Immunisation: other aspects

As well as providing extensive information relating to individual diseases and vaccines the Greenbook also provides useful information on associated issues:

Consent

- written consent is not required
- for children not competent to give or withhold consent a person with parental responsibility may give consent on their behalf
- parental responsibility is defined by the Children Act 1989. Mothers automatically have parental responsibility. Fathers have responsibility if they are married to the mother when the child was born or subsequently marry her. Unmarried fathers may acquire parental responsibility by:
- 1. Parental Responsibility Order granted by the court
- 2. Residence Order granted by the court
- 3. Parental Responsibility Agreement
- since 2003 unmarried fathers can acquire parental responsibility if they are named on the child's birth certificate
- a step parent can can acquire parental responsibility if they marry the mother and either get a Parental Responsibility Agreement or the court grants a Parental Responsibility Order
- if parents disagree then immunisation cannot go ahead without specific court approval
- a person with parental responsibility does not need to be present at the time of immunisation. A grandparent or childminder, for example, may bring the child provided that the healthcare provider is satisfied that the person with parental responsibility has consented in advance. Written confirmation is not required.

Vaccine storage

- generally should be stored in the a fridge at **+2ºC to +8ºC** and kept in original packaging to protect the vaccine from UV light
- refrigerator temperature should be monitored using a maximum-minimum thermometer and recorded daily
- ordinary domestic refrigerators should not be used
- surgeries should keep no more than 2 to 4 weeks' supply of vaccines at any time

Over-the-counter treatments

Cough and cold remedies

In 2009 the Medicines and Healthcare products Regulatory Agency (MHRA) / Commission on Human Medicines (CHM) announced a major change in the regulation of over-the-counter (OTC) preparations aimed at children with coughs/colds (e.g. Tixylix, Medised etc)

This affected medicines containing a wide range of ingredients:

- cough suppressants: dextromethorphan and pholcodine
- expectorants: guaifenesin and ipecacuanha
- nasal decongestants: ephedrine, oxymetazoline, phenylephrine, pseudoephedrine and xylometazoline
- antihistamines: brompheniramine, chlorphenamine, diphenhydramine, doxylamine, promethazine and triprolidine

Products these ingredients should therefore be avoided in children under the age of 6 years. Products aimed at children aged 6-12 years which contain these ingredients will only be available after discussion with a pharmacist, i.e. Not on the shelves.

Whooping cough (pertussis)

Overview

- caused by the Gram negative bacterium *Bordetella pertussis*
- incubation period = 10-14 days
- children in the UK are routinely vaccinated at 2, 3 and 4 months and 3-5 years
- around 1,000 cases are reported each year in the UK

Features, 2-3 days of coryza precede onset of:

- coughing bouts: usually worse at night and after feeding, may be ended by vomiting & associated central cyanosis
- inspiratory whoop: not always present (caused by forced inspiration against a closed glottis)
- persistent coughing may cause subconjunctival haemorrhages or even anoxia leading to syncope & seizures
- symptoms may last 10-14 weeks* and tend to be more severe in infants
- marked lymphocytosis

Diagnosis

- per nasal swab culture for *Bordetella pertussis* - may take several days or weeks to come back
- PCR and serology are now increasingly used as their availability becomes more widespread

Management

- oral erythromycin to eradicate the organism and reduce spread
- has not been shown to alter the course of the illness

Complications

- pneumonia
- bronchiectasis
- seizures

*weeks, not days

Squint

Squint (strabismus) is characterised by misalignment of the visual axes. Squints may be divided into concomitant (common) and paralytic (rare)

Concomitant	Paralytic
Due to imbalance in extraocular muscles	Due to paralysis of extraocular muscles
Convergent is more common than divergent	

Detection of a squint may be made by the corneal light reflection test - holding a light source 30cm from the child's face to see if the light reflects symmetrically on the pupils

The cover test is used to identify the nature of the squint

- ask the child to focus on a object
- cover one eye
- observe movement of uncovered eye
- cover other eye and repeat test

Management

- eye patches may help prevent amblyopia
- referral to secondary care is appropriate

Adoption in the UK

Key points

- the average age of a child at adoption is around 4 years old
- single people, married couples, cohabiting couples and same-sex couples can all adopt
- people wanting to adopt must be aged at least 21 years old
- the child must live with the adoptive parents for 3 months before the adoption is finalised
- after this time all rights and responsibilities pass to the adoptive parents
- at the age of 18 years a child who has been adopted is entitled to their original birth certificate

Developmental milestones: social behaviour and play

- The table below summarises the major social behaviour and play milestones

Age	Milestone
6 weeks	Smiles (Refer at 10 weeks)
3 months	Laughs Enjoys friendly handling
6 months	Not shy
9 months	Shy Takes everything to mouth

- **Feeding**

May put hand on bottle when being fed	6 months
Drinks from cup + uses spoon, develops over 3 month period	12 -15 months
Competent with spoon, doesn't spill with cup	2 years
Uses spoon and fork	3 years
Uses knife and fork	5 years

- **Dressing**

Helps getting dressed/undressed	12-15 months
Takes off shoes, hat but unable to replace	18 months
Puts on hat and shoes	2 years
Can dress and undress independently except for laces and buttons	4 years

- **Play**

Plays 'peek-a-boo'	9 months
Waves 'bye-bye'	12 months
Plays 'pat-a-cake'	
Plays contentedly alone	18 months
Plays near others, not with them	2 years
Plays with other children	4 years

Measles

Overview

- RNA paramyxovirus
- spread by droplets
- infective from prodrome until 5 days after rash starts
- incubation period = 10-14 days

Features

- prodrome: irritable, conjunctivitis, fever
- Koplik spots (before rash): white spots ('grain of salt') on buccal mucosa
- rash: starts behind ears then to whole body, discrete maculopapular rash becoming blotchy & confluent

Complications

- encephalitis: typically occurs 1-2 weeks following the onset of the illness)
- subacute sclerosing panencephalitis: very rare, may present 5-10 years following the illness
- febrile convulsions
- pneumonia, tracheitis
- keratoconjunctivitis, corneal ulceration
- diarrhoea
- increased incidence of appendicitis
- myocarditis

Management of contacts

- if a child not immunized against measles comes into contact with measles then MMR should be offered (vaccine-induced measles antibody develops more rapidly than that following natural infection)
- this should be given within 72 hours

Acne vulgaris: management

Acne vulgaris is a common skin disorder which usually occurs in adolescence. It typically affects the face, neck and upper trunk and is characterised by the obstruction of the pilosebaceous follicles with keratin plugs which results in comedones, inflammation and pustules.

Acne may be classified into mild, moderate or severe:

- mild: open and closed comedones with or without sparse inflammatory lesions
- moderate acne: widespread non-inflammatory lesions and numerous papules and pustules
- severe acne: extensive inflammatory lesions, which may include nodules, pitting, and scarring

A simple step-up management scheme often used in the treatment of acne is as follows:

- single topical therapy (topical retinoids, benzyl peroxide)
- topical combination therapy (topical antibiotic, benzoyl peroxide, topical retinoid)
- oral antibiotics: e.g. Oxytetracycline, doxycycline. Improvement may not be seen for 3-4 months. Minocycline is now considered less appropriate due to the possibility of irreversible pigmentation. Gram negative folliculitis may occur as a complication of long-term antibiotic use - high-dose oral trimethoprim is effective if this occurs
- oral isotretinoin: only under specialist supervision

There is no role for dietary modification in patients with acne

Childhood infections

The table below summarises the main characteristics of childhood infections

Chickenpox	• Fever initially • Itchy, rash starting on head/trunk before spreading. Initially macular then papular then vesicular • Systemic upset is usually mild
Measles	• Prodrome: irritable, conjunctivitis, fever • Koplik spots: white spots ('grain of salt') on buccal mucosa • Rash: starts behind ears then to whole body, discrete maculopapular rash becoming blotchy & confluent
Mumps	• Fever, malaise, muscular pain • Parotitis ('earache', 'pain on eating'): unilateral initially then becomes bilateral in 70%
Rubella	• Rash: pink maculopapular, initially on face before spreading to whole body, usually fades by the 3-5 day • Lymphadenopathy: suboccipital and postauricular
Erythema infectiosum	• Also known as fifth disease or 'slapped-cheek syndrome' • Caused by parvovirus B19 • Lethargy, fever, headache • 'Slapped-cheek' rash spreading to proximal arms and extensor surfaces
Scarlet fever	• Reaction to erythrogenic toxins produced by Group A haemolytic streptococci • Fever, malaise, tonsillitis

	• 'Strawberry' tongue • Rash - fine punctate erythema sparing face
Hand, foot and mouth disease	• Caused by the coxsackie A16 virus • Mild systemic upset: sore throat, fever • Vesicles in the mouth and on the palms and soles of the feet

Urinary tract infection in children: features, diagnosis and management

Urinary tract infections (UTI) are more common in boys until 3 months of age (due to more congenital abnormalities) after which the incidence is substantially higher in girls. At least 8% of girls and 2% of boys will have a UTI in childhood

Presentation in childhood depends on age:

- infants: poor feeding, vomiting, irritability
- younger children: abdominal pain, fever, dysuria
- older children: dysuria, frequency, haematuria
- features which may suggest an upper UTI include: temperature > 38ºC, loin pain/tenderness

NICE guidelines for checking urine sample in a child

- if there are any symptoms or signs suggestive or a UTI
- with unexplained fever of 38°C or higher (test urine after 24 hours at the latest)
- with an alternative site of infection but who remain unwell (consider urine test after 24 hours at the latest)

Urine collection method

- clean catch is preferable
- if not possible then urine collection pads should be used
- cotton wool balls, gauze and sanitary towels are not suitable
- invasive methods such as suprapubic aspiration should only be used if non-invasive methods are not possible

Management

- infants less than 3 months old should be referred immediately to a paediatrician
- children aged more than 3 months old with an upper UTI should be considered for admission to hospital. If not admitted oral antibiotics such as cephalosporin or co-amoxiclav should be given for 7-10 days
- children aged more than 3 months old with a lower UTI should be treated with oral antibiotics for 3 days according to local guidelines, usually trimethoprim, nitrofurantoin, cephalosporin or amoxicillin. Parents should be asked to bring the children back if they remain unwell after 24-48 hours
- antibiotic prophylaxis is not given after the first UTI but should be considered with recurrent UTIs

Asthma in children: management of acute attacks

Criteria for admission

- transfer children with severe or life threatening asthma urgently to hospital
- children with acute asthma in primary care who have not improved after receiving up to 10 puffs of B2 agonist should be referred to hospital

Bronchodilator therapy

- give a B2 agonist 2 puffs via a spacer
- increase B2 agonist dose by 2 puffs every 2 minutes according to response up to 10 puffs
- continue B2 agonist as required but not exceeding 4-hourly
- if symptoms are not controlled repeat B2 agonist and refer to hospital

Steroid therapy

- should be given to all children with an asthma exacerbation
- treatment should be given for 3-5 days

Usual prednisolone dose

Age	**Dose as per BTS**	**Dose as per cBNF**
2 - 5 years	20 mg od	1-2 mg/kg od (max 40mg)
> 5 years	30 - 40 mg od	1-2 mg/kg od (max 40mg)

Constipation in children

The frequency at which children open their bowels varies widely, but generally decreases with age from a mean of 3 times per day for infants under 6 months old to once a day after 3 years of age.

NICE produced guidelines in 2010 on the diagnosis and management of constipation in children. A diagnosis of constipation is suggested by 2 or more of the following:

	Child < 1 year	**Child > 1 year**
Stool pattern	Fewer than 3 complete stools per week (type 3 or 4 on Bristol Stool Form Scale) (this does not apply to exclusively breastfed babies after 6 weeks of age) Hard large stool 'Rabbit droppings' (type 1)	Fewer than 3 complete stools per week (type 3 or 4) Overflow soiling (commonly very loose, very smelly, stool passed without sensation) 'Rabbit droppings' (type 1) Large, infrequent stools that can block the toilet
Symptoms associated with defecation	Distress on passing stool Bleeding associated with hard stool Straining	Poor appetite that improves with passage of large stool Waxing and waning of abdominal pain with passage of stool Evidence of retentive posturing: typical straight legged, tiptoed, back arching

		posture Straining Anal pain
History	Previous episode(s) of constipation Previous or current anal fissure	Previous episode(s) of constipation Previous or current anal fissure Painful bowel movements and bleeding associated with hard stools

The vast majority of children have no identifiable cause - idiopathic constipation. Other causes of constipation in children include:

- dehydration
- low-fibre diet
- medications: e.g. Opiates
- anal fissure
- over-enthusiastic potty training
- hypothyroidism
- Hirschsprung's disease
- hypercalcaemia
- learning disabilities

After making a diagnosis of constipation NICE then suggesting excluding secondary causes. If no red or amber flags are present then a diagnosis of idiopathic constipation can be made:

	Indicates idiopathic constipation	**'Red flag' suggesting underlying disorder**
Timing	Starts after a few weeks of life Obvious precipitating factors coinciding with the start of symptoms: fissure, change of diet, timing of potty/toilet training or acute events such as infections, moving house, starting nursery/school, fears and phobias, major change in family, taking medicines	Reported from birth or first few weeks of life
Passage of meconium	< 48 hours	> 48 hours
Stool pattern		'Ribbon' stools
Growth	Generally well, weight and height within normal limits, fit and active	Faltering growth is an **amber** flag
Neuro/locomotor	No neurological problems in legs, normal locomotor development	Previously unknown or undiagnosed weakness in legs, locomotor delay
Abdomen		Distension
Diet	Changes in infant formula, weaning, insufficient fluid intake or poor diet	
Other		**Amber** flag: Disclosure or evidence that raises concerns over possibility of child maltreatment

Prior to starting treatment the child needs to be assessed for faecal impaction. Factors which suggest faecal impaction include:

- symptoms of severe constipation
- overflow soiling
- faecal mass palpable in abdomen (digital rectal examination should only be carried out by a specialist)

NICE guidelines on management

If faecal impaction is present

- polyethylene glycol 3350 + electrolytes (Movicol Paediatric Plain) using an escalating dose regimen as the first-line treatment
- add a stimulant laxative if Movicol Paediatric Plain does not lead to disimpaction after 2 weeks
- substitute a stimulant laxative singly or in combination with an osmotic laxative such as lactulose if Movicol Paediatric Plain is not tolerated
- inform families that disimpaction treatment can initially increase symptoms of soiling and abdominal pain

Maintenance therapy

- very similar to the above regime, with obvious adjustments to the starting dose, i.e.
- first-line: Movicol Paediatric Plain
- add a stimulant laxative if no response
- substitute a stimulant laxative if Movicol Paediatric Plain is not tolerated. Add another laxative such as lactulose or docusate if stools are hard
- continue medication at maintenance dose for several weeks after regular bowel habit is established, then reduce dose gradually

General points

- do not use dietary interventions alone as first-line treatment although ensure child is having adequate fluid and fibre intake
- consider regular toileting and non-punitive behavioural interventions
- for all children consider asking the Health Visitor or Paediatric Continence Advisor to help support the parents.

The NICE guidelines do not specifically discuss the management of very young child. The following recommendations are largely based on the old Clinical Knowledge Summaries recommendations.

Infants not yet weaned (usually < 6 months)

- bottle-fed infants: give extra water in between feeds. Try gentle abdominal massage and bicycling the infant's legs
- breast-fed infants: constipation is unusual and organic causes should be considered

Infants who have or are being weaned

- offer extra water, diluted fruit juice and fruits
- if not effective consider adding lactulose

Nocturnal enuresis

The majority of children achieve day and night time continence by 3 or 4 years of age. Enuresis may be defined as the 'involuntary discharge of urine by day or night or both, in a child aged 5 years or older, in the absence of congenital or acquired defects of the nervous system or urinary tract'

Nocturnal enuresis can be defined as either primary (the child has never achieved continence) or secondary (the child has been dry for at least 6 months before)

NICE issued guidance in 2010. Management:

- look for possible underlying causes/triggers (e.g. Constipation, diabetes mellitus, UTI if recent onset)
- advise on fluid intake, diet and toileting behaviour
- reward systems (e.g. Star charts). NICE recommend these 'should be given for agreed behaviour rather than dry nights' e.g. Using the toilet to pass urine before sleep
- NICE advise: 'Consider whether alarm or drug treatment is appropriate, depending on the age, maturity and abilities of the child or young person, the frequency of bedwetting and the motivation and needs of the family'. Generally:
- an enuresis alarm is first-line for children under the age of 7 years
- desmopressin may be used first-line for children over the ago 7 years, particularly if short-term control is needed or an enuresis alarm has been ineffective/is not acceptable to the family
- please see the link for more details

Immunisation schedule

The current UK immunisation schedule is as follows. Please note that this table includes the changes announced in 2010 which merged the 12 and 13 month visits into one.

At birth	BCG / hepatitis B vaccine if risk factors (see below)
2 months	DTaP/IPV/Hib + PCV
3 months	DTaP/IPV/Hib + Men C
4 months	DTaP/IPV /Hib + PCV + Men C
12-13 months	Hib/Men C + MMR + PCV
3-5 years	MMR + DTaP/IPV
12-13 years	HPV vaccination for girls
13-18 years	DT/IPV

At birth the BCG vaccine should be given if the baby is deemed at risk of tuberculosis (e.g. Tuberculosis in the family in the past 6 months). Hepatitis B vaccine should be given at birth if the mother is HBsAg +ve.

Key

- DTaP = Diphtheria, Tetanus, acellular Pertussis vaccine
- IPV = Inactivated Polio Vaccine
- Hib = *Haemophilus influenzae* B vaccine
- PCV = Pneumococcal Conjugate Vaccine

- Men C = Meningococcal C vaccine
- MMR = Measles, Mumps, Rubella vaccine
- DT = Diphtheria, Tetanus vaccine
- HPV = Human Papilloma Vaccine

Developmental dysplasia of the hip

Developmental dysplasia of the hip (DDH) is gradually replacing the old term 'congenital dislocation of the hip' (CDH). It affects around 1-3% of newborns.

Risk factors

- female sex: 6 times greater risk
- breech presentation
- positive family history
- firstborn children
- oligohydramnios
- birth weight > 5 kg
- congenital calcaneovalgus foot deformity

DDH is slightly more common in the left hip. Around 20% of cases are bilateral.

Clinical examination is made using the Barlow and Ortolani tests:

- Barlow test: attempts to dislocate an articulated femoral head
- Ortolani test: attempts to relocate a dislocated femoral head

Ultrasound is used to confirm the diagnosis if clinically suspected

Management

- most unstable hips will spontaneously stabilise by 3-6 weeks of age
- Pavlik harness (flexion-abduction orthosis) in children younger than 4-5 months
- older children may require surgery

Paediatric drug doses: emergency

The current BNF should always be consulted prior to prescribing drugs you are unfamiliar with, the following is just a guide

IM benzylpenicillin for suspected meningococcal septicaemia in the community

< 1 year	300 mg
1 - 10 years	600 mg
> 10 years	1200 mg

Feverish illness in children

The 2007 Feverish illness in children guidelines by NICE introduced a 'traffic light' for risk stratification of children under the age of 5 years presenting with a fever. It should be noted that these guidelines only apply 'until a clinical diagnosis of the underlying condition has been made'. A link to the guidelines is provided but some key points are listed below.

Assessment

The following should be recorded in all febrile children:

- temperature
- heart rate
- respiratory rate
- capillary refill time

Signs of dehydration (reduced skin turgor, cool extremities etc) should also be looked for

Measuring temperature should be done with an electronic thermometer in the axilla if the child is < 4 weeks or with an electronic/chemical dot thermometer
in the axilla or an infra-red tympanic thermometer.

Risk stratification

Please see the link for the complete table, below is a modified version

Green - low risk	**Amber - intermediate risk**	**Red - high risk**
• Normal colour	• Pallor reported by parent/carer	• Pale/mottled/ashen/blue
• Responds normally to social cues	• Not responding normally to social cues	• No response to social cues • Appears ill to a healthcare professional
• Normal cry	• Wakes only with prolonged stimulation	• Unable to rouse
• Not dehydrated	• Decreased activity	• Weak, high-pitched or continuous cry
• No amber or red signs	• Not smiling	• Grunting
	• Nasal flaring	• Tachypnoea:
	• Tachypnoea:	- RR > 60 breaths/minute
	- RR > 50 breaths/minute age 6-12 months	• Moderate or severe chest indrawing
	- RR > 40 breaths/minute age > 12 months	• Reduced skin turgor
	• Oxygen saturation = 95% in air	• Age 0-3 months, temperature > 38°C
	• Crackles	• Age 3-6 months, temperature > 39°C
	• Dry mucous membrane	• Non-blanching rash
	• Poor feeding in infants	• Bulging fontanelle
	• CRT = 3 seconds	• Neck stiffness
	• Reduced urine output	• Status epilepticus
	• Fever for = 5 days	• Focal neurological signs
	• Swelling of a limb or joint	• Focal seizures
	• Non-weight bearing/not using an extremity	• Bile-stained vomiting
	• A new lump > 2 cm	

Management

If green:

- Child can be managed at home with appropriate care advice, including when to seek further help

If amber:

- provide parents with a safety net or refer to a paediatric specialist for further assessment
- a safety net includes verbal or written information on warning symptoms and how further healthcare can be accessed, a follow-up appointment, liaison with other healthcare professionals, e.g. out-of-hours providers, for further follow-up

If red:

- refer child urgently to a paediatric specialist

Other key points include

- oral antibiotics should not be prescribed to children with fever without apparent source
- if a pneumonia is suspected but the child is not going to be referred to hospital then a chest x-ray does not need to be routinely performed

Autism

Epidemiology

- 75% of children are male
- usually develops before 3 years of age

All 3 of the following features must be present for a diagnosis to be made

- global impairment of language and communication
- impairment of social relationships
- ritualistic and compulsive phenomena

Other features

- most children have a decreased IQ - the 'idiot savant' is rare

Associated conditions

- Fragile X
- Rett's syndrome

Roseola infantum

Roseola infantum (also known as exanthem subitum, occasionally sixth disease) is a common disease of infancy caused by the human herpes virus 6 (HHV6). It has an incubation period of 5-15 days and typically affects children aged 6 months to 2 years.

Features

- high fever: lasting a few days, followed by a
- maculopapular rash
- febrile convulsions occur in around 10-15%
- diarrhoea and cough are also commonly seen

Other possible consequences of HHV6 infection

- aseptic meningitis
- hepatitis

Asthma in children: assessment of acute attacks

- The 2011 BTS/SIGN guidelines suggest the following criteria are used to assess the severity of asthma in general practice:

  Children between 2 and 5 years of age

Moderate attack	**Severe attack**	**Life-threatening attack**
SpO2 > 92%	SpO2 < 92%	SpO2 <92%
No clinical features of severe asthma	Too breathless to talk or feed	Silent chest
	Heart rate > 140/min	Poor respiratory effort
	Respiratory rate > 40/min	Agitation
	Use of accessory neck muscles	Altered consciousness
		Cyanosis

- **Children greater than 5 years of age**

  Attempt to measure PEF in all children aged > 5 years.

Moderate attack	**Severe attack**	**Life-threatening attack**
SpO2 > 92%	SpO2 < 92%	SpO2 < 92%
PEF > 50% best or predicted	PEF 33-50% best or predicted	PEF < 33% best or predicted
No clinical features of severe asthma	Can't complete sentences in one breath or too breathless to talk or feed	Silent chest
	Heart rate > 125/min	Poor respiratory effort
	Respiratory rate > 30/min	Altered consciousness
	Use of accessory neck muscles	Cyanosis

Limping child

Causes of a limping child may vary according to age

Transient synovitis	Acute onset Usually accompanies viral infections, but the child is well or has a mild fever More common in boys, aged 2-12 years
Septic arthritis/osteomyelitis	Unwell child, high fever
Juvenile idiopathic arthritis	Limp may be painless
Trauma	History is usually diagnostic
Development dysplasia of the hip	Usually detected in neonates 6 times more common in girls
Perthes disease	More common at 4-8 years Due to avascular necrosis of the femoral head
Slipped upper femoral epiphysis	10-15 years - Displacement of the femoral head epiphysis postero-inferiorly

Cow's milk protein intolerance/allergy

Cow's milk protein intolerance/allergy (CMPI/CMPA) occurs in around 3-6% of all children and typically presents in the first 3 months of life in formula fed infants, although rarely it is seen in exclusively breastfed infants.

Both immediate (IgE mediated) and delayed (non-IgE mediated) reactions are seen. The term CMPA is usually used for immediate reactions and CMPI for mild-moderate delayed reactions.

Features

- regurgitation and vomiting
- diarrhoea
- urticaria, atopic eczema
- 'colic' symptoms: irritability, crying
- wheeze, chronic cough
- rarely angioedema and anaphylaxis may occur

Diagnosis is often clinical (e.g. improvement with cow's milk protein elimination). Investigations include:

- skin prick/patch testing
- total IgE and specific IgE (RAST) for cow's milk protein

Management

If the symptoms are severe (e.g. failure to thrive) refer to a paediatrician.

Management if formula-fed

- extensive hydrolysed formula (eHF) milk is the first-line replacement formula for infants with mild-moderate symptoms
- amino acid-based formula (AAF) in infants with severe CMPA or if no response to eHF
- around 10% of infants are also intolerant to soya milk

Management if breast-fed

- continue breastfeeding
- eliminate cow's milk protein from maternal diet
- use eHF milk when breastfeeding stops, until 12 months of age and at least for 6 months

CMPI usually resolves by 1-2 years of age. A challenge is often performed in the hospital setting as anaphylaxis can occur.

Sudden infant death syndrome

Sudden infant death syndrome is the commonest cause of death in the first year of life. It is most common at 3 months of age

Risk factors

- prematurity
- parental smoking
- hyperthermia (e.g. over-wrapping)
- putting the baby to sleep prone
- male sex
- multiple births
- bottle feeding
- social classes IV and V
- maternal drug use
- incidence increases in winter

Following a cot death siblings should be screened for potential sepsis and inborn errors of metabolism

Paediatric basic life support

The 2010 Resuscitation Council guidelines made the following changes to paediatric basic life support

- compression:ventilation ratio: lay rescuers should use a ratio of 30:2. If there are two or more rescuers with a duty to respond then a ratio of 15:2 should be used
- age definitions: an infant is a child under 1 year, a child is between 1 year and puberty

Key points of algorithm (please see link attached for more details)

- unresponsive?
- shout for help
- open airway
- look, listen, feel for breathing
- give 5 rescue breaths
- check for signs of circulation
- 15 chest compressions:2 rescue breaths (see above)

Child abuse: NICE guidelines

NICE published guidelines on when to suspect child maltreatment in 2009. Remember child abuse may include physical, emotional and sexual abuse, neglect and fabricated or induced illness.

In the guidelines there are a large number of features listed which should raise the suspicion of abuse. The full list has **not** been replicated here (please use the link provided) - we have only picked selected features.

Neglect

Features where you should consider abuse	Features where you should suspect abuse
Severe and persistent infestations (e.g. Scabies or head lice) Parents who do not administer essential prescribed treatment Parents who persistently fail to obtain treatment for tooth decay Parents who repeatedly fail to attend essential follow-up appointments Parents who persistently fail to engage with child health promotion Failure to dress the child in suitable clothing Animal bite on an inadequately supervised child	Failure to seek medical advice which compromises the child's health Child who is persistently smelly and dirty Repeat observations that: • poor standards of hygiene that affects the child's health • inadequate provision of food • living environment that is unsafe for the child's development stage

Sexual abuse

Features where you should consider abuse	Features where you should suspect abuse
Persistent dysuria or anogenital discomfort without a medical explanation Gaping anus in a child during examination without a medical explanation Pregnancy in a young women aged 13-15 years Hepatitis B or anogenital warts in a child 13-15 years	Persistent or recurrent genital or anal symptoms associated with a behavioural or emotional change Anal fissure when constipation and Crohn's disease have been excluded as the cause STI in a child younger than 12 years (where there is no evidence of vertical or blood transmission Sexualised behaviour in a prepubertal child

Physical abuse

Features where you should consider abuse	Features where you should suspect abuse
Any serious or unusual injury with an absent or unsuitable explanation Cold injuries in a child with no medical explanation Hypothermia in a child without a suitable explanation Oral injury in a child with an absent or suitable explanation	Bruising, lacerations or burns in a child who is not independently mobile or where there is an absent or unsuitable explanation Human bite mark not by a young child One or more fractures if there is an unsuitable explanation, including: • fractures of different ages

- X-ray evidence of occult fractures

Retinal haemorrhages with no adequate explanation

Growing pains

A common presentation in General Practice is a child complaining of pain in the legs with no obvious cause. Such presentations, in the absence of any worrying features, are often attributed to 'growing pains'. This is a misnomer as the pains are often not related to growth - the current term used in rheumatology is 'benign idiopathic nocturnal limb pains of childhood'

Growing pains are equally common in boys and girls and occur in the age range of 3-12 years.

Features of growing pains

- never present at the start of the day after the child has woken
- no limp
- no limitation of physical activity
- systemically well
- normal physical examination
- motor milestones normal
- symptoms are often intermittent and worse after a day of vigorous activity

Food allergy in children and young people

The 2011 NICE guidelines differentiate between IgE mediated and non-IgE mediated allergies. It should be noted that the guidance does not govern food intolerance, which is not caused by immune system dysfunction.

The first step is to identify possible food allergy and differentiate the possible causes:

IgE-mediated

Skin

- pruritus
- erythema
- urticaria
- angioedema

Gastrointestinal system

- nausea
- colicky abdominal pain
- vomiting
- diarrhoea

Respiratory system

- upper respiratory tract symptoms - nasal

Non-IgE-mediated

Skin

- pruritus
- erythema
- atopic eczema

Gastrointestinal system

- gastro-oesophageal reflux disease
- loose or frequent stools
- blood and/or mucus in stools
- abdominal pain
- infantile colic
- food refusal or aversion
- constipation
- perianal redness
- pallor and tiredness
- faltering growth plus one or more gastrointestinal symptoms above (with

itching,sneezing, rhinorrhoea or congestion (with or without conjunctivitis)
- lower respiratory tract symptoms - cough, chest tightness, wheezing or shortness of breath

or without significant atopic eczema)

Symptoms of anaphylaxis

If the history is suggestive of an IgE-mediated allergy

- offer a skin prick test or blood tests for specific IgE antibodies to the suspected foods and likely co-allergens

If the history is suggestive of an non-IgE-mediated allergy

- eliminate the suspected allergen for 26 weeks, then reintroduce. NICE advise to 'consult a dietitian with appropriate competencies about nutritional adequacies, timings and follow-up'

Atopic eczema is suggestive of a non-IgE mediated food allergy.

Asthma in children: stepwise management

The British Thoracic Society differentiate between children younger and older than 5 years in their 2011 guidelines:

Children aged under 5 years

Step	Therapy
1	As-required reliever therapy: short-acting beta2-agonist
2	Regular preventer therapy: inhaled corticosteroids, 200-400mcg/day* Or, if inhaled corticosteroids cannot be used, a leukotriene receptor antagonist
3	Children aged 2-5 years: trial of a leukotriene receptor antagonist. If already taking leukotriene receptor antagonist reconsider inhaled corticosteroids Children aged under 2 years: refer to respiratory paediatrician
4	Refer to a respiratory paediatrician

Children aged over 5 years (similar to adult guidance)

Step	Therapy
1	As-required reliever therapy: short-acting beta2-agonist
2	Regular preventer therapy: inhaled corticosteroids, 200-400mcg/day*
3	1. Add inhaled long-acting B2 agonist (LABA)

	2. Assess control of asthma: • good response to LABA - continue LABA • benefit from LABA but control still inadequate: continue LABA and increase inhaled steroid dose to 400 mcg/day* (if not already on this dose) • no response to LABA: stop LABA and increase inhaled steroid to 400 mcg/ day.* If control still inadequate, institute trial of other therapies, leukotriene receptor antagonist or SR theophylline
4	Increase inhaled corticosteroids to high-dose, up to 800mcg/day*
5	Use daily steroid tablet at lowest dose providing control Maintain inhaled corticosteroids at 800mcg/day Refer to a paediatrician

*beclometasone dipropionate or equivalent

MMR vaccine

Children in the UK receive two doses of the Measles, Mumps and Rubella (MMR) vaccine before entry to primary school. This currently occurs at 12-15 months and 3-4 years as part of the routine immunisation schedule

Contraindications to MMR

- severe immunosuppression
- allergy to neomycin
- children who have received another live vaccine by injection within 4 weeks
- pregnancy should be avoided for at least 1 month following vaccination
- immunoglobulin therapy within the past 3 months (there may be no immune response to the measles vaccine if antibodies are present)

Adverse effects

- malaise, fever and rash may occur after the first dose of MMR. This typically occurs after 5-10 days and lasts around 2-3 days

Puberty

Males

- first sign is testicular growth at around 12 years of age (range = 10-15 years)
- testicular volume > 4 ml indicates onset of puberty

- maximum height spurt at 14

Females

- first sign is breast development at around 11.5 years of age (range = 9-13 years)
- height spurt reaches its maximum early in puberty (at 12) , before menarche
- menarche at 13 (11-15)
- there is an increase of only about 4% of height following menarche

Hearing problems in children

The most common causes of hearing problems in children are listed below

Conductive

- secretory otitis media
- Down's syndrome*

Sensorineural

- hereditary - Usher syndrome, Pendred syndrome, Jervell-Lange-Nielson syndrome, Wardenburg syndrome
- congenital infection e.g. rubella
- acquired - meningitis, head injury
- cerebral palsy
- perinatal insult

*may have elements of sensorineural loss as well

Neonatal blood spot screening

Neonatal blood spot screening (previously called the Guthrie test or 'heel-prick test') is performed at 5-9 days of life

The following conditions are currently screened for:

- congenital hypothyroidism
- cystic fibrosis
- phenylketonuria
- sickle cell disease

- medium chain acyl-CoA dehydrogenase deficiency (MCADD)

Innocent murmurs

Innocent murmurs heard in children include

Ejection murmurs	Due to turbulent blood flow at the outflow tract of the heart
Venous hums	Due to the turbulent blood flow in the great veins returning to the heart. Heard as a continuous blowing noise heard just below the clavicles
Still's murmur	Low-pitched sound heard at the lower left sternal edge

Characteristics of an innocent ejection murmur include:

- soft-blowing murmur in the pulmonary area or short buzzing murmur in the aortic area
- may vary with posture
- localised with no radiation
- no diastolic component
- no thrill
- no added sounds (e.g. clicks)
- asymptomatic child
- no other abnormality

Obesity in children

Defining obesity is more difficult in children than adults as body mass index (BMI) varies with age. BMI percentile charts are therefore needed to make an accurate assessment. Recent NICE guidelines suggest to use 'UK 1990 BMI charts to give age- and gender-specific information'

NICE recommend

- consider tailored clinical intervention if BMI at 91st centile or above.
- consider assessing for comorbidities if BMI at 98th centile or above

By far the most common cause of obesity in childhood is lifestyle factors. Other associations of obesity in children include:

- Asian children: four times more likely to be obese than white children
- female children
- taller children: children with obesity are often above the 50th percentile in height

Cause of obesity in children

- growth hormone deficiency
- hypothyroidism
- Down's syndrome
- Cushing's syndrome
- Prader-Willi syndrome

Consequences of obesity in children

- orthopaedic problems: slipped upper femoral epiphyses, Blount's disease (a development abnormality of the tibia resulting in bowing of the legs), musculoskeletal pains
- psychological consequences: poor self-esteem, bullying
- sleep apnoea
- benign intracranial hypertension
- long-term consequences: increased incidence of type 2 diabetes mellitus, hypertension and ischaemic heart disease

Diarrhoea and vomiting in children

Diarrhoea and vomiting is very common in younger children. The most common cause of gastroenteritis in children in the UK is rotavirus. Much of the following is based around the 2009 NICE guidelines (please see the link for more details).

Clinical features

NICE suggest that typically:

- diarrhoea usually lasts for 5-7 days and stops within 2 weeks
- vomiting usually lasts for 1-2 days and stops within 3 days

When assessing hydration status NICE advocate using normal, dehydrated or shocked categories rather than the traditional normal, mild, moderate or severe categories.

Clinical dehydration	Clinical shock
Appears to be unwell or deteriorating Decreased urine output Skin colour unchanged Warm extremities Altered responsiveness (for example, irritable, lethargic) Sunken eyes	Decreased level of consciousness Cold extremities Pale or mottled skin

Dry mucous membranes Tachycardia Tachypnoea Normal peripheral pulses Normal capillary refill time Reduced skin turgor Normal blood pressure	 Tachycardia Tachypnoea Weak peripheral pulses Prolonged capillary refill time Hypotension

The following children are at an increased risk of dehydration:

- children younger than 1 year, especially those younger than 6 months
- infants who were of low birth weight
- children who have passed six or more diarrhoeal stools in the past 24 hours
- children who have vomited three times or more in the past 24 hours
- children who have not been offered or have not been able to tolerate supplementary fluids before presentation
- infants who have stopped breastfeeding during the illness
- children with signs of malnutrition

Features suggestive of hypernatraemic dehydration:

- jittery movements
- increased muscle tone
- hyperreflexia
- convulsions
- drowsiness or coma

Diagnosis

NICE suggest doing a stool culture in the following situations:

- you suspect septicaemia or
- there is blood and/or mucus in the stool or
- the child is immunocompromised

You should consider doing a stool culture if:

- the child has recently been abroad or
- the diarrhoea has not improved by day 7 or
- you are uncertain about the diagnosis of gastroenteritis

Management

If clinical shock is suspected children should be admitted for intravenous rehydration.

For children with no evidence of dehydration

- continue breastfeeding and other milk feeds
- encourage fluid intake
- discourage fruit juices and carbonated drinks

If dehydration is suspected:

- give 50 ml/kg low osmolarity oral rehydration solution (ORS) solution over 4 hours, plus ORS solution for maintenance, often and in small amounts
- continue breastfeeding
- consider supplementing with usual fluids (including milk feeds or water, but not fruit juices or carbonated drinks)

Cerebral palsy

Cerebral palsy may be defined as a disorder of movement and posture due to a non-progressive lesion of the motor pathways in the developing brain. It affects 2 in 1,000 live births and is the most common cause of major motor impairment

Possible manifestations include:

- abnormal tone early infancy
- delayed motor milestones
- abnormal gait
- feeding difficulties

Children with cerebral palsy often have associated non-motor problems such as:

- learning difficulties (60%)
- epilepsy (30%)
- squints (30%)
- hearing impairment (20%)

Causes

- antenatal (80%): e.g. cerebral malformation and congenital infection (rubella, toxoplasmosis, CMV)
- intrapartum (10%): birth asphyxia/trauma
- postnatal (10%): intraventricular haemorrhage, meningitis, head-trauma

Classification

- spastic (70%): hemiplegia, diplegia or quadriplegia
- dyskinetic
- ataxic
- mixed

Management

- as with any child with a chronic condition a multidisciplinary approach is needed
- treatments for spasticity include oral diazepam, oral and intrathecal baclofen, botulinum toxin type A, orthopaedic surgery and selective dorsal rhizotomy
- anticonvulsants, analgesia as required

Absence seizures

Absence seizures (petit mal) are a form of generalised epilepsy that is mostly seen in children. The typical age of onset of 3-10 years old and girls are affected twice as commonly as boys

Features

- absences last a few seconds and are associated with a quick recovery
- seizures may be provoked by hyperventilation or stress
- the child is usually unaware of the seizure
- they may occur many times a day
- EEG: bilateral, symmetrical 3Hz spike and wave pattern

Management

- sodium valproate and ethosuximide are first-line treatment
- good prognosis - 90-95% become seizure free in adolescence

Breast feeding

Advantages	Disadvantages
Mother • bonding • involution of uterus • protection against breast and ovarian cancer • cheap, no need to sterilise bottle • contraceptive effect (unreliable) Immunological • IgA (protects mucosal surfaces), lysozyme (bacteriolytic enzyme) and lactoferrin (ensures rapid absorption of iron so not available to bacteria) • reduced incidence of ear, chest and gastro-intestinal infections • reduced incidence of eczema and asthma reduced incidence of type 1 diabetes mellitus Reduced incidence of sudden infant death syndrome Baby is in control of how much milk it takes	Transmission of drugs Transmission of infection (e.g. HIV) Nutrient inadequacies (prolonged breast feeding may lead to vitamin D deficiency) Vitamin K deficiency Breast milk jaundice

Constipation in children

The frequency at which children open their bowels varies widely, but generally decreases with age from a mean of 3 times per day for infants under 6 months old to once a day after 3 years of age.

NICE produced guidelines in 2010 on the diagnosis and management of constipation in children. A diagnosis of constipation is suggested by 2 or more of the following:

	Child < 1 year	Child > 1 year
Stool pattern	Fewer than 3 complete stools per week (type 3 or 4 on Bristol Stool Form Scale) (this does not apply to exclusively breastfed babies after 6 weeks of age) Hard large stool 'Rabbit droppings' (type 1)	Fewer than 3 complete stools per week (type 3 or 4) Overflow soiling (commonly very loose, very smelly, stool passed without sensation) 'Rabbit droppings' (type 1) Large, infrequent stools that can block the toilet
Symptoms associated with	Distress on passing stool Bleeding associated with hard stool	Poor appetite that improves with passage of large stool

defecation	Straining	Waxing and waning of abdominal pain with passage of stool Evidence of retentive posturing: typical straight legged, tiptoed, back arching posture Straining Anal pain
History	Previous episode(s) of constipation Previous or current anal fissure	Previous episode(s) of constipation Previous or current anal fissure Painful bowel movements and bleeding associated with hard stools

The vast majority of children have no identifiable cause - idiopathic constipation. Other causes of constipation in children include:

- dehydration
- low-fibre diet
- medications: e.g. Opiates
- anal fissure
- over-enthusiastic potty training
- hypothyroidism
- Hirschsprung's disease
- hypercalcaemia
- learning disabilities

After making a diagnosis of constipation NICE then suggesting excluding secondary causes. If no red or amber flags are present then a diagnosis of idiopathic constipation can be made:

	Indicates idiopathic constipation	**'Red flag' suggesting underlying disorder**
Timing	Starts after a few weeks of life Obvious precipitating factors coinciding with the start of symptoms: fissure, change of diet, timing of potty/toilet training or acute events such as infections, moving house, starting nursery/school, fears and phobias, major change in family, taking medicines	Reported from birth or first few weeks of life
Passage of meconium	< 48 hours	> 48 hours
Stool pattern		'Ribbon' stools
Growth	Generally well, weight and height within normal limits, fit and active	Faltering growth is an **amber** flag
Neuro/locomotor	No neurological problems in legs, normal locomotor development	Previously unknown or undiagnosed weakness in legs, locomotor delay
Abdomen		Distension

Diet	Changes in infant formula, weaning, insufficient fluid intake or poor diet	
Other		**Amber** flag: Disclosure or evidence that raises concerns over possibility of child maltreatment

Prior to starting treatment the child needs to be assessed for faecal impaction. Factors which suggest faecal impaction include:

- symptoms of severe constipation
- overflow soiling
- faecal mass palpable in abdomen (digital rectal examination should only be carried out by a specialist)

NICE guidelines on management

If faecal impaction is present

- polyethylene glycol 3350 + electrolytes (Movicol Paediatric Plain) using an escalating dose regimen as the first-line treatment
- add a stimulant laxative if Movicol Paediatric Plain does not lead to disimpaction after 2 weeks
- substitute a stimulant laxative singly or in combination with an osmotic laxative such as lactulose if Movicol Paediatric Plain is not tolerated
- inform families that disimpaction treatment can initially increase symptoms of soiling and abdominal pain

Maintenance therapy

- very similar to the above regime, with obvious adjustments to the starting dose, i.e.
- first-line: Movicol Paediatric Plain
- add a stimulant laxative if no response
- substitute a stimulant laxative if Movicol Paediatric Plain is not tolerated. Add another laxative such as lactulose or docusate if stools are hard
- continue medication at maintenance dose for several weeks after regular bowel habit is established, then reduce dose gradually

General points

- do not use dietary interventions alone as first-line treatment although ensure child is having adequate fluid and fibre intake
- consider regular toileting and non-punitive behavioural interventions
- for all children consider asking the Health Visitor or Paediatric Continence Advisor to help support the parents.

The NICE guidelines do not specifically discuss the management of very young child. The following recommendations are largely based on the old Clinical Knowledge Summaries recommendations.

Infants not yet weaned (usually < 6 months)

- bottle-fed infants: give extra water in between feeds. Try gentle abdominal massage and bicycling the infant's legs
- breast-fed infants: constipation is unusual and organic causes should be considered

Infants who have or are being weaned

- offer extra water, diluted fruit juice and fruits
- if not effective consider adding lactulose

Hypotonia

Hypotonia, or floppiness, may be central in origin or related to nerve and muscle problems. An acutely ill child (e.g. septicaemic) may be hypotonic on examination. Hypotonia associated with encephalopathy in the newborn period is most likely caused by hypoxic ischaemic encephalopathy

Central causes

- Down's syndrome
- Prader-Willi syndrome
- hypothyroidism
- cerebral palsy (hypotonia may precede the development of spasticity)

Neurological and muscular problems

- spinal muscular atrophy
- spina bifida
- Guillain-Barre syndrome
- myasthenia gravis
- muscular dystrophy
- myotonic dystrophy

Croup

Croup is a form of upper respiratory tract infection seen in infants and toddlers. It is characterised by stridor which is caused by a combination of laryngeal oedema and secretions. Parainfluenza viruses account for the majority of cases.

Epidemiology

- peak incidence at 6 months - 3 years
- more common in autumn

Features

- stridor
- barking cough (worse at night)
- fever

- coryzal symptoms

Clinical Knowledge Summaries (CKS) suggest using the following criteria to grade the severity*:

Mild	Moderate	Severe
• Occasional barking cough • No audible stridor at rest • No or mild suprasternal and/or intercostal recession • The child is happy and is prepared to eat, drink, and play	• Frequent barking cough • Easily audible stridor at rest • Suprasternal and sternal wall retraction at rest • No or little distress or agitation • The child can be placated and is interested in its surroundings	• Frequent barking cough • Prominent inspiratory (and occasionally, expiratory) stridor at rest • Marked sternal wall retractions • Significant distress and agitation, or lethargy or restlessness (a sign of hypoxaemia) • Tachycardia occurs with more severe obstructive symptoms and hypoxaemia

CKS suggest admitting any child with moderate or severe croup. Other features which should prompt admission include:

- < 6 months of age
- known upper airway abnormalities (e.g. Laryngomalacia, Down's syndrome)
- uncertainty about diagnosis (important differentials include acute epiglottitis, bacterial tracheitis, peritonsillar abscess and foreign body inhalation)

Management

- CKS recommend giving a single dose of oral dexamethasone (0.15mg/kg) to all children regardless of severity
- prednisolone is an alternative if dexamethasone is not available

Emergency treatment

- high-flow oxygen
- nebulised adrenaline

*these in turn are based partly on the Alberta Medical Association (2008) Guideline for the diagnosis and management of croup.

Breast feeding: contraindications

The major breastfeeding contraindications tested in exams relate to drugs (see below). Other contraindications of note include:

- galactosaemia
- viral infections - this is controversial with respect to HIV in the developing world. This is because there is such an increased infant mortality and morbidity associated with bottle

feeding that some doctors think the benefits outweigh the risk of HIV transmission

Drug contraindications

The following drugs can be given to mothers who are breast feeding:

- antibiotics: penicillins, cephalosporins, trimethoprim
- endocrine: glucocorticoids (avoid high doses), levothyroxine*
- epilepsy: sodium valproate, carbamazepine
- asthma: salbutamol, theophyllines
- psychiatric drugs: tricyclic antidepressants, antipsychotics**
- hypertension: beta-blockers, hydralazine, methyldopa
- anticoagulants: warfarin, heparin
- digoxin

The following drugs should be avoided:

- antibiotics: ciprofloxacin, tetracycline, chloramphenicol, sulphonamides
- psychiatric drugs: lithium, benzodiazepines
- aspirin
- carbimazole
- sulphonylureas
- cytotoxic drugs
- amiodarone

*the BNF advises that the amount is too small to affect neonatal hypothyroidism screening

**clozapine should be avoided

Childhood syndromes

Below is a list of common features of selected childhood syndromes

Edward's syndrome	Micrognathia Low-set ears Rocker bottom feet Overlapping of fingers
Fragile X	Learning difficulties Macrocephaly Long face Large ears Macro-orchidism
Noonan syndrome	Webbed neck Pectus excavatum Short stature Pulmonary stenosis

Patau syndrome	Microcephalic, small eyes Cleft lip/palate Polydactyly Scalp lesions
Pierre-Robin syndrome	Micrognathia Posterior displacement of the tongue Cleft palate
Prader-Willi syndrome	Hypotonia Hypogonadism Obesity
William's syndrome	Short stature Learning difficulties Friendly, extrovert personality Transient neonatal hypercalcaemia Supravalvular aortic stenosis

Intussusception

Intussusception describes the invagination of one portion of bowel into the lumen of the adjacent bowel, most commonly around the ileo-caecal region.

Intussusception is usually affects infants between 6-18 months old. Boys are affected twice as often as girls

Features

- paroxysmal abdominal colic pain
- during paroxysm the infant will characteristically draw their knees up and turn pale
- vomiting
- blood stained stool - 'red-currant jelly'
- sausage-shaped mass in the abdomen

Investigation

- ultrasound is now the investigation of choice and may show a target-like mass

Management

- the majority can be treated with reduction by barium enema under radiological control
- if this fails, or the child has signs of peritonitis, surgery is performed

Cleft lip and palate

Cleft lip and palate affect around 1 in every 1,000 babies.

Pathophysiology

- polygenic inheritance
- maternal antiepileptic use increases risk
- cleft lip results from failure of the fronto-nasal and maxillary processes to fuse
- cleft palate results from failure of the palatine processes and the nasal septum to fuse

Problems

- feeding: orthodontic devices may be helpful
- speech: with speech therapy 75% of children develop normal speech
- increased risk of otitis media for cleft palate babies

Management

- cleft lip is repaired earlier than cleft palate, with practices varying from repair in the first week of life to three months
- cleft palates are typically repaired between 6-12 months of age

Gynaecological problems in children

In general vaginal examinations and vaginal swabs should not be performed - referral to a paediatric gynaecologist is appropriate for persistent problems

Most newborn girls have some mucoid white vaginal discharge. This usually disappears by 3 months of age

Vulvovaginitis

- commonest gynaecological disorder in girls
- risk factors include poor hygiene, tight clothing, lack of labial fat pads protecting vaginal orifice and lack of protective acid secretion found in the reproductive years
- bacterial (such as Gardnerella and Bacteroides) or fungal organisms may be responsible
- sexual abuse may occasionally present as vulvovaginitis
- if bloody discharge consider foreign body

Management

- advise about hygiene
- soothing creams may be useful
- topical antibiotics/antifungals
- oestrogen cream in resistant cases

Vaccinations

It is important to be aware of vaccines which are of the live-attenuated type as these may pose a risk to immunocompromised patients. The main types of vaccine are as follows:

Live attenuated

- **BCG**
- **measles, mumps, rubella (MMR)**
- **oral polio**
- **yellow fever**
- **oral typhoid***

Inactivated preparations

- rabies
- influenza

Detoxified exotoxins

- tetanus

Extracts of the organism/virus (sometimes termed fragment)**

- diphtheria
- pertussis ('acellular' vaccine)
- hepatitis B
- meningococcus, pneumococcus, haemophilus

Notes

- influenza: different types are available, including whole inactivated virus, split virion (virus particles disrupted by detergent treatment) and sub-unit (mainly haemagglutinin and neuraminidase)
- cholera: contains inactivated Inaba and Ogawa strains of Vibrio cholerae together with recombinant B-subunit of the cholera toxin
- hepatitis B: contains HBsAg adsorbed onto aluminium hydroxide adjuvant and is prepared from yeast cells using recombinant DNA technology

*whole cell typhoid vaccine is no longer used in the UK

**may also be produced using recombinant DNA technology

Child health surveillance

The following table gives a basic outline of child health surveillance in the UK

Antenatal	Ensure intrauterine growth Check for maternal infections e.g. HIV Ultrasound scan for fetal abnormalities Blood tests for Neural Tube Defects

Newborn	Clinical examination of newborn Newborn Hearing Screening Programme e.g. oto-acoustic emissions test Give mother Personal Child Health Record
First month	Heel-prick test day 5-9 - hypothyroidism, PKU, metabolic diseases, cystic fibrosis, medium-chain acyl Co-A dehydrogenase deficiency (MCADD) Midwife visit up to 4 weeks*
Following months	Health visitor input GP examination at 6-8 weeks Routine immunisations
Pre school	National orthoptist-led programme for pre-school vision screening to be introduced
Ongoing	Monitoring of growth, vision, hearing Health professionals advice on immunisations, diet, accident prevention

*this doesn't seem to happen in practice with health visitors usually taking over at 2 weeks

Precocious puberty

Definition

- 'development of secondary sexual characteristics **before 8 years in females and 9 years in males'**
- more common in females

Some other terms

- thelarche (the first stage of breast development)
- adrenarche (the first stage of pubic hair development)

May be classified into:

1. Gonadotrophin dependent ('central', 'true')

- due to premature activation of the hypothalamic-pituitary-gonadal axis
- FSH & LH raised

2. Gonadotrophin independent ('pseudo', 'false')

- due to excess sex hormones
- FSH & LH low

Males - uncommon and usually has an organic cause

Testes

- bilateral enlargement = gonadotrophin release from intracranial lesion
- unilateral enlargement = gonadal tumour
- small testes = adrenal cause (tumour or adrenal hyperplasia)

Females - usually idiopathic or familial and follows normal sequence of puberty

Organic causes

- are rare, associated with rapid onset, neurological symptoms and signs and dissonance
- e.g. McCune Albright syndrome

Henoch-Schonlein purpura

Henoch-Schonlein purpura (HSP) is an IgA mediated small vessel vasculitis. There is a degree of overlap with IgA nephropathy (Berger's disease). HSP is usually seen in children following an infection

Features

- palpable purpuric rash (with localized oedema) over buttocks and extensor surfaces of arms and legs
- abdominal pain
- polyarthritis
- features of IgA nephropathy may occur e.g. haematuria, renal failure

Treatment

- analgesia for arthralgia
- treatment of nephropathy is generally supportive. There is inconsistent evidence for the use of steroids and immunosuppressants

Prognosis

- usually excellent, HSP is a self-limiting condition, especially in children without renal involvement
- around 1/3rd of patients have a relapse

Rickets

Rickets is a term which describes inadequately mineralised bone in developing and growing bones. This results in soft and easily deformed bones. It is usually due to vitamin D deficiency. In adults the equivalent condition is termed osteomalacia

Predisposing factors

- dietary deficiency of calcium, for example in developing countries
- prolonged breast feeding

- unsupplemented cow's milk formula
- lack of sunlight

Features

- in toddlers - genu varum (bow legs), in older children - genu valgum (knock knees)
- 'rickety rosary' - swelling at the costochondral junction
- kyphoscoliosis
- craniotabes - soft skull bones in early life
- Harrison's sulcus
- reduced serum calcium - symptoms may results from hypocalcaemia
- raised alkaline phosphatase

Management

- oral vitamin D

Attention Deficit Hyperactivity Disorder

Attention Deficit Hyperactivity Disorder (ADHD) is characterised by

- extreme restlessness
- poor concentration
- uncontrolled activity
- impulsiveness

ADHD is diagnosed in about 5% of American children, In the UK, where the term hyperkinetic syndrome is preferred, only 0.1% of children are diagnosed with the condition. The male:female ratio is 5:1

Management

- specialist assessment is required in all cases
- unless a food diary has shown a link between diet and behaviour there is no basis for recommending the avoidance of artificial colourings or the use of fatty acid supplements
- methylphenidate (Ritalin) - side-effects include abdominal pain, nausea, dyspepsia. Growth is not usually affected but it is advised to monitor growth during treatment
- atomoxetine

Seizures: acute management

Most seizures are self-limiting and stop spontaneously but prolonged seizures may be potentially life-threatening.

Basics

- check the airway and apply oxygen if appropriate
- place the patient in the recovery position
- if the seizure is prolonged give benzodiazepines

BNF recommend dose for rectal diazepam, repeated once after 10-15 minutes if necessary

Neonate	1.25 - 2.5 mg
Child 1 month - 2 years	5 mg
Child 2 years - 12 years	5 - 10 mg
Child 12 years - 18 years	10 mg
Adult	10 - 20 mg (max. 30 mg)
Elderly	10 mg (max. 15 mg)

Transient tachypnoea of the newborn

Transient tachypnoea of the newborn (TTN) is the commonest cause of respiratory distress in the newborn period. It is caused by delayed resorption of fluid in the lungs

It is more common following Caesarean sections, possibly due to the lung fluid not being 'squeezed out' during the passage through the birth canal

Chest x-ray may show hyperinflation of the lungs and fluid in the horizontal fissure

Supplementary oxygen may be required to maintain oxygen saturations. Transient tachypnoea of the newborn usually settles within 1-2 days

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Ongoing	Monitoring of growth, vision, hearing Health professionals advice on immunisations, diet, accident prevention

X-linked recessive

In X-linked recessive inheritance only males are affected. An exception to this seen in examinations are patients with Turner's syndrome, who are affected due to only having one X

chromosome. X-linked recessive disorders are transmitted by heterozygote females (carriers) and male-to-male transmission is not seen. Affected males can only have unaffected sons and carrier daughters.

Each male child of a heterozygous female carrier has a 50% chance of being affected whilst each female child of a heterozygous female carrier has a 50% chance of being a carrier.

The possibility of an affected father having children with a heterozygous female carrier is generally speaking extremely rare. However, in certain Afro-Caribbean communities G6PD deficiency is relatively common and homozygous females with clinical manifestations of the enzyme defect are seen.

Cerebral palsy

Cerebral palsy may be defined as a disorder of movement and posture due to a non-progressive lesion of the motor pathways in the developing brain. It affects 2 in 1,000 live births and is the most common cause of major motor impairment

Possible manifestations include:

- abnormal tone early infancy
- delayed motor milestones
- abnormal gait
- feeding difficulties

Children with cerebral palsy often have associated non-motor problems such as:

- learning difficulties (60%)
- epilepsy (30%)
- squints (30%)
- hearing impairment (20%)

Causes

- antenatal (80%): e.g. cerebral malformation and congenital infection (rubella, toxoplasmosis, CMV)
- intrapartum (10%): birth asphyxia/trauma
- postnatal (10%): intraventricular haemorrhage, meningitis, head-trauma

Classification

- spastic (70%): hemiplegia, diplegia or quadriplegia
- dyskinetic
- ataxic
- mixed

Management

- as with any child with a chronic condition a multidisciplinary approach is needed
- treatments for spasticity include oral diazepam, oral and intrathecal baclofen, botulinum toxin type A, orthopaedic surgery and selective dorsal rhizotomy

- anticonvulsants, analgesia as required

Minimal change glomerulonephritis

Minimal change glomerulonephritis nearly always presents as nephrotic syndrome, accounting for 75% of cases in children and 25% in adults

The majority of cases are idiopathic, but in around 10-20% a cause is found:

- drugs: NSAIDs, rifampicin
- Hodgkin's lymphoma, thymoma
- infectious mononucleosis

Features

- nephrotic syndrome
- normotension - hypertension is rare
- highly selective proteinuria*
- renal biopsy: electron microscopy shows fusion of podocytes

Management

- majority of cases (80%) are steroid responsive
- cyclophosphamide is the next step for steroid resistant cases

Prognosis is overall good, although relapse is common. Roughly:

- 1/3 have just one episode
- 1/3 have infrequent relapses
- 1/3 have frequent relapses which stop before adulthood

*only intermediate-sized proteins such as albumin and transferrin leak through the glomerulus

G6PD deficiency

Glucose-6-phosphate dehydrogenase (G6PD) deficiency is the commonest red blood cell enzyme defect. It is more common in people from the Mediterranean and Africa and is inherited in a X-linked recessive fashion. Many drugs can precipitate a crisis as well as infections and broad (fava) beans

Features

- neonatal jaundice is often seen
- intravascular haemolysis
- Heinz bodies on blood films

Diagnosis is made by using a G6PD enzyme assay

Some drugs causing haemolysis

- anti-malarials: primaquine
- ciprofloxacin
- sulphonamides

Some drugs thought to be safe

- penicillins
- cephalosporins
- macrolides
- tetracyclines
- trimethoprim

Benign rolandic epilepsy

Benign rolandic epilepsy is a form of childhood epilepsy which typically occurs between the age of 4 and 12 years.

Features

- seizures characteristically occur at night
- seizures are typically partial (e.g. paraesthesia affecting face) but secondary generalisation may occur (i.e. parents may only report tonic-clonic movements)
- child is otherwise normal

EEG characteristically shows centro-temporal spikes

Prognosis is excellent, with seizures stopping by adolescence

Hypokalaemia and hypertension

For exams it is useful to be able to classify the causes of hypokalaemia in to those associated with hypertension, and those which are not

Hypokalaemia with hypertension

- Cushing's syndrome
- Conn's syndrome (primary hyperaldosteronism)
- Liddle's syndrome
- 11-beta hydroxylase deficiency*

Carbenoxolone, an anti-ulcer drug, and liquorice excess can potentially cause hypokalaemia associated with hypertension

Hypokalaemia without hypertension

- diuretics
- GI loss (e.g. Diarrhoea, vomiting)
- renal tubular acidosis (type 1 and 2**)
- Bartter's syndrome
- Gitelman syndrome

*21-hydroxylase deficiency, which accounts for 90% of congenital adrenal hyperplasia cases, is not associated with hypertension

**type 4 renal tubular acidosis is associated with hyperkalaemia

Vision testing in children

A newborn's visual acuity is only about 6/200. This improves to 6/60 at 3 months but does no reach adult levels until about 2 years of age.

The table below summarises the vision tests which may be performed when assessing children:

Age	**Test**
Birth	Red reflex
6 weeks	Fix and follow to 90 degrees (e.g. Red ball 90cm away)
3 months	Fix and follow to 180 degrees No squint
12 months	Can pick up 'hundreds and thousands' with pincer grip
> 3 years	Letter matching test
> 4 years	Snellen charts Ishihara plates for colour vision

Kawasaki disease

Kawasaki disease is a type of vasculitis which is predominately seen in children. Whilst Kawasaki disease is uncommon it is important to recognise as it may cause potentially serious complications, including coronary artery aneurysms

Features

- high-grade fever which lasts for > 5 days
- conjunctival injection
- bright red, cracked lips
- strawberry tongue
- cervical lymphadenopathy
- red palms of the hands and the soles of the feet which later peel

Kawasaki disease is a clinical diagnosis as there is no specific diagnostic test

Management

- high-dose aspirin*
- intravenous immunoglobulin
- echocardiogram (rather than angiography) is used as the initial screening test for coronary artery aneurysms

Complications

- coronary artery aneurysm

*Kawasaki disease is one of the few indications for the use of aspirin in children. Due to the risk of Reye's syndrome aspirin is normally contraindicated in children.

School exclusion

The table below summarises Health Protection Agency guidance on school exclusion

Advice	**Condition(s)**
No exclusion	Conjunctivitis Fifth disease Roseola Flu Infectious mononucleosis Head lice Threadworms
24 hours after commencing antibiotics	Scarlet fever
Four days from onset of rash	Measles
Five days from onset of rash	Chickenpox
Five days from onset of swollen glands	Mumps
Five days after commencing antibiotics	Whooping cough
Six days from onset of rash	Rubella
Until symptoms have settled for 48 hours	Diarrhoea & vomiting
Until lesions have crusted over	netigo
Until treated	Scabies