actions pending against him.

Social circumstances Determine where the patient lives and if he shares accommodation with others. Enquire about income and how he is coping financially. Ask if there are any dependants or any outstanding debts, and if he is receiving any form of social support or monetary assistance.

Personality Try to describe the patient's usual and present mood. How does he feel about himself and about other people? How does he enjoy himself and how does he react to good, bad, or stressful events?

Corroboration Extremely important information can be gathered from close relatives, GPs, community, or social services, which can verify or enhance information obtained directly from the patient.

Mental state examination

Having taken an appropriately thorough history, make an assessment of the patient's mental state. If the patient is violent, disturbed, or, for some other reason, unable to provide background history, then the information or observations gathered whilst assessing the mental state become even more crucial to diagnosis.

Appearance and behaviour

Gather information from the moment the interview begins. Is the patient appropriately dressed? Is he clean and tidy, or neglected? Does his general posture, body movement, and facial expression suggest fear, anxiety, aggression, withdrawal, detachment, or low mood? Does he maintain eye contact? Does he respond appropriately to external stimuli or is he easily distracted? Does he appear to be hallucinating or responding to no obvious stimuli? Are there any abnormal movements, tics, grimaces, or dystonic movements? Note whether behaviour is steady and consistent, or labile and unpredictable.

Speech

Describe the rate, volume, intonation, and spontaneity of speech. Note the presence of dysarthria or dysphasia. Record any examples of invented new words (neologisms), unusual phrases, perseveration, or garbled speech verbatim. Note vagueness, over-preciseness, or sudden switching to new themes or subjects (flight of ideas).

Mood

Taking cues from the appearance and behaviour, enquire about the patient's prevailing mood, opinion of himself, and view of the future. Enquire about suicidal thoughts and thoughts of harm to others. Ask about disturbances in sleep, appetite, libido, concentration, and mood variations during a typical day. Ask about irritability or memory disturbance (particularly of short-term memory).

Thought abnormalities

Record these as they are found during the interview (eg thought blocking or flight of ideas). Test for concrete thinking by asking the patient to interpret a simple proverb. Ideas of reference or persecutory delusions may require direct enquiry to be revealed (eg asking about neighbours, electrical devices). Similarly, passivity phenomena may require specific questioning to be elicited (eg 'Is anyone making you think or move without you wanting to?').

Hallucinations/perceptive abnormalities

Record the presence of any hallucinations, including their nature and specific content. Visual, olfactory, gustatory, and tactile hallucinations should prompt suspicion of organic, rather than psychiatric, disease.

Insight and mental capacity

Does he believe he is ill? Does he think he requires treatment, and would he be willing to accept it? Does he have mental capacity (see ➲ Mental health assessment issues, p. 631)?

Cognitive assessment

Although the psychiatric interview will, in general, reveal information about a patient's cognitive abilities, a formal evaluation of higher mental function is essential. Failure to do this can lead to organic brain disease being falsely labelled as a 'functional' or purely psychiatric illness, resulting in inappropriate treatment. Assess the following:

- Level of consciousness (eg alert, hyperalert, withdrawn, or comatose).
- Orientation.
- Attention and concentration.
- Registration of new information.
- Recall of recent and distant memories.
- Ability to interpret instructions and carry out tasks.

The Mini-Mental State Examination

The Mini-Mental State Examination was designed as a screening tool for the assessment of cognitive function in the elderly. It is in widespread use, but note that, as with many psychological tests, it is subject to copyright.

Assessment of risk

Consider whether the patient and/or others are at any risk of harm. Ask if the patient has any thoughts of self-harm and/or harm to other individuals. Establish if there is any past history of self-harm or violence. Try to decide if the patient is at risk of abuse/neglect, and consider whether he may be a 'vulnerable adult'—such concerns should trigger a Safeguarding Alert.

Children at risk

Find out if there are any children in the patient's household and, if so, whether or not there are satisfactory arrangements in place to care for them. Concerns should prompt consideration of involvement of social services and/or child protection referral.

Physical examination

A physical examination completes any psychiatric evaluation. Specifically check for evidence of those physical illnesses which can be associated with psychiatric disturbance (eg thyroid disease, substance withdrawal, head injury, epilepsy, cerebrovascular disease, or other intracranial pathology). Carefully examine for focal neurological signs, meningism, organic confusional states, intoxication, and injury. In acute psychological disturbance, perform and record the following basic observations and investigations (this may prove to be very difficult in violent or aggressive individuals):

- Baseline pulse, RR, BP, and SpO_2.
- T°.
- BMG/blood glucose.
- Urinalysis.
- Breath alcohol (if available).

Undertake other investigations, such as U&E, FBC, blood alcohol level, CXR, or CT scanning, if clinically relevant. Urine drug screening, TFTs, or electroencephalogram (EEG) may be indicated in some situations, but the results are rarely available acutely.

The aggressive patient: background

A significant (albeit small) proportion of patients exhibit aggressive behaviour towards staff (and others) who are attempting to help them. Sometimes this amounts to physical violence. All ED staff need appropriate training in this area, bearing in mind that recognition and prevention of aggression is just as important as knowing how to manage it when it occurs.

Underlying causes

Medical illness

Recognize that a patient's agitation and/or aggression may reflect an underlying treatable acute medical condition. Such conditions may be compounded (as well as being potentially caused) by the use of *alcohol and/or illicit drugs*:

- Hypoglycaemia (see ➲ Hypoglycaemia, pp. 158–9).
- Head injury.
- Hypoxia (any cause).
- Distended bladder.
- Post-ictal confusional states (epilepsy or drug overdose).
- Organic brain syndromes (eg delirium/acute confusional states—see ➲ Acute confusional states (delirium), pp. 140–1).

Psychiatric illness

Most violent, aggressive, or bizarre patients in the ED are not mentally ill. Violence resulting directly from psychiatric illness, which needs urgent treatment, is relatively uncommon. It is restricted to a small number of patients and tends to be associated with the following:

- A past history of violent behaviour.
- Schizophrenia and other psychoses (eg mania or paranoid disorders), especially when there are delusions or hallucinations that focus upon one particular individual.
- Personality disorder, particularly sociopathic, impulsive, or explosive disorders.
- Learning disability.

Warning signs of impending violence

Violent episodes can often be predicted and prevented. The experienced practitioner may be able to spot the signs of approaching trouble at an earlier stage. Warning signs include the following:

- Angry facial expressions, gestures, and posture (aggressive body language).
- Restlessness, overt irritation, discontentment, pacing about, overarousal (dilated pupils, tachycardia, ↑ RR).
- Prolonged eye contact.
- Loud speech and changes in tone of voice.
- Verbally threatening and/or reporting feelings of anger/violence.
- Repeating behaviour which has previously preceded violent episodes.
- Blocking escape routes.

Safe consultations with potentially violent patients

Planning before the consultation

Physical design issues

Most EDs have specially designed facilities (eg interview room door designed to open outwards in order to allow rapid, easy exit). Regard any loose items as potential weapons (eg telephones, chairs, lamps).

Safety first

Safety comes first—ensure that patients are not allowed to harm themselves, other patients, or staff. Aim to conduct the consultation in a quiet, comfortable, and preferably non-clinical area. However, compromise privacy, rather than safety, so if there are concerns, it may be necessary to undertake the consultation in a standard cubicle. Consider having another member of staff present during the consultation. Before consulting with any potentially violent patient, ensure the following:

- Other staff know where you are and with who you are.
- You know how to get help (a 'panic button' or other personal alarm).
- Staff know to respond immediately.
- Staff know what to do if there is a problem.

Information gathering

Get as much information as possible beforehand. Useful sources include relatives, police, social services, GP, and other health professionals.

The consultation

The outcome of the consultation depends heavily upon how it is conducted:

- Ensure that your own body language does not provoke the situation.
- Remain calm and sympathetic, maintaining a reassuring and non-judgemental manner.
- Listen to any immediate complaint or grievance, with minimum interruption.
- Engage in conversation, with continuing reassurances that you are there to help.
- Adopt an attentive, but relaxed, posture.
- Speak slowly and clearly, keeping your voice low.
- Avoid excessive eye contact.
- Sit between the patient and the door. Do not directly face the patient (this may appear confrontational and provides a larger target).
- Do not turn your back on the patient, especially when leaving the room.

Documentation and debrief following any violent episode

After any episode of verbal aggression or physical violence, make detailed notes, complete local incident forms, and arrange a debrief. Report it to a senior member of staff ± the police (as appropriate). Subsequently, when dealing with the same patient, do not purposely avoid him or treat him obviously differently, as this will merely emphasize concepts of his own unacceptability and may lead to further aggression.

Managing aggression

Violent behaviour is unusual if a calm, sensible approach is followed. If violence does occur, focus upon preventing the patient from harming other patients/relatives, staff, or themselves (see https://www.nice.org.uk).

Approach to the aggressive patient

Get immediate help from police/security officers and other staff. Avoid physical confrontation. Position yourself so as not to block escape. Take note of where the alarm buttons are. Continue de-escalation techniques.

- Find out what the problem is, establish a rapport, and encourage reasoning.
- Show concern and stay attentive.
- Avoid patronizing comments. Never insult the patient or make promises or commitments that cannot be kept.
- Remember that direct body contact can be misinterpreted.
- Do not engage in prolonged eye contact.
- Bear in mind that psychotic patients have different perceptions of personal space and may feel threatened by staff coming into what would otherwise be a normal and non-threatening distance.
- Try to maintain a calm atmosphere with a non-critical, non-domineering approach.

Management of physical violence

If physical violence occurs, safety of staff, other patients, and relatives takes priority. Concern for property is secondary—it can be replaced. Even during a violent act, a calm approach with talking and listening often prevents escalation of the event and the need for physical confrontation.

Physical restraint Avoid physical intervention, if at all possible. Where physical restraint is required, use the minimum degree of force, applied for the minimum length of time (ideally <10min) in order to control the episode. Apply it in a manner that attempts to calm, rather than provoke, further aggression. This will require sufficient members of staff to control the event without injury to anyone involved.

Restrain by holding clothing, rather than limbs. If limbs have to be grasped, hold near a major joint to reduce leverage and the possibility of fracture or dislocation. Remove the patient's shoes or boots. In exceptional circumstances (eg when a patient is biting), the hair may have to be held firmly. Never apply pressure to the neck, throat, chest, back, or abdomen, and do not deliberately inflict pain. If the patient has to be placed on the floor, the supine position is preferable to the prone position.

Do not attempt restraint unless sufficient staff/expertise is available. Put one person in charge to ensure airway and breathing are not compromised and vital signs are monitored. Only ↓ restraint once it is certain that the risk has ↓—this may mean use of medication.

Weapons Ask for any weapon to be placed in a 'neutral' position, rather than handed over. Do not attempt to remove it from an aggressor.

Emergency tranquillization

Pharmacological restraint using sedative drugs is a last resort only used on the advice of senior and experienced staff. Emergency sedation carries significant dangers. Sedative drugs may mask important signs of underlying illness, eg an intracranial haematoma requiring urgent treatment. Normal protective reflexes (including airway reflexes such as gag and cough response) will be suppressed. Respiratory depression and the need for tracheal intubation and IPPV may develop. Adverse cardiovascular events (eg hypotension and arrhythmias) may be provoked, particularly in a struggling, hypoxic individual. Finally, staff need to be aware of medicolegal implications of the carrying out any restraint.

Oral tranquillization

If possible, give sedative drugs PO, rather than by injection. However, PO treatment may not be feasible in a violent and disturbed patient.

- Give *lorazepam* (1–2 mg PO) if there is no psychotic context.
- Give *lorazepam* (1–2 mg PO) + antipsychotic (eg *haloperidol* 1.5–3mg PO) if there is a psychotic context.
- Allow sufficient time for response before considering a second dose.

IM (rapid) tranquillization

If PO therapy is inappropriate (refused, failed, or not indicated), choose between IM lorazepam OR IM haloperidol + promethazine.

In most instances, IM lorazepam is the most appropriate first choice:

- Give lorazepam (2–4 mg IM) and allow sufficient time for it to work.
- Consider giving a further dose of IM lorazepam if there is a partial response, but if there is no response, consider IM haloperidol (5–10mg) + IM promethazine hydrochloride (25–50mg) instead.

Do not use IM haloperidol + promethazine if there is any history of cardiovascular disease (including long QTc) or if there is no normal ECG recorded.

Monitor the patient's vital signs closely after any IM tranquillization—record observations every 15min if the patient:

- Is asleep/sedated.
- Has taken illicit drugs or alcohol.
- Has any pre-existing physical health problem.
- Has experienced any injury from restrictive intervention.
- If the *BNF*'s maximum dose has been exceeded.

IV tranquillization

Senior staff will only consider using IV drugs (eg benzodiazepine) in truly exceptional circumstances, when immediate tranquillization is essential (see 2015 NICE Guidance 10 on 'Violence and aggression', available at: https://www.nice.org.uk/guidance/ng10).

Self-harm

The term 'deliberate self-harm' is no longer used. Psychiatric symptoms are often associated with self-harm but tend to be transient and predominantly related to social or emotional factors. Psychiatric illness is relatively uncommon (~5–8% of cases, mostly depression). ~90% of self-harm involves self-poisoning, and the remainder physical self-injury (eg cutting). Most self-harm episodes are impulsive (considered for <1hr beforehand). Associated alcohol consumption is common and may have precipitated the event. However, assess carefully—1% of self-harm patients do commit suicide within a year. It is often prudent to admit patients with self-harm to an ED observation ward, allowing alcohol to wear off until the situation can be properly assessed. Useful guidance on the treatment and management of self-harm in EDs has been published by NICE (http://www.nice.org.uk) and the Royal College of Psychiatrists (http://www.rcpsych.ac.uk).

Triage

Following an episode of physical self-harm and/or overdose, perform a rapid initial assessment (triage) to establish the degree of urgency of the situation, mental capacity, willingness to stay, distress levels, and presence of mental illness. Factors that may render the situation more urgent include:

- Need for urgent treatment for physical injury and/or overdose.
- Immediate risk of violence to others.
- Immediate risk of further self-harm.
- Need for treatment, but the patient is threatening to leave.

Australian Mental Health Triage Scale

This combined physical and mental health triage scale is recommended by NICE and can be adapted for easy use (see http://www.rcpsych.ac.uk). Some features are summarized in Table 14.1.

Table 14.1 Australian Mental Health Triage Scale

Triage category	Features
1 Extremely urgent	Violent, possessing a weapon, or further self-harm in the ED
2 Very urgent	Extremely agitated/restless, aggressive, confused/unable to co-operate, or requiring restraint
3 Urgent	Agitated/restless, bizarre behaviour, psychotic symptoms, severe depression, and/or anxiety
4 Less urgent	Symptoms of anxiety and/or depression without suicidal ideation
5 Least urgent	Compliant, co-operative, and communicative

The system in place should ensure self-harm patients are checked upon at least every hour—a change in triage category may require more urgent assessment.

Management plan

Offer all patients who present to the ED after self-harm a psychosocial assessment of the needs and risk by an appropriately trained individual. Some units continue to admit all patients with deliberate self-harm for psychiatric appraisal once medically fit, but sheer numbers can make this difficult. A selective approach distinguishes patients with underlying psychiatric pathology and/or true suicidal intent—both requiring formal psychiatric evaluation. Many centres have developed psychiatric liaison services with medical and nursing mental health specialists who can offer expert input in a timely fashion.

Assessment

Involve family/carers, whenever possible, with the patient's consent.
Focus upon:

- Events and circumstances leading up to the episode of self-harm.
- Preparation, concealment, and true intention of a self-harm act.
- Outcome of the act (eg unintended danger or accidental discovery).
- Current stresses and financial, legal, or interpersonal problems.
- Alcohol or substance misuse.
- Previous self-harm or psychiatric illness.

Decide about psychiatric referral using this information. If in doubt, refer. Also refer immediately any child or adolescent who presents with self-harm. Some EDs run a system whereby patients who are not deemed to be at immediate risk can return the following day for an appointment with a psychiatric liaison nurse/specialist for psychosocial assessment. Ensure that the patient's GP receives written communication about the patient's ED attendance and discharge.

Factors suggesting suicidal intent

- Careful preparation (eg saving tablets) and/or significant premeditation.
- Final acts (eg organizing finances, insurance, or a will).
- Performing self-harm alone, secretly, or when unlikely to be discovered.
- Not seeking help following self-harm.
- A definite, sustained wish to die.

Suicide notes can be important but are sometimes left for dramatic effect and so are not always reliable indicators.

Take all self-harm acts by individuals aged >65y seriously—consider them to be evidence of suicidal intent until proved otherwise.

Risk of further self-harm

Recurrence Is most likely if there have been repeated previous episodes (eg habitual self-cutters or recurrent overdoses).

Socio-demographic predictors Include being single or separated, aged 25–54y, and unemployed or social class V.

Other factors Include drug or alcohol dependence, a history of criminal behaviour, previous psychiatric treatment, or the presence of a personality disorder.

Assessment of suicide risk

Prevention of suicide is a primary aim in assessing patients who self-harm. Certain factors are common amongst completed suicides and are significant if found in a patient who self-harms:

- ♂.
- Elderly (particularly ♀).
- Living alone.
- Separated, divorced, or widowed.
- Unemployed or retired.
- Physical illness (eg painful, debilitating, or terminal conditions).
- Psychiatric illness (especially schizophrenia and depression).
- Alcoholism.
- Sociopathic personality disorder.
- Violent method of deliberate self-harm (eg hanging, shooting, drowning, or high fall).

Modified Sad Persons Scale

It can be difficult for clinicians without psychiatric training to assess suicide risk. The modified 'Sad Persons Scale' attempts to assist non-psychiatrists with this task. Previously, it was stated that patients with scores of <6 may be discharged (depending upon circumstances), but latest guidance advises against the use of scores to assess suicide risk (http://www.nice.org.uk). However, the scale serves as a guide regarding risk factors and as a useful prompt for areas to consider (see Table 14.2).

Table 14.2 Modified Sad Persons Scale

	Score
Sex ♂	1
Age <19 or >45y	1
Depression or hopelessness	2
Previous suicide attempts or psychiatric care	1
Excessive alcohol or drug use	1
Rational thinking loss (psychotic or organic illness)	2
Separated, widowed, or divorced	1
Organized or serious attempt	2
No social support	1
Stated future intent (determined to repeat or ambivalent)	2

Repeat self-harmers

Consider referral to local organizations to help those who self-harm repeatedly, as well as national organizations (eg Samaritans—a listening service). Specific advice for people who repeatedly self-injure includes advice and instruction on harm minimization issues, self-management of superficial injuries, and dealing with scar tissue. The risk management plan within the overall care plan will help patients face the future. NICE guidance CG133, 'Information for the public' section (available at: http://www.nice.org.uk) may be useful.

Mental health assessment issues

Patients who present with self-harm can pose difficult problems that are not often a feature of patients who do not have mental health problems. The management of some of these issues is addressed by NICE (http://www.nice.org.uk) and summarized below.

Timing of psychosocial assessment

The ideal is to offer psychosocial assessment of patients with self-harm as soon as possible. There are occasions when this assessment needs to be delayed, including the following:

- Life-saving treatment for physical injuries is needed.
- The patient is unconscious and/or significantly under influence of alcohol/drugs, and therefore not capable of being properly assessed.

Patient threatening to leave the department

Sometimes patients state that they wish to leave the department before psychosocial assessment. Very often, it is possible to persuade them to stay. Perform an assessment of the patient's mental capacity and mental illness to decide whether it is necessary to detain him/her under the Mental Capacity Act or Mental Health Act if he/she attempts to leave.

Diminished mental capacity and/or significant mental illness

If there is diminished mental capacity and/or significant mental illness, refer for urgent mental health assessment and prevent the patient from leaving the department. If the patient does manage to leave the department despite best efforts, contact the police in order to try to bring him/her back.

No reduction in mental capacity and no significant mental illness

If there is no reduction in mental capacity and no significant mental illness and the patient leaves, pass the information on to his/her GP and to the relevant mental health services as soon as possible, to enable rapid follow-up.

Physical treatments

Management of poisoning is the focus of ➲ Chapter 4. Note that it is sensible to measure paracetamol levels in any patient who presents with a history of overdose of paracetamol and/or other drugs.

Try to close superficial skin wounds <5cm long with tissue adhesive strips. Employ standard assessment and treatment for deeper skin wounds or those >5cm in length (see ➲ Wound closure, p. 415), taking into account the preferences of the patient.

Concerns about children and other dependants

Always analyse a patient's presentation following an episode of self-harm in the context of the family and social setting. In particular, consider whether the self-harm behaviour places children or other dependants at home at risk (eg patient self-harms whilst sole carer for a child). Make referrals to social services to protect children and other vulnerable persons as appropriate—this can be a tricky area, so if in doubt, discuss with a senior.

Depression

The lifetime risk of depression is ~10% for men and ~20% for women. General population prevalence is 3–6% (↑ with age). Coexisting psychiatric or physical illness can make depression difficult to diagnose. Conversely, depression may be the presenting feature of physical illness (eg hypothyroidism, Cushing's syndrome, or malignancy). ~15% of those with recurrent affective disorder eventually commit suicide. Persisting suicidal ideation or recent self-harm, even if trivial, is highly significant in the presence of a diagnosis of depression.

Background

Mood disorders are more common in relatives of depressives. Life events involving loss (partner, friend, health, job, status) can precipitate depression. Loss of a parent in childhood, unemployment, and lack of a confiding relationship with a partner ↑ vulnerability.

Presentation and symptoms

Depressed patients almost always have persistent low mood, loss of interest and enjoyment (anhedonia), and lack of energy. Mood is unaffected by circumstances. Look for common features (see Table 14.3).

Table 14.3 Common features indicating a person's mood

Common symptoms	Somatic or vegetative symptoms
↓ self-esteem and self-confidence	Sleep disturbance
↓ concentration and attention	↓ appetite
Memory disturbance (especially short-term)	Weight loss
Bleak and pessimistic views of the future	Constipation
Ideas of self-harm or suicide	Amenorrhoea
Feelings of guilt or worthlessness	Loss of interest or enjoyment

Look for self-neglect. Does the patient exhibit psychomotor retardation (slow movements and speech) or is he agitated? Is eye contact maintained? Are there deficits of short-term memory and cognition that improve with ↑ effort? Psychotic symptoms occur in very severe cases (eg hallucinations or delusions). These are mood-congruent: derogatory voices, ideas of poverty, guilt, nihilism (patient believes he has no bowel, no clothes, no life, etc.). Anxiety can be a feature of depression.

Atypical depression can involve reversal of usual somatic symptoms, leading to ↑ appetite, ↑ weight, hypersomnia, and reversed diurnal mood variation.

Treatment

Arrange psychiatric assessment for patients with *severe depression*, suicidal ideation, or psychotic features. Most respond to antidepressants, but do not start these in the ED. Some patients also require antipsychotics or electroconvulsive therapy (ECT). In cases with psychotic features or where there is a high risk of death from suicide or profound self-neglect, ECT is effective.

Mild/moderate cases may respond to psychological therapy. Counselling can help specific problems (eg bereavement or marital difficulties).

Mania

Mania and hypomania are less common than other mood disorders but more often require compulsory hospital admission. Pathologically elevated mood combines with over-activity, irrationality, poor judgement, and lack of insight (see Table 14.4 for primary and other features). This leads to severe disruption of relationships, employment, or finances. Untreated, high rates of divorce, debt, violence, or suicide occur. Onset may be acute or insidious. Manic disorders can arise spontaneously or follow depressive illness, stress, surgery, infection, or childbirth. Antidepressant medication, ECT, steroids, and amphetamines can all precipitate mania, as can lithium withdrawal.

Table 14.4 Primary and other features of mania

Primary features	Other features
Over-cheerfulness	Irritability
Over-talkativeness	Flight of ideas
Over-activity	Distractibility
	Grandiosity
	↓ requirement for sleep
	Delusions (mood-congruent)
	Hallucinations
	Impaired judgement
	Irresponsibility and impetuousness
	Gambling and promiscuity

Hypomania denotes an intermediate state without delusions, hallucinations, or complete disruption of normal activities.

Differential diagnosis

Schizophrenia can present with disorganized behaviour, violent excitement, delusions, and incomprehensible speech. The content of delusions (ie bizarre, rather than mood-congruent) will help distinguish this from mania.

Approach to the patient

Stay calm and non-confrontational. Beware infectious optimism, which can easily lead to underestimating the severity of illness or the requirement for admission. Seek additional information from relatives. Irritability can be the dominant symptom of mania and may be expressed as a savage, highly detailed catalogue of the interviewer's shortcomings. Irritable patients can become angry or violent in the face of even minor frustrations.

Treatment

Manage overt manic illness in hospital to avoid behaviour harmful to the patient or others. Insight is often ↓ or absent, so compulsory admission may be required. Liaise with the psychiatrist before commencing drug treatment, as this may adversely affect assessment. Lithium is traditional and effective, both as acute treatment and as prophylaxis. However, increasingly, other drugs (eg valproate) are now being used.

Schizophrenia

This affects all areas of personal function, including thought content and process, perception, speech, mood, motivation, and behaviour. A common pattern is acute exacerbation, with ↑ residual deficit between episodes. 30% of those who suffer a first episode never have another. Another 30% develop chronic symptoms requiring frequent admission or long-term care. The lifetime risk is 1/100.

Clinical features

No single symptom is pathognomonic—hallucinations or delusions simply confirm psychosis.

Schneider's first rank symptoms Originally suggested schizophrenia in the absence of organic disorder. It is now acknowledged that they can occur in mania and other conditions:

- *Auditory hallucinations*: ≥2 voices discussing the subject in the third person or giving a running commentary on his/her thoughts/behaviour.
- *Thought withdrawal, insertion, or broadcasting*.
- *Somatic passivity*: sensations, emotions, or actions are externally imposed or controlled.
- *Delusional perception*: a genuine perception takes on abnormal significance for the subject and is the basis of their delusional system.
- *Gedankenlautwerden*: voices repeating the subject's thoughts out loud or anticipating the subject's thoughts.

Diagnosis

Mental state examination will help to exclude organic and affective disorders, remembering:

- Non-auditory hallucinations are more common in organic conditions.
- Delusions in depression and mania are mood-congruent.

Differential diagnoses

- *Organic causes*: temporal lobe epilepsy, drug-induced states, alcoholic hallucinosis, cerebral tumour, encephalitis, head injury.
- *Psychiatric*: affective psychoses, schizo-affective disorder, psychogenic psychosis, delusional disorder (eg infestation), personality disorder.

Management

Patients not known to have schizophrenia

Refer to the psychiatric team who will advise about the need for urgent antipsychotic treatment.

Patients known to have schizophrenia

Schizophrenics frequently present to the ED with mental health issues and problems. It can be difficult to formulate a management plan unless relevant background information is available. Liaise with relevant individuals (including the community psychiatric nurse and psychiatrist) to decide whether to treat in hospital or in the community and what form any treatment should take.

Complications of psychiatric drugs

Antipsychotic drugs

Acute dystonic reactions (grimacing, facial and masseter spasm, deviated gaze, torticollis, limb rigidity, and behavioural disturbances) frequently present to the ED. They follow ingestion of antipsychotics (eg phenothiazines or haloperidol) and/or other drugs (eg metoclopramide), even in therapeutic dosages. Reactions can occur up to 1 week after ingestion. Acute dystonia can dislocate the mandible. Dystonia can be mistaken for malingering, as symptoms can be briefly interrupted by voluntary actions. Once diagnosed, *treat with* procyclidine 5–10 mg IV bolus, repeated as necessary after a few minutes.

Dramatic resolution of symptoms occurs within minutes, confirming the diagnosis. Symptoms may recur—treat with procyclidine 5mg PO every 8hr. Large doses of procyclidine cause euphoria and fixed dilated pupils, hence, its abuse by some patients. Diazepam also works but is less effective and carries risks of excessive drowsiness or respiratory depression.

Clozapine

This is an atypical antipsychotic used in treatment-resistant schizophrenia. Agranulocytosis occurs in 3% of patients. For this reason, all patients are enrolled with the Clozaril Patient Monitoring Service (telephone 0845 7698269) which supervises regular blood screening. Check FBC for neutropenia in any patient presenting with fever, sore throat, or other infection.

Monoamine oxidase inhibitors

MAOIs (eg phenelzine, tranylcypromine) irreversibly block enzymes responsible for oxidative metabolism of 5HT, noradrenaline, tyramine, and other amines. Once discontinued, enzyme inhibition continues for up to 2 weeks, during which time other drugs should not be introduced. Newer, reversible inhibitors of monoamine oxidase A (RIMAs), eg moclobemide, cease to have effects after 24–48hr. MAOIs cause postural hypotension, but acute hypertensive reactions follow ingestion of amine-rich foods (eg Bovril™, Marmite™, cheese, red wine). Noradrenaline release causes vasoconstriction, tachycardia, and hypertension that can, in severe cases, lead to intracerebral or subarachnoid haemorrhage. Similar hypertensive crises can be caused by concurrent use of levodopa, sympathomimetics, and amphetamine, or drinking certain low-alcohol beers or wines.

Lithium

Lithium toxicity presents with severe nausea, vomiting, cerebellar signs, or confusion. SSRIs (eg fluoxetine), anticonvulsants, antipsychotics, diuretics, methyldopa, and calcium channel blockers can all precipitate toxicity.

- Look for tremor, cerebellar ataxia, muscular twitching (myoclonus), spasticity, choreiform movements, upgoing plantar responses, incoordination, slurred speech, impaired concentration, drowsiness, and coma.
- Check serum lithium (plain, not lithium heparin tube!) and U&E immediately. Serum lithium levels correspond poorly with clinical signs (toxicity can occur within the therapeutic range), so toxicity is a clinical diagnosis. Stop lithium and treat according to severity of toxicity (see ➲ Lithium poisoning, p. 205).

Munchausen's syndrome

Also known as 'hospital hopper', this is characterized by recurrent admissions with factitious symptoms and signs of physical illness. Other basic components are a morbid attraction to the sick role, pathological lying, and pleasure from deceiving medical staff. The incidence is unknown, but it is probably underestimated. There may be an underlying personality disorder, but true psychiatric illness is rare. Origins are uncertain—excessive dependency, inability to form trusting relationships, attention-seeking, childhood hospitalization, and resentment of doctors for previous treatment have all been suggested.

Presentation

Common presentations involve detailed and convincing descriptions of cardiac chest pain, abdominal pain (especially pancreatitis), haematemesis, haemoptysis, rectal bleeding, haematuria, or pyrexia. More rarely, patients present with artefactual dermatitis or with a dramatic history of trauma (eg fall or pedestrian knockdown). Distinguish Munchausen's syndrome from:

- *Malingering*: fabricating illness for definite gain (eg stealing drugs, avoiding court appearance, faking symptoms to obtain opioids).
- *Somatoform disorders*: physical symptoms or signs without organic cause, but not under voluntary control.
- *Fabricated and induced illness*: see Fabricated or induced illness, p. 760.

Suspicious features

- Incomplete or inconsistent disclosure of personal details and past history.
- Patient a long way from home area for unclear reasons.
- Recent dramatic history of surgery, MI, or complications elsewhere.
- Excellent knowledge of finer details of past treatment and/or complications.
- *Multiple scars*: laparotomies, sternotomy, venous cutdowns.
- Elaborate history of allergy (eg allergic to all painkillers, except pethidine).
- Unconvincing claims of medical or paramedical occupation.
- Unusual/demanding behaviour and/or avoidance of eye contact.
- No ascertainable organic cause for the symptoms.

Management

Early recognition is important, but first exclude genuine illness. Consider admission to make the diagnosis, even though this achieves the patient's aim. If suspicions are aroused, discreetly check past history. Once discovered, most patients self-discharge, often noisily, but rarely violently.

Avoid a 'showdown'. Simply state that deception is at an end and that no retribution is planned, and offer to help the patient with their problem.

Do not use placebos to uncover fabricated illness—they can work equally well on genuine symptoms!

Once discovered, record events carefully, particularly the medical history given, background details, appearance, and scars. Circulate details to other EDs.

Factitious disorder in health care workers

The Clothier report (Department of Health, 1994) advised that patients with severe personality disorder (by inference, factitious disorder) should be prevented from working in health-related disciplines. Detection of factitious disorder in health care workers has serious implications. If suspected, discuss immediately with the ED consultant.

Medically unexplained symptoms

Background

A significant proportion of patients who attend the ED have symptoms for which no cause is found. Some of these patients manage to build up a significant volume (or volumes!) of medical records.

Terminology

There is a potentially confusing range of terms in use.

Somatization

Physical symptoms with presumed psychological origin.

Somatoform pain disorder

Persistent, severe unexplained pain, which is attributed to psychological disorders.

Conversion (dissociative) disorders

Loss or disturbance of normal motor or sensory function, which is attributed to a psychological origin (thoughts/memories to the conscious mind are 'converted' into physical symptoms, eg amnesia).

Factitious symptoms

Symptoms which are intentionally produced, with the aim of receiving a medical diagnosis—when there is secondary gain (eg legal compensation, obtaining opioid drugs), it is known as *malingering*.

Medically unexplained symptoms

This is an umbrella term, which makes no assumptions about the cause of the symptoms.

Differential diagnosis

Patients who present acutely with medically unexplained symptoms may be suffering from a range of problems, including: anxiety, depression, psychosis, 'functional somatic illness', conversion disorders, factitious disorders, malingering, and uncommon medical syndromes that have not yet been diagnosed.

Approach to patients with medically unexplained symptoms

The Royal College of Psychiatrists (℔ http://www.rcpsych.ac.uk) has published some useful recommendations. Consider the following:

- Try to obtain past medical and psychiatric records/summaries (computerized records may assist in this process) and/or speak to the GP. Helpfully, frequent attenders with medically unexplained symptoms sometimes have a care plan which can guide management when they attend the ED.
- If the patient's medical complaints are known to be unexplained (or part of a psychiatric illness), then further investigations may be inappropriate.
- Investigate judiciously—do not underestimate the ability to cause iatrogenic harm.

Alcohol abuse

Alcohol-related problems account for up to 15% of ED workload in the UK. Alcoholics have ↑ rates of heart disease, malignancy, and stroke but often succumb to injuries. Excessive alcohol consumption is a feature of 30% of road traffic fatalities, 25% of fatal work injuries, 30% of drownings, and 50% of burn deaths. Alcohol is involved in ~30% of suicides, ~60% of homicides, and most assaults. Suspicion is the key to detecting alcohol problems.

Units

The number of 'units' (10mL of pure alcohol) is included on packaging. A bottle of wine contains ~10U, and a bottle of spirits ~30U. Current advice is a 'safe' limit of 14U/week (♂ and ♀).

Alcohol absorption, metabolism, and elimination

Alcohol is absorbed from the small intestine and, to a lesser extent, the stomach. The rate of absorption depends on the nature of the drink and any associated food consumed. Alcohol is absorbed more slowly from dilute drinks (eg wine), compared with more concentrated fortified sherry or port. Alcohol is water-soluble, so distributes throughout the body. It is mostly metabolized in the liver by an enzymatic process involving alcohol dehydrogenase, which converts it to acetaldehyde and then acetic acid. A relatively small amount of alcohol is excreted unchanged in the urine (and, to a lesser extent, in breath and sweat).

Clearance of alcohol The rate of clearance of alcohol from blood varies enormously between individuals, with typical quoted values of 10–20mg/dL/hr in most adults, although higher values occur in some chronic alcoholics.

Assessing alcohol problems

A history of alcohol consumption is notoriously unreliable when taken from heavy drinkers and chronic alcoholics, who may significantly under-report the extent of their drinking and its effect upon their lives. The actual amount of alcohol consumed is less important than the consequences of drinking to the patient. Cover the following areas:

Biological GI upset/bleeding, withdrawal fits, blackouts, peripheral neuropathy.

Psychological Low mood, hallucinations, delusions, memory problems.

Social Marital, work, driving, debt, criminality.

Significant features include compulsion to drink and loss of control.

The CAGE questionnaire

- Have you ever felt you should *Cut down* your drinking?
- Have people *Annoyed you* by criticizing your drinking?
- Have you ever felt *Guilty* about your drinking?
- Have you ever had a drink first thing in the morning to steady your nerves or to get rid of a hangover (*Eye opener*)?

Any single +ve answer is significant, and >1 +ve answer is probably diagnostic of chronic alcohol dependence.

Acute alcohol intoxication

Effects of intoxication

Alcohol depresses the nervous system—initial euphoric effects are due to suppression of inhibition by the cerebral cortex. Effects vary between individuals and Table 14.5 is a very rough guide. Behaviour, including propensity to violence, is influenced by the environment and social setting. Although death may occur at levels of >350mg/100mL, the risk of a harmful or fatal event ↑ at any level—especially road traffic collisions, work, and home injuries and assaults (including sexual assault). The current UK blood alcohol legal limit for driving is 80mg/mL.

Table 14.5 Effects of various concentrations of alcohol

Blood alcohol concentration (mg/100mL = mg/dL)	Effects
30–50	Measurable impairment of motor skills
50–100	Reduced inhibitions, 'excitant effect'
100–150	Loss of co-ordination and control
150–200	'Drunkenness', nausea, ataxia
200–350	Vomiting, stupor, possible coma
350+	Respiratory paralysis, possible death

Alcohol intoxication is characterized by slurred speech, inco-ordination, unsteady gait, nystagmus, lethargy, and facial flushing. The differential diagnosis is extensive: head injury, hypoglycaemia, post-ictal confusional states, hepatic encephalopathy, meningitis, encephalitis, or intoxication with other drugs. In most patients, these conditions can be excluded by examination and simple investigations (although some not infrequently coexist with acute alcohol intoxication—especially head injury and hypoglycaemia).

Management

Aim to discharge conscious, ambulant patients who exhibit uncomplicated acute alcohol intoxication if accompanied by a responsible adult.

Violent patients Who appear intoxicated require examination prior to escort from the ED by the police. As a minimum, perform a brief neurological examination, simple observations, and BMG.

Comatose patients Are a medical emergency. Protect the airway and anticipate vomiting (recovery position may be useful). Exclude hypoglycaemia and other metabolic causes of coma. Exclude head or neck injury, and adopt a low threshold for CT. Observe closely.

Alcohol-induced hypoglycaemia Particularly affects chronic alcoholics and children. It also occurs in binge drinkers who present with alcoholic ketoacidosis. Hypoglycaemia can occur during intoxication and up to 24hr after. In children, fits may result.

Coagulation disorders Often occur in alcoholics with liver damage. They often have ↓ platelets (direct effect of alcohol on bone marrow). Consider this in patients presenting with GI haemorrhage or head injury.

Alcohol withdrawal

'Simple' alcohol withdrawal

Uncomplicated alcohol withdrawal is common, usually starting within 12hr of stopping (or reducing) alcohol intake. Withdrawal symptoms often start before alcohol is completely cleared from blood. Features include anxiety, restlessness, tremor, insomnia, sweating, tachycardia, and ataxia. Simple withdrawal can be managed on an outpatient or day-patient basis. Consider commencing treatment in the ED for uncomplicated withdrawal (eg diazepam 5–10mg PO or chlordiazepoxide 10–30mg), but leave decisions about continuing treatment to inpatient teams. Inpatient detoxification is indicated for those with a history of withdrawal seizures, delirium tremens, or withdrawal symptoms who are being admitted for other problems. The revised Clinical Institute Withdrawal Assessment for Alcohol (CIWA-Ar) Score assesses ten clinical signs of withdrawal and may help to guide treatment (🔗 https://www.agingincanada.ca/CIWA.HTM). *Note*: alcoholics admitted with 'simple' withdrawal may be thiamine-deficient, so use this as an opportunity to give parenteral and/or PO thiamine.

Delirium tremens

Occurs in a small minority of alcoholics who undergo withdrawal but carries significant mortality. Typically starts >48hr after stopping drinking. As well as 'simple' withdrawal, there may be significant autonomic hyperactivity, with tachycardia, hyper-reflexia, hypertension, fever, visual or tactile hallucinations, sinister delusions, disorientation, and confusion. Deaths occur from arrhythmias (secondary to acidosis, electrolyte disturbance, or alcohol-related cardiomyopathy), infection, fits, or cardiovascular collapse. Monitor closely, check BMG, offer oral lorazepam, and refer to the medical team/HDU. If oral lorazepam is declined and/or symptoms persist or worsen (especially fits), give IV lorazepam and involve ICU. Experts may use haloperidol or olanzapine (see 🔗 http://www.nice.org.uk).

Alcohol withdrawal seizures

Typically self-limiting grand mal fits, occurring hours or days after the last alcoholic drink. Check BMG and treat ongoing fits with IV lorazepam (see ➲ Seizures and status epilepticus, pp. 156–7)—phenytoin is not usually indicated. Examine for possible head injury. In patients who have recovered from a short-lived fit, consider oral lorazepam to prevent further fits.

Alcoholic ketoacidosis

Can occur when an alcoholic stops drinking, vomits repeatedly, and does not eat. Ketoacidosis develops from fatty acid breakdown, complicated by dehydration from vomiting. The patient usually presents 1–2 days after the last binge with vomiting, signs of chronic alcohol abuse, and a high anion gap metabolic acidosis. ABG may reveal ↓ pCO_2, ↓ HCO_3^-, and normal pO_2. pH is variable because metabolic acidosis may be altered by metabolic alkalosis from vomiting and possibly respiratory alkalosis. Plasma ethanol is low or absent. Give IV 0.9% saline with 5% glucose and thiamine supplementation, whilst monitoring U&E, glucose. Refer to the medical team and consider HDU/ICU.

Alcohol-related brain injury

Wernicke–Korsakoff syndrome develops in problem drinkers who are thiamine-deficient. Autopsy analysis suggests that the syndrome may occur in as many as 12.5% of chronic alcohol misusers. Make a presumptive diagnosis of Wernicke–Korsakoff syndrome in patients with a history of alcohol misuse and one or more of the following unexplained symptoms: ataxia, ophthalmoplegia, nystagmus, confusion, memory disturbance, reduced conscious level, hypotension, and/or hypothermia.

Wernicke's encephalopathy

This is characterized by degenerative changes around the third ventricle and aqueduct, particularly the mammillary bodies. It presents with an acute confusional state, nystagmus, ophthalmoplegia, ataxia, and polyneuropathy. Ataxia typically affects the trunk and lower extremities. Clinical abnormalities may develop acutely or evolve over several days.

Initially treat with parenteral thiamine (eg Pabrinex® 2–3 pairs tds—10mL as an IVI in 100mL of 0.9% saline over 30min). This may occasionally cause anaphylaxis, so ensure resuscitation facilities are available. Refer to the medical team for continuing IV thiamine, unless Wernicke's is excluded.

Korsakoff's psychosis

This is an amnesic state with profound retrograde and anterograde amnesia, but relative preservation of other intellectual abilities. It typically develops after Wernicke's encephalopathy, but some patients develop a combined syndrome from the outset with memory loss, eye signs, and unsteadiness, but without confusion. Treat with parenteral thiamine and admission, as for Wernicke's encephalopathy.

Help for alcoholics

The relatively regular contact between those with alcohol problems and EDs may be viewed as an opportunity to offer intervention. There is good evidence to suggest that brief interventions may reduce alcohol consumption and the risk of physical harm. Consider the 1min Paddington Alcohol Test to help patients who present with alcohol-related problems (see http://www.rcem.ac.uk). Warn alcoholics about the risks of a sudden very dramatic reduction in alcohol intake.

The following organizations may help patients and relatives:

- Alcoholics Anonymous (see http://www.alcoholics-anonymous.org.uk), plus local networks and telephone numbers.
- Al-Anon for relatives (tel: 0800 0086 811) (see http://www.al-anonuk.org.uk).

Medically assisted alcohol withdrawal

Aim to offer admission for medically assisted withdrawal to those in acute alcohol withdrawal who are <16y, vulnerable (frail, multiple comorbidities, learning difficulties, lacking social support), or at high risk of developing withdrawal fits or delirium tremens (see http://www.nice.org.uk).

Drug and substance abuse

Drug users present to the ED at times of crisis (eg acute intoxication, overdose, withdrawal, or other medical complications of drug use). Do not assume all drug users present to the ED simply to obtain drugs. Find out about local addiction services and how referrals are made. Direct those seeking help with a drug problem to the appropriate services. Know the local preferred drugs of abuse and the preferred methods of taking them. Find out what terminology is used locally for each substance.

Do not supply drugs of dependence to users. Prescriptions are carefully controlled by addiction services and pharmacists. Elaborate tales of lost or stolen drugs/prescriptions are invariably false.

Manage painful conditions in drug users as for other patients. Do not withhold analgesia if in obvious pain. For minor complaints, simple analgesia is as effective as in non-drug users. Do not dismiss symptoms simply because the patient is a drug user. Even drug users get acute appendicitis and other common acute illnesses.

Intoxication

As with alcohol, mild cases require little intervention. Observation by a responsible adult or briefly on a ward usually suffices. Discharge patients when ambulant and fully orientated, having excluded serious problems.

Glue and solvents Users may smell of substances or have them on their clothes or skin. There may be a perioral rash. Intoxication produces euphoria, agitation or drowsiness, slurred speech, and unsteady gait.

Benzodiazepines and CNS depressants Mild intoxication is similar to that with alcohol. ↑ intoxication produces nystagmus, diplopia, strabismus, hypotonia, clumsiness, and moderately dilated pupils.

Amphetamines, ecstasy, cocaine, and mephedrone Produce hyperstimulation, restlessness, pyrexia, and sympathomimetic effects. Cocaine effects occur more rapidly. Severe cases exhibit paranoia, violent behaviour, or seizures. Cocaine may also cause chest pain, arrhythmias, or even MI. Ecstasy can cause an idiosyncratic reaction similar to malignant hyperthermia (see ➲ Recreational drugs, pp. 222–3).

Overdose

Protect the airway, provide O_2 as required, and exclude hypoglycaemia or serious injury in all cases.

Opioid overdose Is often inadvertent, either from use of unusually pure drugs or after a period of abstinence (tolerance is ↓). Characteristic signs are coma with pinpoint pupils and respiratory depression (see ➲ Opioid poisoning, p. 196). Pulmonary oedema, hypothermia, and rhabdomyolysis can occur. Hypoxia may cause dilated pupils. If opioid overdose is suspected, give naloxone 0.4–0.8mg IV, repeated according to response (for further detail regarding treatment, see ➲ Antidotes for poisons, pp. 194–5). Remember to ensure that the patient is observed for at least 6hr after the last dose of naloxone.

Intentional overdose Requires assessment of suicide risk (see ➲ Assessment of suicide risk, p. 630) and mental capacity in case the patient threatens to leave against advice.

Skin complications

SC drug injection ('skin popping') can cause cellulitis, abscesses, extensive skin necrosis, necrotizing fasciitis, tetanus, botulism, and anthrax. Refer for formal exploration, drainage, and follow-up by the surgical team for all but the most minor infections. Apparently 'simple' abscesses may extend deeply into muscle or form part of a false aneurysm! Needle fragments rarely require removal unless they embolize (eg to the lungs).

Anthrax in drug users After an outbreak of anthrax in heroin users in Scotland in 2010, Health Protection Scotland (http://www.hps.scot.nhs.uk) advised doctors to suspect anthrax in a drug user presenting with any of the following:

- Severe soft tissue infection and/or signs of severe sepsis/meningitis.
- Clinical features of inhalational anthrax (see Anthrax, p. 243).
- Respiratory symptoms + features of meningitis or intracranial bleeding.
- GI symptoms (eg pain, bleeding, nausea, vomiting, diarrhoea, ascites).

Approach Get expert help early to advise on management (ICU, surgeons, microbiology, public health, hospital infection team). Start IV antibiotics according to advice (eg combination of ciprofloxacin, clindamycin + penicillin, or if there is soft tissue infection: ciprofloxacin, clindamycin, penicillin, flucloxacillin + metronidazole). Experts will advise on whether to use anthrax immune globulin IV (human) antitoxin.

Vascular complications

IV injection ('mainlining') of drugs causes phlebitis, DVT, and bacterial endocarditis. Chronic injectors may resort to neck or groin vessels (the femoral artery being commonly damaged). Arterial injection can cause false aneurysms, fistulae, or peripheral emboli. Occasionally, IV drug users present with massive and devastating blood loss from an injection site (particularly the groin)—apply firm pressure, resuscitate with IV fluids ± blood, and call for the surgical team.

Inadvertent arterial injection of poorly soluble preparations causes severe limb pain, skin pallor, and mottling with paraesthesiae in the presence of palpable (often bounding) peripheral pulses. Diffuse soft tissue damage may result in compartment syndromes, rhabdomyolysis, renal failure, and irreversible limb damage necessitating amputation.

Orthopaedic complications

Injecting drug users who present with acutely painful joints (especially hip joints) may have septic arthritis. Clinical and radiological evidence may be minimal, so adopt a high index of suspicion. Provide analgesia, take blood cultures and FBC, and admit for joint aspiration and IV antibiotics.

Drug withdrawal states

Sometimes drug users present with overt evidence of drug (± alcohol) withdrawal. It can be difficult to judge if the problem is drug intoxication, drug-related (eg stimulant-induced psychosis, withdrawal), or coexisting disease. Observe and monitor closely—treat symptomatically (eg with small doses of oral benzodiazepines), and refer to the medical team.

Compulsory hospitalization

Compulsory detention of patients in the UK requires the patient to be *both*:

- Suffering from a mental disorder (mental illness or handicap).
- Requiring emergency hospital admission to protect the health or safety of the patient or for the protection of others.

Emergency detention under mental health legislation does not allow treatment for psychiatric illness. Emergency treatment of psychiatric or physical illness is carried out under *common law*. In this situation, there must be an immediate threat to life or serious danger to the patient or others if treatment is not given. For this reason, mental health legislation cannot be used to impose emergency treatment without patient consent. Note that ED patients are not legally inpatients until they go to a ward.

Detention of psychiatric emergencies in the ED

England and Wales

Section 2 is used most commonly in the ED. It requires recommendations from two doctors to be accepted by an approved social worker and allows detention for up to 28 days for assessment and treatment.

Scotland

The Mental Health (Care and Treatment) (Scotland) Act 2003 came into effect in 2005 (see http://www.mwcscot.org.uk). Part 5 of the Act enables a fully registered medical practitioner to grant an *emergency detention certificate* that authorizes managers of a hospital to detain someone for 72hr. Before granting an emergency detention certificate, the doctor needs to consult and gain consent of a mental health officer, unless impracticable. The patient is then examined by a psychiatrist, who, if not satisfied that relevant criteria are met, cancels the certificate.

Northern Ireland

Mental Health (Northern Ireland) Order 1986, Part II, Article 4—admission for assessment of mental disorder.

- Requires two or three doctors, including the responsible medical officer (RMO)—in charge of the patient's treatment.
- Application by the nearest relative or an approved social worker.
- Lasts 7 days, renewable up to 14 days.
- Lasts until discharge by the RMO board or nearest relative or until detained under Article 12.

Section 136 (England)

This allows a police officer to detain someone in a public place when he/she appears to be mentally disordered and is causing disturbance. The police officer's responsibility is to take the detained person to a 'place of safety' (usually a police station or a psychiatric ward) where he/she is assessed by a psychiatrist and an approved social worker.

The *Mental Health Act (Scotland) 2003* provides police officers in Scotland with similar powers—a police constable may remove a person to a place of safety from a public place if a mental disorder is suspected and it is also suspected that the person needs immediate care and treatment.

Mental Capacity Act

The Mental Capacity Act (MCA) 2005 offers a comprehensive framework for decision-making on behalf of adults aged >16y lacking capacity to make decisions on their own behalf. It only applies in England and Wales.

Defining capacity

A person lacks capacity if, when a decision needs to be made, they are unable to make or communicate the decision because of an 'impairment or disturbance of the mind or brain'. There is a 2-stage test of capacity:

- Is there an impairment of, or disturbance in the functioning of, the person's mind or brain? If so,
- Is the impairment or disturbance sufficient that the person lacks the capacity to make that particular decision?

Five statutory principles

- Capacity must be assumed unless it is established to be lacking.
- A person is not being treated as unable to make a decision unless all practicable steps to help him do so have been taken without success.
- A person should not be treated as unable to make a decision merely because he makes an unwise decision.
- A decision made, or an action performed, for or on behalf of a person who lacks capacity must be taken in his/her best interests.
- Before a decision is made or an action performed, consideration must be given to whether the purpose for which it is needed can be as effectively achieved in a way that is less restrictive of the person's rights and freedom of action.

Assessment of capacity

A person lacks capacity if he/she fails:

- To understand the information relevant to the decision.
- To retain the information relevant to the decision.
- To use or weigh the information.
- To communicate the decision (by any means).

Admission and treatment

Patients can be admitted and treated under the MCA 2005 only if six qualifying safeguards are met:

- The person is at least 16y old.
- The person has a mental disorder.
- The person lacks capacity to decide whether to be in hospital or a care home for the proposed treatment or care.
- The proposed deprivation of liberty is in the person's best interests and it is necessary and a proportionate response to the risk of harm.
- The person is not subject, or potentially subject, to specified provisions of the Mental Health Act in a way that makes them ineligible.
- There is no advance decision or decision of an attorney or deputy which makes the proposed deprivation of liberty impossible.

In other circumstances, consider using the Mental Health Act 1983 to admit a mentally disordered patient who lacks capacity to consent.

Chapter 15

Paediatric emergencies

Paediatric problems also covered elsewhere in this book

The paediatric environment

Caring for children

Children are not little adults. They differ from adults anatomically, physiologically, emotionally, and in the spectrum of pathological conditions to which they are susceptible. It is natural for those hospital staff who have not previously dealt with children to be slightly apprehensive about treating them, particularly when they are distressed or seriously unwell. Be guided by more experienced staff, who are often adept at dealing with children as patients (and very often as parents as well). Such staff are particularly good at recognizing children who are seriously unwell—listen carefully to what they have to say. There is no substitute for experience, but practical courses aimed at managing emergencies in children (eg Advanced Paediatric Life Support (APLS)) are highly recommended. These courses deservedly devote much time to the recognition of seriously ill or injured children, according to whether or not they are physiologically deranged. Consider each child according to expected 'normal' physiological values (see Table 15.1).

Children do not always respond in the same way to illness as adults. They are particularly likely to be frightened of doctors, nurses, and hospitals. Do not waste the opportunity to make important observations (RR, pattern and effort, behaviour, conscious level, colour, and parental interaction). Spend time talking to children to reassure them and win their confidence before starting any examination or performing any procedure (unless, of course, they require emergency resuscitation). Lowering yourself to their physical level will make you less intimidating. Involve the parents from the start (see ➲ Interacting with parents, p. 648). Where appropriate, allow children to relax and play with toys. Play therapists can be particularly helpful by providing distraction during procedures.

Interacting with parents

Parents are patients too. They are likely to be understandably upset and worried. Take time to explain to the parents exactly what is happening to their children at all stages. Obtain appropriate consent, but do not delay life-saving measures. For the sake of both parents and children, try to allow parents to remain with their children as much as possible. This is especially important during resuscitation—allocate an experienced member of nursing staff to look after and explain to parents what is happening. If the presence of the parents is impeding the progress of the resuscitation, consider gently asking them to step outside.

Analgesia

Make an assessment of the extent of pain (see ➲ Assessment of pain in children, p. 282). Physiological differences between adults and children do not diminish the need to provide adequate analgesia for children. Reassurance is often an important component, but be honest and do not be tempted to tell to a child that a painful procedure (eg emergency insertion of an IV cannula) will not produce any pain or discomfort—this will simply cause the child to lose confidence in the ED team.

Weight estimation

Try to weigh children who need treatment. This is important as most drug doses are based on weight. However, it is not always possible to weigh a sick child. In an emergency, use a chart, Broselow tape, or one of the formulae for estimating children's weight.

A baby typically weighs around 3.5kg at birth, becoming 4.5kg at 1 month, and 7.5kg by 6 months.

The following formula estimates a child's weight, based upon age (between 1 and 10y):

$$\text{Weight in kg} = (\text{age in years} + 4) \times 2$$

So a 6y old child will weigh:

$$(6 + 4) \times 2 = 20\text{kg}$$

This formula often underestimates the weight of many children in the UK or other developed countries, but it may overestimate the weight of children from other regions. A formula using mid-arm circumference (MAC) has been developed in Asia and is:

$$\text{Weight in kg} = (\text{mid-arm circumference in cm} - 10) \times 3$$

So a child with a 15cm MAC will weigh: $(15 - 10) \times 3 = 15$kg.

Drug doses

Do not estimate 'rough doses' of drugs for children based on knowledge of adult doses. Instead, use the weight and age of a child, together with a reference source [eg *BNF for Children* (*BNFC*), which is available at: https://bnfc.nice.org.uk] to determine the appropriate dose.

Preparation for resuscitation

Find out where the paediatric resuscitation equipment is kept and how it works. Learn the paediatric resuscitation guidelines and practise BLS and other procedures on manikins. Knowledge of normal (expected) physiology at various ages helps to evaluate sick children in the ED.

Table 15.1 Normal (expected) physiological values at different ages*

Age (y)	RR	Heart rate	Systolic BP (mmHg)
<1	30–40	110–160	70–90
1–2	25–35	100–150	80–95
2–5	25–30	95–140	80–100
5–12	20–25	80–120	90–110
>12	15–20	60–100	100–120

Expected systolic BP = 80 + (age in years × 2) mmHg.

* Adapted from APLS.

Primary assessment and resuscitation

Preparation

Caring for a sick child is a daunting task. Get experienced help early—call for senior ED, paediatric, and ICU/paediatric intensive care unit (PICU) help if you are alerted that a sick or injured child is being brought to the ED. Many hospitals run team response systems (eg 'PERT'—Paediatric Emergency Response Team).

A pre-alert from the ambulance service provides time to prepare, including allocating roles and working out in advance the likely doses of drugs and amounts of fluid that will be required. If the child's details are available, it may also be possible to obtain background information, most particularly past medical history and allergies, which is very useful when children with complex problems present.

ABCDE approach

Perform a rapid primary assessment of airway, breathing, circulation, disability, and exposure to quickly identify and treat life-threatening problems as they are found. This will help to maintain vital functions before disease-specific therapies are started. Early recognition and treatment of these problems will help to avoid cardiorespiratory arrest with its poor outcome.

Airway

Assess Patency by looking, feeling, and listening.

Resuscitate If there is no air movement, perform chin lift or jaw thrust. If there is still no evidence of air movement, give rescue breaths using an appropriately sized bag–valve–mask device. If the child is breathing, listen for stridor (implies airway obstruction), and look for recession.

Breathing

Assess the effort of breathing By measuring the RR, looking for intercostal recession and accessory muscle use, and listen for gasping, stridor, wheeze, and grunting. Note that a child's RR can vary according to a number of factors (eg being upset or distressed), so interpret a single value cautiously—instead, look for the trend.

Assess the efficacy of breathing By looking for chest expansion, auscultation of the chest, and measuring SpO_2. A 'silent chest' is a very worrying sign.

Assess the effects of respiratory failure By assessing mental status, measuring the heart rate (↑ with hypoxia, but bradycardia is a pre-terminal sign), and examining skin colour (hypoxia causes pallor, and cyanosis is a late sign). Reduced breathing effort and gasping may indicate exhaustion (a pre-terminal sign), cerebral depression, or neuromuscular disease.

Resuscitate Give high-flow O_2 to any child with respiratory difficulty or hypoxia. If respiration is inadequate, support with basic airway care and bag–valve–mask ventilation and get senior ED/ICU/PICU help to provide a definitive airway (tracheal intubation and IPPV).

Circulation

Assess Heart rate (bradycardia is a late sign of cardiovascular failure), pulse volume, capillary refill, BP, and skin T°. Remember that BP is usually maintained until shock is advanced, so hypotension is a pre-terminal sign. Look for the effects of circulatory failure: tachypnoea, mottled cold skin, poor urine output (defined as <2mL/kg/hr in infants or <1mL/kg/hr in children aged >1y), agitation, and drowsiness.

Be alert for signs which might suggest a cardiac cause for the shock: cyanosis despite O_2, ↑ JVP, heart murmurs, and enlarged liver.

Resuscitate Give high-flow O_2 to all shocked patients. Gain IV/IO access; take blood samples, and give 20mL/kg of crystalloid. Reassess and repeat if necessary.

Disability

Any problem with 'ABC' can affect 'D'.

Assess Conscious level. Initially, categorize according to AVPU scale:

A—Alert

V—responds to Voice

P—responds to Pain

U—Unresponsive

Check pupil size, reaction, and equality.

Assess GCS (or children's equivalent—see ➔ Assessing injuries in children, pp. 736–7) and posture (floppy, decerebrate, decorticate, etc.). Check BMG.

Resuscitate A child who does not respond to voice has an urgent need to have the airway secured. Treat hypoglycaemia and fits, and get senior help urgently.

Exposure

Check T°. Expose to look for rashes (eg meningococcal disease, anaphylaxis) and for bruising/injuries.

Reassessment

- After initial evaluation and intervention, follow this up with a more detailed approach to identify specific problems.
- Reassess ABCDE frequently to assess progress and detect deterioration.
- Undertake a secondary assessment by obtaining a full history (from the parents, paramedics, teachers, and witnesses) and undertaking a detailed physical examination.

Standard immunization schedule

The UK Department of Health actively encourages immunization for children according to the standard schedule shown in Table 15.2 (see also https://www.gov.uk or *BNFC*). The recommended timing of the early immunizations is a compromise between trying to protect children whilst they are at most risk and delaying it until immunization is likely to be most effective. Children who have completed a course of immunization against a particular disease are obviously less likely to present with that disease.

Unfortunately, a significant proportion of children are still not receiving standard vaccines. Carefully enquire exactly which immunizations the child has received (information is often available from the child's GP or health visitor). Failure to follow the recommended schedule may result in the child presenting with an otherwise unusual disease.

Table 15.2 Standard childhood vaccines

Age	Vaccine
2 months	Diphtheria, tetanus, pertussis, polio, Hib, meningococcal group B, rotavirus, hepatitis B
3 months	Diphtheria, tetanus, pertussis, polio, Hib, rotavirus, hepatitis B, pneumococcal
4 months	Diphtheria, tetanus, pertussis, polio, Hib, meningococcal group B, hepatitis B
12–13 months	Measles, mumps, rubella, (MMR), pneumococcal, Hib, meningococcal groups B and C
2–8y	Influenza
3–5y	Diphtheria, tetanus, pertussis, polio, MMR
11–14y	HPV (two doses 6–24 months apart)
13–15y	Meningococcal groups A with C and W135 and Y vaccine
13–18y	Tetanus, diphtheria, polio

Reactions to immunizations

Vaccination is frequently wrongly blamed for symptoms caused by an incidental viral illness. However, mild reactions, such as swelling and erythema at the injection site, are relatively common following administration of a variety of immunizations. These respond to symptomatic treatment and an expectant approach. Severe anaphylactic reactions involving airway obstruction or circulatory collapse are uncommon but require prompt and aggressive treatment (see Anaphylaxis, pp. 44–5).

Immunization in other countries

If a child who normally lives outside the UK attends the ED, enquire carefully about their vaccination history. Likewise, if you are working outside the UK, make sure you know the local immunization schedule as this can have a significant impact on the type of communicable disease seen, particularly in children.

Immunization in the ED

If a child attending the ED has not been immunized against diphtheria, tetanus, and pertussis and needs tetanus immunization, give the 'triple vaccine' (DPT) to avoid repeated injections. Inform the GP about any immunizations given.

Expected child development

It is useful to know the standard paediatric milestones (see Table 15.3) in order to judge whether or not child development is at the expected level.

Table 15.3 Paediatric milestones* (after allowance for preterm delivery)

2 months	Eyes follow movement. Smiles and makes noises when talked to
3 months	Holds object placed in hand
3–4 months	Turns head to sound
6 months	Sits on floor with hands forwards for support Transfers object from one hand to the other
9–10 months	Crawls
12 months	Walks with one hand held; says two or three words with meaning
13 months	Walks unaided
18 months	Makes tower of two or three bricks
21–24 months	Joins two or three words together to make sentence
2y	Can build a tower of six or seven bricks
2½y	Knows full name and gender; can stand on tiptoes

* See: Illingworth RS. *The Normal Child*, tenth edn. Churchill Livingstone, Edinburgh, 1991.

Venous access and venepuncture

Venepuncture

Needles frighten children. Topical anaesthetic cream (eg tetracaine—see Topical anaesthesia, p. 298) is useful whenever the need for blood sampling is not urgent. 4% tetracaine (Ametop®, amethocaine) anaesthetizes the skin and ↓ pain but should be applied for 30min before venepuncture and for 45min before cannulation. Identify prominent veins at two separate sites, apply cream and cover with an adhesive film dressing, then let the child play.

As in adults, if an IV cannula is inserted, it should be possible to obtain samples of blood via this—even if aspiration fails, blood will often drip out. The amount of blood sampled depends upon the size of the child and laboratory requirements, remembering that total blood volume is only 80mL/kg. Check requirements and obtain the appropriate bottles before attempting venepuncture.

Neonates FBC and U&E can be performed on capillary samples obtained from heel pricks. Ask an assistant to hold the foot and ankle firmly to encourage venous engorgement, then smear white soft paraffin on the heel and prick it with a lancet. Collect drops of blood into prepared capillary sample tubes.

Toddlers and infants Aspirate via a 23G butterfly needle in the hand or forearm. This allows the needle to stay in the vein, despite the child moving. Samples of 1mL are usually required.

Older children Use a 21G butterfly needle.

IV cannulae

The route chosen to obtain venous access will depend upon the available veins and urgency of the problem. First attempt to insert an IV cannula percutaneously into an upper limb vein. Once inserted, flush the cannula, then secure it with adhesive tape, a splint, and bandage. In general, the following sizes of cannulae are appropriate:

- *24G (orange/yellow)*: neonates and infants.
- *22G (blue)*: toddlers and small children.
- *20G (pink) or 18G (green)*: older children.

Smaller cannulae are designed so the needle does not protrude much beyond the end of the cannula. This means that once a 'flashback' is obtained, the tip of the cannula may already be within the vein—advancing the needle further may puncture the other side of the vein and exit it. If attempts to insert a cannula into the hand or arm fail, it may be possible to use veins in the feet, ankle, or the scalp (useful in neonates, but first ensure that the intended target is not the superficial temporal artery). In an emergency, allow a maximum of 90s, and if still unsuccessful, then gain *IO access* (see Intra-osseous infusion, pp. 656–7), which is quick, easy, and reliable. Other venous access routes (eg central, femoral) require specialist training, are time-consuming, and are associated with significant complications (see Other routes of venous access, p. 655). Give fluids by infusion pump or paediatric infusion set to avoid over-transfusion.

Other routes of venous access

Femoral lines

The femoral vein lies medial to the artery in the groin. It allows rapid venous access to be obtained and is particularly useful in cardiac arrest where physical constraints (eg several resuscitating staff) restrict access to the neck. Complications include sepsis (use strict aseptic technique), ↑ risk of thrombosis, and damage to other structures, including the hip joint. Femoral venous access may be achieved with or without USS guidance—the use of USS will depend upon resources, expertise, and the individual situation but may help to minimize the risks of complications.

External jugular vein cannulation

This is an option in children in whom spinal injury is not a concern. Place the child 15–30° head down and turn the neck to one side. The vein runs superficially and caudally over the sternocleidomastoid at the junction of its middle and lower third. Ask an assistant to compress the vein distally to distend and immobilize it.

Central venous access

The techniques (and complications) are similar to those in adults (see ➔ Central venous access, pp. 58–9), except that smaller equipment is needed. Safe insertion of central lines in children requires considerable experience and training, and is best achieved with USS guidance, which is sometimes unavailable in a resuscitation situation. Other routes may be more appropriate during initial resuscitation.

'Cut-downs'

The traditional site for cut-downs is the long saphenous vein at the ankle. Although this may remain an option during resuscitation, it can be time-consuming and so is rarely used, unless IO needles are not available. In infants, the long saphenous vein is located half a finger breadth superior and anterior to the medial malleolus. For children, it is situated one finger breadth superior and anterior to the medial malleolus.

Umbilical venous access

This can be useful in newborn resuscitation (see ➔ Venous access—the umbilical vein, p. 661).

Intra-osseous infusion

If urgent venous access is required, but not obtained within 90s by percutaneous venous puncture, strongly consider using the IO route. Fluid and drugs given into the medullary cavity of long bones rapidly reach the central venous circulation. Gaining IO access is reasonably easy and can be performed quickly. It is particularly useful in young children but may be used in all ages, including adults.

Indications

These include major burns, trauma, cardiac arrest, and septic shock.

Contraindications

These include infection or fracture at (or proximal to) the insertion site, ipsilateral vascular injuries, multiple unsuccessful attempts, osteogenesis imperfecta, and osteopetrosis.

Equipment

IO needles are usually of 16–18G and have a central metal stylet attached to a handle. A battery-powered mechanical driver (EZ-IO®) with paediatric or adult IO needles is available and can be used to insert the needle to a specific depth, possibly ↓ complications such as compartment syndrome. It can be used in babies weighing >3kg.

Site of insertion

First choice is the proximal tibia 2.5cm below the tibial tuberosity on the flat anteromedial surface, thus avoiding the epiphyseal growth plate (see Fig. 15.1). If this route is not available, because of local infection or trauma, other options are: to use the distal femur (3cm above the lateral lower femoral condyle on the antero-lateral surface), the distal tibia (proximal to the medial malleolus), or the antero-lateral proximal humerus at the greater tuberosity.

Manual intra-osseous needle insertion technique

- Support the limb on a pad or blanket.
- Sterilize the skin and use an aseptic technique. A small skin incision may be needed.
- Firmly grasp the handle and use a twisting motion to advance the needle and stylet through the cortex of the bone. (Note that some IO needles are designed with a thread and so require a rotatory, not an oscillatory, action.)
- Aim at 90° to the bone surface, or slightly away from the epiphyseal growth plate. Stop when the slight 'give' of the medullary cavity is felt.
- Remove the stylet and try to confirm correct placement by aspirating bone marrow (use this to check BMG or cross-match).
- If aspiration is not possible, the needle may still be correctly positioned—attach a primed 3-way tap with an extension set, and flush the needle and 3-way tap with 10mL of 0.9% saline, ensuring that there is no swelling of the surrounding soft tissues.
- It is most effective in children to give drugs and fluid by boluses using 20mL syringes and a 3-way tap.
- If necessary, immobilize with a POP backslab applied carefully to the posterior leg (eg for transport to PICU).

Mechanical intra-osseous needle insertion technique

- Support the limb on a pad or blanket.
- Use a 15mm needle for patients weighing 3–39kg, a 25mm needle for patients weighing >39kg, and a 45mm needle for obese adult patients.
- Identify the insertion point and place the needle, loaded into the mechanical driver (drill), at the insertion point.
- Push the needle perpendicularly through the skin until reaching bone without drilling. Ensure that at least one 5mm marker line is visible above the skin. Press the button on the drill to turn it on, and push until a loss of resistance is felt.
- Remove the driver and stylet; attach a primed 3-way tap with an extension set, and flush the needle and 3-way tap with 10mL of 0.9% saline.
- Attach the giving set and secure as for manually inserted IO needles.

Use blood taken from an IO needle for BMG and culture or cross-matching, but not for FBC (automated blood counters may give spurious results). If using an IO needle in responsive patients, administer 0.5mg/kg of 2% lidocaine slowly into the needle before beginning the infusion to minimize pain.

Complications of intra-osseous access

- Extravasation of fluid and compartment syndrome.
- Infection (cellulitis or osteomyelitis).
- Iatrogenic fracture.
- Fat or bone micro-emboli.
- Fractures and/or epiphyseal growth plate injury.

Ensure that IO needles are removed within 24hr to minimize the risk of infection and other complications. Aim to secure conventional IV access as soon as possible after IO needle insertion.

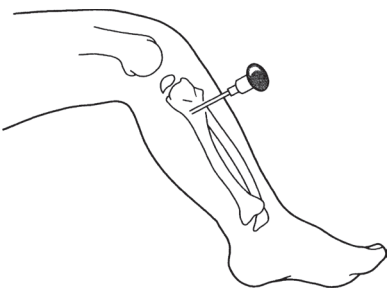


Fig. 15.1 Tibial intra-osseous access.

Resuscitation of the newborn

Neonatal resuscitation is usually undertaken by neonatologists, but unexpected deliveries require other personnel to initiate resuscitation. Fortunately, most newborn babies do not need resuscitation. The discomfort of being born into a hostile environment provides the major initial stimulus to breathe. Treat any baby requiring resuscitation in a warm room with an overhead heater. Call urgently for experienced help and start the clock.

Approach (See Fig. 15.2.)

Make sure the umbilical cord is securely clamped, then dry the baby, remove wet towels, wrap the baby in dry towels, and put a hat on the baby. Assess breathing by chest movement (auscultation at birth is unreliable), heart rate (best assessed by a stethoscope placed over the apex), and tone in the limbs. Repeat assessments every 30s during resuscitation. The Apgar scores (ranging from 0 to 10, based upon assessment of heart rate, respirations, muscle tone, reflex irritability, and colour) at 1 and 5min are traditional, but do not delay resuscitation to calculate the score.

A healthy baby has good tone, cries within a few seconds of delivery, has a heart rate of 120–150/min, and becomes rapidly pink in the first 90s.

A less healthy baby has poorer tone and slower heart rate, and may not establish adequate respiration by 90–120s. The most sick are pale, floppy, apnoeic, and bradycardic.

Airway

Open the airway by placing the baby's head in the neutral position (with the neck neither flexed nor extended). Because of the large occiput, a towel under the shoulders of the baby may help. Avoid hyperextension of the neck as this can occlude the pharyngeal airway. Consider a jaw thrust in very floppy babies. Remove visible meconium or secretions using a paediatric Yankauer sucker.

Breathing

If the baby is not breathing adequately by 90s, give five inflation breaths (pressures of 30cmH_2O for 2–3s). Aim to ventilate with air, but be guided in the use of O_2 by the 'pre-ductal' O_2 saturation (eg right hand) over time.

If the heart rate ↑, this indicates successful ventilation of the lungs. If the baby is apnoeic, continue ventilation at 30–40 breaths/min until self-ventilating. If the heart rate does not ↑, then the most likely cause is that the lungs have not been inflated. Recheck the head position and consider a jaw thrust and longer inflation time. Repeat the five inflation breaths and look for chest movement. If the heart rate remains <60/min or absent despite good chest movement, start chest compressions.

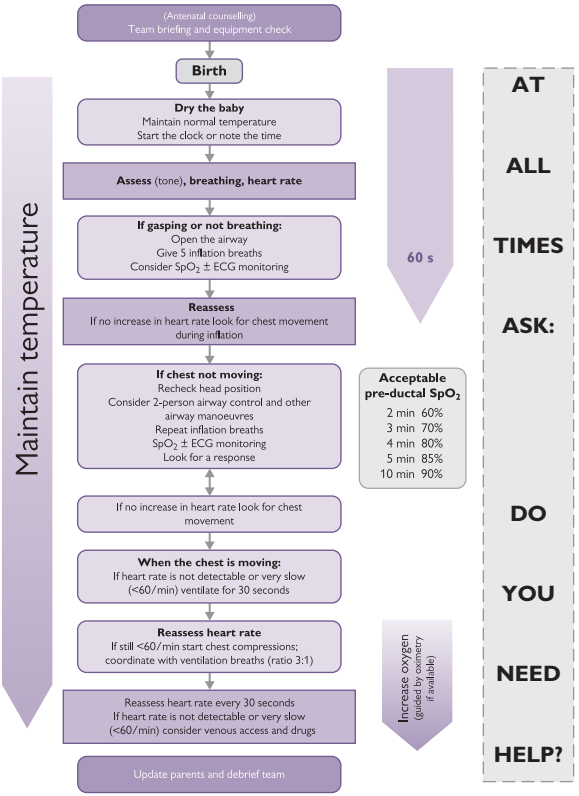


Fig. 15.2 Algorithm for newborn life support 2015.

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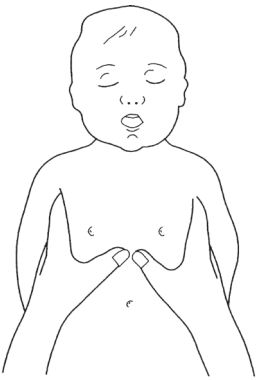
CPR of the newborn

Chest compressions

(Only start after successful lung inflation.)

Grip the chest in both hands in such a way that two thumbs can press on the lower third of the sternum (just below the intermammary line), with the fingers over the spine at the back (see Fig. 15.3). Overlapping thumbs may give better compressions but is more tiring to perform. Aim to depress the AP diameter of the chest by a third.

Use a chest compression to inflation *ratio of 3:1*. Aim for a rate of 120 events (90 compressions + 30 ventilations) per minute.



Using encircling fingers

Fig. 15.3 Method of CPR in the newborn.

Tracheal intubation

Treat continuing apnoea with tracheal intubation using a 3mm tube (2.5mm in premature babies). Precede intubation by pre-oxygenation with bag–valve–mask ventilation for 30s.

Meconium

Meconium (green) staining of liquor is quite common, but true meconium aspiration is actually quite rare. The previous practice of focussing upon aggressively trying to clear meconium from the airway at an early stage has not been shown to be of benefit and might be detrimental by delaying basic resuscitation efforts. Reserve attempts to visualize the oropharynx and aspirate meconium for those patients where meconium appears to be so thick as to block the airway.

Drugs

Only use drugs if there is no significant cardiac output despite effective lung inflation and chest compression. Give drugs IV via an umbilical vein catheter or an IO needle.

- *Give adrenaline* 10mcg/kg (0.1mL/kg of 1 in 10,000) if there is no initial response; if this is ineffective, consider ↑ dose to 30mcg/kg (0.3mL/kg of 1 in 10,000).
- *Consider giving sodium bicarbonate* 1–2mmol/kg (2–4mL of 4.2% solution/kg) when there is no cardiac output despite all resuscitative efforts or in profound and unresponsive bradycardia.
- *Hypoglycaemia*: a potential problem for all newborns, and BMG may be unreliable when reading <5mmol/L. Take blood sample to confirm, and treat immediately with a bolus of 2.5mL/kg of 10% glucose.
- *Suspect hypovolaemia if* very pale baby, PEA, history of antepartum haemorrhage, placenta praevia or vasa praevia, or unclamped cord. Give 10mL/kg of 0.9% saline, followed by O –ve (and CMV –ve) blood, repeated as necessary.
- *Atropine and calcium* have no role in newborn resuscitation.

Venous access—the umbilical vein

The easiest and fastest method of obtaining venous access in the newborn is to cannulate the umbilical vein. Identify the umbilical vein in the cut umbilical stump—it is the single large dilated vessel adjacent to the two constricted arteries (see Fig. 15.4). Prepare a 5F gauge catheter with 0.9% saline, and insert it 5cm into the umbilical vein. Suture and secure in place.

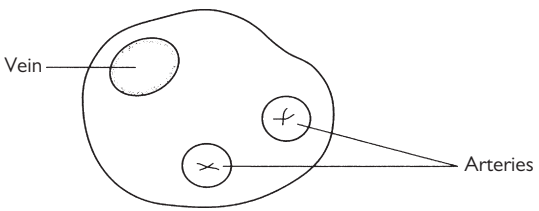


Fig. 15.4 Diagram of a cross-section of the umbilicus.

Stopping resuscitation efforts

If there are no signs of life after 10min of continuous and adequate resuscitation efforts, then discontinuation of resuscitation may be justified. Senior ED and neonatal staff will be involved in making this decision.

Paediatric Basic Life Support

Follow the algorithm (see Fig. 15.5). For choking, see ➲ Choking from a foreign body, p. 664.

Evaluate responsiveness

Gently stimulate and ask loudly, 'Are you alright?' If the child does not respond, shout for help ± get someone to go for assistance.

Open airway

Open the airway by head tilt and chin lift. Desirable degrees of tilt are neutral if <1y and 'sniffing the morning air' if >1y. Do not press on the soft tissues under the chin, as this may block the airway. If it is still difficult to open the airway, try a jaw thrust. If there is any suspicion that there may have been a neck injury, instruct a second rescuer to manually immobilize it, and use either chin lift or jaw thrust alone. If this is unsuccessful, add the smallest amount of head tilt needed to open the airway.

Check breathing

Whilst keeping the airway open, look, listen, and feel for breathing for 10s. If the child is not breathing or is making infrequent irregular breaths, carefully remove any obvious obstruction, and give five initial rescue breaths (with the rescuer taking a breath between each rescue breath).

Rescue breaths

For children (>1y) Whilst maintaining head tilt and chin lift, give breaths mouth-to-mouth, pinching off the nose. Blow steadily for ~1s, watching for the chest to rise. Take your mouth away; watch the chest fall, and repeat this sequence five times.

For infants (<1y) Ensure the neutral position of the head and apply chin lift. Give mouth-to-mouth and nose breaths, ensuring a good seal. Blow steadily for ~1s, watching for the chest to rise. Take your mouth away; watch the chest fall, and repeat this sequence five times.

Difficulty achieving an effective breath suggests airway obstruction. Reposition head tilt/chin lift, and try again. If still unsuccessful, attempt with a jaw thrust instead. Try up to five times to give effective breaths. If still unsuccessful, consider the possibility of FB airway obstruction.

Check pulse

Over the next 10s, check for signs of life—any movement, coughing, or normal breathing, and check for a pulse (use the carotid for >1y and the brachial for those <1y). If there are no signs of life and/or no pulse or pulse <60/min with poor perfusion or you are unsure—start chest compression.

Chest compression

For infants (<1y) Perform chest compressions (100–120/min) by placing both thumbs flat, side by side, on the lower third of the sternum, with the tips pointing towards the infant's head. Encircle the rib cage with the tips of the fingers supporting the infant's back. Press down with the thumbs at least one-third of the depth of the chest (or by ~4cm).

In children (>1y) Using the heel of one hand, compress the lower half of the sternum by at least one-third of the depth (or by ~5cm) of the chest at a rate of 100–120/min. Use two hands, if necessary, to achieve this.

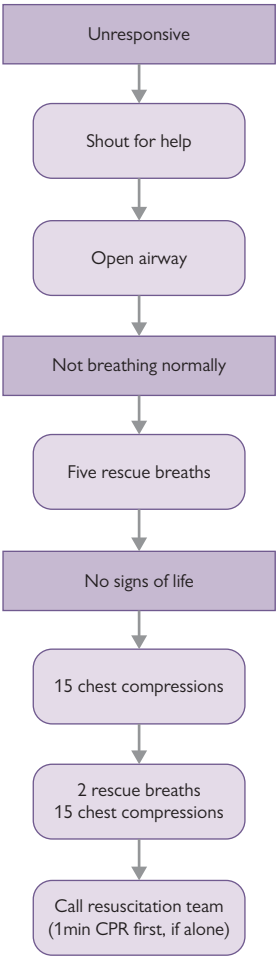


Fig. 15.5 Paediatric Basic Life Support 2015 (health care professionals with a duty to respond).

Choking from a foreign body

Despite preventative measures (eg making pen tops with holes in them), children continue to die each year from airway obstruction due to FB impaction. FB aspiration produces a sudden-onset airway problem, which helps to distinguish it from other causes of airway obstruction (epiglottitis, bacterial tracheitis—see ➲ Stridor: upper respiratory tract infections, pp. 692–3), which may be worsened by the basic measures described below.

The majority of choking events in children are witnessed and occur during play or whilst eating. FB airway obstruction is characterized by sudden onset of respiratory distress associated with coughing, gagging, or stridor, with no other signs of illness. If the child is coughing effectively (fully responsive, loud cough, able to take a breath before coughing, crying or verbal response to questions), encourage coughing and observe for the cough becoming ineffective.

Conscious, but ineffective cough

If conscious with an ineffective cough, give five back blows. In the infant, support in a head-downward prone position, and in the child, aim for a head-down or forward-leaning position. Deliver five sharp *back blows*, with the heel of one hand centrally between the shoulder blades. If ineffective, turn to the supine position and give five *chest thrusts* to infants (using the same landmarks as for CPR), but thrusts are sharper and delivered at a slower rate, and *abdominal thrusts* to children >1y. Perform *abdominal thrusts* from behind the child, placing your fist between the umbilicus and the xiphisternum and grasping it with your other hand, then pulling sharply inwards and upwards—repeat up to five times.

Following chest or abdominal thrusts if the object has not been expelled and the victim is still conscious, then repeat the sequence of back blows and chest (for infant) or abdominal (for children) thrusts.

Do not use abdominal thrusts for infants.

Unconscious from foreign body airway obstruction

If a child with FB airway obstruction is or becomes unconscious, place him on a flat surface, then open the mouth and look for any obvious object. If one is seen, use a single finger sweep to remove it. It may be possible to remove the FB with Magill's forceps under direct laryngoscopy. Do not attempt blind or repeated finger sweeps. Open the airway and attempt five rescue breaths. If a breath does not make the chest rise, reposition the head before making the next attempt. If there is no response whilst attempting the five rescue breaths, proceed to chest compression with ventilation using a ratio of 15:2. Each time the airway is opened, check for a FB, and if visible, try to remove it (see Fig. 15.6).

If the obstruction appears to have been relieved, open and check the airway. If the child is not breathing, deliver rescue breaths. If initial measures prove unsuccessful and the child is hypoxic, consider a *surgical airway* (eg needle cricothyroidotomy if aged <12y, surgical cricothyroidotomy if older—see ➲ Airway obstruction: surgical airway, p. 336).

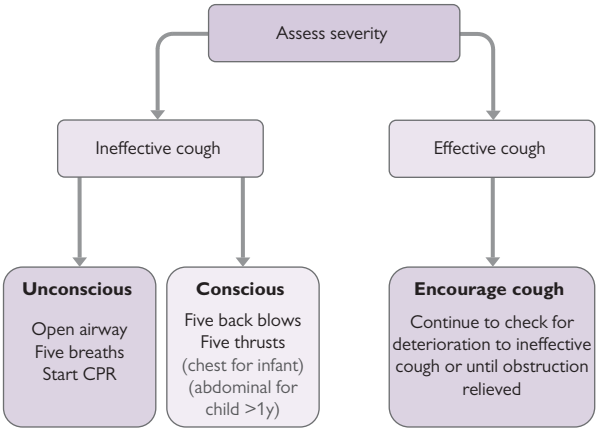


Fig. 15.6 Paediatric foreign body airway obstruction treatment 2015.
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Anaphylaxis in children

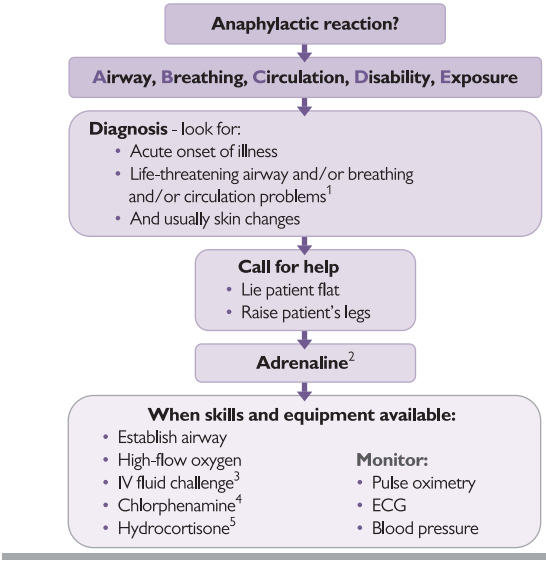
The background, causes, and pathophysiology of anaphylaxis in children is similar to that in adults (see ➲ Anaphylaxis, pp. 44–5). Treat according to the 2015 UK Resuscitation Council algorithm, shown in Fig. 15.7. After initial treatment, admit the child for observation in case of a delayed or biphasic reaction.

Notes for anaphylaxis algorithm

1 IM adrenaline is the agent of choice in anaphylaxis and should be administered without delay.
2 If profound shock is judged immediately life-threatening, consider giving a slow bolus of 1mcg/kg of IV adrenaline as a *1 in 100,000* solution (= 10mcg/mL solution). *This is hazardous* and is recommended *only* for experienced specialists who can also obtain IV access without delay. Note that a different dilution of adrenaline is required for IM, compared to IV, use. Adrenaline can also be given via the IO route in the same dose as the IV route.
3 An inhaled β_2-agonist, such as salbutamol, may be used as an adjunctive measure if bronchospasm is severe and does not respond rapidly to other treatment.
4 For children who have been prescribed an EpiPen®, 150mcg can be given instead of 120mcg, and 300mcg can be given instead of 250mcg or 500mcg.
5 A crystalloid may be safer than a colloid.
6 Do not use the SC route for adrenaline. It has no role in anaphylaxis because its absorption is appreciably slower than IM adrenaline.

Consider taking blood samples for mast cell tryptase testing as soon as possible after starting treatment if the cause is thought to be venom-related, drug-related, or idiopathic (see 🔗 https://www.nice.org.uk/cg134):

- A sample as soon as possible after emergency treatment has started.
- A second sample ideally within 1–2hr (but no later than 4hr) from the onset of symptoms.



1 Life-threatening problems:

Airway:	Swelling, hoarseness, stridor
Breathing:	Rapid breathing, wheeze, fatigue, cyanosis, SpO_2 <92%, confusion
Circulation:	Pale, clammy, low blood pressure, faintness, drowsy/coma

2 Adrenaline (*give IM unless experienced with IV adrenaline*)
IM doses of 1:1000 adrenaline (repeat after 5 min if no better)

• Adult:	500 micrograms IM (0.5mL)
• Child more than 12 years:	500 micrograms IM (0.5mL)
• Child 6–12 years:	300 micrograms IM (0.3mL)
• Child less than 6 years:	150 micrograms IM (0.15mL)

Adrenaline IV to be given **only by experienced specialists**
Titrate: Adults 50 micrograms; Children 1 microgram/kg

3 IV fluid challenge:
Adult—500–1000mL
Child—crystalloid 20mL/kg

Stop IV colloid
if this might be the cause of anaphylaxis

	4 Chlorphenamine (IM or slow IV)	**5 Hydrocortisone** (IM or slow IV)
Adult or child more than 12 years:	10mg	200mg
Child 6–12 years:	5mg	100mg
Child 6 months to 6 years:	2.5mg	50mg
Child less than 6 months:	250 micrograms/kg	25mg

Fig. 15.7 UK Resuscitation Council algorithm 2015.
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Paediatric Advanced Life Support

Overall, cardiac arrest in children has a worse outcome than in adults, because the causes are different. Early recognition of deterioration is crucial to prevent cardiac arrest.

Initial approach

Follow the Resuscitation Council (UK) guidelines (https://www.resus.org.uk) in Fig. 15.8. Assess and treat according to ABCDE. Establish BLS (see Paediatric Basic Life Support, p. 662). Ventilate with O_2 using a bag–valve–mask, then deliver compressions at a rate of 100–120/min, with a compression:ventilation ratio of 15:2. Perform tracheal intubation if expertise allows (with minimal interruption to chest compressions)—this will secure the airway and allow uninterrupted compressions (except during pulse checks and defibrillation) and ventilation at 10–12/min. Capnography can help to reassure that the tracheal tube is in the tracheobronchial tree and may provide information about the quality of CPR. A sudden ↑ in end-tidal CO_2 ($ETCO_2$) may provide an early indication of ROSC.

Non-shockable rhythms: PEA and asystole

Focus on giving good-quality BLS with high-concentration O_2 and minimal interruptions. Give adrenaline IV/IO 10mcg/kg (0.1mL/kg of 1 in 10,000), repeated every 3–5min (every other loop) whilst in arrest.

Search carefully for reversible causes of the arrest—in particular, exclude tension pneumothorax and consider hypovolaemia. Septic shock, haemorrhage, and dehydration are implicated relatively frequently, so consider an initial IV fluid bolus of 20mL/kg of 0.9% saline at an early stage in the resuscitation. Follow this with further IV fluid and/or blood as appropriate.

Shockable rhythms: VF and pulseless VT

VF is uncommon in children but occasionally occurs in children with congenital heart disease. Ensure delivery of good-quality CPR—only interrupt chest compressions and ventilation for defibrillation. When selecting the energy level to use during defibrillation, if the defibrillator can only deliver certain predetermined 'stepped' shocks, choose the nearest higher 'step' to that required. Paddles (or pads) for children are 8–12cm in size (4.5cm in infants). After shock delivery, resume CPR immediately without checking for a pulse and continue for 2min unless there is a response from the patient to indicate ROSC. If VF/pulseless VT persists, give IV adrenaline 10mcg/kg and IV amiodarone 5mg/kg (diluted in 5% glucose) after the third shock. Continue shocks every 2min if a shockable ryhthm continues; give further IV adrenaline every 3–5min, and consider a further dose of IV amiodarone (5mg/kg) after the fifth shock.

Parents present during resuscitation

Whenever possible, give parents the chance to stay with their child during resuscitation. If parents wish to be present, ensure a dedicated staff member stays with them throughout and explains what is happening.

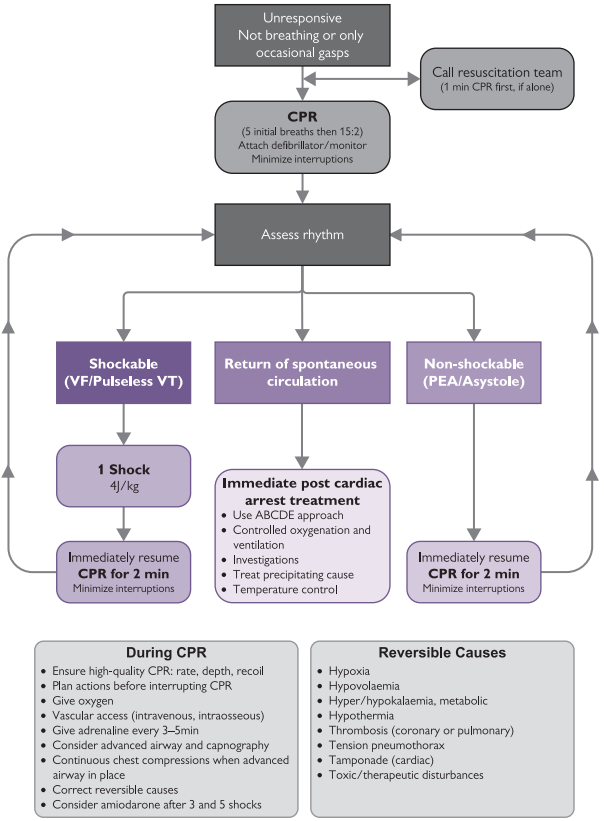

Fig. 15.8 Paediatric Advanced Life Support 2015.

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Notes on paediatric ALS

Airway

O_2 Give high-flow O_2 (use a well-fitting mask with a reservoir).

Suction Use a rigid suction catheter to aspirate pharyngeal contents.

Oropharyngeal airway An airway may help when ventilating with a bag–valve–mask device, whilst personnel and equipment are prepared for tracheal intubation. Size the airway by matching its length to the distance between the central incisor teeth and the angle of the mandible. Use a tongue depressor or laryngoscope to displace the large tongue, and insert the airway the 'right way up' in order to avoid trauma to the palate.

Bag–valve–mask ventilation Attach high-flow O_2 to a self-inflating bag–valve–mask device. Use a 500mL (up to age 1y) or 1600mL bag (>1y).

Tracheal intubation This method of securing the airway requires experience and practice. Call for senior help. Always use a capnograph. Follow the same technique as that described for adults (see ➲ Airway obstruction: basic measures, pp. 334–5), except:

- Use a straight-bladed laryngoscope in infants (<1y).
- Use the correct size of ET tubes in children, either cuffed or uncuffed.
- Correct size of ET tube:

$$\text{Internal diameter (mm)} = (\text{age in years}/4) + 4$$

Equipment sizes, drugs, and doses

Become familiar with, and use, the Broselow tape (see Box 15.1 for key formulae).

Venous access First attempt to secure peripheral venous access. If this is not obtained within 90s, attempt IO access (see ➲ Intra-osseous infusion, pp. 656–7).

High-dose adrenaline Not recommended and may be harmful.

Atropine 20mcg/kg (minimum dose 100mcg, max 600mcg)—may be used for patients with bradycardia related to ↑ vagal tone. There is no evidence of efficacy for atropine.

Magnesium Indicated for polymorphic VT or documented hypomagnesaemia—give 25–50mg/kg over several minutes to a max of 2g.

Calcium chloride 0.2mL/kg of 10% solution—given for hypocalcaemia, hyperkalaemia, and clinically severe overdose of calcium channel-blocking drugs. Do not give in the same IV/IO line as bicarbonate.

Sodium bicarbonate Not recommended routinely, but consider it in prolonged arrest, hyperkalaemia, and arrhythmias associated with tricyclic antidepressant overdose. The dose is 1–2mL/kg of 8.4% solution IV/IO. Ensure adequate flushing after giving it. Avoid mixing with other agents (it inactivates adrenaline and precipitates out calcium).

Glucose Treat hypoglycaemia with IV glucose (2mL/kg of 10% glucose).

IV fluids Give a 20mL/kg IV normal saline bolus where cardiac arrest is secondary to hypovolaemia or sepsis.

Discontinuing resuscitation

Resuscitation efforts are unlikely to be successful if there is no ROSC at any time after 30min of life support and in the absence of recurring or refractory VF/VT. Prolong resuscitation for patients who are hypothermic or who may have been poisoned.

Paediatric resuscitation chart (See Fig. 15.9.)

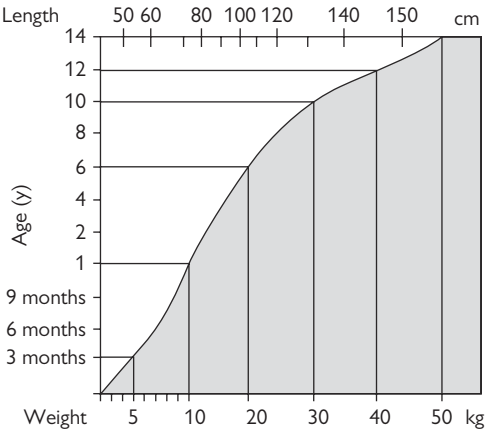

Fig. 15.9 Paediatric resuscitation chart.

Box 15.1 Key resuscitation formulae

Assume a birthweight of 3.5kg, reaching 10kg by the end of the first year.

- Weight in kg = (age in years + 4) × 2 [works for ages 1–10y]
- Tracheal tube internal diameter in mm = (age/4) + 4
- Tracheal tube length (oral) in cm = (age/2) + 12

Laryngeal mask sizes for children:

- Size 1 for weight up to 5kg.
- Size 1.5 for weight 5–10kg.
- Size 2 for weight 10–20kg.
- Size 2.5 for weight >20kg.

Defibrillation for VF/pulseless VT = 4J/kg.

Drug doses

- *Glucose in hypoglycaemia*: 2mL/kg of 10%.
- *Adrenaline IV in cardiac arrest*: 0.1mL/kg of 1 in 10,000.
- *Lorazepam IV for seizures*: 0.1mg/kg.
- *Diazepam PR for seizures*: 0.5mg/kg.
- *Midazolam buccal for seizures*: 0.5mg/kg.
- *Phenytoin IVI for continuing seizures*: 20mg/kg IVI over 30min.
- *Morphine for pain*: IV 0.1–0.2mg/kg (titrated according to pain).

Children with tachyarrhythmias

Arrhythmias are uncommon in children—*obtain expert advice* at an early stage. Children may present with poor feeding, heart failure, shock, or palpitations. Sinus tachycardia may be as fast as 220/min in infants and 180/min in children. Consider undiagnosed congenital heart disease in infants.

SVT in children

Distinguish SVT from sinus tachycardia. In sinus tachycardia, the heart rate is <200/min, P waves are upright in ECG leads I and aV_F, there is beat-to-beat variation in rate, and the history is consistent with shock.

SVT with no shock

In the *absence of clinical evidence of shock*, try *vagal stimulation*: immersion of the face in iced water, or Valsalva manoeuvre, or unilateral carotid massage. If this is unsuccessful, give adenosine 100mcg/kg IV rapidly, followed by a saline flush, followed, if still unsuccessful, by further dose(s) at 200mcg/kg, then 300mcg/kg. If this fails, seek expert help and consider IV amiodarone or propranolol or synchronized DC shock with appropriate anaesthesia.

SVT with shock

If *clinically shocked*, but responsive, try vagal manoeuvres and obtain expert help to give synchronized shocks (starting at 1J/kg, ↑ if unsuccessful to 2J/kg) under anaesthesia. If there is any delay, try adenosine IV, as outlined for haemodynamically stable patients.

Ventricular tachycardia in children

Until proved otherwise, initially consider wide-complex tachycardia in children to be VT (as opposed to SVT with bundle branch block).

Causes of VT in children

These include: hyperkalaemia, long QT syndrome, congenital heart disease, myocarditis, and cardiomyopathy. Tricyclic poisoning (see ➲ Tricyclic antidepressant poisoning, pp. 202–3) often produces tachycardia and wide QRS resembling VT.

Management

Address ABCDE, then treat according to the clinical condition:

- *If the child with VT is clinically shocked, but conscious*: arrange urgent anaesthesia, followed by synchronized DC shocks, starting at 2J/kg (followed, if necessary, by 4J/kg).
- *If the child is not clinically shocked*: involve a (paediatric) cardiologist and consider amiodarone 5mg/kg IVI over 30min.
- *Torsades de pointes*: treat with magnesium sulfate IVI 25–50mg/kg (up to a maximum of 2g), but seek expert guidance.

Children with bradyarrhythmias

Background

Heart rates of <60/min in children are usually seen as part of a pre-terminal sequence of events in response to profound hypoxia and ischaemia. However, bradycardia can occur in children due to ↑ ICP or poisoning (eg β-blockers or digoxin). In addition, some very athletic fit older children may normally have low resting heart rates.

Management

Look for, and treat, the underlying cause. If the bradycardia is the result of vagal stimulation (eg tracheal intubation or tracheal suctioning), give IV/IO atropine 20mcg/kg (minimum dose 100mcg, maximum dose 600mcg).
If the child is shocked and hypoxic and has a heart rate of <60/min:

- Get expert help.
- Assess ABCDE.
- Give O_2 and ventilate as necessary.
- Give fluid bolus IV 20mL/kg and repeat as required.
- If these steps are ineffective, give adrenaline 10mcg/kg IV, and if the response to this is not satisfactory, start an adrenaline IVI of 0.05–2mcg/kg/min.

Sudden infant death syndrome

Sudden infant death syndrome (SIDS) (also called SUDI—sudden unexplained death in infancy; previously known as 'cot death' or 'crib death') is ↓ in incidence, but each death is a tragedy. A senior doctor (consultant) should manage distressed parents (and staff). It remains a leading cause of infant death (1 in 2000 live births), with 90% occurring between 1 and 6 months of age. Most hospitals now have detailed SUDIC (sudden unexpected death in infancy and childhood) protocols, which should be followed in this situation.

Definition

Sudden death in infancy with no cause identified after autopsy.

Aetiology

Although the aetiology is unknown, a variety of theories have been proposed, including prone sleeping position, airway obstruction, apnoea, viral illness, and overheating.

Risk factors

Passive smoking, ♂, winter months, sleeping prone, premature babies, twins, apnoeic spells in first week of life, lower socio-economic groups, maternal illicit drug abuse in pregnancy, sibling with SIDS, and co-sleeping (especially if parent has been drinking alcohol).

Prevention

- Avoid overheating (aim for ambient T° of 16–20°C).
- Avoid duvets and excess bedding in infancy.
- Place infant's feet at cot end to prevent migration under blankets.
- Sleep supine (unless Pierre–Robin, scoliosis, or oesophageal reflux).
- Consider apnoea alarm.
- Avoid infant sharing bed with parent.

Approach

- Take the infant into the resuscitation room, and continue resuscitation as for cardiac arrest unless there is post-mortem staining or rigidity.
- Call the ED consultant and consultant paediatrician.
- Ensure that a named senior nurse stays with the parents.
- Immediately after death is declared, prepare yourself, then inform the parents in the presence of the senior nurse. Use the techniques described in ➲ Breaking bad news, pp. 26–7. Refer to the child throughout by their first name.
- Some hospitals have dedicated bereavement counsellors—involve them early.
- Allow the parents to see and hold the baby, and suggest that they keep a lock of their hair.
- Take digital or polaroid photographs of the baby—give them to the parents and file copies in the notes.
- Explain further procedures (eg autopsy) to the parents and provide written information, eg '*A guide to the post mortem examination procedure involving a baby or child*' (Department of Health, ref 29768/A).

- Offer to request a minister of religion and involve a social worker.
- Careful documentation, including general appearance, state of nutrition, weight, rectal T°, marks from procedures, rashes, any visible injuries, and appearance of the retinae. Inform the GP to arrange to visit the parents and discuss whether to suppress lactation with bromocriptine if the mother is breastfeeding.
- Retain clothes and bedding (stored in a paper bag, not polythene), and inform the police and coroner (Procurator Fiscal in Scotland) in all cases.
- Ensure blood, urine, and skin specimens will be obtained (looking for infection and inborn errors of metabolism).
- Arrange a further appointment for the parents with the same consultant paediatrician.
- Suggest The Lullaby Trust (https://www.lullabytrust.org.uk) which offer bereavement support for families (tel: 0808 802 6868), as well as advice regarding 'safer sleeping' and training and help for professionals.
- Advise about preventative measures for siblings. If the baby was a twin, recommend admission of the surviving twin with the mother for monitoring and investigation.
- Cancel any hospital outpatient appointments and vaccination appointments for the child.
- Inform the parents that the police will visit them as a matter of course.
- Finally, consider yourself and your colleagues.

Staff have feelings too

All staff involved with the child and family (ambulance staff, police, GP, nurses, and doctors—including you) will be traumatized by the experience. Those who are themselves parents with young children may be particularly distressed. At the very least, a debriefing session over a cup of coffee will be required.

'Near miss sudden infant death syndrome' (apparent life-threatening event)

Refer to the paediatrician for admission and monitoring any infant whose parents report an apparently life-threatening event ('ALTE'): apnoea, colour change, tone change, cyanosis, choking, and gagging. Note that the term Brief Unresolved Unexplained Event (BRUE) is an alternative way of describing this. The patient may appear well at the time of presentation. Liaise with the paediatric team, and take blood (to include FBC, U&E, glucose, Ca^{2+}, Mg^{2+}, and phosphate) and admit for apnoea monitoring.

The *differential diagnosis* includes arrhythmias and congenital heart disease, child abuse, gastro-oesophageal reflux, meningitis and sepsis, seizures, and metabolic disorders. In 50% of cases, no cause is found. Despite parental anxiety, short apnoeic episodes (<15s) may, in fact, be entirely normal. Theophylline, home monitoring devices, and counselling have all been used for infants believed to be at risk.

Problems of neonates and infants

Neonatal cephalohaematoma

This haematoma results from birth trauma and overlies a single skull bone (usually parietal). It resolves spontaneously—do not attempt to aspirate.

Umbilical cord sepsis

The dried cord separates at 1 week. If the stump develops signs of infection (becoming moist and red), refer to the paediatrician.

Breast swelling

Neonatal breasts commonly swell, due to exposure to maternal hormones. Occasionally, these breasts lactate ('witch's milk') and very occasionally become infected, requiring parenteral antibiotics.

Neonatal jaundice

Jaundice within 24hr of birth is highly abnormal. Neonates who develop jaundice after 24hr mostly have 'physiological jaundice' (typically in the first week, especially premature babies) or 'breast milk jaundice' (typically in second week—self-limiting, breastfeeding can usually continue). Refer all patients to exclude serious underlying disorders: Rh haemolytic disease, ABO incompatibility, congenital spherocytosis, glucose-6-phosphate dehydrogenase (G6-PD) deficiency, CMV infection, hypothyroidism, and biliary atresia. The paediatrician will check: serum bilirubin (including ratio of conjugated:unconjugated), FBC, blood film, U&E, LFTs, direct antiglobulin test, TFTs, and infection screen.

Neonatal conjunctivitis

A watery/sticky eye in the first few days of life may be due to an unopened tear duct, or occasionally due to gonococcal or chlamydial infection acquired from the mother's genital tract. Therefore, take a swab for Gram staining for gonococci and culture for *Chlamydia*. Refer the baby and mother if organisms are demonstrated; otherwise arrange GP follow-up.

Sepsis

Potentially life-threatening sepsis (eg meningitis) may present in a non-specific manner in infants (this is especially true of neonates). Classic presentations are replaced by: feeding problems, irritability, drowsiness, jaundice, hypotonia, poor weight gain, petechiae or skin rash, apnoea, bradycardia, and cyanotic episodes. Neonates at ↑ risk are those with low birthweight, those previously ventilated, and those with congenital abnormalities.

Treatment Give O_2 and IV fluids (20mL/kg). Refer for admission and urgent investigation: BMG, urine culture, FBC, blood cultures, TORCH screen (*Toxoplasma*, rubella, CMV, herpes), CXR, abdominal X-ray (if necrotizing enterocolitis suspected), and LP. Commence 'blind' antibiotics (see *BNFC*).

Crying babies

It is quite normal for babies to cry. The amount of crying varies enormously, as does the ability of parents to cope with it. With more acute onset of irritability and crying, exclude an acute cause (eg otitis media, incarcerated hernia, testicular torsion, intussusception, fractured limb), before reassuring and counselling the parents. Parents who are driven to despair may benefit from a self-help group (eg CRY-SIS, tel: 08451 228 669, https://www.cry-sis.org.uk) or follow-up with a paediatrician.

Feeding difficulties

Parents bring their babies to the ED with a variety of feeding problems. The underlying causes vary widely and range from acute life-threatening sepsis to chronic parental anxiety or overfeeding. Obtain a careful feeding history and watch the baby feed. Babies normally require at least 15mL of milk/kg/day on day 1, ↑ to ~150mL/kg/day by day 7. Plot the weight, height, and head circumference on centile charts. Take weight loss or failure to satisfactorily gain weight seriously—it may be due to a significant underlying disorder (eg pyloric stenosis). Remember that newborn babies lose up to 10% of their birthweight in the first week but should regain it by 2 weeks. Arrange for the health visitor to advise. Refer chronic feeding problems to the GP or paediatrician.

Bilious vomiting

Occasionally neonates and infants present with bilious vomiting, a sign of serious pathology. The most important differential diagnosis is intestinal malrotation (volvulus) secondary to peritoneal bands, which requires emergency laparotomy to avoid total small bowel infarction (see ➲ Abdominal pain in children, pp. 720–1). Consult a paediatric surgeon urgently. Other differential diagnoses include an obstructed hernia, Hirschsprung's disease, and sepsis.

Metabolic diseases (inborn errors of metabolism)

Occasionally neonates present to the ED days after birth with coma or seizures with no obvious cause (infection, trauma, hypoglycaemia, etc.). These infants may have an inborn error of metabolism (e.g. maple syrup urine disease, urea cycle disorders, and hyperammonaemia), and they require urgent specialist paediatric care, often at a tertiary children's hospital. If an older child presents to the ED with a previously diagnosed metabolic disease, seek expert advice by referring to the paediatrician early. Remember that the parents are almost certain to know more about the disease than the doctors and nurses in the ED.

Treatment Give O_2 and IV fluids (20mL/kg), and treat hypoglycaemia and sepsis. Refer for admission and urgent investigation by a paediatrician. Emergency treatment protocols for this challenging group of patients are available in an easily accessible form at the British Inherited Metabolic Diseases Group website (http://www.bimdg.org.uk).

Skin problems in infants

Minor skin problems are common in infants. The combination of a skin rash and an ill infant should arouse suspicion of serious illness (eg ➲ Meningococcal disease, pp. 682–3) and prompt urgent referral. *Do not discharge an infant with an undiagnosed rash*—obtain an expert opinion.

Neonates

Multiple tiny white papules (*milia*) seen on the face of neonates are superficial epidermal inclusion cysts. Erythematous lesions with central white vesicles are common in the first days of life—*erythema toxicum* ('neonatal urticaria'). Both are harmless and disappear spontaneously within days.

Peeling skin

Peeling skin is a common feature of post-mature babies and should be distinguished from scalded skin syndrome and Kawasaki disease (➲ Skin lesions in multisystem disease, pp. 688–9).

Scalded skin syndrome ('toxic epidermal necrolysis')

This staphylococcal infection results in red, peeling skin, sometimes with blistering. Refer for admission and IV antibiotics.

Eczema

Usually managed most appropriately by the GP and outpatient department with emollients ± topical corticosteroids, but if very severe, refer for a period of inpatient treatment. Sometimes the scratched skin becomes secondarily infected, requiring admission for IV antibiotics.

Impetigo

Any breach in the skin (eg eczema, nappy rash, scabies) may develop impetigo. Staphylococcal or streptococcal infection results in an ulcerative, erythematous area, which forms a golden brown crust that spreads rapidly. If the infection is localized and the child is well, treat with topical fusidic acid (if extensive—PO flucloxacillin); arrange GP follow-up, and advise the parents to isolate the child from other children until it has resolved. If the child is unwell, refer for IV antibiotics.

Nappy rash ('ammoniacal dermatitis')

Erythema with some ulceration in the nappy area, but sparing the flexures, is usually the result of excessive moisture contact with the skin. Treat by exposure to fresh air as much as practicable and frequent changing of nappies. Consider barrier creams (see *BNFC*).

Monilial infection

Nappy rash may become infected with *Candida albicans*, leading to erythema of the flexures. Give nystatin cream, and advise regular changing.

Seborrhoeic dermatitis

This erythematous, greasy rash commonly involves the nappy area, the occipital region, and behind the ears. It may become infected with *Candida albicans*—treat with nystatin and refer to the GP.

Febrile illness in preschool children

Febrile illness is extremely common in childhood. Search for serious causes requiring treatment (meningitis, encephalitis, pneumonia, UTI, arthritis, Kawasaki disease). It can be difficult to assess the severity of illness in younger children, so adopt the NICE suggested 'traffic light' system as summarized in Fig. 15.10 (https://www.nice.org.uk), updated 2017.

	Green – low risk	Amber – intermediate risk	Red – high risk
Colour (of skin, lips, or tongue)	• Normal colour	• Pallor reported by parent/carer	• Pale/mottled/ashen/blue
Activity	• Responds normally to social cues • Content/smiles • Stays awake or awakens quickly • Strong normal cry/not crying	• Not responding normally to social cues • No smile • Wakes only with prolonged stimulation • Decreased activity	• No response to social cues • Appears ill to a health care professional • Does not wake or if roused does not stay awake • Weak, high-pitched, or continuous cry
Respiratory		• Nasal flaring • Tachypnoea: – RR >50 breaths/minute, age 6–12 months – RR >40 breaths/minute, age >12 months • Oxygen saturation ≤95% in air • Crackles in the chest	• Grunting • Tachypnoea: RR >60 breaths/minute • Moderate or severe chest indrawing
Circulation and hydration	• Normal skin and eyes • Moist mucous membranes	• Tachycardia: – >160 beats/minute, age <12 months – >150 beats/minute, age12–24 months – >140 beats/minute, age 2–5 • CRT ≥3 • Dry mucous membranes • Poor feeding in infants • Reduced urine output	• Reduced skin turgor
Other	• None of the amber or red symptoms or signs	• Age 3–6 months, temperature ≥ 39°C • Fever for ≥5 days • Rigors • Swelling of a limb or joint • Non-weight-bearing limb/not using an extremity	• Age <3 months, temperature ≥38°C* • Non-blanching rash • Bulging fontanelle • Neck stiffness • Status epilepticus • Focal neurological signs • Focal seizures

CRT, capillary refill time; RR, respiratory rate
* Some vaccinations have been found to induce fever in children aged under 3 months
This traffic light table should be used in conjunction with the recommendations in the NICE guideline on fever in under 5s.

Fig. 15.10 Traffic light system to assess children with fever. © NICE (2019) NG143 Fever in under 5s: assessment and initial management. Available from <www.nice.org.uk/guidance/ng143>. All rights reserved. Subject to Notice of rights, <https://www.nice.org.uk/terms-and-conditions#notice-of-rights>. NICE guidance is prepared for the National Health Service in England. All NICE guidance is subject to regular review and may be updated or withdrawn. NICE accepts no responsibility for the use of its content in this product/publication.

Management based upon level of risk

If a diagnosis is reached, treat accordingly. If the cause of fever is unclear (no diagnosis is reached), the traffic light system may help to guide:

- If the child has any 'red' feature, refer for admission.
- If 'amber' features are present, consider discharge with a safety net plan (eg verbal/written advice on what to watch out for and what to do; arrangements for follow-up or admission directly if concerns).
- If there are only 'green' features, aim to discharge, with advice on what to do in the event of deterioration.

Adopt a low threshold for admitting febrile infants aged <3 months, as they are difficult to assess. For other children, a period of observation can help to reassure parents and staff that there is no obvious serious underlying cause. Similarly, when deciding about discharge, take into account family and social factors, as well as parental wishes/concerns. If a child presents with a fever and a non-specific/unusual rash, one option is to admit for observation for a few hours.

The sick febrile child

If there is evidence that a child with fever is seriously ill or has severe sepsis, act quickly and decisively.

Approach

- Assess the Airway, Breathing, and Circulation of the child to identify and treat life-threatening problems as they are found, in order to maintain vital functions before disease-specific therapies are started (see Primary assessment and resuscitation, pp. 650–1).
- Involve senior ED staff, PICU, and senior paediatric staff as soon as a child is suspected of being critically unwell.
- Measure and record T°—use an electronic thermometer in the axilla if <4 weeks old; if older than 4 weeks, use an electronic or chemical dot axillary thermometer or infra-red tympanic thermometer.
- Specifically search for an impaired conscious level and lack of recognition of parents/carers. Check BMG in all sick children.
- Early recognition and treatment of respiratory failure and shock are essential to avoid deterioration and subsequent cardiorespiratory arrest.
- Administer O_2 to maintain SpO_2 >94%.
- Give a bolus of 0.9% saline 20mL/kg IV/IO if there are any signs of shock (tachycardia, CRT >2s, mottled skin, purpuric rash, ↓ conscious level).
- If there is any suspicion or sign of meningococcal disease, administer parenteral benzylpenicillin or cefotaxime as soon as possible.
- If the child is <3 months old, check FBC, blood cultures, CRP, and urine; if unwell or WCC <5 or >15 × 10^9/L, or <1 month old, perform LP and give parenteral antibiotics. If <3 months old, add ampicillin to cover *Listeria*.
- If the child is >3 months old, check FBC, blood cultures, CRP, and urine; get CXR if T° >39°C or WCC >20 × 10^9/L or clinically unwell.
- Check U&E, ABG, and lactate if clinically unwell or drowsy.
- Consider LP if clinically unwell and febrile at any age, especially <1y.
- If the child is drowsy or has a ↓ conscious level (especially in the presence of focal neurological signs or focal seizures), consider adding IV aciclovir to cover the possibility of herpes simplex encephalitis.
- Resuscitate aggressively with repeated IV fluid boluses, inotropes, and early ventilation for children with ↓ conscious level.
- In older children, do not forget rarer causes of fever and impaired conscious level, including illicit drugs such as MDMA ('Ecstasy') or other amphetamines or ketamine.
- Try to obtain a detailed history of the illness from parents and carers at the earliest opportunity. Remember to include the vaccination history and any recent travel, or recent illness in the child's family or school.

Purpuric rashes

The development of a purpuric rash is greeted with understandable parental alarm, due to the well-publicized association with meningococcal disease. History, examination, and FBC help to identify the cause.

Causes of purpuric lesions

- Meningococcal disease (see ➲ Meningococcal disease, pp. 682–3).
- Henoch–Schönlein purpura.
- Thrombocytopenia.
- Immune thrombocytopenia.
- Leukaemia.
- Septic shock.
- Aplastic anaemia.
- Some viral illnesses.
- Trauma.
- Forceful coughing or vomiting may cause petechiae of the face.

Meningococcal disease

(See ➲ Meningococcal disease, pp. 682–3.)

Presume that an ill child (particularly an infant) who develops a purpuric rash has meningococcal meningitis/septicaemia, and treat urgently for this.

Henoch–Schönlein purpura

This vasculitic process affects small arteries in the kidneys, skin, and GI tract. It is relatively common in 4–11y olds and appears to follow a viral or bacterial infection. Erythematous macules develop into palpable purpuric lesions, which are characteristically concentrated over the buttocks and extensor surfaces of the lower limbs, although the distribution can be atypical in younger children. Associated symptoms include abdominal pain, testicular pain, and joint pains (arthritis in the ankles and knees). Nephritis may occur, producing micro- or macroscopic haematuria and proteinuria. Very occasionally, this progresses to renal failure.

Check BP, urinalysis, urine microscopy, FBC (platelets are normal), U&E.

Refer To the paediatrician.

Immune thrombocytopenia

Probably results from an autoimmune reaction to preceding viral infection. Presents with a purpuric rash, mucous membrane bleeding, conjunctival haemorrhage, and occasionally GI bleeding. Check FBC (platelets are $<30 \times 10^9$/L). Refer for investigation and follow-up. In the presence of lymphadenopathy or splenomegaly, consider alternative diagnoses.

Treatment Is usually expectant, since the natural course is for most cases to resolve spontaneously over 3 months. Occasionally, life-threatening haemorrhage occurs—obtain expert help; resuscitate with O_2 and IV fluids, and give platelets.

Acute leukaemia

This may present acutely to the ED with purpura associated with thrombocytopenia. Look for hepatomegaly, splenomegaly, and lymphadenopathy. FBC/blood film reveals anaemia with blast cells, ↓ platelets, and ↑ WBC.

Refer For admission.