Paediatrics Teaching

History

Document: Name, age, persons present, whom gave the history

PMH to include:

- Pregnancy
  - Infections/illnesses
  - Bleeding
  - Drugs, including alcohol
  - Previous pregnancies
- Birth
  - Gestation
  - Birth weight
  - Mode of delivery
  - Resuscitation needed?
  - Any time on SCBU?
- Immunisations
  - 2, 3, 4 months – DTP, Hib, Polio, Meningitis C
  - 12-15 months – MMR
  - Pre-school – boosters – DTP, Polio, MMR
  - 13 years - BCG
- Childhood illnesses
  - Chicken pox, croup
  - Excessive number?
- Development
  - Normal milestones
    - Gross motor, fine motor
    - Speech and language
    - Social development
- Growth
  - Relative to siblings or school peer group
  - 'Red book' – parent held record
- Family history
  - Atopy
  - Sibling physical health and development
  - Consanguinity
  - Spontaneous abortions
  - Childhood deaths
- Social history
  - Parents' ages and jobs
  - Family network
  - Siblings
- Educational history
  - School – mainstream?
  - Academic progress
  - Friends

Examination

General observation:

- Appearance – Well/ill? Well-dressed and clean? Dysmorphic features?
- Nutrition – Well nourished?
- Behaviour – Alert/drowsy/irritable? Behaviour with parents and doctor?

Systems examination:

- Always plot growth, including head circumference
- RS
    - Consider CF, atopy – any correlation?
    - Check SpO_2
    - Check ENT
- CVS
    - Consider congenital disease
    - Check RR, liver – increase in rate and size with heart failure
    - Check SpO2, femoral pulses (co-arctation of aorta)
- GI
    - Skin turgor (dehydration)
    - Urine dipstick
- CNS
    - Check skin (skin and CNS arise from ectoderm), ask for birthmarks, check parents
    - Neurology and development are linked
- PNS
    - Observe in play

Preparation is vital – relationship building, set up room.

Start peripherally (or make friends with tummy!) Ears and throat last. Demonstrate on toys/parents first. Under 7, use toys/books, build trust via parents, clothing less of an issue. Over 7, respect privacy, be careful to explain.

Neurological Assessment

Careful history important, may involve teachers, health visitors, parents, etc as well as child. Observing spontaneous activity is useful, and generally precedes formal examination.

1. Dysmorphic features
2. Head circumference – usually not enjoyed, so leave to end
3. Cranial nerves – baby can follow interesting object. Child more full exam by copying actions. Corneal reflex seldom necessary.
4. Fundoscopy important. Holding down baby will cause crying and eye closing – try to keep them calm. Get child to describe picture behind you to maintain gaze
5. Power – spontaneous activity usually best guide
6. Tone – need to know normal. Look for scissoring of legs in infants, difficulty supinating, beware of toe walking
7. Gross and fine motor – observe at play, simple tasks (developmental assessment)
8. Other professionals may be needed – e.g. for vision or hearing assessment.

Development

Age/mth	Gross motor	Fine motor	Communication	Social/Personal
0-6	Loss of primitive reflexes. Head control, roll from prone to supine, chest + abdo lifted when prone	Looks at hands 3/12, reaches 4/12, grasp voluntarily and transfer 4-6/12	Vocalises when talked to 8/52, shows pleasure + displeasure, smiles and vocalises at mirror image	Smiles in response 6/52, drinks from cup held to lips, stretches arms to be taken
6-12	Independent sitting, crawling, standing, cruising	Transferring objects, index finger use, pincer grip, mouthing objects	Babbling (single then double syllable), imitates sounds, waves goodbye	Finger feeds, holds arms out to assist dressing, afraid of strangers
12-18	Independent walking, stairs holding rail, throws ball	Holds pencil, begins to scribble, tower of 2-4 bricks	Singles words, names objects in book, points to 2/3 body parts, imitates household chores	Manages spoon, drinks from cup, takes off socks and shoes, may start using potty
18-24	Stairs alone, runs, kicks ball without overbalancing	Tower of 6-7 bricks, vertical and circular stroke, turns door know, jar lid	2-3 word sentence, use I me you, understands simple commands, shows toys to others, symbolic play	Independent feeding with spoon/fork, Puts on socks, shoes, pants, sphincter control achieved
24-36	Jumps off bottom step, stand on one foot few seconds, rides tricycle	Tower of 9, copies circle, imitates cross, imitates building a bridge	Nursery rhymes, asks questions, counts to 10, names 1 colour, pretend play	Dresses and undresses with simple fastenings, unbuttons, toilet trained
36-48	Stairs one foot on each step, skips on one foot	Imitates gate with bricks, copies cross, imitates square	Knows name, age, often address. Increase in previous patterns	Dresses and undresses fully, including buttons, plays well with other children

Children over 3 – Goodenough draw-a-man test:
1. Ask child to draw picture of man/woman
2. Count number of body parts drawn
3. Items/4 +3 gives estimate of mental age

Particular warning signs:
- Weak sucking and rooting at 0-3 months
- Poor head control, hands not in midline, primitive reflexes at 4-6 months

- Not reaching for toys at 7 months
- Not sitting steadily at 9 months
- Not mobile, no pincer grasp at 12 months
- Not walking at 18 months
- Unable to run, not pulling toys, unsteady gait at 24 months

Unusual to find treatable cause, but curative if done early. Support and explanation to child and family. Multidisciplinary team involvement to achieve full potential.

Neonatology

LBW: <2.5kg
VLBW: <1.5kg
ELBW: <1.0kg
Pre-term: Before 37/40
SGA (Small for Gestational Age): Many definitions, from <10th centile downwards. Can be normal variation, or result of IUGR.
Causes include TORCH infections, smoking, alcohol, drugs, maternal malnourishment (maternal factors), pre-eclampsia (placental factors), multiple pregnancy, chromosomal abnormality (foetal factors)

Risks to pre-term infants:
Birth asphyxia, meconium aspiration
Hypothermia
Respiratory
- Lack of surfactant before 37/40, poor lung development
- Antenatal steroids, artificial surfactant, respiratory support with O2, CPAP ventilation

Infection – esp. Grp B Strep
Brain
- Ischaemia from lack of autoregulation, hypoxia.
- Haemorrhage

Liver
- Increased jaundice (failure to conjugate bilirubin) leading to kernicterus
- Phototherapy first choice, then exchange transfusion used

Gut
- Necrotising Enterocolitis (NEC)
- Absent or reduced feeding and protective reflexes

Glucose tolerance
Eyes
- Retinopathy of prematurity, especially if excess O_2 given

Renal immaturity
Patent ductus arteriosus
Haematology
- Anaemia often seen around 3/12, worse if pre-term

Fluid and electrolyte loss

Risks of SGA:

Birth asphyxia, meconium aspiration	NEC
Infection	Growth/development
Hypothermia	Intrauterine death
Polycythaemia	Respiratory disease
Health middle age (Barker hypothesis)	

Common Neonatal Problems

In UK, 500 000-700 000 births annually, 80 000 premature, 17 000 need ICU care.

Mature infant	*Premature infant*
Infection	Respiratory Distress Syndrome
Feeding issues	Fluid/electrolyte imbalance
Jaundice	Temperature instability
Congenital malformations/hereditary disorders	Infection
Effects of maternal conditions	'Premature' problems
Inborn errors of metabolism	
Obstetric/birth injuries	

Infection
Early – Grp B Strep, Coliforms, S aureus
Late – S epidermidis, S aureus, pseudomonas (hospital acquired, more in prems/SGA)
Lethargy, poor feeding, respiratory distress, vomiting, irritability, apnoea
Temperature instability, hypo/hyperglycaemia, ↑CRT, acidosis, 'does not handle well'

Feeding issues
Poor feeding, vomiting, failure to regain birth weight (up to 10% loss, regained in 10/7 acceptable), excessive or prolonged jaundice.
Common causes of obstruction – volvulus, duodenal/ileal atresia, meconium ileus

Jaundice
70-80% of infants. 10/7 normal at term, ~20/7 if premature

Hereditary
Trisomies 21, 18, 13
Chromosomal microdeletions – Prader-Willi, Angelman, Di-George, Beckwith-Weidemann

Maternal Conditions
Diabetes, thyroid disorders, substance misuse

Metabolic errors
Neurological or hepatic syndromes, sepsis, dysmorphology, cardiac involvement

Birth injuries
Caput succedaneum, cephalhaematoma, bruising/forceps marks, subconjunctival haemorrhage, facial paralysis, brachial palsy, fractures

Respiratory Disease

Assess:

- Rate
- Respiratory distress – accessory muscles, tracheal tug, grunting, nasal flare
- Noises – stridor/wheeze/grunting
- Colour – pink/pallor/blue
- Chest shape – hyperinflation? Harrison's sulcus suggests chronic increased work of breathing

Respiratory infections

Most common infection in childhood, 80-90% viral (RSV, adenovirus, influenza, etc) Bacterial causes include Strep pneumoniae, Grp A ß haemolytic strep, H. influenzae, Mycoplasma pneumoniae, Bordetella pertussis.

Viral infections

- URTI
    - Paracetamol/ibuprofen
- Bronchiolitis
    - Acute breathlessness with wheeze and dry cough
    - RSV in 80% of cases
    - Supportive treatment
- Croup (laryngotracheitis)
    - Acute onset barking cough with stridor
    - Oral or nebulised steroids, humidified air
- Pneumonia

Bacterial infections

- Epiglottitis
    - Fever, stridor, salivary drooling, no cough
    - Medical emergency – airway management and IV antibiotics
- Pertussis
    - Bordetella pertussis – causes whooping cough
    - Lymphocytosis on FBC
    - Treat with erythromycin
- Pneumonia
    - Fever, (usually) productive cough, pleuritic chest pain, referred abdo pain
    - Clinical signs variable and may not be present. CXR to confirm
    - Treatment involves antibiotics, chest physio, and oxygen
    - Complications include lung abscess and empyema

Cystic Fibrosis

Inherited disease, CFTR gene mutation

- >1000 known variants, ~15 give 80% cases. ΔF508 most common
- Ion channel (Na^+, Cl^-)
- Some areas have neonatal screen – genes, sweat test, or nasal potential difference

Lung disease

- Normal cause of death – now 40-50yr life expectancy at birth
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- Recurrent chest infections:
    - S aureus – daily flucloxacillin to age 5, then as needed
    - Haemophilis Influenzae – Augmentin
    - Pseudomonas – Oral or IV Ciprofloxacin
- Inflammatory response – inhaled ± oral steroids
- Chest physio 12°
- Bronchial hyperreactivity – mimics asthma

Gut involvement

- Meconium ileus pre-natal gives microcolon at birth
- Pancreatic insufficiency
    - Steatorrhoea, ADEK deficiency
    - Pancreatic enzymes (Creon capsules), multivitamins, high calorie food

Joint disease, decreased fertility (M>F), liver disease

Asthma

Three components – smooth muscle constriction, oedema, mucous plugging

Presentation

- Nocturnal cough (DD – post nasal drip, gastroesophageal reflux)
- Early morning cough
- Exercise induced cough or wheeze
- Acute wheeze with reduced PEFR and FEV_1 usually intermittent after trigger

Chronic Rx:

Age	<2	2-5	5-12
Step 1	Short acting β_2 agonist prn	Short acting β_2 agonist prn	Short acting β_2 agonist prn
Step 2	Inhaled steroid 100-200µg bd	Inhaled steroid 100-200µg bd	Inhaled steroid 200-400µg bd
Step 3	Refer to paeds	Leukotriene receptor antagonist (Monteleukast)	Long acting β_2 agonist
Step 4		Refer to paeds	±double steroid ±monteleukast ±theophylline
Step 5			Oral steroids

Acute Rx:

- ABC
- Assess severity
    - Wheeze, accessory muscles, RR, pulse, SpO_2, PEFR (>5)/feeding (<5)
- OSH(IT)
    - 100% O_2, sit up
    - Salbutamol (MDI+spacer or nebs)
    - Hydrocortisone IV 4mg/kg or oral pred 10mg <2, 20mg 2-5, 30-40mg >5
    - Ipatropium (125/250/500mg neb)
    - Theophylline IV 5mg/kg bolus (ECG monitor)
        - IV salbutamol (15µg/kg bolus)
- CXR
- Need to monitor serum K^+ for hypokalaemia if giving high dose salbutamol

BTS guidelines for therapy.
CXR on first presentation, or suspicion of pneumothorax.
ABG – pCO_2 should be decreased. Normal or rising suggests exhaustion.
Death rate has remained constant for decades – non-compliance, late presentation, under treatment all contribute.

Cardiology

Almost exclusively congenital problems, incidence ~1% of births. In the best centres, 75% are detected prenatally at 20/40 scan.

Cyanotic

- Tetralogy of Fallot
  - Late cyanosis – months to one year
  - Pulmonary stenosis, RV hypertrophy, VSD, aorta overrides RV
  - Repair between 9-12/12
- Transposition of Great Arteries
  - Early cyanosis
  - Survival is via PDA and Patent Foramen Ovale
  - Exogenous prostaglandins given to maintain PDA
- Pulmonary valve stenosis (Rare) – problem if severe, consider ToF
- Tricuspid atresia (Very rare) – need VSD to survive after PDA closes
- Truncus arteriosus (Very rare) – single outflow vessel from heart
- Total Anomalous Pulmonary Venous Drainage (Very rare)
  - Pulmonary vein drains to right atrium

Acyanotic

- Shunts – R→L prenatal, change to L→R over first 2-4 weeks of life
  - ASD – often benign, don't cause failure.
    - Primum – surgery. Secundum – often interventional radiology
  - AVSD – common in Downs. Surgical closure if large.
  - VSD – Commonest L→R shunt
    - High flow → failure in days/weeks. Usually surgical closure
  - PDA
    - Indomethacin to block prostaglandins (but many side effects)
    - Surgery or interventional radiology also options
- Blocks
  - Aortic valve
  - Co-arctation of aorta (arch, usually after left SC artery)
  - Hypoplastic left heart

(PDA – Patent Ductus Arteriosus)

Look for colour, respiratory rate and effort, sweaty, clammy skin, failure to thrive.
Assess for abnormal pulses (rate/strength), heaves/thrills, palpable liver, murmurs.
Confirm diagnosis with CXR, ECG, Echo.

Infectious Disease

Epiglottitis – Much reduced after Hib vaccine in 1993. Formulation changed in 1999 – less local reaction, but some breakthrough cases now appearing.

Haemolytic Uraemic Syndrome (E Coli O157:H7). E Coli expresses a Shiga toxin, causing erythrocyte destruction. Presents with abdo cramps, bloody stools (70%), but little or no fever. Treatment is supportive of fluid/electrolyte balance, nutrition, anaemia, seizures.

Toxic shock (Scalded Skin Syndrome) – Group A Strep or S Aureus superadded infection.

Bronchiolitis – Peak incidence at 3/12, commonest cause of paediatric admissions. Caused by RSV. May cause apnoea.

HIV – rare in UK, but should be considered for unusual illnesses and failure to thrive.

Vomiting

Infant:
- Gastroenteritis
- Other infection (Sepsis, UTI, meningitis, etc)
- Pyloric stenosis
- Reflux
- Diabetes
- Cows milk protein intolerance
- Constipation
- Surgical (hernia, volvulus, etc)

Child:
- Infection
- Constipation
- Surgical (hernia, appendicitis, etc)

Gastroenteritis – vomiting generally precedes diarrhoea.

Dehydration:

Mild (3-5%)	*Moderate (5-10%)*	*Severe (>10%)*
Mild tachycardia	Appears ill	Incipient/actual shock
Thirst	Marked tachycardia	
Dry mucous membranes	BP normal	
Reduced urine output (>4-6hrs without passing urine)	Reduced skin turgor	
	Depressed anterior fontanelle	
	Sunken eyes	
	Absent tears	
	Increased cap refill time	

Mild – consider oral/NG rehydration
Moderate-severe – consider NG rehydration if <2, IV otherwise

Bolus of 10-20ml/kg saline. Check BM and bloods, infusion of 0.45% saline, variable glucose.

Maintenance fluid – 100ml/kg/day for first 10kg, 50ml/kg/day for next 10kg, 20ml/kg/day for subsequent. Aim to replace 50% of deficit in 6 hours, remainder over next 18 hours. Consider additional 10ml/kg/day for each 1°C rise in temperature.

Oncology

Prevalence around 1 in 700 by age 15, with 1400 cases diagnosed annually in UK. Care is based at 22 regional centres, with shared care to more local DGH where possible. Few national centres for specialist interventions, e.g. bone marrow transplant and orthopaedics.

Commonest types:

Leukaemia	30%	
Brain	19%	92% of cancer is non-epithelial in paeds <15
Lymphoma	13%	
Neuroblastoma	8%	
Wilms'	5%	

Main risk factors are radiation, viruses, and genetics (DNA repair defects – XP, AT, Blooms, Fanconi's; Downs; NF)
75% are cured – most childhood cancers are chemosensitive and respond to multiagent chemotherapy. RT and surgery also have roles.

Acute toxicity of chemotherapy:

CNS – nausea and vomiting	Myelosupression
Gut – mucositis, diarrhoea, ↓ absorption	Renal – electrolyte leaks
Hair loss	Liver (rarely) – acute hepatitis

Late toxicity of chemotherapy:

Growth	Kidneys	Liver (rarely)
Endocrine function	Fertility	2nd malignancies
Lungs	Deafness	
Heart	Brain	

Social and family issues – education (missed school, intellect and concentration affected by treatment), finances, family stress, insurance.

	Acute Lymphocytic Leukaemia	Wilms' Tumour	Neuroblastoma
Proliferating line	Immature white cell precursors	Embryonal cells in kidney	Neural crest cells of adrenal/sympathetic chain
Incidence/x10^6/yr	30	5	8
Presentation	Fatigue, infection, bruising, pallor, pain	Lump, pain, haematuria	Abdo/pelvis, mets to bone/bone marrow
Diagnosis	FBC+film, bone marrow, LP (CSF disease)	US abdo, biopsy. CXR + CT chest/abdo stage	Urinary VMA, biopsy
Treatment	Chemo (♀:2yrs, ♂:3yrs) Rarely RT to CNS/testis	Neo-adjuvant & adjuvant chemo, surgery, RT if residual disease	Depends on stage

Neuroblastoma:
Stage 1/2 - surgery
Stage 3, low risk - + chemo
Stage 3, high risk, 4/5 – intensive chemo, surgery, high dose therapy with PBSCT, RT, differentiation Rx (Retinoic acid)

Growth and Puberty

Normal growth can vary greatly – range in healthy population, ethnic/genetic variation, inequality in basic health and nutrition.
Stages:
1. Initial measuring – routine screen or on basis of concern
2. Recording
3. Interpretation
4. Action (as indicated)

Up to age two length is measured, standing height from two upwards. Sitting height is also measured as a guide to spinal length, and head circumference (occipitofrontal) in infants. Values are plotted on centile charts, which should be population specific. Genetic target height (mid-parental height +7cm for ♂, -7cm for ♀) gives an indication of which centile child should be on.
Growth disorders (short stature):
- Familial
- Low birth weight
- Chronic diseases
- Nutritional insufficiency
- Neglect/abuse
- Endocrine causes – thyroid disease, GH deficiency, Cushing syndrome, pseudohypoparathyroidism
- Genetic/skeletal causes – Turner syndrome, Prader-Willi, achondroplasia

Tall stature:
- Familial
- Marfan syndrome
- Overgrowth syndromes (e.g. Beckwith-Wiedemann)
- Pituitary tumours

Puberty – assessed by Tanner stage (I-V). Disorders are constitutional delay of growth and puberty, and precocious puberty – latter needs investigation if <8♀, <9♂. Bone age – measure of how close bones are to fusing. Assessed by XR left wrist, growth plates and metacarpals. ♀ fuse at 16, ♂ at 18. Early puberty corresponds to older bone age than chronological age – children tall for age, but end up short as growth terminates early.

Child Protection

Legal framework form Children Act 1989. Multiagency, social services led. Intervention requires risk of serious harm. Information sharing important – for preference with consent, but confidentiality may be broken if required ('public interest' – child abuse as a crime). Abuse may be physical, sexual, emotional, or by neglect. Child protection can be wider than simply preventing abuse. 'Balance of probability' is level needed to enter child protection pathway.

Main risk to children is from those known to them. Highest risk of murder in UK is from parents, before one year of age.

Physical abuse – concerns raised by:
- Discrepant/changing/inadequate history
- Classical findings on examination (e.g. torn frenulum, bruising behind ears, hand marks, unusual burn patterns, bruising to buttocks/abdomen)
- Failure/delay in seeking medical assistance
- Some # patterns – e.g. spiral # humerus. Need to consider (rare) possibility of osteogenesis imperfecta
- Shaken baby syndrome – retinal and subdural haemorrhage, rib fractures
- Frozen watchfulness

Overlap between neglect and deprivation (e.g. cold injury)
'Biscuit test' – foraging behaviour
Emotional effects can reduce growth

Sexual abuse most common in girls <5. May present with self harm, pregnancy, STD (consider transmission at birth if <2), forensic evidence, disclosure.

Misc
- ~95% of abdo pain in children is non-organic.
- CXR of infant often shows the (proportionally large) thymus.
- Newborn check – Barlow tests for unstable hip (posterior pressure in adduction, then clicks on abduction), Ortolani tests for dislocated hip (clicks on abduction).
- Transient tachypnoea of newborn – failure of removal of amniotic fluid from lung, increased risk after LSCS.