Aims

Hot/Recent topics

Past FRCA paper questions

Paediatric DAS guidelines

Resuscitation guidelines
Paediatrics in Final Written FRCA

Paediatrics is generally ‘over represented’ (along with ICM, Obs and Vasc) in examinations.

Gain practical paediatric experience at work

Which Topics should I revise?

Hot topics at recent ‘updates’ meetings
Recently published guidelines
Recently published articles
Past papers
Recent Topic Examples
RCOA CPD Study Days

The paediatric **pre-operative assessment** clinic

Challenges of anaesthetic management of **uncooperative and difficult** children

Management of **severe burns** in paediatrics

Intra and post-operative **pain** management

**Day case Tonsillectomy**

**TIVA** for tots

Managing **trauma** in the young

Corrective **spinal surgery** – New frontiers

Non cardiac surgery in children with **cardiac disease**

Stabilisation and **retrieval** of the acutely ill child

The **obese** child
APAGBI Guidelines

Review of ENT provision, 2019

Joint guidance on GA in children - effect on developing brain, 2019

APA Consensus Statement on updated fluid fasting guidelines for children prior to elective general anaesthesia, 2018

Prevention of Peri-op Venous Thromboembolism in Paediatric Patients, 2017


Paediatric Difficult Airway Guidelines, 2015

Recent Articles in BJA education

Anxiolytic premeds
   July 2020

Paediatric adeno-tonsillectomy
   June 2020

Burns management
   March 2020

US guided nerve blocks
   Feb 2020

Management of a child with Tracheostomy
   Jan 2020

Paediatric respiratory distress
   Nov 2019

Tetralogy of Fallot
   Nov 2019

Post op vomiting
   Oct 2019

Venous thrombo embolism
   Sep 2019
Topics in past papers

- Congenital Heart Dis 2014
- Squint surgery 2011/19
- URTI and elective surgery 2017
- Autim 2015
- Laryngo-spasm 2019
- Airway anatomy 2013
- Ex premmie and surgery 2017
- Meningococcoal sepsis 2018/12
- Downs syndrome 2011/16
- Cerebral palsy 2013/18
- Non Accidental Injury 2008/16
- Congenital Heart Dis 2014
Past Final FRCA Questions
SBA:

15kg 2 yr old boy under GA for small umbilical hernia. LMA spont breathing. Otherwise F+W.

30 min into procedure sudden brady to 30bpm and ETCo2 = 0.

How should you proceed?

**Which is the correct answer**

A) 4.0 ETT, 300 mcg adrenaline, defib 30 J

B) 4.5 ETT, 150mcg adrenaline, defib set to 60 J

C) 4.0 ETT, 150mcg adrenaline, defib 60J

D) 4.5 ETT, 150mcg adrenaline, defib set to 30 J

E) 4.0 ETT 300mcg adrenaline, defib set to 60J
a) List the normal anatomical features of young children (<3 years old) which may adversely affect upper airway management? (35%)

b) Which airway problems may occur due to these anatomical features? (30%)

c) Outline how these problems are overcome in clinical practice? (35%)
Airway Anatomical Features

Large head / Short neck / Prominent occiput

Large tongue (relative to mandibular space)

Obligate nasal breathers

Delicate soft Tissues

High anterior larynx (C2-3) (C4-5 in adults)

High epiglottis so that the infant can breathe and swallow at the same time

Long U-shaped epiglottis (flops posteriorly, so keep head in neutral position)

Angle of mandible 140° (120° in adults)

Trachea 4-5cm long and funnel shaped

Airway narrowest at level of cricoid cartilage (vocal cords in adults)

Trauma easily causes oedema (pseudostratified ciliated epithelium only loosely bound to underlying areolar tissue)

Because Resistance $\alpha 1/$radius, small amount of oedema increases resistance a lot

More reactive (i.e. more likely to develop laryngospasm)
Airway Anatomy overcoming issues

Position optimally for intubation
Neutral position
Use adjuncts (guedel) but avoid trauma
Hold airway on bony prominences
Laryngoscope blades size and shape
Use correct sizes of airways
Observe closely for endo-bronchial intubation
Scrutinise ETT after each movement / head change position
Avoid all airway trauma
Cuff v uncuffed ETT
A 9-year-old child with Down’s syndrome is scheduled for an adeno-tonsillectomy.

a) List airway/respiratory (30%), cardiovascular (10%) and neurological (10%) features of the syndrome relevant to the anaesthetist

b) What are the general principles involved in the preoperative (15%), intraoperative (25%) and postoperative (10%) management of this patient with Down's syndrome?
Downs Syndrome

Extra chromosome 21

Results from:

Commonly - Non-disjunction at the time of gamete formation

Less commonly - translocation (4%) or mosaic trisomy 21 (1%)
Airway/Respiratory

Macroglossia and microganthia

Possible subglottic stenosis – smaller ETT tube

Atlanto-axial instability (20%) - avoid excess neck movements esp at laryngoscopy

OSA is commonly due to adenotonsillar hypertrophy

Chronic lower respiratory tract infections are common often secondary to reduced immunity and gastro oesophageal reflux
**Cardiovascular**

CHD occurs in 40-60%

Most common left to right shunt leading to pulmonary hypertension

Endocardial cushion defect: AVSD (40%), VSD (27%), ASD (10%)

Other defects

PDA (12%) and TOF (8%)

Pulmonary hypertension is more severe and earlier in onset with defects resulting in left to right shunt

Without corrective surgery may progress to Eisenmenger’s Syndrome
**Neurological**

Developmental delay (95-99%)

Epilepsy (10%)

Early onset Alzheimer's

Microcephaly
Perioperative Management

Pre-operative
Often difficult to obtain history from patient
History ?cyanotic episodes
OSA – ?HDU admission
?History of surgical corrections or invasive procedures should be noted
Previous anaesthetic charts
Examination: careful assessment of airway, signs of heart failure
Investigations: C-spine X-ray
Premedication: EMLA cream, analgesia, sedative, antacid
Perioperative Management

Intra-operative
Parent/carer should be present
Prepare for:
  - Difficulties with cooperation at induction – calm environment, ? Restraint
  - IV access may be difficult
  - Airway difficulties
  - Careful airway manipulation
  - Second pair of hands
Strict asepsis for all procedures – decreased immunity and increased risk of infection
Increased vigilance for aspiration risk
Multi-modal analgesia – minimal/avoid opioids
Perioperative Management

**Post-operative**

May require overnight stay esp if history of OSA

High incidence of laryngospasm and airway obstruction

Increased risk of post-operative chest infection and pulmonary oedema (prone to airway hypotonia)

Supplemental humidified oxygen and physiotherapy should be started early if needed

Multi-modal analgesia – avoid opioids
You have anaesthetised a 5-year-old boy for manipulation of a forearm fracture. During the operation you notice that he has multiple bruises on his upper arms and body that you think may indicate child abuse.

a) Which other types of physical injury should raise concerns of abuse in a child of this age? (6 marks)

b) What timely actions must be taken as a result of your concerns? (7 marks)

c) List parental factors (5 marks) and features of a child’s past medical history (2 marks) that are known to increase the risk of child abuse.
All healthcare professionals have responsibility to act if they suspect a child has been subjected to physical abuse

a) In what situations may the anaesthetist encounter possible child abuse? (20%)  
b) List the clinical features that would arouse suspicion that physical child abuse has occurred? (40%)  
c) What should the anaesthetist do if they suspect child abuse has taken place? (30%)
Child Abuse

A child is defined as anyone who has not yet reached their 18th birthday.

The Children Acts 1989 and 2004 safeguarding is everyone’s responsibility, and the welfare of children is paramount.

Four Categories

Physical abuse
Emotional abuse
Sexual abuse
Neglect
## Risk Factors for Child Abuse

<table>
<thead>
<tr>
<th>Child Related Factors</th>
<th>Parental Factors</th>
<th>Family Factors</th>
<th>Social Factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Chronic disability/illness</td>
<td>• Step-parents</td>
<td>• Single-parent families</td>
<td>• Unemployment</td>
</tr>
<tr>
<td>• Prematurity/low birth weight</td>
<td>• Teenage parents</td>
<td>• Domestic violence</td>
<td>• Poverty</td>
</tr>
<tr>
<td>• Unplanned/unwanted children</td>
<td>• Substance abuse</td>
<td></td>
<td>• Social isolation</td>
</tr>
<tr>
<td>• Children with physical or learning disability/behavioural problems</td>
<td>• Parents abused as a child</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Disabled parents</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Mental health problems</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Situations Encountered by Anaesthetist for an at Risk Child

Resuscitation of a critically ill child who has sustained injuries under circumstances that can not be explained

During routine pre-operative assessment/examination or surgical procedure where unusual or unexplained signs are noted that may explain physical or sexual abuse

When asked to anaesthetise a child for formal forensic examination

If informed by the child directly

In the paediatric intensive care unit where injuries cannot be explained by normal circumstances

Dental lists
Clinical Features of Abuse

Unusual bruising – both the pattern and the extent of the bruising is important, particularly in the non-ambulant baby/child

Unexplained thermal injury, for example, cigarette burns

Bite marks

Unexplained fractures

Unusual injuries in inaccessible places, e.g. neck, ears, hands, feet and buttocks

Unexplained intra-oral injury in a non-ambulant child

Unexplained anogenital injury

Poisoning
Clinical Features of Abuse

Unusual ano-genital signs/appearance

Other trauma without an adequate history, e.g. intra-abdominal injury

Very poor quality parent/child relationship, e.g. the parent seems oblivious to the emotional needs of the child, or is verbally abusive to the child

Parental risk factors such as parents with mental health or substance misuse issues, and living in a home where domestic violence takes place
Care pathway for anaesthetists to report safeguarding/child protection concerns

- An anaesthetist has concerns about child's welfare (inform surgical team)
  - Discuss with on-call consultant paediatrician. Named or Designated doctor/nurse for safeguarding/child protection as appropriate
    - Consultant paediatrician and anaesthetist should have a discussion with the parents and child when surgery is complete
      - Concerns remain
        - Ensure documentation is complete
          - Assessment made. Safeguarding/child protection procedures should follow

- No further safeguarding/child protection action
  - Ensure documentation is complete

LOCAL TELEPHONE CONTACTS
- Named doctor ...
- Named nurse ...
- Designated nurse ...
- Designated doctor ...
- Local Social Services ...
Duties of the anaesthetist RCOA

To act in the best interests of the child, which are always paramount.

To be aware of the child’s rights to be protected.

To respect the rights of the child to confidentiality.

To contact a paediatrician with experience of child protection for advice (on-call paediatrician for child protection, named or designated doctor/nurse).

Where appropriate, to report child protection/safeguarding concerns to relevant professionals including Social Care.

To be aware of local child protection mechanisms.

To clearly document findings in association with paediatric colleagues. To be aware of the rights of those with parental responsibility.
Remember
Child Welfare is of Paramount
September 2011 – Squint Surgery

You are asked to assess 4 year old child who is scheduled for strabismus (squint) surgery as a day case procedure.

a) List the anaesthetic related issues this case presents (60%)

b) During surgical traction, the patient suddenly develops profound sinus bradycardia. How would you manage this situation? (20%)

c) Describe the key post-operative problems and relevant management strategies. (30%)
You are asked to assess a 15kg 4-year-old child who is scheduled for a strabismus (squint) correction as a day case procedure.

a) List the anaesthetic considerations of this case, with regards to: age of the patient (4 marks), day case surgery (3 marks) and type of surgery. (4 marks)

b) During the operation, the patient suddenly develops a profound bradycardia. What is your immediate management of this situation? (2 marks)

c) What strategies would you employ to reduce postoperative nausea and vomiting (4 marks) and postoperative pain? (3 marks)

-examiners report detailed pass 51% (ie not good) too much focus on social issues in day case. Not enough on med/anaesth/surg. Many omitted role of LA techniques.
## Anaesthetic Issues

<table>
<thead>
<tr>
<th>Paediatric Patient</th>
<th>Fulfil appropriate day case criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Altered physiology</td>
<td>• Anaesthetic/surgical factors – relatively short surgery, no significant haemorrhage, not difficult airway</td>
</tr>
<tr>
<td>• Altered psychology</td>
<td>• Medical factors – ASA 1 or 2</td>
</tr>
<tr>
<td>• Paediatric trained staff/unit</td>
<td>• Social factors – parent willing, not single carer with multiple other siblings, phone access, transport</td>
</tr>
<tr>
<td>• Consent</td>
<td></td>
</tr>
</tbody>
</table>

### Problems of all ophthalmic surgery
- Limited access to airway during surgery

### Problems specific to squint surgery
- High incidence of PONV
- Oculo-cardiac reflex during surgery
- Significant post-operative pain

### Miscellaneous
- Increased incidence of squint in children with underlying primary or secondary myopathy
- Risk of malignant hyperthermia
- ? Isolated site
## Paediatric Day Case Exclusion Criteria

<table>
<thead>
<tr>
<th>Patient Factors</th>
<th>Anaesthetic Factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>If not ASA 1 or 2 with controlled systemic disease e.g. asthma, epilepsy</td>
<td>Inexperienced anaesthetist</td>
</tr>
<tr>
<td>Full term infant &lt;50 weeks corrected gestation</td>
<td>Family history of MH</td>
</tr>
<tr>
<td>Pre-term infant &lt;50-60 weeks post conceptual age</td>
<td>Sibling to a victim of sudden infant death syndrome</td>
</tr>
<tr>
<td>Preterm infants are at increased risk of apnoea in post operative period</td>
<td>Potential/known difficult airway</td>
</tr>
<tr>
<td>Innocent heart murmur or complex cardiac disease</td>
<td>OSA</td>
</tr>
<tr>
<td>Sickle cell disease (NOT trait)</td>
<td></td>
</tr>
<tr>
<td>Known diabetes mellitus</td>
<td></td>
</tr>
<tr>
<td>Active infection</td>
<td></td>
</tr>
<tr>
<td>Presence of viral/bacterial infection</td>
<td></td>
</tr>
<tr>
<td>Take 2-4 weeks to completely resolve</td>
<td></td>
</tr>
</tbody>
</table>
## Anaesthetic Factors Affecting IOP

<table>
<thead>
<tr>
<th>Increase IOP</th>
<th>Decrease IOP</th>
<th>Minor/No effect on IOP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Suxamethonium</td>
<td>Propofol, Thiopentone</td>
<td>Ketamine</td>
</tr>
<tr>
<td>Hypoxia</td>
<td>Halothane, Sevoflurane, Isoflurane,</td>
<td>Opioids</td>
</tr>
<tr>
<td></td>
<td>Desflurane</td>
<td></td>
</tr>
<tr>
<td>Hypercapnia</td>
<td>Acetazolamide, mannitol</td>
<td>Atropine</td>
</tr>
<tr>
<td>Laryngoscopy, coughing, straining, crying</td>
<td>Hypothermia</td>
<td>NDMR</td>
</tr>
<tr>
<td>Increased venous pressure</td>
<td>Hypocapnia</td>
<td></td>
</tr>
<tr>
<td>External pressure</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Bradycardia & Eye Surgery

Ask surgeon to stop

Call emergency

Assess ABC, 5 breaths if apnoea, check pulse, 15:2 if arrest, Adrenaline.

Management

Administer IV atropine (20mcg/kg)

Exclude other causes e.g. hypoxia, acidosis, hypothermia
## Post-operative Problems

<table>
<thead>
<tr>
<th>PONV</th>
<th>Pain</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Avoid prolonged fasting times</td>
<td>• Multi-modal approach and post-operative</td>
</tr>
<tr>
<td>• Intra-operative fluid administration</td>
<td>instructions</td>
</tr>
<tr>
<td>• TIVA technique</td>
<td>• Regular oral paracetamol and NSAIDS</td>
</tr>
<tr>
<td>• Avoid opioids if possible</td>
<td>• Amethocaine eyedrops</td>
</tr>
<tr>
<td>• Combination anti-emetics – ondansetron,</td>
<td>• Diclofenac eye drops +sub-Tenon’s</td>
</tr>
<tr>
<td>dexamethasone</td>
<td>• Other LA blocks</td>
</tr>
</tbody>
</table>


Anxious Child Apr 2008

a) What strategies are available and appropriate to decrease preoperative anxiety in children for day case surgery? (45%)

A 12 year old girl is admitted for prominent ear correction as a day case. She is very anxious and uncooperative when you see her preoperatively. She will not engage with any attempts to calm her down and subsequently refuses to cooperate with anaesthetic induction. However, her mother is insistent that you go ahead with the anaesthetic.

b) How would you proceed in this scenario? Explain your reasoning. (45%)
Anxiolytic Pre Medication

Hazel is a 4 year old girl presenting for a dental treatment and extractions under GA. She presented 2 weeks ago for the same procedure but it was abandoned as Hazel became distressed and uncooperative.

Describe non pharmacological techniques that could be used pre operatively to reduce Hazel's anxiety. (4)

You are considering using a sedative pre medication. Are there any instances where this might not be inappropriate? (4)

You decide Hazel is suitable for a sedative pre med. Name 3 suitable medications. Give the onset time. (3)

For your chosen 3 medications please describe any drawbacks each medication has (6)

Hazel weighs 28Kg. What problems does this pose when using a sedative pre med. (3)
# Anxiolytic Pre Medication

## Non pharmacological techniques:

- Pre hospital info and preparation
- Play therapy
- Distraction (videos, bubbles, games)
- Handling equipment
- Pleasant environs (music, dim lights, fewer staff)
- Involve parents
- Communication aids (passports)
- Relaxation exercises

## Sedative pre medication CI’s:

- Anticipated difficult airway
- OSA
- Increased risk aspiration
- Renal /liver impairment
- red. LOC or raised ICP
- Acute systemic illness
- Unexplained fall in SaO2
- URTI
- Adverse response to proposed medication

- Unsuitable environment
- No supervision
Hazel is a 4 year old girl presenting for a dental treatment and extractions under GA. She presented 2 weeks ago for the same procedure but it was abandoned as Hazel became distressed and uncooperative.

You decide Hazel is suitable for a sedative pre med. Name 3 suitable medications. Give the onset time in minutes. (3)

<table>
<thead>
<tr>
<th>Medication</th>
<th>Onset Time (minutes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Midazolam (Oral)</td>
<td>30-45</td>
</tr>
<tr>
<td>Midazolam (Buccal)</td>
<td>20</td>
</tr>
<tr>
<td>Dexmedetomidine (nasal or buccal)</td>
<td>25</td>
</tr>
<tr>
<td>Clonidine (oral)</td>
<td>45 – 60</td>
</tr>
<tr>
<td>Temazepam (tablet)</td>
<td>60</td>
</tr>
<tr>
<td>Ketamine (oral / IM)</td>
<td>10 - 15</td>
</tr>
<tr>
<td>Morphine (oral)</td>
<td>20 - 30</td>
</tr>
</tbody>
</table>
Anxiolytic Pre Medication

For you chosen 3 medications please describe any drawbacks each medication has (6)

<table>
<thead>
<tr>
<th>Medication</th>
<th>Drawbacks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Midazolam (PO)</td>
<td>Taste, paradoxical agitation, wears off</td>
</tr>
<tr>
<td>Midazolam (buccal)</td>
<td>Paradoxical agitation, wears off</td>
</tr>
<tr>
<td>Dexmedetomidine (nasal or buccal)</td>
<td>Caution in patients with Gr 2/3 HB, HTN, digoxin (causes brady cardia and hypotension)</td>
</tr>
<tr>
<td>Clonidine (PO)</td>
<td>Caution CVS disease, long onset (causes brady cardia and hypotension)</td>
</tr>
<tr>
<td>Temazepam (PO)</td>
<td>Long onset</td>
</tr>
<tr>
<td>Ketamine (PO,IM)</td>
<td>Salivation, hallucinations, delerium PON+V. Needs anasethetist present once given</td>
</tr>
<tr>
<td>Morphine (PO)</td>
<td>Risk RS depression, apnoea, vomiting</td>
</tr>
</tbody>
</table>
Hazel weighs 28Kg.

What problems does this pose when using a sedative pre med. (3)

According to WETFLAG calculation a 4yr old should weight 16kg. Even allowing for natural variation this would indicate Hazel is obese.

Premedication in obese children is problematic for the following reasons.

Likely co existence of OSA (dexametomidine and ketamine may hold advantages)

GORD

Dosing is very challenging (look at old notes!).

Morphine IBW

Dexmetomidine / clonidine adjusted BW

Midazolam increased ? Total BW but ?OSA
Luke 2 day old neonate, born at 37 weeks by NVD without complications. He has been brought in to ED after a sudden collapse at home.

a) A common cause of sudden collapse in a neonate is congenital heart disease. State 2 other common causes.

b) List 4 clinical signs that are supportive of a diagnosis of congenital heart disease.

Luke 2 day old neonate, born at 37 weeks by NVD without complications. He has been brought in to ED after a sudden collapse at home.

a) A common cause at sudden collapse in a neonate is congenital heart disease. State 2 other common causes.

Any of:

- sepsis
- hypoglycaemia
- metabolic / endocrine disorder
- trauma / NAI
Luke 2 day old neonate, born at 37 weeks by NVD without complications. He has been brought in to ED after a sudden collapse at home.

a)

b) List 4 clinical signs supportive of a diagnosis of congenital heart disease.

- Tachypnoea and sweating whilst feeding
- Persistent tachycardia
- Hepatomegaly
- Oedema face / forearm / back legs
- Radio – femoral delay
- Cyanosis
- Heart murmur
Luke 2 day old neonate, born at 37 weeks by NVD without complications. He has been brought in to ED after a sudden collapse at home.


- RV outflow tract obstruction / pulmonary valve stenosis
- VSD
- RV Hypertrophy
- Over riding aorta
d) List 2 conditions associated with Tetralogy of Fallot

e) Other than feeding list 2 other precipitants of a cyanotic episode (tet spell)

f) Describe the physiological changes in cardiac blood flow that arise during a Tet spell

g) list 2 ways of managing these cyanotic episodes in the period leading up to corrective surgery
d) List 2 conditions associated with Tetralogy of Fallot

- Di George syndrome
- Downs syndrome
- Cleft Lip and Palate
- Hypospadias
- 22q 11 chromosome deletion syndrome
e) Other than feeding list 2 other precipitants of a cyanotic episode (tet spell)

- Tachycardia
- Hypotension
- Defaecation
- Crying
Describe the physiological changes in cardiac blood flow that arise during a Tet spell.

A Tet spell is precipitated by acute decrease in SVR or increase in pulmonary vascular resistance (PVR). Result is increased R to L shunt across VSD.
List 2 ways of managing these cyanotic episodes in the period leading up to corrective surgery.
An 8-yr-old child is scheduled for an elective right femoral osteotomy due to impending dislocation of the hip. She has severe cerebral palsy.

a) What is cerebral palsy? (3 marks)

b) List typical clinical features of severe cerebral palsy, with their associated anaesthetic implications. Do this for the central nervous system (3 marks), respiratory system (2 marks), musculoskeletal system (3 marks) and gastrointestinal system. (2 marks)

c) What are the expected problems in providing adequate postoperative analgesia in this patient? (2 marks)

d) Outline a management plan to optimise analgesia in this patient. (5 marks)
What is cerebral palsy?

Collective term used to describe a diverse group of neurological disorders characterised by varying degrees of motor, sensory and intellectual impairment

Incidence ~1 in 500 live births

Onset: 80% antenatal / 20% post natal 1st 2yr of life
List typical clinical features of severe cerebral palsy

**Neurological**

- Motor impairment
- Impaired intellectual and cognitive function
- Visual and auditory impairment
- Expressive language disorder problems affecting speech – can exacerbate anxiety due to communication difficulties
- Abnormal perception of pain and touch
- Epilepsy
**Respiratory**

If premature, will have underlying chronic lung disease secondary to respiratory distress syndrome

*Increased risk of aspiration pneumonitis*

Weak cough / respiratory muscle hypotonia / recurrent chest infections

Scoliosis / restrictive lung defects, pulmonary hypertension, cor pulmonale and respiratory failure

**Musculoskeletal**

Fixed flexion deformity of limbs and trunk secondary to contractors – difficulty in position patient and vascular access

*Increased risk of joint dislocation and fractures – care on transferring patient*

**Bleeding**

**Heat loss**
**Gastro-intestinal**

Swallowing difficulty secondary to pseudo-bulbar palsy

Oesophageal dismotility and GORD

Malnutrition and dehydration

Anaemia and electrolyte imbalance

Likely to have NG or gastrostomy feed

**Other**

Significant side effects and drug poly-pharmacy can have implications for anaesthesia
Management plan to optimise analgesia

Regular paracetamol and NSAID

IV morphine infusions / LA based epidural infusions / regional blocks as appropriate

Analgesia - “continuous” rather than “on demand” regimens

Caudal avoiding opiates but including clonidine / preservative free ketamine would be useful

Epidural also appropriate

Hypothermia and pain trigger muscle spasms
Paediatric Difficult Airway Guidelines - 2015
Difficult mask ventilation (MV) – during routine induction of anaesthesia in a child aged 1 to 8 years

Difficult MV → Give 100% oxygen → Call for help

**Step A Optimise head position**

- Consider:
  - Adjusting chin lift/jaw thrust
  - Inserting shoulder roll if <2 years
  - Neutral head position if >2 years
  - Adjusting cricoid pressure if used
  - Ventilating using two person bag mask technique

- Check equipment
- Depth of anaesthesia

- Consider changing:
  - Circuit
  - Mask
  - Connectors
  - If equipment failure is suspected, change to self-inflating bag and isolate from anaesthetic machine promptly

- Consider deepening anaesthesia
  - Use CPAP

**Step B Insert oropharyngeal airway**

- Call for help again if not arrived

- Assess cause of difficult mask ventilation
  - Light anaesthesia
  - Laryngospasm
  - Gastric distension – pass OG/NG tube

- Maintain anaesthesia/CPAP
  - Deepen anaesthesia (Propofol first line)
  - If relaxant given – intubate
  - If intubation not successful, go to unanticipated difficult tracheal intubation algorithm

**Step C Second-line: Insert SAD (e.g. LMA™)**

- Insert SAD (e.g. LMA™) – not > 3 attempts
- Consider nasopharyngeal airway
- Release cricoid pressure

- Yes → Good airway → SpO₂ >80% → Continue
- No → SpO₂ <80% → Attempt intubation
  - Consider paralysis
  - Succeed → Proceed
  - Fail → Go to scenario cannot intubate
    - Cannot ventilate (CICV)

*SAD = supraglottic airway device*
Unanticipated difficult tracheal intubation – during routine induction of anaesthesia in a child aged 1 to 8 years

Difficult direct laryngoscopy

Give 100% oxygen and maintain anaesthesia

Call for help

**Step A Initial tracheal intubation plan when mask ventilation is satisfactory**

- Direct laryngoscopy – not > 4 attempts
  - Check:
    - Neck flexion and head extension
    - Laryngoscopy technique
    - External laryngeal manipulation – remove or adjust
    - Vocal cords open and immobile (adequate paralysis)
  - If poor view – consider bougie, straight blade laryngoscope* and/or smaller ETT

  **Succeed**
  - Tracheal intubation

  **Failed intubation with good oxygenation**

**Step B Secondary tracheal intubation plan**

- Insert SAD (e.g. LMA™) – not > 3 attempts
  - Oxygenate and ventilate
  - Consider increasing size of SAD (e.g. LMA™) once if ventilation inadequate

  **Succeed**
  - Failed oxygenation e.g. \( \text{SpO}_2 < 90\% \) with \( \text{FiO}_2 \ 1.0 \)

  - Convert to face mask
  - Optimise head position
  - Oxygenate and ventilate
  - Ventilate using two person bag mask technique, CPAP and oronasopharyngeal airway
  - Manage gastric distension with OG/NG tube
  - Reverse non-depolarising relaxant

  **Failed ventilation and oxygenation**

**Call for help again if not arrived**

- Consider modifying anaesthesia and surgery plan
- Assess safety of proceeding with surgery using a SAD (e.g. LMA™)

  **Unsafe**
  - Postpone surgery
  - Wake up patient

  **Safe**
  - Proceed with surgery
  - Consider 1 attempt at FOI via SAD (e.g. LMA™)

    **Succeed**
    - Verify intubation, leave SAD (e.g. LMA™) in place and proceed with surgery

    **Failed intubation via SAD (e.g. LMA™)**

    **Failed ventilation and oxygenation**

  - Postpone surgery
  - Wake up patient

  **Go to scenario cannot intubate, cannot ventilate (CICV)**


*SConsider using indirect laryngoscope if experienced in their use

SAD = supraglottic airway device
Cannot intubate and cannot ventilate (CICV) in a paralysed anaesthetised child aged 1 to 8 years

Failed intubation
inadequate ventilation

**Step A** Continue to attempt oxygenation and ventilation

- FiO₂ 1.0
- Optimise head position and chin lift/jaw thrust
- Insert oropharyngeal airway or SAD (e.g. LMA™)
- Ventilate using two person bag mask technique
- Manage gastric distension with an OG/NG tube

**Step B** Attempt wake up if maintaining SpO₂ >80%

If rocuronium or vecuronium used, consider sugammadex (16mg/kg) for full reversal

Prepare for rescue techniques in case child deteriorates

**Step C** Airway rescue techniques for CICV (SpO₂ <80% and falling) and/or heart rate decreasing

[Diagram showing decision tree for ENT availability and success/failure]

*Note: Cricothyroidotomy techniques can have serious complications and training is required – only use in life-threatening situations and convert to a definitive airway as soon as possible*

**Call for help again if not arrived**

Consider:
- Surgical tracheostomy
- Rigid bronchoscopy + ventilate / jet ventilation (pressure limited)

Continue jet ventilation set to lowest delivery pressure until wake up or definitive airway established

- Perform surgical cricothyroidotomy / transtracheal and insertion of ETT / tracheostomy tube*
- Consider passive O₂ insufflation while preparing

**Cannula cricothyroidotomy**

- Extend the neck (shoulder roll)
- Stabilise larynx with non-dominant hand
- Access the cricothyroidotomy membrane with a dedicated 14/16 gauge cannula
- Aim in a caudad direction
- Confirm position by air aspiration using a syringe with saline
- Connect to either:
  - adjustable pressure limiting device, set to lowest delivery pressure
  - 4Bar O₂ source with a flowmeter (match flow 1 l/min to child’s age) and Y connector
- Cautiously increase inflation pressure/flow rate to achieve adequate chest expansion
- Wait for full expiration before next inflation
- Maintain upper airway patency to aid expiration

*Call for help*  

SAD = supraglottic airway device

Paediatric Resuscitation Guidelines
WET FLAG calculations

Weight
1-12months (0.5 x age in months) + 4
1-5yrs (2 x age in yrs) + 8
6-12yrs (3 x age in yrs) + 7

Electricity
4 Joules / Kg/ biphasic

Tube ETT
Internal Diameter (age/4 + 4) = --- mm
Length (age/2 + 12) =--- cm
Nasopharyngeal tube (age/2 + 15) =--- cm
WET FLAG calculations

**Fluids**
- Medical / cardiac arrest – 20 ml/ kg
- Trauma cases initial Bolus 10 ml/ kg, then 2\textsuperscript{nd} 10 ml/kg

**Lorazepam**
- 0.1 mg / Kg IV/ IO

**Adrenaline**
- 0.1 ml/kg of 1:10,000 = 10mcg/kg

**Glucose**
- 2ml / kg of 10% dextrose
Paediatric Advanced Life Support

Unresponsive
Not breathing or only occasional gasps

Call resuscitation team (1 min CPR first, if alone)

CPR
(5 initial breaths then 15:2)
Attach defibrillator/monitor
Minimise interruptions

Assess rhythm

Shockable
(VF/Pulseless VT)

1 Shock
4 J kg⁻¹

Immediately resume CPR for 2 min
Minimise interruptions

Return of spontaneous circulation

Immediate post cardiac arrest treatment
- Use ABCDE approach
- Controlled oxygenation and ventilation
- Investigations
- Treat precipitating cause
- Temperature control

Non-shockable
(PEA/Asystole)

Immediately resume CPR for 2 min
Minimise interruptions

During CPR
- Ensure high-quality CPR: rate, depth, recoil
- Plan actions before interrupting CPR
- Give oxygen
- Vascular access (intravenous, intracessous)
- Give adrenaline every 3-5 min
- Consider advanced airway and capnography
- Continuous chest compressions when advanced airway in place
- Correct reversible causes
- Consider amiodarone after 3 and 5 shocks

Reversible Causes
- Hypoxia
- Hypovolaemia
- Hyper/hypokalaemia, metabolic
- Hypothermia
- Thrombosis (coronary or pulmonary)
- Tension pneumothorax
- Tamponade (cardiac)
- Toxic/therapeutic disturbances
Thank you!!