

EMS WORLD®

Charting the Future of Out-of-Hospital Care

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TUBES FOR KIDS: HELPFUL HINTS & MEMORY AIDS

How to quickly determine tube sizes for pediatrics and other patients

By Scott DeBoer RN, MSN, CPEN, CEN, CCRN, CFRN, EMT-P; Jason Chancey, BSN, EMT-P, CEN, CFRN; Michael Rushing, NRP, BSN, RN, CEN, CFRN, CPEN, TCRN, CCRN-CMC; Lisa DeBoer, NREMT-B, CET; Michelle Webb, RN, MSN, CRNA; and Michael Seaver, RN, BA

When we begin the educational process that brings us to our EMS careers, a common thought is, *So much to learn, so little time!* Concepts great and small are presented and hopefully ingrained in our brains for immediate recall when needed. But as time passes and more knowledge is gained, the more likely it becomes that other, previous knowledge will become buried and harder to recall. This is especially true for items that are seldom used (but may be critically important).

Remembering numbers is easy when you use them on a regular basis—your birth date, PIN numbers, anniversaries (hopefully) of significant family events. Conversely, rarely used means easily forgotten. This can pose quite a challenge in our jobs because those seldom-confronted emergencies require the same high level of recall speed and precision we rely on during more common situations. In the days of manual defibrillation, we could all recite “200, 300, 360” without hesitation. This is partly because we used it regularly and partly because there was little variability when it took place.

But consider this situation: A child, approximately 4 years of age, is en route to the emergency department via ALS ambulance. He is the only survivor of a head-on motor vehicle crash. He is unconscious and hemodynamically unstable—perilously

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close to losing his life-and-death struggle. The medics orally intubate him with a 5.0 endotracheal tube.

Anticipating a hectic situation upon arrival, you want to prepare additional equipment, including a variety of tubes in the appropriate sizes. So what size nasogastric, orogastric, urinary (Foley) catheter, suction catheter, and chest tube would you gather for this child? Since this probably isn't the type of situation you encounter on a regular basis, it sure would be nice to have a trick to remember all those numbers.

You're in luck! Once you have the correct ETT size, you can easily use the following rules for the rest:

- Two times the size of the ETT is the suggested size of the suction catheter, NG/OG tube, and urinary catheter;
- Three times the size of the ETT is approximately where the

oral ETT should be taped at the lip;

- Four times the size of the ETT is the suggested size of the chest tube to be placed for evacuation of a pneumothorax (air in the chest);
- Five times the size of the ETT is the suggested size of the chest tube to be placed for evacuation of a hemothorax (blood in the chest).

Knowing the 5.0 ETT is the appropriate size for this child (all bets are off if you start with the wrong size ETT tube!), twice the ETT size ($2 \times 5 = 10$) means you should have a 10-Fr OG/NG, a 10-Fr suction catheter, and a 10-Fr urinary catheter on hand. Three times the ETT size ($3 \times 5 = 15$) means the oral endotracheal tube should be taped at 15 cm at the lip. Since the child has a 5.0 ETT, four and five times the ETT means a 20-Fr chest tube should be placed for a pneumothorax and a 24-Fr (they don't make 25-Fr) tube for a hemothorax. (As an interesting side note, more and more EDs, pediatric ICUs, and critical care transport teams are now using much smaller "pigtailed," or small-bore chest tubes.)

Sounds pretty straightforward. But what about a 3-year-old child intubated with a 4.5 ETT? Same math, just with decimal points: Twice the ETT size (2×4.5) means the sizes most likely appropriate would be a 9-Fr OG/NG tube, a 9-Fr suction catheter, and a 9-Fr urinary catheter.

But wait a minute—what's the problem with finding a 9-Fr NG tube, suction, or urinary catheter? They aren't made—only even sizes are available! So tubes and catheters that are just a little bit smaller—e.g., 8-Fr in this case—should work just fine.

With a 4.5 ETT, three times the tube (3×4.5) also means the oral endotracheal tube should be taped at 13.5 cm at the lip. Since the child has a 4.5 ETT, four and five times the ETT means a 16-Fr chest tube should be placed for pneumothorax ($4 \times 4.5 = 18$, but 18-Fr chest tubes don't exist), and a 20- or 24-Fr chest tube (22.5-Fr chest tubes don't exist either) should be placed for a hemothorax.

Lastly, what about a 16-year-old intubated with an 8.0 ETT? Twice the ETT size (2×8) means a 16-Fr OG/NG, suction catheter, and urinary catheter. The oral endotracheal tube (3×8) should be taped at 24 cm at the lip. And a 32-Fr chest tube should be placed for a pneumothorax (4×8), and a 40-Fr tube for a really big hemothorax (5×8).

Backup/Alternative Airways

Nonvisualized airways, such as the King airways (laryngeal tubes), laryngeal mask airways of various types and from various manufacturers, and i-gels, are being used in increasing numbers in both the prehospital and hospital environments. These alternative airways are now part of rapid sequence airway management, which incorporates the same drugs as rapid sequence intubation (RSI) but includes the placement of an alternative airway instead of the traditional (and more error-prone) endotracheal tube. If, in an emergency situation, the alternative airway is placed and needs to be switched out for an ETT or surgical airway, staff in

RULES FOR TUBE SIZES

WHETHER FOR BABIES, KIDS, OR EVEN ADULTS, SIMPLY REMEMBER THESE EASY MULTIPLIERS:

NG/OG	2x size of ETT
Suction catheter	2x size of ETT
Urinary (Foley) catheter	2x size of ETT
Taped at lips	3x size of ETT
Chest tube (pneumothorax)	4x size of ETT
Chest tube (hemothorax)	5x size of ETT

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LARYNGEAL MASK AIRWAYS AND I-GEL AIRWAYS			
	AuraGain, LMA Supreme, i-gel	Weight	Ways to Remember
Peds	1	< 5 kg	1 for 1 hour old
	1.5	5–10 kg	1½ for up to 1½ years old
	2	10–20 kg	2 years old to 20 kg
	2.5	20–30 kg	2.5 for 25 kg
Big People	3	30–50 kg	Bigger than Broselow 3
	4	50–70 kg	4 (for) just about all adults
	5	70–100 kg	5 if bigger than a backboard

KING/LARYNGEAL TUBE AIRWAYS			
	King	Weight/Length	Ways to Remember
Peds	0	< 5 kg	0 for a 0-year-old
	1	5–12 kg	1 for a 1-year-old
	2	12–25 kg	2 for a 2-year-old
	2.5	25–35 kg	2.5 for 25 kg
Big People	3	4–5 feet	Bigger than Broselow 3
	4	5–6 feet	4 for just about all adults
	5	> 6 feet	5 if bigger than a backboard

Tube size memory aids for the AuraGain, LMA Supreme, and i-gel (above), and for King/laryngeal tube airways (left)

the emergency department, surgical unit, or ICU can do so in a much more controlled setting, with more toys and more help.

But when it comes to the sizes of these alternative airways, trying to remember who gets what is not the easiest, especially under stress. In the presence of high stress and low repetition, research shows us that memory alone is highly overrated.^{1,2} Cheat sheets and apps such as Broselow-Luten and Handtevy are invaluable; however, they may or may not have the specific tube you're searching for. For instance, the Broselow-Luten tape indicates sizes for pediatric laryngeal mask airways but not King airways or i-gels. Ongoing research shows guesstimating doesn't work either, and many airway device instructions for use show sizing based on weight,^{3,4} Color-coding with the Broselow-Luten (length) and Handtevy (age) systems works great, but contrary to popular belief, the colors of

When under high levels of stress, people tend to lose their situational awareness, and this makes it difficult to recall information.

the tops, cradles, or packages of backup airways do not correspond to the tapes.

Conclusion

We owe it to the patients we care for to understand the correct tube size. On hectic scenes we may have a difficult time recalling information from memory alone. When under high levels of stress, people tend to lose their situational awareness, and this makes it difficult to recall information quickly and correctly. That is why having memory aids is so beneficial.

Knowing and practicing using these tube tricks will free up mental capacity to think critically and analyze patients' presentations on chaotic scenes. Practicing these tricks on a regular basis will ensure you can perform at your highest level when needed. If we do not prepare at regular intervals for these types of situations, we are preparing for failure. ☘

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