Gulliver in the Land of Lilliput – Differences Between Us and the Little People

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1) A – The Pediatric Airway

a) Narrowest part is the crichoid ring
   i) cricoid ring provides a natural seal for the endotracheal tube
   ii) cuffed tubes may cause airway damage in younger children
   iii) use uncuffed endotracheal tubes in children age < 8 years

b) Larynx is positioned more anteriorly and higher
   i) increased risk of aspiration
   ii) direct visualization of the vocal cords more difficult during intubation
   iii) use cricoid pressure to assist with visualization of vocal cords during intubation

c) Flexible trachea and soft larynx
   i) hyperextension or hyperflexion of the neck can compress and obstruct airway
   ii) place child in "sniffing" position

d) Shorter tracheal length
   i) increased chance of mainstem intubation
   ii) changes in head position will cause movement in endotracheal tube
   iii) flexion and extension of the neck may move endotracheal tube
   iv) pay meticulous attention to initial endotracheal tube position
   v) maintain head in a midline position to avoid extension or flexion of neck

e) Smaller upper and lower airways
   i) foreign matter more easily obstructs
   ii) suction mouth and nose frequently/administer nebulized bronchodilators as indicated

f) Tongue is larger relative to oropharynx
   i) airway is commonly obstructed by the tongue, especially in the patient with decreased LOC
   ii) be meticulous in positioning and repositioning

g) Infants are obligate nose breathers for the first several months of life
   i) obstruction nasal passages may produce significant respiratory distress
   ii) suction nares frequently

Kid-Tip Workspace – Endotracheal Tube (ETT) Management

*To estimate the correct ETT **size**, use the formula* (Age + 16)/4

Example: 4 year old patient (4 + 16)/4 = 20/4 = size 5 ETT

Your turn: 2 year old patient (____ + ____)/_____ = size _____ ETT

Kid-Tip Workspace – Endotracheal Tube (ETT) Management

*To estimate the correct ETT **placement**, use the formula* ETT size x 3 = centimeters tip-to-lip

Example: Patient has a size 5 ETT 5 x 3 = 15 centimeters at tip-to-lip mark

Your turn: Patient has a size 3.5 ETT _____ x _____ = _____ centimeters at tip-to-lip mark

2) B – Breathing

a) Cartilaginous ribs are twice as compliant as those of an adult
   i) retractions are more common
   ii) deliver highest possible concentration of oxygen to children in respiratory distress
   iii) allow patient position of comfort with caretaker

b) Intercostal muscles are poorly developed
   i) peak pressures are dependent on diaphragm function
   ii) anything obstructing diaphragm movement can lead to respiratory failure
   iii) if possible, maintain patient in an upright position
   iv) decompress stomach with an orogastric or nasogastric tube

c) Type and severity of retractions are an indicator of respiratory distress
   i) substernal
   ii) subcostal
   iii) intercostal
   iv) suprasternal (tracheal tugging)
   v) axillary

3) C – Circulation

a) Myocardial fibers are shorter and less elastic
   i) more difficult to adjust stroke volume
   ii) patient compensates with strokes rather than volume
   iii) tachycardia becomes an early sign of shock

b) Infants and children have an overall smaller blood volume
   i) child's circulating blood volume is 80 ml/kg
   ii) adult's circulating blood volume is 70 ml/kg
   iii) smaller amounts of blood loss can cause volume depletion

Kid-Tip Workspace – Estimate of % Blood Loss

Child's circulating blood volume is 80 ml/kg *Adult's circulating blood volume is 70 ml/kg*

Child – 17 kg x _____ml = _____ ml circulating blood volume

Adult – 68 kg x _____ml = _____ ml circulating blood volume

Your patient has lost 100 ml of blood volume – what percentage is this?

Adult - _____ blood volume/100ml = _____% loss

Child - _____ blood volume/100ml = _____% loss

Remember to consider blood replacement therapy after acute blood loss totals 5 – 7% of the pediatric circulating volume

c) Pediatric response to < 25% circulating blood loss
   i) tachycardia
   ii) decreased consciousness
   iii) dulled response to pain
   iv) cyanotic, cold extremities
   v) increased capillary refill time

d) Pediatric response to 25% - 40% circulating blood loss
   i) weak, thready pulse
   ii) increased heart rate
   iii) cold, clammy
   iv) irritable, combative, confused, lethargic
   v) decreased urine output

e) Pediatric response to > 40% circulating blood loss
   i) hypotension
   ii) tachycardia to bradycardia
   iii) comatose
   iv) pale, cold
   v) no urine output

f) Assessment of Circulatory Status
   i) blood pressure - may remain normotensive until 25% loss due to vasoconstriction
   ii) capillary refill time – should be < 2 seconds

g) Cardiac Arrhythmias
   i) most common significant arrhythmias:
      (1) bradycardia and SVT

Kid-Tip – Pediatric Cardiac Arrhythmias

Bradycardia is the most significant terminal cardiac rhythm in children (versus VT or VFib in adults)

Most often a result of hypoxia and is not well tolerated

Treatment: Oxygen (Positive Pressure Ventilation), CPR, Epinephrine

SVT is the other most significant cardiac rhythm in children

Usually well tolerated, may lead to cardiovascular collapse

Definition - > 180 bpm in a child, > 220 bpm in an infant

Treatment: Adenosine, Synchronized Cardioversion, Vagal Maneuvers

h) Pediatric Fluids
   i) Maintenance with D/5/Something
   ii) BOLUS with Normal Saline at 20 ml/kg over 20 minutes

Kid-Tip Workspace – Pediatric Fluid Maintenance

For first 10 kg – 4 ml/kg
For second 10 kg – 2 ml/kg
Remaining kg – 1 ml/kg
Add together for total hourly fluid maintenance

Example: 8 year old weighing 25 kg

(first ten kg) 10 x 4 = 40
(second ten kg) 10 x 2 = 20
(remaining kg) 5 x 1 = 5
TOTAL Hourly Rate = 65 ml/hr

Your Turn – Your patient weighs 18 kg

____ *x 4* = _____

____ *x 2* = _____

____ *x 1* = _____ *Total Hourly Rate* = _____*ml/hr*