

Pediatric Airway Management

By:

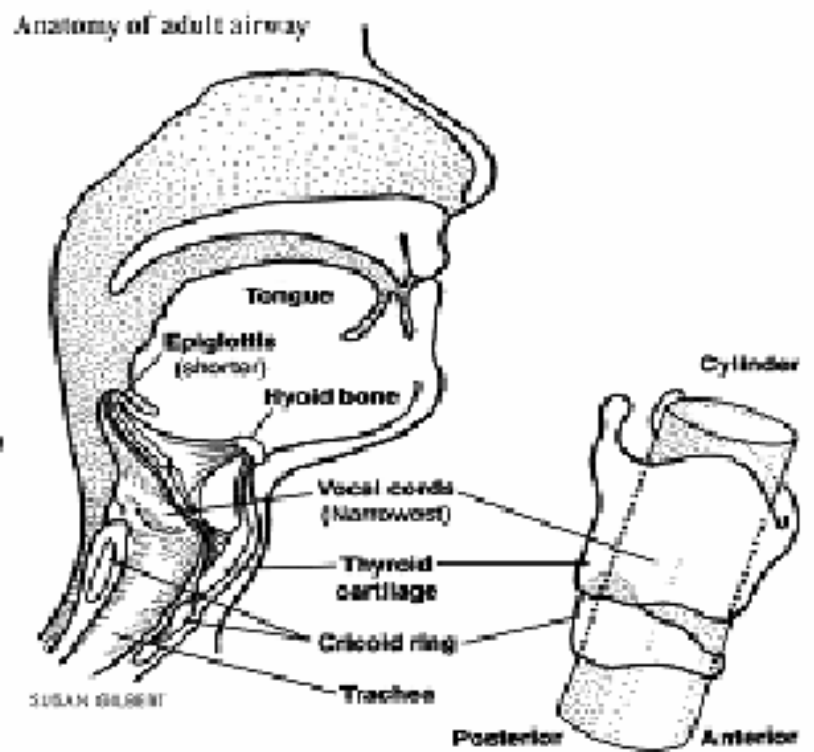
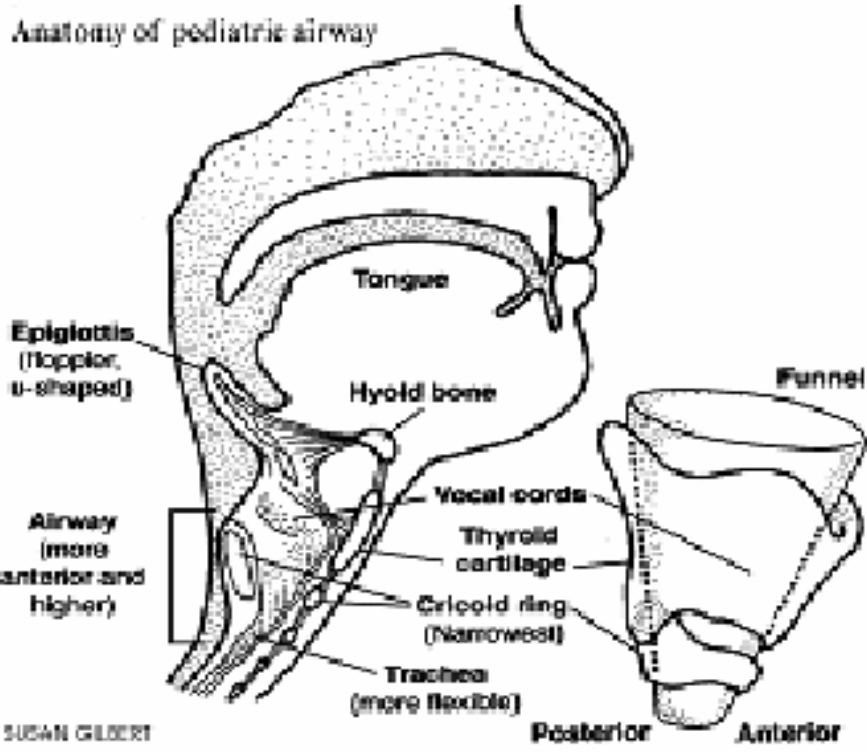
Debbie Cain RRT



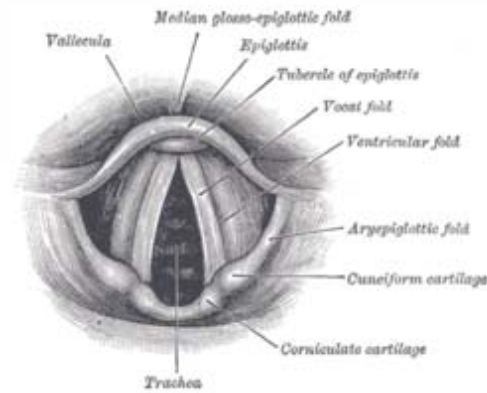
An agency of the Provincial
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Pediatric versus Adult Airway



Adult vocal cords



Infant vocal cords



The neonatal airway



The Difficult Airway



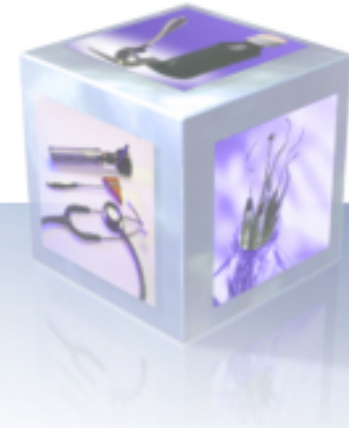
Recessed Mandible



Pierre Robin



Mobius Syndrome



Definition of a Difficult Airway



- Clinical situation where the clinician experiences difficulty with face mask ventilation of the upper airway, difficulty with tracheal intubation, or both.

Mobius Syndrome



- Small mouth
- Cleft palate
- Poor or absent airway reflexes
- Brain Stem deformities and immaturity

A Case Study



- 39 + 3/7 weeks gestation G3L2
- Transferred at 8 hours of age from northern community

Previous history



- Unplanned pregnancy
- Had morning after pill
- Misoprostol for Therapeutic Abortion
- D and C

6 months later



- Went to physician for fetal movement at 6 months gestation
- Still pregnant with polyhydramnios

Caesarian section



- For polyhydramnios and non-reassuring stress test (0 heart rate variability)

Resuscitation Record



- Birth weight 2894 grams
- Apgars 2, 5 and 6
- Flat at birth
- Received IPPV and Chest Compressions X 2 minutes
- 0 epinephrine
- Unable to visualize airway

Presentation



- Small recessed jaw
- Cleft palate
- 0 blinking
- Absent cough and gag
- Very small mouth
- Bag and mask fairly easy

First ABG – yikes!



- 6.88/133/25/-19 (2 hours 20 minutes after birth)
- 7.22/115/39/-12 (2 hours after that)
- Hb 179-210, sugars stable
- Airway noted to be very positional

Problems with Airway



- Unable to insert LMA due to small mouth
- Cleft palate
- Short webbed neck
- Recessed chin
- Tongue small and posterior
- Grade III view
- Minimal respiratory effort

Mallampati grading of airways

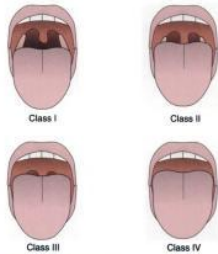


Figure 3.8 Mallampati grades. Adapted from Walls RM, Litton RC, Murphy ME, Schneider SE. *Manual of Emergency Airway Management*. Lippincott Williams & Wilkins, 2000.

Course have developed the "LEMON Law" for identification of the adult difficult airway as follows³:

- L—Look externally
- E—Evaluate the 3-3-2 Rule (3 fingers between the patient's teeth, 3 fingers at the space from the mentum to the hyoid bone, and 2 fingers between the thyroid notch and the floor of the mouth)
- M—Mallampati grade
- O—Obstruction
- N—Neck mobility

Algorithms for management of the difficult airway have been published for adults but not specifically for pediatric patients, although some have been proposed as modifications of adult algorithms (Figure 3.9).

Selected conditions associated with the difficult pediatric airway are listed in Table 3-2. Once one of these risk factors has been identified, a step-wise approach should be taken, including calling for anesthesia or surgical assistance and considering other types of airway management, such as awake intubation, LMA, lighted stylet, or cricothyrotomy. Before starting any RSI procedure, it should be established that the patient can be effectively ventilated by the bag-mask ventilation technique and appropriate airway adjuncts, or an emergency airway tray should be readily available.

uvula.¹⁰ The classification is an indication of the amount of space in the mouth to accommodate the laryngoscope and tracheal tube. There are four Mallampati grades, with Grade I indicating excellent oral access and Grade IV difficult access and intubation (Figure 3.8). The significance of the Mallampati score in infants and small children is unknown. The developers of the National Emergency Airway

CASE SCENARIO 2

A 13-month-old boy is brought to the emergency department by paramedics. The mother had found him choking and gagging in the kitchen next to a container of spilled nuts. She immediately called 9-1-1. Paramedics note that the child's appearance is normal and alert, the work of breathing is increased with audible stridor and subcostal retractions, and his color is normal. Paramedics administer blow-by O₂ and transport the child to the emergency department. On arrival, the child is awake and alert and in moderate respiratory distress. The patient is placed immediately in a monitored bed. Vital signs are respiratory rate of 60/min, heart rate of 160/bpm, blood pressure of 88/56, temperature 37.1°C, and oxygen saturation 93%.

1. What are your initial management priorities?
2. What diagnostic studies are necessary?
3. What are the possible complications to consider on initial evaluation?
4. What is the definitive management of this condition and disposition of the patient?



On admission to BCCH



- Baby hand ventilated from northern community to BCCH by physician and paramedics
- Baby is now 13 hours old
- Two person R.T. bagging with ETCO₂ in place and flow inflating bag
- Oral airway does help
- PCO₂ now down to 49 mmHg

ENT and Anaesthesia called



- Fiberoptic scope reveals a strange airway
- Unable to pass ET tube with fiberoptic scope
- Trachlight unsuccessful due to no neck
- Laryngoscopy unsuccessful due to abnormal airway

Bag/Mask Ventilation



- Most children require two person bag mask ventilation
- Due to secretions and poor tone
- Intubation often difficult

Oral Pharyngeal Airways



- Not always helpful due to gag reflex
- Difficult to select the best size
- Often the tongue is too large
- Useful in this case due to absent gag and cough

Nasopharyngeal airways



- Better tolerated than oral pharyngeal airways
- Can cause nose bleeds due to adenoids
- Further airway obstruction

Successful intubation



- Anesthetist performs blind intubation and is successful with #3.0 ETT.
- Leak is large and placed on pressure control ventilation with the Evita 4.
- #3.5 ETT placed 2 days later with airway exchange catheter by anesthesia

Difficult airways in pediatrics



- More difficult airways seen in the neonatal population
- Premature infants with small cricoid cartilage and prolonged intubations
- Laryngotracheobronchial malacia
- Craniofacial disorders and other congenital abnormalities

Noninvasive ventilation



- Neuromuscular disease children now using non-invasive ventilation due to technological innovation, smaller mask interfaces and expectations of society
- Breath stacking and assisted coughing techniques

Non-invasive ventilation



Non invasive CPAP and BIPAP



- Very helpful for laryngo and/or tracheo and/or broncheomalacia
- SMA type 1
- Congestive heart failure
- ~150 patients across British Columbia

Teaching sessions for parents



- All families going home with children at risk for airway management problems receive formal instruction
- Classes given regularly twice per week
- Children with tracheostomies, invasive and non-invasive ventilation receive more extensive training.

Emergency procedures

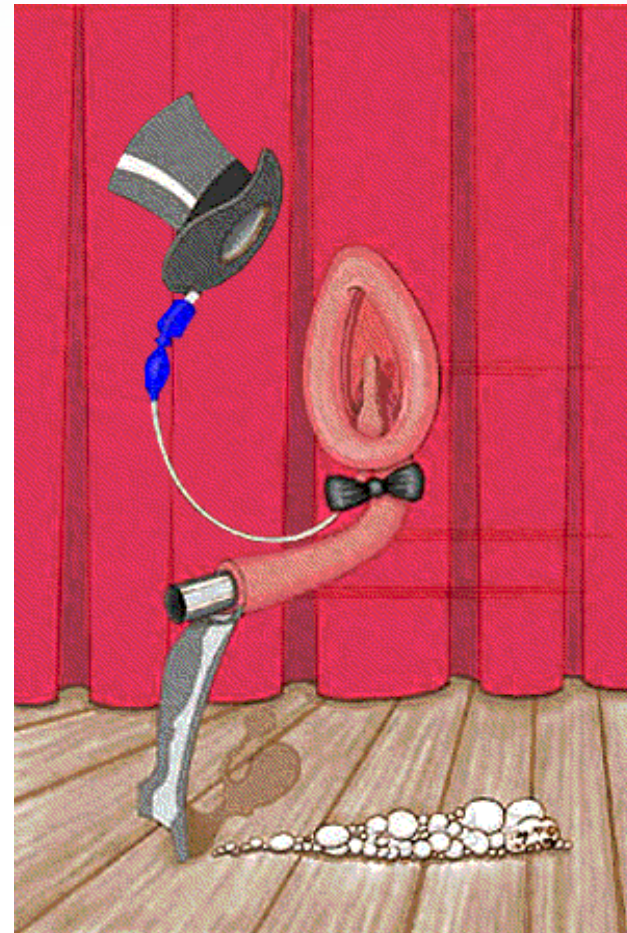


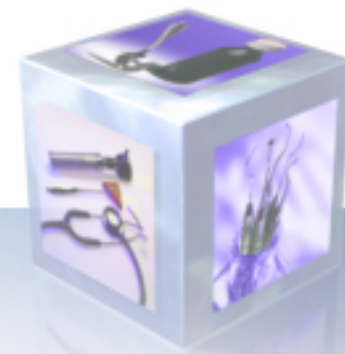
- Before discharge, parents are taught airway management
- Parents can change tracheostomy tube
- Parents can deal with emergency trach change and resuscitation if necessary

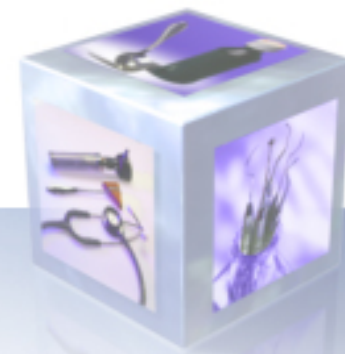
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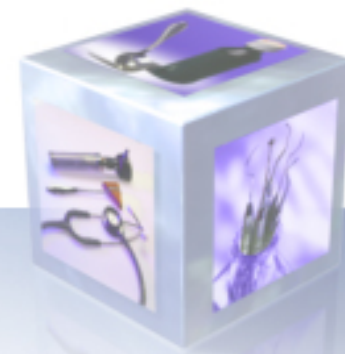


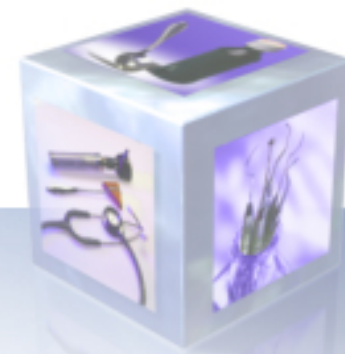
- QUESTIONS?

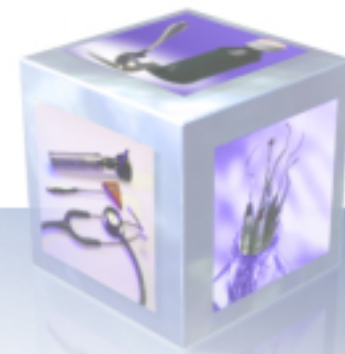


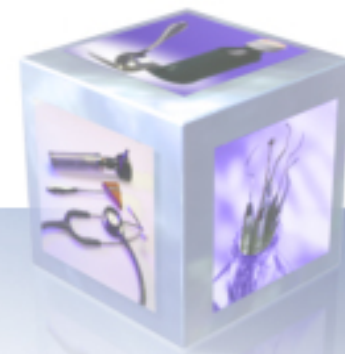


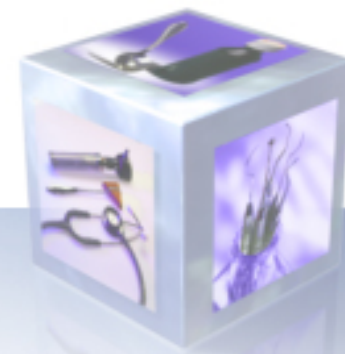


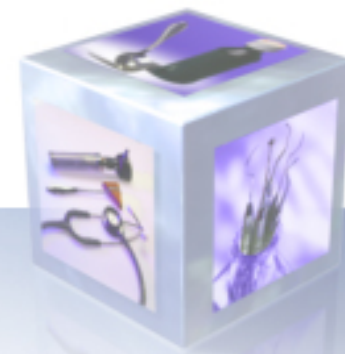


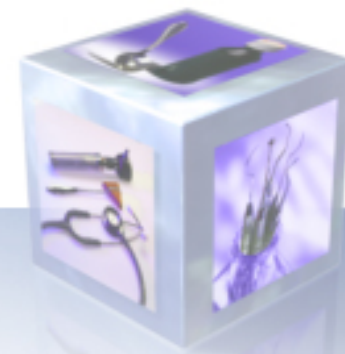


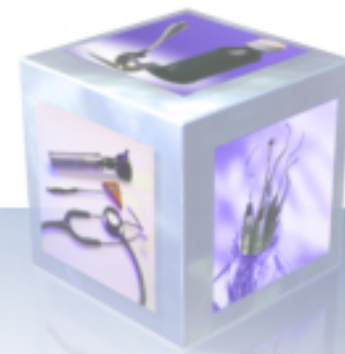


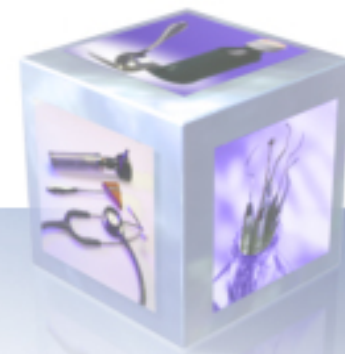


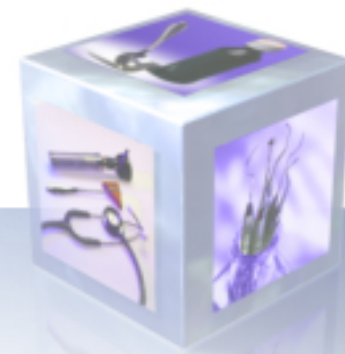


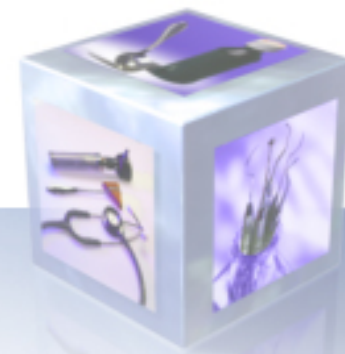




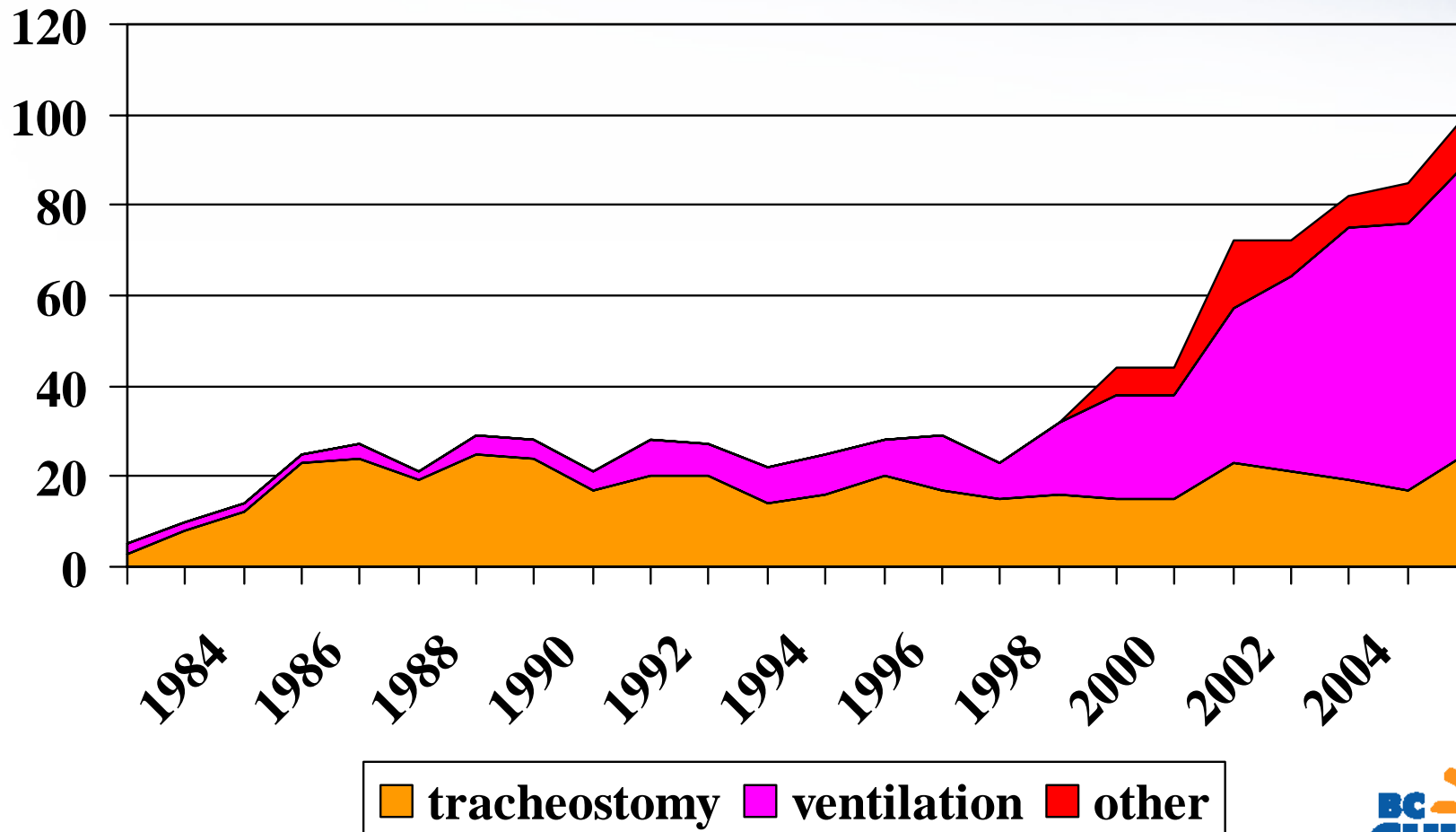




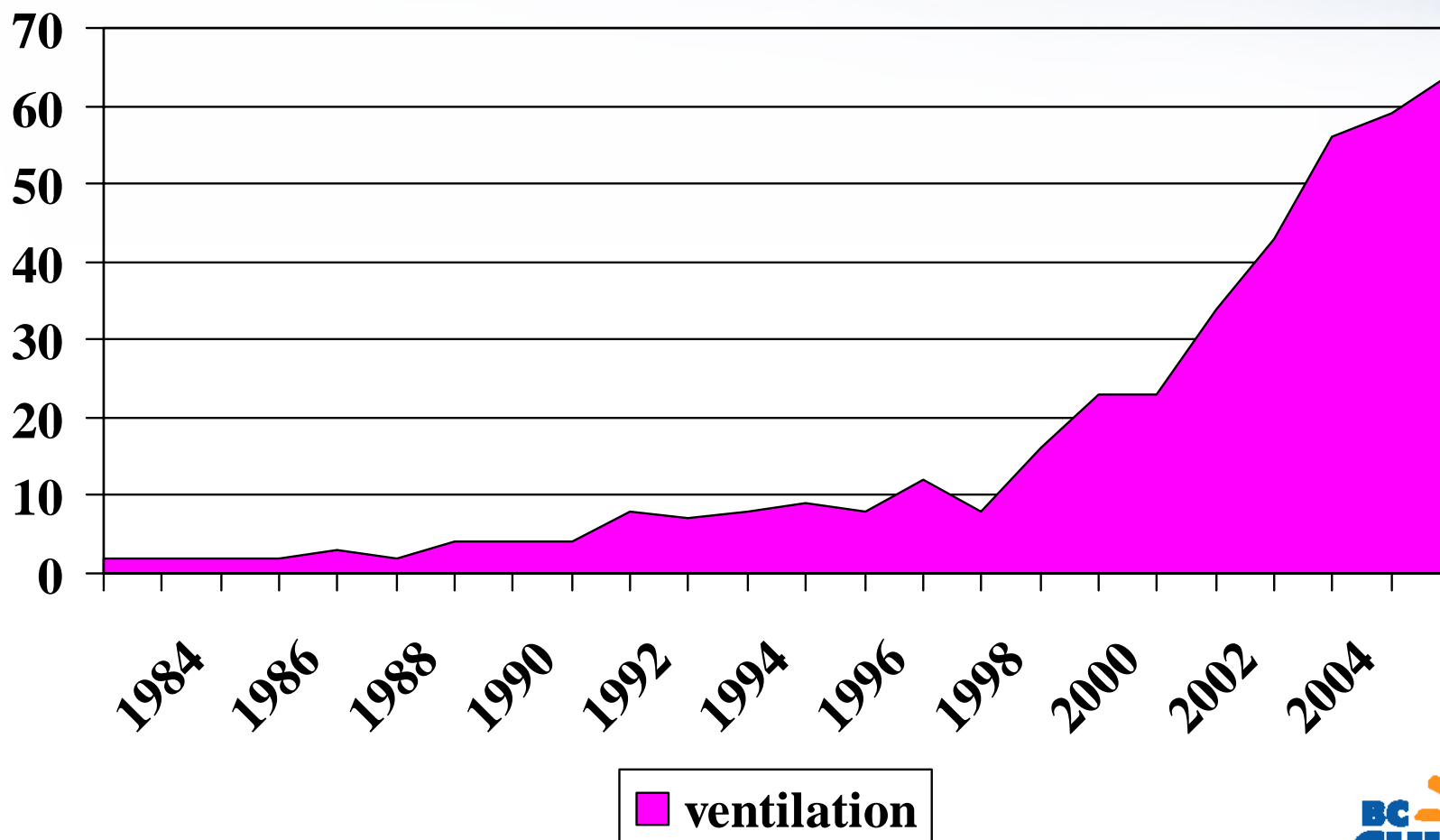
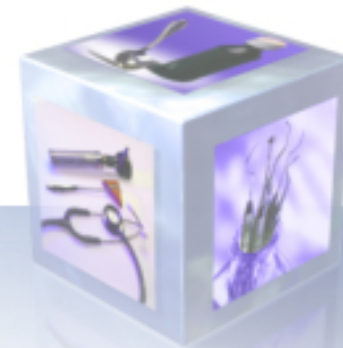




Active patients: 1982 - 2005



Total ventilated patients: 1982 - 2005



Kids who require home ventilation



- Neuromuscular disorders
- Brain stem tumours
- C-spine fracture
- Central hypoventilation syndrome

Discharge Process



- Secure funding for equipment and supplies
- Procure equipment and supplies
- Education and training for caregivers
- Community outreach initiatives – building capacity
- Ongoing support

Current Funding Options for Ventilators



- At Home Program
- Extended Benefits
- ICBC
- Service clubs
- Private donations

Respiratory Therapist allocation to Discharge Program

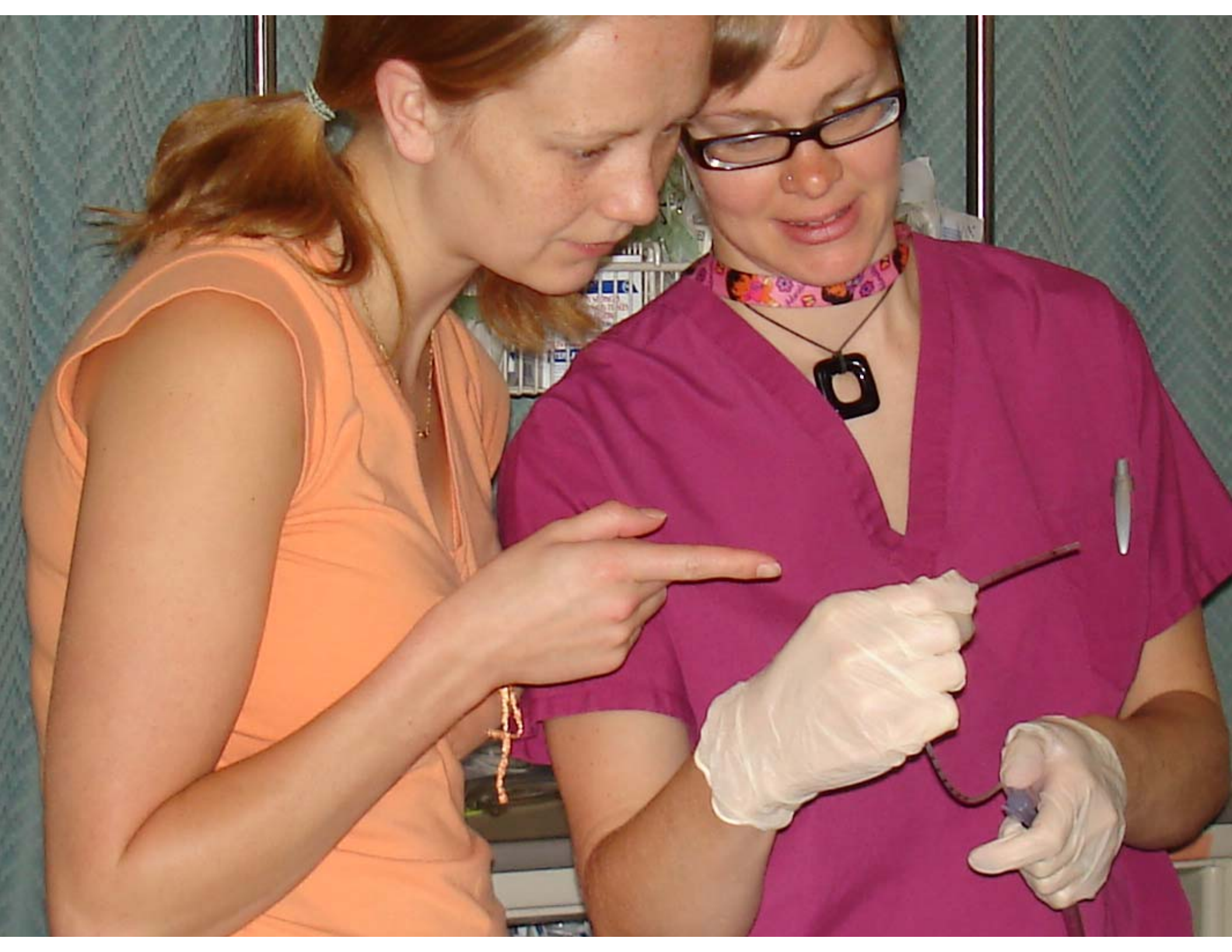


- Transitional Care unit
 - 1.0 FTE

TCU RT role



- Equipment selection for child
- Teach parents and caregivers
- Attend trach/vent clinic
- Phone consultations
- RT for TCU/SNU





Community teaching



- .2 Respiratory Therapist



Community teaching



- .2 Nursing



What is involved in community teaching?



- When a child is discharged home, nursing, RT and sometimes physician go to community
- All health care team is invited
- Child specific course is usually 2 days with “hands on” skills taught

Examples of areas



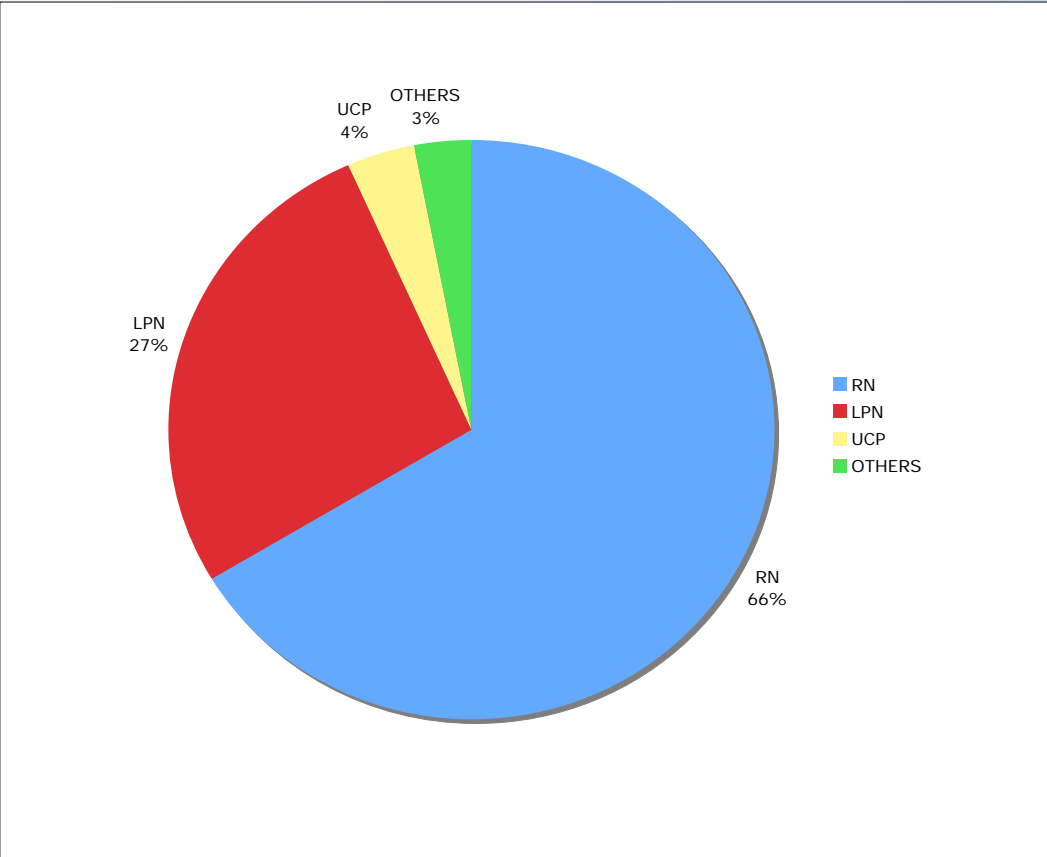
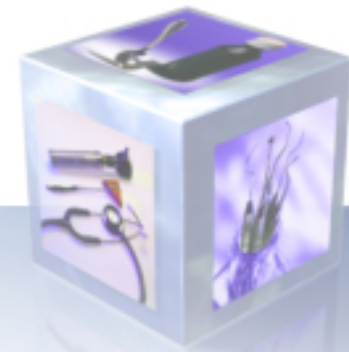
- Prince George
- Whitehorse
- Golden
- Kelowna
- Nanaimo
- Victoria

Regular workshops



- Once per month, usually at BCCH
- 2 days for tracheostomy care
- 3 days for ventilation
- Dates are set 18 months in advance

PARTICIPANT PROFILE
HOME TRACHEOSTOMY/HOME VENTILATION CARE
EDUCATION SESSIONS FOR NSS (MINISTRY CONTRACT)
APRIL 2006 TO MARCH 2007



Legends:
 RN: Registered Nurse
 LPN: Licenced Practice Nurse
 UCP: Unregulated Healthcare Provider
 Others: Physicians, parents

Designation	Number	Percentage %
RN	111	66
LPN	45	27
UCP	6	4
Others	5	3
Total	167	100



Changes for 2008/09



- Developing partnership with Victoria General for teaching
- Regular workshops offered less frequently (8 times/year)
- 2 days for trach care and 2 days for ventilatory care

Child Specific workshops



- As requested
- Based in community where child lives

Skills update and review



- Held every year for each region
- Abbotsford/Mission area ~ 4 hours
- Vancouver Island ~10 hours
- Lower Mainland ~24 hours
- Kootenays ~ 10 hours

Funding



- Annual contract between BCCH and Ministry of Children and Families

The two BiPap devices used by our program:



Respironics Synchrony ®



Respironics BiPap®



Humidification



An agency of the Provincial Health Services Authority

Advantages of BIPAP



- No trach
- Masks improved for small children
- Pressure control now available
- Oxygen can be delivered if needed
- Alarms now incorporated

The LTV ventilator



The Legendair ventilator





An agency of the Provincial Health Services Authority



Summary



- Respiratory Therapy has a very important role for the patient needing respiratory support in the home.
- Take advantage of every opportunity to become involved in the community