EMERGENCY PEDIATRIC AIRWAY: HOW TO MANAGE AND KEEP IT SAFE?

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Securing an airway is undoubtedly the most important lifesaving skill that any prehospital and hospital emergency medical service provider has acquired, and it represents a vital task for the anesthetists. Due to the unique pediatric airway, anatomic, physiologic and emotional characteristics of the growing infant and child, clinicians must be aware of the technique and tools they choose to provide safe and effective control over the airway in any emergency scenario. Ultimately and always, the primary goal is to provide child's oxygenation and ventilation.

KEY WORDS: airway, children, emergency

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INTRODUCTION

Good level of knowledge, clinical experience, assessment, preparation, training and practicing is needed to recognize challenges in child's airway and make them manageable (1-8). Airway handling in pediatric patients is normally easy in experienced hands, for anesthetists working in specialized hospitals with appropriate personnel and equipment (1-8). Anatomic, physiologic and emotional specificity of neonates, infants, children and teens are differences which, compared to adults, make pediatric airway difficult for anesthetists and clinicians with little experience in pediatrics (1-8). According to literature data, children account for about 10% of all ambulance transports, and only 1% of them are critically ill, which means that practitioners do not have much or enough experience in intubating or managing airway in children (8-11). The most common pediatric emergencies are traumatic injury (≈29%), pain, abdominal and others (≈10%), general illness (≈10%), respiratory distress (≈9%), behavioral disorder (≈8.6%), seizure (≈7%), and asthma (≈4%) (8-11). Furthermore, there are numbers of syndromes and congenital anomalies, typically seen in pediatric population presented with unique anatomic or functional specificity, which can predict a difficult pediatric airway and which are always a challenge for airway management, even for the experienced ones (1,2). Respiratory emergencies are the leading cause of pediatric hospital admissions and death during the first year of life, except for congenital abnormalities. Most pediatric cardiac arrests begin as respiratory failures or respiratory arrests. How to ensure safe airway for every child during emergency in prehospital and hospital settings? What exactly should you do to maximize the likelihood of success in emergency? This text focuses on many airway challenges that physicians, pediatricians, anesthetists and other healthcare professionals involved in the emergency care of children are facing. The context was selected based on the educational needs determined from the professional practice gaps identified. The gaps were derived from a variety of sources including evolution and outcome data from practitioners.

DISCUSSION

Child's anatomy and physiology

Children are not small adults. Basically, the main anatomic differences between the pediatric and adult airways are size, shape and position (1). These differences are more pronounced in infants and younger children, and have important implications for airway manage-

ment (1). The main notable anatomic differences include (1):

1. Large head and prominent occiput
   - implication: neck flexed in supine position, upper airway obstruction and no lining up of oral, pharyngeal and laryngeal axes
   - management: sniffing position and shoulder roll for infants;
2. Larger tongue than the mouth can contain
   - implication: upper airway obstruction
   - management: maneuvers to open airway with jaw thrust/oropharyngeal airway.

In situations of a reduced level of consciousness, muscle tone is diminished, the head will flex, and pharyngeal tone will decrease, resulting in reduced oropharyngeal volume and occlusion of the oropharynx by the tongue (1-5). Simple airway-opening techniques, such as triple maneuvers (head tilt, chin lift, jaw thrust, and/or oropharyngeal airway), are usually enough to open the child's airway (1). If there is concern for C-spine injury, use a simple jaw thrust (4-9).

3. Cephalad larynx
   - implication: larynx seems more anterior
   - management: lateral approach to laryngoscopy.
4. Epiglottis angled over vocal cord, long, stiff and floppy
   - implication: epiglottis often obstructs the view of vocal cords
   - management: straight laryngoscopy blade in younger children to lift the large epiglottis.
5. The larynx is conically shaped, widest at the supraglottic and narrowest at the subglottic level, with the narrowest segment at the level of the cricoid. The cricoid is a complete ring of cartilage, so any mucosal edema, inflammation, hemangioma or papilloma, aberrant embryologic development such as laryngomalacia, and laryngeal clefts, iatrogenic causes such as subglottic stenosis, or compression of the airway structures by a mass located outside the airway at this level results in higher resistance of air flow and increased chance of airway obstruction.
6. The trachea is short, in line with the right bronchus and with small diameter, so mucosal edema, inflammation, tumors and tracheomalacia result in exponential increase in resistance to air flow; according to Poiseuille's law, air flow is proportional to the fourth power of the airway radius.

The age-dependent descent of the laryngeal structures is essential in the transition from obligatory nasal to oral breathing (1). Infants and babies up to 6 months have obligatory nasal breathing (1). Calcification of the larynx and trachea typically does not occur until the teenage years (1).

The flexible cartilaginous rings of the trachea can predispose to dynamic obstruction with negative pressure ventilation, especially when any partial airway obstruction exists (1).

Differences in respiratory physiology between adults and pediatric patients have an effect on airway management. Pediatric patients have predisposition to hypoxemia. Oxygen consumption of an infant is greater (6-8 mL/kg/min *versus* 4-6 mL/kg/min) than in adults, just like the production of carbon dioxide (100-150 mL/kg/min *versus* 60 mL/kg/min) (1). Respiratory rate in children is higher because of the need for higher minute ventilation, so that CO_2 can be eliminated. The closing capacity is larger than the FRC. All this physiologic features lead to low tolerance of apnea, shorter time to desaturation than in adults, significant hypoxemia, bradycardia, acidosis, and cardiac arrest. The physiologic respiratory rate *per* minute according to age is calculated as follows: PR=24-age/2 (1). Physiologic tidal volume in spontaneous ventilation is TV=6-8 mL/kg, and during mechanical ventilation it is 7-10 mL/kg (1). For induction of anesthesia, it is very important to know that kids have a relatively larger extracellular fluid compartment, which means quicker onset and shorter duration of rapid sequence induction (RSI) drugs (1). Children are anxious, frightened, usually uncooperative in contact with medical staff and when they are crying or screaming, for example, on induction of anesthesia, they will be desaturating even more quickly (1). For these reasons, premedication-preoperative sedation and parental presence for induction of anesthesia are necessary (1).

Assessment

Any sick child needs immediate attention and intervention. Remember, when the child 'crashes', they will crash quickly with rapid progression to decompensated shock.

Pediatric assessment coverage is as follows (13-15):

1. General assessment (pediatric assessment triangle, PAT)
2. Initial assessment (ABCDEs and transport decision)
3. Additional assessment (focus is on history and physical exam; detailed physical exam if trauma)
4. Ongoing assessment

General assessment is regarded as pediatric assessment triangle (PAT): appearance, work of breathing and circulation to skin. PAT can be completed under one minute, does not require any equipment, and uses observational and listening skills. PAT does not replace vital signs and the ABCDEs but precedes and supplements them.

Appearance as part of PAT reflects adequacy of oxygenation, ventilation, brain perfusion, homeostasis and CNS function. Assessing appearance of a child includes muscle tone, mental status or interactivity level, consolability, look or gaze, and speech or cry. Breathing as a component of PAT reflects adequacy of oxygen, oxygenation and ventilation. Assessing breathing of a child includes body position, visible movement of chest or abdomen (children up to 6-7 years are primarily diaphragmatic breathers), respiratory rate and effort, and audible airway sounds. Circulation as part of PAT reflects adequacy of cardiac output and perfusion of vital organs. Assessing circulation of a child includes skin color. Cyanosis indicates respiratory failure and vasoconstriction.

Normal heart rates by age are:

- infant	100-160 beats *per* minute
- toddler	90-130 beats *per* minute
- preschool-aged child	80-120 beats *per* minute
- school-aged child	70-120 beats *per* minute
- adolescent	70-120 beats *per* minute

Below in the text, attention will be focused on child's breathing and airway assessment. The primary goal of pediatric airway management is to ensure oxygenation and ventilation. The best is to look at the sick child from afar first. Is the chest moving? Can you hear breathing sounds? Are there any abnormal airway sounds (stridor, snoring, muffled or horse speech grunting and wheezing)? Is there increased respiratory effort with retractions or respiratory effort with no airway or breathing sounds? Is the child's position forced (sniffing, tripoding, refusing to lie down)? Answers to these questions give us an insight into the pediatric patient's oxygenation and ventilation status. Data in medical history on recent or current respiratory distress problems are very important to complete assessment, evaluation, recognizing the problems and make plan for handling it:

- Upper respiratory tract infection (URTI) – cough, laryngospasm, bronchospasm, desaturation during anesthesia
- Snoring – adenoid hypertrophy, obstructive sleep apnea (OSA), upper airway obstruction
- Chronic cough – subglottic stenosis, previous tracheoesophageal fistula repair
- Productive cough – bronchitis, pneumonia
- Sudden onset of new cough – foreign body aspiration
- Inspiratory stridor – macroglossia, laryngeal web, laryngomalacia, extrathoracic foreign body
- Hoarse voice – laryngitis, vocal cord palsy, papillomatosis
- Wheezing – asthma, pulmonary edema, allergic reactions, pneumonia, foreign body aspiration
- Repeated pneumonia – GERD, bronchiectasis, tracheoesophageal fistula, immune suppression, congenital heart disease
- Previous anesthetic problems
- Atopy, allergy – increased airway reactivity
- Congenital syndrome – Pierre Robin sequence, Treacher-Collins, Kllipel-Feil, Down's, Turner, Goldenhar, Apert, achondroplasia, Hallerman-Streiff, Crouzan, choanal atresia
- Environmental smokers

Normal respiratory rates by age are:

- infant	30-60 breaths *per* minute
- toddler	20-30 breaths *per* minute
- preschool-aged child	20-30 breaths *per* minute
- school-aged child	20-30 breaths *per* minute
- adolescent	12-20 breaths *per* minute

Practitioners are faced with 'normal', 'impaired normal' (previously 'normal' but acutely altered due to trauma, infection, swelling, burns), and 'known abnormal' (congenital abnormalities and syndromes) in their daily practice.

All the airway anatomic problems or difficulties may be accompanied by functional problems (1). Predictors of a difficult pediatric airway include younger age (particularly <1-year-old), congenital malformations and emergencies (1-6). One of the very useful tools for prediction of difficult airway assessment is mnemonic **LEMON** (1)**:**

L - look externally (facial trauma, large incisors, large tongue, short neck, micrognathia)
E - evaluate the 3-3-2 rule (incisor distance/mouth opening - 3 child's finger breadths, hyoid-mental distance - 3 child's finger breadths, thyroid-hyoid distance - 2 child's finger breadths),
M - Mallampati (Mallampati score >3)
O - Obstruction (presence of any condition such as epiglottitis, edema, peritonsillar abscess, trauma, etc.)
N - Neck mobility (limited neck mobility)

Mnemonic **SOAP ME** is useful for preparation of airway management equipment (1):

S – suction (catheters 6-16 French) and Yankauer tips (two sizes)
O – oxygen and how to deliver (nasal cannula, oxygen flow, masks and appropriate bag)
A – airway (appropriate ETT, oral or nasal airway, stylets, laryngoscopes)
P – pharmacology (RSI meds)
ME – monitoring equipment ($EtCO_2$ detector, stethoscope, monitors)

Children with the unexpected difficult normal airway are usually healthy and have no previous symptoms or signs that indicate a difficult airway (1-7). Airway problems in these children during anesthesia could be anatomic (upper airway collapse, adenoid hypertro-

phy) and functional (laryngospasm, bronchospasm, insufficient depth of anesthesia, muscle rigidity, gastric hyperinflation, alveolar collapse) (1-7). These problems are time critical and require prompt recognition and immediate treatment to prevent hypoxia and potentially devastating consequences.

Children with an impaired normal airway (foreign body, allergy and inflammation) and children with expected difficult airway, i.e. known abnormal (syndromes and congenital abnormalities) require significantly more experienced personnel to handle the airway and to maintain good oxygenation.

Prehospital airway management

Limited equipment, impossible good access and positioning of patient's head, presence of hypoxia, anatomic disorder, debris, secretions, blood, vomitus, dental damage, spine immobilization, simultaneous performance of CPR or other therapy procedures are some issues which complicate airway management in prehospital setting. Guidelines on prehospital airway management recommend laryngeal mask airway (LMA) and other extraglottic devices such as combi tube (there are no pediatric sizes), laryngeal tube with gastric port, ILMA (ideal for inexperienced practitioners, provides ventilation and intubation but there are no pediatric sizes) in the prehospital airway settings (9-12). Suitable equipment, prepared airway trolleys adapted to local conditions, accepted difficult airway algorithms that are simple and easy to memorize, and trained personnel are essential for the appropriate airway management of pediatric patients (1-6).

Good bag-mask ventilation technique is the cornerstone of successful oxygenation and ventilation (1). This requires regular (daily) practice. Difficult face mask ventilation in healthy children is very rare, with only 0.02% of all cases (1,2). Technique of one-person face mask ventilation is performed with left hand gripping E-C (third, fourth and fifth fingers lift the jaw up, thumb and index fingers hold the mask tight against the face) and with right hand bagging (1). Two-person face mask ventilation technique means that E-C is gripped with both hands of one provider and the other provider does bagging (1). Sniffing is optimal head position to open the upper airway (1). Occiput is relatively large, specifically shaped in infants and younger children, therefore airway management should be performed with a small towel under the shoulders to avoid flexion of the neck (1). Choosing an adequate size of the face mask, large enough to cover the mouth and nose, is important as well (1). Different sizes of oropharyngeal and nasopharyngeal airway are part of necessary equipment for successful ventilation and oxygenation of our patients (1). For oropharyngeal airway, keep in mind the risk of laryngospasm and gag reflex in light level of unconsciousness (1). The nasopharyngeal airway rarely causes laryngospasm and gag reflex even if it is placed during light level of unconsciousness and its advantage is the possibility to connect bag valve (Ambu bag) or (T piece) for ventilation (1). If the child is drooling or cannot handle secretions due to obstruction, help them use gravity to expel secretions by placing them upright in a position of comfort or on their side (1). Equipment for suctioning secretions (all sizes of suction catheters should be available) and preventing gastric content regurgitation in unconscious patients is necessary and mandatory (1).

Use memory aids such as the Broselow tape or medical apps for equipment sizing and drug dosing (1). One of the fastest ways to calculate weight of a child if age is known is as follows: for infant up to 1-year-old [(age in months +9)/2], for children aged 1-5 years [2x(age in years +5)] and children aged 5-14 years (4x age in years) (1,8-11). Remember that the least invasive maneuvers are often most beneficial.

Also remember that an oral airway is contraindicated if the patient is alert or has an intact gag reflex, and that a nasal airway adjunct is contraindicated in severe central face trauma (1). If needed, two nasal airways and one oral can all be placed in order to facilitate the patient's airway.

Unexpected difficult bag-mask ventilation needs to exclude and treat anatomic obstruction (reopening the airway-triple maneuvers, oro- or nasopharyngeal airway-nasal obstruction, two-person ventilation) and exclude and treat functional obstruction (laryngospasm, thoracic rigidity, bronchospasm and overinflated stomach) (1). The suggested algorithm (https://www.das.uk.com/guidelines) overcomes problems with difficult face mask ventilation in children during routine induction of anesthesia but there are applicable, useful and powerful steps for solving difficulties with face mask ventilation generally (1-8).

Laryngeal mask airway is a supraglottic airway device (USA). The term 'supraglottic' means above or over the glottis or above or over the larynx that sits over the glottis. Over years, various designs, induction and insertion techniques have been described. Most of them require air to inflate the cuff and usually come in pediatric and neonate sizes. The selection of appropriate size of the LMA is determined according to the weight of the child (Table 1).

Table 1. *Laryngeal mask airway (LMA) sizes in pediatric patients*

Patient weight	LMA size
<5 kg	#1
5-10 kg	#1.5
10-20 kg	#2
20-30 kg	#2.5
30-50 kg	#3

The role of LMA as a powerful, useful airway management tool is well known in routine pediatric airway usage, in pediatric difficult airway and in pediatric emergency as well. LMA is typically more user-friendly than a face mask and avoids many of the problems associated with endotracheal intubation (1,2). They are inserted blindly and provide high success rates of oxygenation and ventilation with a minimum of initial and ongoing training (1,2). Placement and removal of LMA are easier compared to endotracheal intubation. LMA provides less traumatism for respiratory tract, better tolerability, improves hemodynamic stability during emergency, less coughing, less sore throat, avoidance of laryngoscopy and hands-free airway (1,2). Improving LMA to minimize the risk of aspiration whilst avoiding compression trauma of perilaryngeal structures is the most important change possible in the development of such a device. The routine use of LMA with gastric access should be a new everyday standard of care.

The LMA has been included in the International Guidelines for Neonatal Resuscitation since 2000 (1,2). The cornerstone of neonatal resuscitation is rapid airway management and providing positive pressure ventilation. Endotracheal intubation (ETI) is the best way to ensure airway during cardiopulmonary resuscitation (CPR) but should be attempted only if the healthcare provider has regular ongoing experience (1,2). Studies have shown that providers frequently require multiple attempts to successfully intubate children, especially newborns during resuscitation (1,2). If personnel skilled in ETI is missing, LMA is an acceptable alternative (1). Success rate of ETI out of hospital is 77% (first past rate without hypotension or hypoxia is only 49%), and of LMA 95.3% (9-12). Extensive list of features that most likely ensure a framework suitable for LMA in prehospital medical service personnel are safety and efficacy, providing spontaneous and positive pressure ventilation, easy to use, demanding minimal equipment (bite block, syringe and tape), efficacy even in suboptimal placement, limits aspiration risk (gastric suctioning or venting), insignificant side effects (airway irritation, cardiovascular responses, spinal movements) and realistic training available by video instructions on suitable manikins (1,2).

Hospital airway management

Endotracheal tube (ETT) with cuff is the best device for airway securing outside the operating theatre when performed by experienced practitioners (1-8). ETT provides protection from aspiration of gastric contents or blood from the mouth, adequate ventilation during chest compressions, suction tracheal secretions, route for drug administration, however, it requires significant training, experience and constant practice. ETI needs to be confirmed with capnometry. The most serious accidental complications of ETI airway management are undetected esophageal intubation and unnoticed tracheal extubation. So, the type of airway device to be used in emergency situations depends not only on the patient's requirements and available equipment, but also on the skill level of medical practitioners who are in charge of the patient's care until the anesthetist with a high airway skill level comes.

Proficiency in direct laryngoscopy and tracheal intubation requires good basic technique, regular practice and dedicated teaching. More than two direct laryngoscopy attempts in children must be limited due to the pediatric airway being susceptible to trauma and swelling (9-13). The primary goal must be prevention of hypoxemia, not tracheal intubation. Pediatric difficult intubation (PeDI) registry data suggest that we should think of switching to an indirect method much sooner if we run into trouble. Success rates of first attempts in the pediatric difficult airway population were found to be substantially higher in video than in direct laryngoscopy (55% *vs.* 3%) (9-13). Although video laryngoscopy improves glottis visualization, it is associated with prolonged time to intubation and we must consider the reduced time of safety apnea. The selection of the appropriate size of ETT is determined according to the child's age (Table 2).

Table 2. *Tube sizes in pediatric patients*

Age	ID (mm)	Distance between incisal and middle trachea (cm) (orotracheal intubation) *	Distance between nostril and middle trachea (cm) (nasotracheal intubation)
Premature babies	2-3	6-8	7-9
Newborns	3-3.5	9-10	10-11
3-9 month babies	3.5- 4	11-12	11-13
9-18 month babies	4-4.5	12-13	14-15
1.5-3 year children	4.5-5	12-14	16-17
4-5 year children	5-5.5	14-16	18-19
6-7 year children	5.5-6	16-18	19-20
8-10 year children	6-6.5	17-19	21-23
11-13 year children	6-7	18-21	22-25
14-16 year children	7-7.5	20-22	24-25
Formula to calculate size of tubes in childern: ID (mm) = (16 + age)/4			
Formula to calculate mouth-trachea distance (cm) = 12 + (age/2)*			
Formula to calculate nostril-trachea distance (cm) = 15 + (age/2)			

Remember that fiberoptic tracheal intubation is considered as the gold standard of difficult pediatric airway management.

For difficult airway scenarios, anesthetists apply different difficult airway management techniques according to difficult airway algorithms (https://www.das.uk.com/guidelines), i.e. bougie, videolaryngoscopy, fiberoptic intubation through or without LMA, LMAs, I-LMAs, rigid bronchoscopy, lighted stylet, videointubation with stylet devices, disposal catheters (exchange, aintree, cook, frova, S-guide, etc.).

Mnemonic **DOPES** is useful to exclude and treat unexpected tracheal tube (TT) ventilation problems (1):

D displacement of TT
O obstruction of TT (secretions, blood, tracheal wall, tracheal foreign body)
P pneumothorax
E equipment problems
S stomach (increased intra-abdominal pressure)

The can't intubate, can't ventilate scenario is happening in failed attempt to oxygenate patient by ETT or face mask or LMAs or ILMAs or fiberoptic intubation or blind nasal intubation. In that case, you should first call someone for help (senior anesthetist, consultant, ENT surgeon) and attempt oxygenation even if it appears futile. Insert both an oral and a nasopharyngeal airway (16-18). Emergency O_2 flush: apply a close-fitting face mask with two hands; an assistant may help with bag-squeezing. This is not time to experiment with unfamiliar, so choose whatever you feel comfortable with, and abandon them early if they prove to be of no benefit (16-18). If the patient is making spontaneous effort and respiratory noise, maintain CPAP and 100% O_2 until they are awaken. If all our attempts to oxygenate the patient fail, only needle or surgical cricothyroidotomy is left until ENT surgeon arrives to perform surgical tracheostomy, which is the last option to secure airway in these patients. Needle cricothyrotomy and bag ventilation or Ventrain emergency ventilation device is recommendation in children <5-year-old (16-18). Needle cricothyrotomy and bag ventilation or Ventrain emergency ventilation device or manujet ventilation in children 5- to 10-year-old (15-17). In children >10-year-old both needle or surgical cricothyrotomy are recommended (16-18).

Epiglottitis and foreign body aspiration are the most serious life-threatening emergencies in children. Epiglottitis is an example of 'impaired normal' (previously 'normal' but acutely altered due to infection and swelling) pediatric airway. Bacterial infection (*Haemophilus influenzae*) affects epiglottis and adjacent pharyngeal tissue and manifests supraglottic edema with partial or complete airway obstruction. Epiglottitis occurs more frequently in children aged 4-7 years. Signs or symptoms are rapid onset (severe distress in hours), high fever, intense sore throat, difficulty on swallowing, drooling, stridor, child sits up, leans forward, extends neck slightly, and one-third are unconscious and in shock. Applying high concentration of oxygen, without any attempt to visualize airway and rapid transport (13-15) are essential in prehospital settings. Informing hospital emergency department (during the transport) to be prepared for the urgent difficult airway management is mandatory.

Foreign body aspiration is an example of 'impaired normal' (previously 'normal' but acutely altered due to the sudden onset of airway obstruction) pediatric airway. It occurs mostly in children younger than 4 years and frequently among boys due to their propensity to physical hyperactivity. Most aspirated foreign bodies are organic materials (nuts, food pieces) and small parts of toys.

Signs or symptoms are respiratory distress, choking, coughing, stridor and wheezing. If a foreign body aspiration incident has been witnessed or suspected, basic life support maneuvers based on the guidelines of the European Resuscitation Council and American Heart Association should be commenced while the local ambulance services are called (19-21). Apply 100% oxygen as tolerated, and then the choking infant younger than 1 year should be placed face down over the rescuer's arm, with the head positioned below the trunk. Five measured back blows are delivered rapidly between the infant's scapulae with the heel of the rescuer's hand. If obstruction persists, the infant should be rolled over and five rapid chest compressions performed (similar to cardiopulmonary resuscitation). This sequence is repeated until the obstruction is relieved. In a choking child older than 1 year, abdominal thrusts (Heimlich maneuver) may be performed, with special care in younger children because of concern of the possible intra-abdominal organ injury. Blind finger sweeps should not be performed in infants or children because the finger may actually push the foreign body further into the airway causing further obstruction. The airway may be opened by jaw thrust, and if the foreign body can be directly visualized, careful removal with the fingers or instruments (Magill forceps) can be attempted. Patients with persistent apnea and inability to achieve adequate ventilation may require emergency intubation, tracheotomy, or needle cricothyrotomy, depending on the setting and the rescuer's skills (19-21). Children with suspected acute foreign body aspiration should be admitted to the hospital for evaluation and treatment.

When foreign body is placed in the lower respiratory tract, bronchoscopy is required for differential diagnosis of suspected tracheobronchial foreign body as-

piration in order to eliminate other common pediatric respiratory concerns, under general anesthesia (19-21). The rigid bronchoscopy remains to be used commonly and is regarded to be the gold standard technique for removal or exclusion of tracheobronchial foreign body. General anesthesia with maintenance of spontaneous breathing is commonly practiced but the adequate depth of anesthesia is not easy to control. Considering that ENT surgeon and anesthetist share the same field, bronchoscopy is a challenging procedure requiring experienced teams with an efficient method of intercommunication and good planning of anesthesia and bronchoscopy ahead of the procedures (19).

CONCLUSION

Airway management training program should be designed to give participants (all types of health providers) a chance to learn and train in both simulation and clinical practice, and demonstrate their ability in applying basic and advanced airway management skills used both in and out of the hospital. There is the need for preventive measures including parental education and awareness as well, especially in the situation of foreign body aspiration, all in order to ensure early and appropriate treatment of child's airway in emergencies and to reduce development of complications, including mortality.

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SAŽETAK

DIŠNI PUT KOD DJECE U HITNIM STANJIMA: KAKO GA ZBRINUTI I OSIGURATI?

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Zbrinjavanje dišnih puteva u spašavanju životno ugroženih bolesnika nesumnjivo je jedna od najvažnijih vještina kojom vladaju liječnici hitne medicinske pomoći kao i ostalo medicinsko osoblje u izvanbolničkim i bolničkim uvjetima, a anesteziologu je to, svakako, osnovna vještina. Zbog jedinstvenih osobitosti dišnog puta djeteta, njegovih anatomskih, fizioloških i emocionalnih karakteristika u različitim životnim dobima, kliničar mora znati i vladati tehnikama i alatima koje odabire za siguran i učinkovit nadzor dišnih putova u svim scenarijima hitnih stanja. Konačno i uvijek primarni je cilj osigurati oksigenaciju i ventilaciju djeteta.

KLJUČNE RIJEČI: dišni put, djeca, hitna stanja