BC Children's Hospital
An agency of the Provincial Health Services Authority

Pediatric Airway

BC Children's Hospital PICU
Physicians & Respiratory Therapists

December 16, 2022

PREPARING FOR INTUBATION IN CHILDREN

PHYSICIAN TO PHYSICIAN

CRITICAL CARE SUPPORT FROM BCCH PEDIATRIC INTENSIVE CARE UNIT (PICU)

Most Responsible Physician (MRP) identifies the need for pediatric consult for transport or advice from the BCCH Pediatric ICU (PICU)

MRP/delegate phones Patient Transfer Network (PTN):

1-866-233-2337

Requests a call with BCCH Pediatric Transport Advisor

PTN connects with PICU Pediatric Transport Advisor & MRP to collaborate on an ADVICE CALL

New option available:
PTN can facilitate a secure GoodSAM video conference for MRP + PICU Transport Advisor + additional specialists as needed

What is a Difficult Airway?

- **ALL** pediatric airways in an emergency setting are potentially difficult airways!
- Call the most experienced laryngoscopist for intubation of any child

Clinical Pearls

- Anticipate – situational awareness
- Things to avoid during intubation
  - hypotension
  - hypoxemia
    - OXYGENATION is life saving - not INTUBATION…so if there's a problem….bag valve mask….
- Risks of medication during intubation
  - hypotension and hypoxemia – be prepared/anticipate
- Use pre-intubation checklist
- Debrief post procedure

Practical Tips

- A child with a normal airway can always be ventilated
- Classic rapid sequence induction is NOT routine in pediatric airway management
- Hypoxia during “classic” RSI is common in children, more common in smaller children, and can be prevented by gentle facemask ventilation
- Cuffed ETT’s are preferred for most children

BCCH PRE-INTUBATION TIMEOUT CHECKLIST

Is a difficult airway anticipated? If YES, CALL ANESTHESIA.

PATIENT PREPARED?

- Nasal cannulae applied
  - < 1 year 5LPM
  - 1-7 years 10LPM
  - >7 years 15LPM
- Functioning IV/IO?
- Patient exposed?
- Patient position optimized?
- Patient pre-oxygenated?
- Patient hemodynamics optimized?
- Does patient airway assessment identify any concerns?
- Failed intubation backup plan?

EQUIPMENT READY?

- Suction
  - rigid suction catheter turned onto max
- Oxygen
  - Mask
  - self inflating bag-valve
  - JR flow inflating system
- Airway equipment
  - working laryngoscope /blade
  - ETT plus 0.5 smaller size
  - lubricated stylet
  - oral airways/NPA
  - LMA
  - V-L available?
- Pharmacologic agents
  - induction/paralytic drugs
  - fluids / vasopressor?
- Monitoring Equipment
  - SaO_2
  - ECG
  - BP
  - waveform $ETCO_2$

TEAM READY?

- Gown, glove and eye protection
- Team members introduced
- Team leader identified
- RT/intubator checked equipment
- Nurse to administer medications
- Anticipated problems identified – anyone have questions or concerns?
- Identify recorder/capture "event start" on bedside Philips monitor

PLAN FOR CONSEQUENCES

- Successful intubation?
  - secure ETT
  - CXR
  - ongoing sedation / paralysis
  - ventilation parameters set
- Document procedure in chart
- Complete NEAR4KIDS audit record
- RT to Complete NEAR4KIDS blue sheet

Preparation: SOAPME

- **S**uction – age appropriate Yankauer
- **O**xygen and delivery devices – high flow nasal cannula
- **A**irway
  - age appropriate oral airways/face masks/LMA's
  - bag-valve or J-R circuit manual ventilator
  - cuffed ETT's and stylet
- **P**harmacy
  - anesthetic agent/muscle relaxant (ketamine/fentanyl/rocuronium)
  - resuscitation drug (adrenaline 1:100,000)
- **M**onitors
  - oximeter
  - ECG
  - BP
  - $ETCO_2$ for confirmation of successful intubation
- **E**quipment – adjuncts for special situations

Airway Strategies: Basic Management

- Opening the airway
  - maneuvers
    - chin lift/jaw thrust
  - adjuncts
    - suction
    - oropharyngeal airway
    - nasopharyngeal airway
- Positioning the patient – age and clinical situation
- Assisting oxygenation
  - high flow mask/high flow nasal prongs/bag-mask
- Assisting ventilation
  - one person bag/mask
  - 2 person bag/mask

Click here for a PALS Airway Management YouTube Video

Pre-treatment

- Induction medications prepared
- Suction upper airway before procedure
  - consider nasal cannula oxygen during oral intubation
- Fluid resuscitation prior to/during procedure
- Rescue medication
  - adrenaline
    - 0.1ml/kg 1:10,000 diluted to 10mls – 1ml = 1mcg/kg

Basic Intubation Steps

- Team ready / checklist reviewed
  - anticipate/pre-treat hypotension-hypovolemia
- Pre-oxygenation during preparation
- Give induction medications
  - gentle bag mask ventilation often required prior to laryngoscopy
    - modified rapid sequence approach
- Laryngoscopy/intubation
  - attach inline $ETCO_2$ monitor once ETT inserted
  - connect to bagger/ventilate/observe exhaled carbon dioxide
  - observe depth mark at teeth
- Secure ETT/CXR to identify tip of ETT above carina

Induction Agents

- Ketamine 0.5-1mg/kg IV
  - can repeat after airway secured
- Fentanyl 1mcg/kg IV
  - can repeat after airway secured
- Rocuronium 1mg/kg IV

Choosing ETT's

- Cuffed vs uncuffed
  - cuffed ETT's routine
  - uncuffed for viral croup
- Size
  - age/4 + 3.5 (internal diameter)

Post-Intubation Care

- Secure the ETT/pass NG-OG
- Continuously monitor $ETCO_2$/SaO_2/BP
- Check CXR – NG and ETT position
- Ongoing sedation/analgesia/+-muscle relaxation
- Lung protective ventilation if acute lung injury
- Neuroprotection if acute neurologic problem
- Avoid gas trapping with obstructive lung disease

Post-Intubation Sedation

- Morphine 10-40 mcg/kg/hr
  - Lower dose for tube comfort
  - Higher dose if trauma and pain
- Midazolam 50-150 mcg/kg/hr
- Dexmedetomidine 0.1-0.7 mcg/kg/hr
  - To reduce midazolam dose requirements
- Rocuronium 0.5-1mg/kg prn
  - for tube safety or clinical situation

Difficult mask ventilation (MV) – during routine induction of anaesthesia in a child aged 1 to 8 years

APA

Difficult MV → **Give 100% oxygen** → **Call for help**

Step A Optimise head position | Check equipment | Depth of anaesthesia

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

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 for 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™)

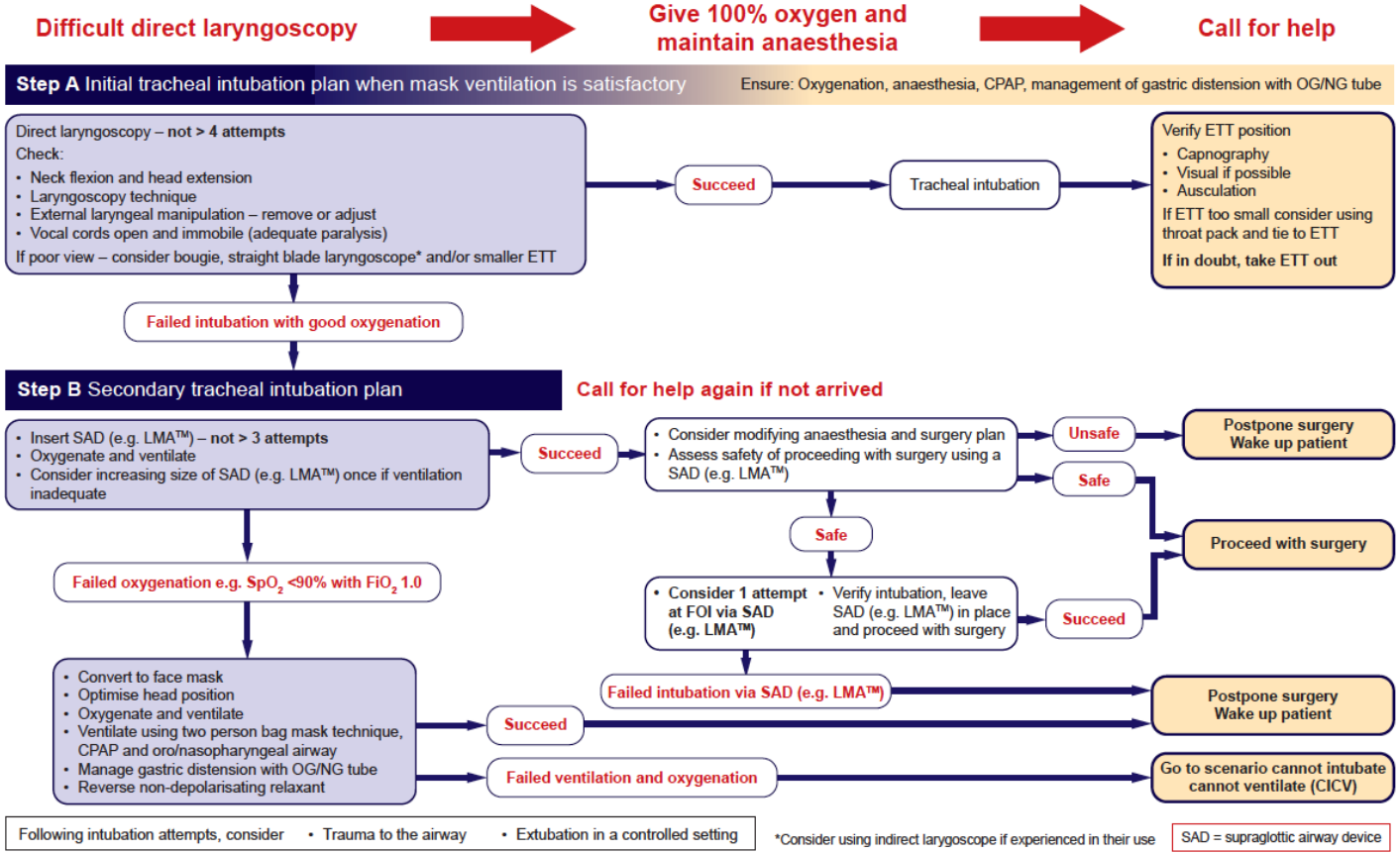
- Insert SAD (e.g. LMA™) – **not > 3 attempts**
- Consider nasopharyngeal airway
- Release cricoid pressure

Good airway?
- Yes → Continue
- No → SpO_2 >80%?
  - Yes → Consider:
    - SAD (e.g. LMA™) malposition/blockage
    - Equipment malfunction
    - Bronchospasm
    - Pneumothorax
    - → Wake up patient
  - No → SpO_2 <80%?
    - Attempt intubation
      - Consider paralysis
      - Succeed → Proceed
      - Fail → Go to scenario cannot intubate cannot ventilate (CICV)

SAD = supraglottic airway device

Pediatric Anesthesia 22 (2012) 1147–1149
http://www.apagbi.org.uk/publications/apa-guidelines

Unanticipated difficult tracheal intubation – during routine induction of anaesthesia in a child aged 1 to 8 years



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