CONTENTS

Message from the President of the College of Anaesthesiologists
Academy of Medicine of Malaysia 2

Message from the Organising Chairperson 3

Organising Committee 4

Programme at a Glance 5

Pre-Congress Workshops 6

Daily Programme 8

Floor Plan & Trade Exhibition 11

Acknowledgements 12

Abstracts 13
It is with great pride and honor that I welcome you to this long awaited Paediatric Anaesthesia Meeting (PAM) 2013.

On behalf of the College of Anaesthesiologists, Academy of Medicine of Malaysia, I would like to take this opportunity to firstly congratulate our Paediatric Anaesthesia Special Interest Group (SIG) for being an active and cohesive force over the last few years in their road-show symposia and teaching sessions all over the country. It has now culminated into a national meeting of this caliber led by its Convenor and also Organising Chairperson, Dr Sushila Sivasubramaniam. Our gratitude goes to Dr Sushila and her dedicated team for their effort in bringing back this important get-together.

In this country, the perioperative and critical care management of paediatric patients is of great interest, not only to the handful of paediatric anaesthetists and intensivists, but also to larger pool of specialist anaesthetists, anaesthetic trainees and medical officers as well as nurses and allied health professionals. I am glad that the Scientific Committee has taken into consideration the interests of everyone, with the ultimate intention of improving and updating knowledge in the management of our precious children.

This PAM promises interesting and exciting sessions with the participation of prominent overseas speakers and local experts with a wealth of experience to share. I have no doubt that it will be well received and that there will be a big demand for more of it!

I wish everyone an enjoyable and stimulating meeting, and perhaps it may convince some to subspecialize as paediatric anaesthetists or intensivists!

Associate Professor Datín Dr Norsidah Abdul Manap
It gives me great pleasure to invite you to the Paediatric Anaesthesia Meeting organised by the College of Anaesthesiologists on 22nd and 23rd March 2013 at the Shangri-La Hotel, Kuala Lumpur.

This two-day meeting is an opportunity for specialist anaesthetists, paediatric anaesthetists, paediatric intensivists, medical officers, nurses and allied health professionals to update their knowledge and improve their anaesthetic and intensive care management of children.

The Scientific Committee has planned a wide-ranging programme with the ultimate aim of improving perioperative care of children undergoing anaesthesia and in the care of the critically ill children. The programme incorporates current topics and controversial issues which are relevant not only to the paediatric anaesthetists but also to the generalists. The meeting format will feature plenaries, lectures, panel discussion and debates. There are also two hands-on workshops which will address handling of the difficult airway in children and total intravenous anaesthesia in children. Three prominent speakers from the United Kingdom and local eminent speakers have been invited to share their expertise.

The Paediatric Anaesthesia Special Interest Group, College of Anaesthesiologists last held a similar meeting in 2003. This is a long overdue meeting.

We do hope you will not only gain knowledge from this meeting but also take the opportunity to renew ties.

Dr Sushila Sivasubramaniam
<table>
<thead>
<tr>
<th>Role</th>
<th>Names</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chairperson</td>
<td>Dr Sushila Sivasubramaniam</td>
</tr>
<tr>
<td>Hon Secretary</td>
<td>Dr Usha Nair</td>
</tr>
<tr>
<td>Hon Treasurer</td>
<td>Dr Rajeswary Kanapathypillai</td>
</tr>
<tr>
<td></td>
<td>Dr Ruwaida Isa</td>
</tr>
<tr>
<td>Publicity / Publications</td>
<td>Dr Lakshmi Thiyagarajan</td>
</tr>
<tr>
<td></td>
<td>Dr Hamidah Ismail</td>
</tr>
<tr>
<td>Business Manager / Venue</td>
<td>Dr Intan Zarina Fakir Mohamed</td>
</tr>
<tr>
<td></td>
<td>Dr Teo Su Ching</td>
</tr>
<tr>
<td>Scientific Committee</td>
<td>Dr Thavaranjitham Sandrasegaram</td>
</tr>
<tr>
<td></td>
<td>Dr Felicia Lim</td>
</tr>
<tr>
<td></td>
<td>Professor Dr Lucy Chan</td>
</tr>
<tr>
<td></td>
<td>Dr Vinod Suppiah</td>
</tr>
<tr>
<td>Date</td>
<td>Time</td>
</tr>
<tr>
<td>------------</td>
<td>---------------</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Please note:**
- Please check the official program for the most accurate and up-to-date information.
- Times may vary slightly.
- Dates and events are correct as per the document provided.
21st March 2013 (Thursday)

**Total Intravenous Anaesthesia (TIVA)**

TIVA can be defined as a technique of general anaesthesia that uses a combination of agents given solely by the intravenous route without simultaneous administration of any inhalational agent except for oxygen and air.

The use of TIVA is made possible because of two main reasons. Firstly the pharmacokinetic and pharmacodynamic properties of modern drugs like propofol and newer synthetic short-acting opioids like remifentanil.

Secondly, new concepts in pharmacokinetic modelling and advances in computer technology resulting in specialized infusion pumps have made TIVA user friendly hence recently there has been a surge in its usage. A team of experts in the field of paediatric anaesthesia will provide hands-on clinical training during this workshop to show us that TIVA for paediatric patients can be administered with confidence and that this method can be widely used in daily clinical practice.

**Coordinators**: Thavaranjitham Sandrasegaram  
**Venue**: Paediatric Institute, Hospital Kuala Lumpur  
**Facilitator**: Rajeswary Kanaphathipillai  
Usha Nair  
Teo Shu Ching  
**Invited Faculty**: Oliver Bagshaw

<table>
<thead>
<tr>
<th>Time</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>0730-0800</td>
<td>Registration</td>
</tr>
<tr>
<td>0800-0805</td>
<td>Introduction by Thavaranjitham Sandrasegaram</td>
</tr>
<tr>
<td>0805-0815</td>
<td>Opening Speech by V Sivasakthi</td>
</tr>
<tr>
<td>0815-0900</td>
<td>Presentation by Oliver Bagshaw - TIVA in Children</td>
</tr>
<tr>
<td>0900-0915</td>
<td>Change to OT Attire</td>
</tr>
<tr>
<td>0915-1200</td>
<td>Hands-on in OT (Group 1 and Group 2)</td>
</tr>
<tr>
<td></td>
<td>Algorithm For Practical Management of TIVA</td>
</tr>
<tr>
<td></td>
<td>Live Demo by Oliver Bagshaw</td>
</tr>
<tr>
<td>1200-1300</td>
<td>Lunch</td>
</tr>
<tr>
<td>1300-1545</td>
<td>Hands-on in OT (Group 3 &amp; Group 4)</td>
</tr>
<tr>
<td></td>
<td>Algorithm For Practical Management of TIVA</td>
</tr>
<tr>
<td></td>
<td>Live Demo in by Oliver Bagshaw</td>
</tr>
<tr>
<td>1545-1600</td>
<td>Closing (Light refreshment will be served)</td>
</tr>
</tbody>
</table>
21st March 2013 (Thursday)

Paediatric Difficult Airway Workshop
Coordinator : Vinod Suppiah
Venue : Clinical Skills Laboratory, Faculty of Medicine, University Malaya Medical Centre, Kuala Lumpur
Invited Faculty : Ann Black

<table>
<thead>
<tr>
<th>Time</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1200 - 1300</td>
<td>Registration and Lunch</td>
</tr>
</tbody>
</table>
| 1300 - 1310 | Welcome and Introduction  
  *Vinodh Suppiah* |
| 1315 - 1400 | The Difficult Paediatric Airway  
  *Ann Black* |
| 1415 - 1615 | Airway Skills Stations  
  1. The Basics  
  2. Laryngeal Masks  
  3. Videolaryngoscopes  
  4. Bronchoscopes  
  5. Cricothyroidotomy and Jet Ventilation  
  6. Miscellaneous Devices |
| 1615 - 1700 | Tea and Case Scenarios                     |
22nd March 2013 (Friday)

0845 - 0900  Opening Remarks by Dr Sushila Sivasubramaniam, Organising Chairperson
Speech by Associate Professor Datin Dr Norsidah Abdul Manap, President, College of Anaesthesiologists, Academy of Medicine of Malaysia

0900 - 1000  PLENARY 1
Chairperson: Thavaranjitham Sandrasegaram
TIVA in Children
Oliver Bagshaw (United Kingdom)

1030 - 1200  SYMPOSIUM 1: Updates
Chairpersons: Rajeswary Kanapathypillai / Intan Zarina Fakir Mohamed

1  Sedation in Neonates & Children
Linda Murdoch (United Kingdom)

2  Anaesthesia in Remote Areas
Thavaranjitham Sandrasegaram (Malaysia)

3  Cardiac Children for Non-cardiac Surgeries
Hamidah Ismail (Malaysia)

1200 - 1430  LUNCH / FRIDAY PRAYERS

1430 - 1515  PLENARY 2
Chairperson: Felicia Lim
Advanced Ventilatory Strategies in Children
Linda Murdoch (United Kingdom)

1515 - 1645  PRO-CON DEBATE:
Moderator: Vinodh Suppiah

1  Rapid Sequence Induction in Paediatric Anaesthesia: A Must?
• Yes: Ina Ismiarti Shariffuddin
• No: Azmil Farid Zabir

2  Albumin or Starch in Kids?
• Albumin: Ruwaida Isa
• Starch: Usha Nair

1645 - 1715  TEA
23rd March 2013 (Saturday)

0830 - 0915  PLENARY 3
Chairperson: Usha Nair
The Difficult Paediatric Airway
Ann Black (United Kingdom)

0915 - 1000  PLENARY 4
Chairperson: Hamidah Ismail
Use Of Cuffed Endotracheal Tube In Infants & Children
Felicia Lim (Malaysia)

1000 - 1030  TEA / VISIT TO EXHIBITION

1030 - 1200  SYMPOSIUM 2: A Mixed Goodie Bag
Chairpersons: Teo Shu Ching / Thavaranjitham Sandrasegaram

   1 Overview of Liver Transplantation in Malaysia
   Sushila Sivasubramaniam (Malaysia)

   2 Smart Infusion Technology
   Linda Murdoch (United Kingdom)

   3 Anaesthesia for Thoracic and Thoracoscopic Surgery in Children
   Oliver Bagshaw (United Kingdom)

1200 - 1300  LUNCH

1300 - 1400  SYMPOSIUM 3: Children Aren’t Scary!
Chairpersons: Sushila Sivasubramaniam / Ruwaida Isa

   1 Coping with Unexpected Airway Problems in the Child
   Ann Black (United Kingdom)

   2 Paediatric Simulation – The Way Forward
   Rajeswary Kanapathypillai (Malaysia)
23rd March 2013 (Saturday)

1400 - 1530  CASE DISCUSSION: Meet-The-Experts
Chairperson: Lucy Chan

1 Burns
   Intan Zarina

2 Foreign Body Broncho
   Teo Shu Ching

3 Resuscitation of the Paediatric Patient in the Recovery Room
   Lakshmi Thiyagarajan

Panel Discussion: Linda Murdoch, Oliver Bagshaw and Ann Black

1530 – 1600  TEA
The Organising Committee of the

**Paediatric Anaesthesia Meeting 2013**

wishes to thank the following for their support and contribution:

**Ministry of Health Malaysia**

**Major Sponsors**
AbbVie Sdn Bhd
Fresenius Kabi Malaysia Sdn Bhd

**Sponsors**
3M Malaysia Sdn Bhd
Aerotrach Sdn Bhd
Anugerah Saintifik Sdn Bhd
B Braun Medical Supplies Sdn Bhd
Baxter Healthcare (M) Sdn Bhd
Draeger Medical S E A Pte Ltd
Fresenius Kabi Malaysia Sdn Bhd
Gambro Renal Care (M) Sdn Bhd
Gemilang Asia Technology Sdn Bhd
Hospimetrix Sdn Bhd
IDS Medical Systems (M) Sdn Bhd
Insan Bakti Sdn Bhd
Jebsen & Jessen Technology (M) Sdn Bhd
KL Med Supplies (M) Sdn Bhd
Malaysian Healthcare Sdn Bhd
Merck Sharp & Dohme (M) Sdn Bhd
Pall-Thai Medical Sdn Bhd
Pfizer (Malaysia) Sdn Bhd
Pharmaniaga Markerting Sdn Bhd
Primed Medical Sdn Bhd
Terumo Malaysia Sdn Bhd
UMMI Surgical Sdn Bhd
Cook Medical Sdn Bhd
Laerdal Malaysia Sdn Bhd
Unipress Distributor Sdn Bhd
Total intravenous anaesthesia (TIVA) has been widely practiced in adult anaesthesia since the introduction of propofol into routine clinical practice in 1986. Although there were reports of the use of TIVA in children as early as 1989, it is only in recent years that it has started to become more popular, despite the concerns regarding propofol infusion syndrome (PRIS) in paediatric intensive care patients. Recent advances in pharmacokinetic modelling have illustrated the differences between adults and children, and lead to the development of more accurate infusion regimes for the paediatric population, which are now available in infusion pumps as part of the open TCI initiative. A recent survey showed that currently only 26% of paediatric anaesthetists use propofol infusions at least monthly.1

The main reasons for using TIVA in children include susceptibility to malignant hyperthermia, muscle biopsy for undefined neuromuscular disease, postoperative nausea and vomiting, scoliosis surgery with spinal cord monitoring and airway procedures. Until recently, manual infusion regimes were the mainstay of practice and demonstrated the need for greater doses of propofol in children, particularly those less than 3 years of age. The reason for this is the difference in front-end pharmacokinetics in children, particularly the increased volume of the central compartment and greater rate of clearance of the drug. Although these regimes worked well in practice, they had their limitations and the introduction of target-controlled infusion (TCI), has allowed a much more scientific approach to the administration of propofol to children. There are two programmes currently available, the Kataria and the Paedfusor. They are similar and both work well in children, although modelling data suggests the former is less accurate than the latter. Both use age and weight as covariates and these also determine the limitations of each model. The Paedfusor is the more versatile with an age range of 1-16 years and a weight range of 5-61kg.

A key to using TCI successfully in children is the principle of propofol-opioid interactions and the synergism that is demonstrated between propofol and, in particular, remifentanil. Co-administration of the latter allows the anaesthetist to greatly reduce the amount of propofol required to keep the paediatric patient asleep. Given that the context-sensitive half-life of propofol increases faster in children than adults, it means that plasma propofol targets of 2.5-3.5 mcg/ml can be achieved, thus limiting the total propofol dose and avoiding prolonged wake-up times. In general, paediatric patients will receive about 50% more propofol than an equivalent sized adult during an anaesthetic, which is why adult models should not be used in younger children, as there is a risk of under-dosing the patient.

Unlike adult models, neither paediatric model allows effect-site targeting, only plasma targeting. The reason for this is that the PK data in the paediatric models uses an adult ke0 value, so any attempt at effect-site targeting would not be accurate anyway. PK studies in children suggest they have higher
ke0 values than adults, with further variation relating to age. The downside of this is that induction in children is slow unless a high initial target is set. Some children find this distressing and it can be upsetting for parents as well. Unfortunately, setting a high initial target may cause problems with pain on injection when the propofol is infused, which can be equally distressing.

Propofol-infusion syndrome has been described in children receiving propofol infusions for intensive care sedation. It is characterised by cardiac failure, acidosis, rhabdomyolysis and lipaemic serum and is probably due to an acquired fatty-acid oxidation disorder at mitochondrial level, leading to accumulation of fatty acids and reduced energy production. Although extremely rare, there have been a few case reports suggesting early PRIS may be present in paediatric patients receiving a propofol infusion as part of their anaesthetic. Measures to reduce the total propofol dose and careful monitoring may be prudent in prolonged cases.

TIVA in children is an effective anaesthetic technique that can be used in a variety of clinical situations. Obvious advantages include less pollution, superior quality wake-up, absence of laryngospasm and less nausea and vomiting. Although not a popular option amongst paediatric anaesthetists, they should all have the knowledge and skills to administer a TIVA anaesthetic in children when needed.

References
Congenital heart disease (CHD) still placed first among common birth defects, occurring approximately 1 in 125 live births. Thirty per-cent amongst these might require surgery during the first year of life due to extra-cardiac anomalies. The presence of CHD increases morbidity and mortality of children undergoing non-cardiac surgery. A review of 191,261 inpatient anaesthetics administered to children revealed an increase in both short-term and 30-day mortality rates for patients with CHD. Patients with major cardiac anomalies, the observed 30-day mortality was nearly twice that of patients with minor cardiac anomaly.

Although physiologically well-compensated patients may undergo non-cardiac surgery with minimal risk, certain patient groups have been identified as high risk: children less than a year of age especially premature infants, patients with severe cyanosis, poorly compensated congestive heart failure or pulmonary hypertension, patients for emergency surgery and patient with multiple coexisting disease.

The spectrum of congenital cardiac lesions is so varied and the type of non-cardiac surgeries performed so diverse that formulating one set of rules for evaluation and perioperative care of these patients are extremely difficult. An understanding of the child’s underlying lesion, the residua and sequelae of any reparative or palliative surgeries he or she undergone and his current functional status will aid in determining the anaesthetic plan and post-operative care.
THE DIFFICULT PAEDIATRIC AIRWAY

Ann Black
United Kingdom

We know that managing the paediatric airway is potentially more concerning to the many anaesthetists than managing the adult airway. The difficult paediatric airways have two distinct parts:

1. The child may have difficult bag mask ventilation - defined as “a condition in which holding a mask airway is difficult or in which BMV is hard to achieve with conventional equipment”
2. The child may be difficult to intubate - defined as “intubation requires specialist techniques, more than three attempts at intubation, or has had a previously documented grade 3/4 laryngoscopy”.

The first group is rare. The incidence of an unanticipated difficult airway is unknown. Difficult intubation is more closely studied. Paediatric airway research is difficult and the evidence base mostly from either equipment assessments or case reports. The incidence of difficult intubation varies between 1.2 % in cardiac children, 7% of babies with cleft palates but much higher, >25%, in children with Hurlers syndrome which is recognised as one of the most difficult groups to manage. Most difficult intubations can be predicted as they occur in syndromal children. This allows us to plan how to manage them. however this is not always the case. In the NAP4 national study of major airway complications. Our hospital data base of difficult airways shows that only 16% of children with a difficult intubation had no syndrome recognised, and 25% had either Treacher Collins or Goldenhaur syndrome.

Assessment Evidence of good predictive tests for identifying the difficult paediatric airway / difficult intubation is sadly not available. Adult tests can be used in some cases but are not validated and of doubtful use. Anaesthetists use airway evaluation of any sort in only 30% of patients. Even so 15-30% of difficult adult airways were not identified in advance. Documentation of airway assessments is poor. Probably the most useful information is gleaned from the previous anaesthetic records.

Management Plan - Awake or asleep? And if asleep should you use a gaseous or IV induction? A survey of paediatric anaesthetists showed that the majority preferred gaseous induction. The anxiety over the use of relaxants is also important. The new paediatric airway guidelines impress that if difficulty at intubation is found unexpectedly muscle relaxation is often already given and indeed of some benefit as the opportunity to intubate is best with relaxed cords. This may however be achieved as easily with a bolus of propofol.

Equipment LMAs or SADs: These are widely used in difficult airway management. Increasingly they have a role at emergencies and at resuscitation though most recently it has been reported that effective BMV is preferable to LMA placement in the hands of non-experts. SADs are also used for
FOI in exchange techniques, either using a catheter exchange or wire. Various ingenious techniques are described. There is evidence that the newer SADs with gastric drainage channels are associated with less gastric distension and have an airway seal at a lower pressure, both advantageous features.

Commonly used indirect laryngoscopes have become increasingly used. Paediatric versions of the Glidescope, Airtraq, CMAC and many others. There are much case based reports of successful use of this equipment. There is very little available comparing different techniques and outcomes. Recent work looking at the use of indirect laryngoscopes in our practice involving children with grade 3/4, there remains an incidence of failure and FOI remains the gold standard for managing difficult intubations. FOI. Paediatric scopes are available and widely used; sizes vary but start from 2.2mm. Techniques include tube over the FOS via a FOI connector or FOS facemask, use of a SAD as a conduit, or use of a wire/ exchange catheter technique. The latter is recommended in the APA/DAS airway management guidelines. Other guidelines have also been reported for the difficult paediatric airway.

Emergency cricothyroidotomy in children is fraught with difficulty. U/s identification of the CTM by u/s may hold some future promise. It is likely that the equipment available at present needs to be updated. Tracheostomy in children, done by an ENT surgeon is more likely to be successful but even this, whether part of the elective plan or maybe a final life saving manoeuvre can be associated with long and short term complications.

References
### 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

#### Step B: Insert oropharyngeal airway

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

- **Call for help again if not arrived**

- **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**

#### Diagram:

- **Yes**
  - **Good airway**
    - **SpO₂ >80%**
    - **Consider:**
      - SAD (e.g. LMA™) malposition/blockage
      - Equipment malfunction
      - Bronchospasm
      - Pneumothorax

- **No**
  - **SpO₂ <80%**
    - **Attempt intubation**
    - **Consider paralysis**

- **Fail**
  - Go to scenario cannot intubate cannot ventilate (CICV)

- **Succeed**
  - Wake up patient
  - Proceed

- **Succeed**
  - Continue
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

  Failed intubation with good oxygenation

  Tracheal intubation → Succeed

  Verify ETT position
  - Capnography
  - Visual if possible
  - Auscultation
  - If ETT too small consider using throat pack and tie to ETT
  - If in doubt, take ETT out

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

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

  - Convert to face mask
  - Optimize head position
  - Oxygenate and ventilate
  - Ventilate using two person bag mask technique, CPAP and orotracheal laryngoscopy
  - Manage gastric distension with ONSG tube
  - Reverse non-depolarising relaxant

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

  - Consider 1 attempt at FOI via SAD (e.g. LMA™)
  - Verify intubation, leave SAD (e.g. LMA™) in place and proceed with surgery

  Failed ventilation and oxygenation

  Go to scenario cannot intubate cannot ventilate (CICV)

Following intubation attempts, consider:
- Trauma to the airway
- Exsufflation in a controlled setting

*Consider using indirect laryngoscope if experienced in their use

SAD = supraglottic airway device

 ensure Oxygenation, anaesthesia, CPAP, management of gastric distension with ONSG tube
Cannot intubate and cannot ventilate (CICV) in a paralysed anaesthetised child aged 1 to 8 years

Failed intubation inadequate ventilation  
Give 100% oxygen  
Call for help

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

- FIO₂ 1.0
- Optimise head position and chin lift jaw thrust
- Insert oesophageal 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 vecuronium 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

- Call for help again if not arrived

**Consider**
- Surgical tracheotomy
- Rigid bronchoscopy + ventilate / jet ventilation (pressure limited)

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

**Percutaneous cannula cricothyroidotomy / transtracheal jet ventilation (pressure limited)**

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

- 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

**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 caudal 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 limit 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

**SAD** = supraglottic airway device
USE OF CUFFED ENDOTRACHEAL TUBE IN INFANTS & CHILDREN

Felicia Lim
Visiting Paediatric Consultant Anaesthesiologist, Universiti Kabangsaan Malaysia Medical Centre
Kuala Lumpur, Malaysia

The basic function of an endotracheal tube is to provide a link between the anaesthesia machine and the patient. Ideally this link should be leak proof so as to provide constant & reliable ventilation without causing undue pressure to laryngeal or tracheal structures. The traditional teaching is that only uncuffed endotracheal tube be used in children younger than 8 or 10 years old. The argument for this is based on the finding that the narrowest part of the airway is the cricoid. Introducing an uncuffed tracheal tube that just fits and seals within the cricoid makes a cuff unnecessary. The key to securing acceptable sealing with uncuffed tubes is by matching the diameter of the endotracheal tube to the diameter of the cricoid ring - cricoidal sealing. Getting this right is a challenge. If a tube is too small, ventilation and monitoring are unreliable. If a tube is too large, mucosal compression and injury to subglottic area will occur. Thus an appropriate size of ETT has been defined as that size of ETT which provides adequate ventilation and at same time allows an audible air leak around the ETT occurring between 15-25 cm H2O pressure.

In practice, selection of an appropriate size ETT to fulfill these 2 criteria is not an easy task as evident by the development of numberless formulae for uncuffed tracheal tube size selection and the high tube exchange rates up to 28%.

In recent years, evidence has accumulated that cuffed tubes can be used safely in children and they have benefits over uncuffed tubes. However there are several concerns for the use of cuffed endotracheal tube in young children. They include the risk of trauma to larynx and subglottic area, higher cost, smaller internal diameter tube, need for cuff pressure monitoring.

It has been found that there are several shortcomings in the design of the conventional paediatric cuffed tubes that can potentially lead to airway trauma. These include inappropriate diameter of the cuff, too long cuffs, wrong cuff position, absence or wrongly positioned intubation depth marks, considerable differences in outer diameters in tubes with identically sized internal diameter.

In 2004 a newly designed paediatric cuffed endotracheal tube, the Microcuff was introduced. The cuff is made of ultra-thin polyurethane (10 mm) and fills the gap between the tube and the tracheal wall without folds and channels. The Murphy eye, a feature on other cuffed tubes, was abandoned which allowed the position of the balloon to be moved more distally on the endotracheal tube shaft. The balloon on the Microcuff tube is short; when inflated, it expands in the trachea, below the subglottis, providing tracheal sealing with a mean intracuff pressure of only 10 cm HO. Depth markings guide the correct placement of the tip of the endotracheal tube within the trachea.
A prospective randomized multicenter trial by Weiss in 2009, comparing Microcuff endotracheal tubes to uncuffed endotracheal tubes in small children shows that postextubation stridor was noted in 4.4% of patients with cuffed and in 4.7% of patients with uncuffed tubes and tracheal tube exchange rate was 2.1% in the cuffed and 30.8% in the uncuffed groups.2

There is strong evidence-based support for the use of cuffed endotracheal tubes in infants and children, and in certain clinical conditions eg: patient with low lung compliance, patient with high aspiration risk and patients where the precise ventilation and CO₂ control is important. However only correctly designed cuffed tubes with a short high volume-low pressure, with a definite intubation depth mark should be used. It is also important to note that the studies with the Microcuff tubes have been conducted on term infants with a body weight of 3 kg or greater. Therefore the use of cuffed Microcuff tubes in premature infants or infants weighing less than 3 kg should be deferred until more data are available.

References:
OVERVIEW OF LIVER TRANSPLANTATION IN MALAYSIA

Sushila Sivasubramaniam
Selayang Hospital, Kuala Lumpur, Malaysia

Pediatric liver transplantation has become a state-of-the-art operation with excellent success and limited mortality. Liver transplantation is a successful and useful therapy for children with chronic or end-stage liver disease and those with a variety of extrahepatic metabolic diseases that can be corrected by liver replacement. Graft and patient survival have continued to improve as a result of improvements in medical, surgical techniques and anesthetic management, organ availability, immunosuppression, and identification and treatment of postoperative complications. The utilization of split-liver grafts and living-related donors not only provided more organs for pediatric patients but has also contributed to reversing a situation in which during the 1980s and 90s children had a greater waiting list mortality compared to adult patients. Paediatric liver transplantation has a 10 year survival rate of 80-90%.

The first successful liver transplant was performed by Starzl in 1963. Taking into account just in the US, there are more than 100 transplant centers that do in excess of 500 paediatric transplantation per year. Paediatric patients account for 12.5% of liver transplant recipients.

The main indications for liver transplantation in the pediatric population are as follows:

2. Intra-hepatic cholestasis: sclerosing cholangitis; Alagille’s syndrome; non-syndromic paucity of intrahepatic bile ducts; and progressive familial intrahepatic cholestasis.
3. Metabolic diseases: Wilson’s disease; α1-antitrypsin deficiency; Crigler-Najjar syndrome; inborn error of bile acid metabolism; tyrosinemia; disorders of the urea cycle; organic acidemia; acid lipase defect; oxaluria type I; and disorders of carbohydrate metabolism.
4. Acute liver failure.
5. Others: primary liver tumor and cystic fibrosis
6. Retransplantation for graft failure. Biliary atresisa continues to be the most common indication for paediatric liver transplantation.

The decision to list a patient for transplantation is based more on the severity of hepatic dysfunction than the underlying aetiology. Pre-assessment and careful patient selection is done by a multidisciplinary anaesthetic, surgical and hepatology team.

The clinical features of endstage liver failure in children are dependent on the aetiology of the primary liver disease and the pace of hepatocellular failure and fibrosis. Factors influencing perioperative management include those related to the failure of synthetic and metabolic function of the liver, redistribution of cardiac output, diminished hepatic blood flow and portal hypertension. These derangement leads to a multitude of associated medical problems.
Anaesthesia for paediatric liver transplantation requires meticulous attention to detail, an understanding of the disease process leading up to the need for transplantation, and an awareness of the haemotological, biochemical, and multi-organ consequences of this operation. The preoperative problems which the anaesthetist encounter, emphasise the importance of good planning and preparation for the intraoperative procedure, simplifies the surgical technique of the operation, and stresses the value of a multidisciplinary approach to the paediatric patient requiring liver transplantation.

Although liver transplantation has been well established in western countries since 1980s, with the introduction of cyclosporine in 1979, Asian countries did not see the introduction of cadaveric organ transplantation until the 1990s, due to varied issues as varied religious and ethical opposition, debate over definition of brain death, and public opinion. In Malaysia, we have performed a total of 59 patients both adult and children since its inception in April 2002. The paediatric patients account for 58% of the liver transplant recipients, of which 53% of the paediatric liver recipients are living related liver transplantation. The road to transplantation of a paediatric patient in Malaysia will be discussed further including the challenges faced by the anaesthetists.

References:
Anaesthesia for children undergoing thoracic procedures can be challenging for a number of reasons. Patients may be small, have significant underlying respiratory pathology and co-morbidity, require lung isolation, and need invasive monitoring intraoperatively. Other considerations for the anaesthetist include potential for blood loss, the method of pain relief and the requirement for high-dependency or intensive care postoperatively.

Significant physiological changes occur with turning to the lateral position, lung isolation and single-lung ventilation (SLV), and surgical interventions such as the induced pneumothorax with thoracoscopy or open thoracotomy. Counter-intuitively, paediatric patients often don’t tolerate SLV as well as their adult counterparts. Anaesthesia and muscle relaxation allow abdominal contents to migrate into the chest, reducing functional residual capacity (FRC). The elastic chest wall is subject to deformation on positioning, causing compression of the dependent lung and resulting in a lower position on the compliance curve. The more compliant upper lung is either isolated or compressed by pneumothorax. Gravitation redistribution of blood flow does not occur, due to the small distance from top to bottom of the chest. Hypoxic-vasoconstriction may be impaired by anaesthetic agents. The result may be a detrimental effect on ventilation-perfusion matching, with a significant increase in oxygen requirement and reduced carbon dioxide clearance. The main cardiovascular change is hypotension, which can be due to a number of reasons, such as fluid-depletion, surgical pneumothorax, compression of large blood vessels by instruments, ongoing blood loss and epidural-related vasodilatation.

Unlike adult patients, the need for lung isolation in children is often less clear-cut. A balance needs to be made between the benefits to the surgeon and the risks to the patient. Absolute indications remain the risk of soiling of the other lung and bronchopleural fistula, which are rarely encountered during routine paediatric practice. Double-lumen tubes are not manufactured for children under the age of about 8 years, so alternative techniques need to be employed, such as endobronchial intubation and the use of bronchial blockers. All have their limitations and potential complications, which the anaesthetist needs to be aware of. Consideration also needs to be given to how easy it will be to reinflate the upper lung at the end of the procedure.

Provision of adequate postoperative pain-relief is an important part of any anaesthetic and this is particularly the case with thoracic procedures. Open thoractotomy and insertion of Nuss bar can be two of the most painful procedures a patient can experience. Epidural analgesia remains the mainstay of effective analgesic provision in these cases. Thoracoscopic procedures are inherently less painful, but the need for a chest drain postoperatively may mean that a local block or opioid analgesia is required to provide adequate comfort.
Apart from operations requiring thoracotomy or thoracostomy, other challenging procedures for the anaesthetist include bronchoscopy and biopsy for anterior mediastinal mass. Both require a thorough preoperative assessment of the patient and clear communication with the surgical team about specific requirements and patient safety concerns. Consideration also needs to be given as to the best anaesthetic technique for these procedures.

In summary, anaesthesia for paediatric thoracic procedures requires consideration of the underlying condition and patient co-morbidity, the need for lung isolation, the physiological effects of anaesthesia and surgery, effective monitoring and pain-relief, and the need for postoperative high-dependency or intensive care.
COPING WITH UNEXPECTED AIRWAY PROBLEMS IN THE CHILD

Ann Black

United Kingdom

Introduction

The following may be a little scary: Mucopolysaccharidoses, severe stridor? Cause in a small baby, caustic ingestion or conjoined twins with airway problems! But if you can plan ahead most of even these are not scary. What is really scary is being in an unfamiliar environment, with staff who you do not know and equipment you have no idea how to use. What is scary is when you are in an ER and a colleague asks you to come and help them with a sick child who needs a tracheal tube or has airway difficulties. It really does not matter what the reason is, you are the expert, and you have to help. So if we want to prepare for such events what can we do?

We are all airway experts. Our training programs teach airway skills. However we know that in the UK clinical training time has decreased. The number of anaesthetists feeling comfortable managing a 6 month old child decreased by 50% this is not good. A study in 2003 showed that only 20% of UK anaesthetists had any difficult airway training and in Japan it was 28% hopefully this is better now. This brings us to how competent someone is but also to how confident they may be in dealing with a particular situation. A doctor new to paediatric anaesthesia may be very confident and competent but they have no idea what trouble is about to happen. MPS is the classic case. Most doctors never see a child with this condition.

Expert paediatric anaesthetists are not available in all hospitals, and certainly paediatric ENT surgeons are not available widely. This means that patients may need to be managed in areas where the expertise and equipment is lacking. A sick child may need to be transferred from one hospital to another - how can this be done safely? In the UK there is a network of transfer teams, ambulances that go out to pick the child up and transfer them to the specialist centre, these are staffed by senior nurses and sometimes doctors but rarely anaesthetists. In a retrospective two year audit, 130 of 1284 patients transferred by our local service, had airway difficulties predicted, 90% were intubated at their base hospital.
We learn using lectures, webinars, workshops, simulators, clinical experience, reading, internet resources. In addition one of the ways we have tackled this issue is to develop some evidence based guidelines for the management of the unanticipated difficult paediatric airway. This work was supported by the Association of Paediatric Anaesthetists and the Difficult Airway Society. The process involved a trawl for international and local guidelines, an extensive review of the literature grading all papers for level of evidence, and then a dissection of each step of a potential pathway for airway management using the Delphi process to make all decisions as robust as possible. We used two expert panel involving UK and international anaesthetists. The process took over two years. and resulted in three guidelines which are published on the web.

In children aged 1-8 years, in the situation of the unanticipated difficult airway:

- Difficult mask ventilation
- Difficult intubation
- Can’t intubate, can’t ventilate

References:
Simulation has been used as a tool for training and assessment for over 30 years. Sim One was the starting point for true computer controlled mannequin simulators, for simulation of the entire patient. We need to assess how effective is simulation training at improving the practice and self-confidence of qualified healthcare in dealing with clinical situations.1

Paediatric anaesthesia and emergency medicine are clinically demanding fields, presenting the practitioner with unique challenges particularly when caring for neonates, infant and small toddlers.2 The demand for paediatric simulator courses is high, presumably fuelled by the perceived imbalance between difficulties of incidents and emergencies and everyday clinical routine, particularly in the areas of infant anaesthesia and paediatric emergency medicine.3

Simulation is a technique to replace or amplify real experiences with guided experiences that evoke or replicate substantial aspects of the real world in a fully interactive manner. A Simulator is a training device that duplicates artificially the condition likely to be encountered in a particular situation.4

The benefits of simulation include immersive, experimental learning, reflective learning, safe Risk-free learning environment, and allows for assessment of learners with standardized clinical scenarios. Other significant benefits of the simulation experience include practice of complex clinical scenarios and ability to evaluate new equipment, interventions, treatment protocols and procedures.7

The use of high fidelity patient simulator on the teaching of non-technical skill is gaining importance. Non-technical skills are skills that do not relate to medical knowledge or technical procedure. Non-technical skills encompass cognitive skills e.g. decision making, situation awareness and interpersonal skills.
A single exposure to anaesthesia crises using a high-fidelity patient simulator can improve the non-technical skills of anaesthesia residents.  

Simulation is currently used as an assessment tool to provide on-going feedback during training. Simulation is an effective training tool for paediatrics acute care providers.

In conclusion the simulator is just an educational tool to enhance training and teaching. Simulation is being used by multiple disciplines eg: Crises Resource Management and competency based training. Simulation may hence point the way forward as the new paradigm for the effective education of clinicians, current and future.

References

5. Southern Health Simulation Centre (2010), Introduction to Simulation-Based Learning.
7. Practicing medicine with Risk: Student and educator’s responses to high-fidelity simulation. Acad-Med. 2001;76:469.72
RESUSCITATION OF THE PAEDIATRIC PATIENT IN THE RECOVERY ROOM

Lakshmi Thiyagarajan
Johor Bahru, Johor, Malaysia

We often take for granted that staff in the Operating theatre will be prepared for any type of emergency. This is a case scenario concerning post-anaesthesia complications in a recovery room that handles paediatric cases only occasionally.