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Airway management skills: Is your staff well trained?

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Editor's note: *When things go wrong in airway management, they do so with a vengeance. Critical airway skills are a must in emergency medicine because intubations tend to occur in less than ideal circumstances. Along with those less than ideal circumstances come less than ideal risks for errors. Errors during endotracheal intubations have serious to devastating consequences for the patient. Hence, a prudent emergency provider anticipates potential problems during the process of airway management. By learning from others' mistakes, as we can do in this issue, we can keep our awareness levels higher for those things that may lead to disaster. — Richard J. Pawl, MD, JD, FACEP*

Introduction

Of all the activities performed by an emergency department (ED) practitioner, managing the airway of a critically ill patient may provide the single greatest challenge. Compromised airways must be identified and corrected within minutes; otherwise, the patient will suffer hypoxic neurological injury and death. This problem is particularly acute in the ED, where bleeding, vomiting, and trauma to the face or neck often render the preferred method of airway control—endotracheal intubation—difficult to achieve.¹ Even when these conditions do not exist, successful intubation may prove elusive. One percent of all ED patients requiring airway management have impaired neck mobility, obesity, or some other physical characteristic that precludes intubation, despite repeated attempts by a skilled operator.²

Because the consequences of hypoxia can be so profound, substandard airway management by an ED practitioner frequently results in litigation. More

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often than not, these lawsuits take the form of wrongful death actions. Allegations of improper airway management tend to fall into one of three broad categories: failure to detect a compromised airway, failure to correct a known airway problem, or failure to acquire and retain the requisite knowledge and skills. After a brief description of potential airway problems and available treatment options, this article will explore some of the medical and legal pitfalls already encountered by ED personnel in each of these categories.

The Difficult Airway

Airway problems take many forms. Trauma to the neck or face may cause structural occlusion.³ Foreign objects, including food, sometimes lodge in the larynx or trachea.⁴ Allergic reactions and infectious diseases such as epiglottitis and croup commonly produce life-threatening angioedema.⁵⁻⁷ Individuals with a diminished level of consciousness from head injury, intoxication, or other medical conditions may vomit and aspirate. These same patients frequently lose muscle tone in the jaw, which causes the tongue

to fall into the back of the pharynx and interfere with breathing.⁸ To make matters worse, some patients have airways that are inherently difficult to manage (*Table 1*).

To the extent possible, the ED practitioner should evaluate the patient's airway before the need for intervention becomes urgent. One method of analysis, the Mallampati score, classifies the extent to which hypopharyngeal structures can be visualized without laryngoscopy. Anesthesiologists traditionally have relied on this score to predict the difficulty of endotracheal intubation.¹² Another method, the Upper-lip Bite Test, measures the ability of the patient to reach or cover the upper lip with the lower incisors.¹³ With the spread of rapid-sequence intubation (RSI) from the operating room to the ED,¹⁴ some authorities have advocated the use of these and other predictive tests when managing the airways of ED patients. Studies reveal widespread disagreement over the value of such methods,¹⁵ however, and because most ED patients cannot cooperate with either test, their usefulness in the ED setting remains somewhat limited.¹⁶ Given the time constraints faced by ED practitioners, it is probably the better practice to take a "big picture" view of the airway, taking into consideration all of the physical characteristics that may interfere with management.

Airway Management Options

Endotracheal intubation is the preferred method of establishing and maintaining a patent airway in the acutely ill patient. Inserted correctly, the endotracheal tube not only guarantees a route through which positive-pressure ventilation may be applied, but also protects the airway against vomiting and subsequent aspiration—a sequence of events that is of particular concern when treating ED patients. This skill may be learned in as little as four hours,¹⁷ and studies have shown that experienced ED physicians intubate just as well as anesthesiologists.¹⁸ In fact, the operator need not be a physician at all.¹⁹ Thus, from a liability standpoint, a hospital derives no benefit from limiting intubation to physicians of a particular specialty or department.²⁰ Those who do not perform intubation regularly may have difficulty with this procedure — a huge risk, since undetected esophageal intubations often prove fatal.²¹

Rapid sequence intubation has become a regular part of ED practice.²² This procedure relaxes the

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TABLE 1. Characteristics Linked to Difficult Airway Management⁹⁻¹¹

- Obesity (weight above 80 kg)
- Narrow face
- Protruding tongue
- Small mouth opening (less than 5 cm)
- Inflexible mandible
- Short, thick neck
- Impaired neck mobility (extension less than 70 degrees)
- Facial hair
- High, arched palate
- Micrognathia
- Previous head or neck surgery
- Presence of foreign bodies
- Dental abnormalities (e.g., large teeth, poor dentition, dentures)
- Hypopharyngeal structures not easily visualized (low Mallampati score)

musculature, giving the practitioner a better view of the glottic opening and increasing the likelihood of successful intubation. RSI is particularly useful when intubating combative head-injury patients, since the struggle to perform laryngoscopy may produce a dangerous spike in intracranial pressure. Fentanyl, etomidate, thiopental, midazolam, ketamine, succinylcholine, and nondepolarizing agents such as vecuronium and rocuronium all have been used by EDs for this purpose in various combinations.²³

Other intubation adjuncts are available, but each has its drawbacks. Fiberoptic bronchoscopes allow direct visualization of the airway, but they are expensive and require a good deal of training and skill to operate properly.²⁴ Lighted stylets are inexpensive and relatively easy to use, but they do not permit direct visualization, and therefore are useless when the airway has been distorted by trauma or is occluded by a foreign object.

When intubation is not possible, the practitioner must consider other methods of airway management. One such alternative, the laryngeal mask airway (LMA), consists of an inflatable mask and connecting tube that is inserted blindly into the pharynx to form a seal around the laryngeal inlet. Easier to place than an endotracheal tube, this device helps to prevent positional airway occlusion, but it does not create a solid barrier between the respiratory and alimentary tracts, and, consequently, it cannot entirely prevent the aspiration of gastric contents. In rare instances, the LMA has triggered bronchoconstriction

and caused damage to upper airway structures.²⁵

Another blindly-inserted airway device, the Combitube, is designed to be effective whether it enters the trachea or esophagus. When it lodges in the trachea, the device functions as an endotracheal tube. When it enters the esophagus, an inflatable cuff at its tip blocks regurgitation during mask ventilation. Use of this device is limited to patients older than 16 years, and the patient must have no deformity of the trachea or upper airway, and no gag reflex. The Combitube has been known to cause esophageal trauma, and because it is not a true endotracheal tube, aspiration sometimes occurs.²⁶

When none of these devices proves adequate, the ED practitioner will have to create a surgical airway. The fastest and most effective way to do this is through percutaneous cricothyroidotomy, which is accomplished by puncturing the cricothyroid membrane with a needle, inserting a guide wire, and using the wire to introduce a dilator and cuffed tube.²⁷ Practitioners must take care not to misplace the tube or allow it to become dislodged, however. Not only will oxygenation fail, but life-threatening subcutaneous emphysema, pneumothorax, or pneumomediastinum may occur.²⁸

Alternatively, the practitioner may employ percutaneous transtracheal jet ventilation, in which a high-pressure oxygen supply is connected to an over-the-needle catheter inserted through the trachea.²⁹ This procedure permits immediate oxygenation, but with exhalation occurring passively through the upper airway, carbon dioxide excretion generally proves inadequate.³⁰ Standard dissection-method surgical tracheostomy represents another option, but this requires considerably greater skill and confidence to execute properly,³¹ and in one study it required six times longer than the percutaneous method to complete.³²

ED practitioners must feel comfortable creating at least one type of surgical airway. They also should familiarize themselves with the contents of the surgical airway kits stocked by the EDs in which they work. Surgical airways may be procedures of last resort, but when they become necessary, the patient will die unless the practitioner is able to perform them immediately and properly.

Pitfalls in the Detection of Airway Occlusion

Airway occlusion can occur at any time, in any

patient. These problems cannot be corrected until they are identified, however, and for ED caregivers, this creates an obligation to monitor the airway status of every patient, regardless of presenting complaint. Some patients have a greater risk of airway compromise than others, and these patients must be watched particularly carefully. As the following cases illustrate, failure to do so invites both medical and legal catastrophe.

Case #1. Feeney v. New England Medical Center.³³ Brian Feeney, a 26-year-old man, was found sitting on a street corner by a City of Boston ambulance crew. He refused to cooperate with physical examination, and would not allow a check of his vital signs. He did admit to heavy alcohol consumption. The emergency medical technicians (EMTs) transported him to the ED of the New England Medical Center, where a triage nurse noted only that he was responsive to pain, was able to speak and move his extremities, and had no obvious signs of trauma. He was placed on his side on a stretcher in an ED hallway outside the main treatment area.

The next time Mr. Feeney was checked, which was at least 20 minutes after his arrival at the hospital, he was no longer breathing. A 30-minute resuscitation effort failed. At autopsy, his blood ethanol was 0.39%, and his death was attributed solely to respiratory arrest. Mr. Feeney's father brought a medical malpractice action against the hospital, the ED physician, and the triage nurse. A screening panel initially found the plaintiff's offer of proof insufficient, on grounds that a patient-physician relationship never existed. However, an appellate court allowed the action to proceed, finding that the patient's outward behavior alone should have permitted the ED staff to "readily recognize grave risk to the patient through depression of the respiratory system."

Case # 2. Arenas v. Gari.³⁴ When 20-month-old Andres Arenas became pale and listless, with vomiting and a temperature of 102°F, his mother administered acetaminophen (Tylenol). The next day, Andres cried uncontrollably, prompting a visit to the family pediatrician. The physician looked into Andres' mouth with an otoscope, listened briefly to Andres' lungs, and checked the child's temperature by feeling the skin. Finding no adventitious breath sounds and no stridor, she sent the child home with-

out ordering a chest x-ray or antibiotics. She diagnosed the condition as gastroenteritis.

During the next three days, Andres remained lethargic and agitated, with a persistent fever and progressively frequent coughing. He drank and urinated little. Andres' father returned to the pediatrician's office, where he spoke with a different doctor, who, without examining the child or referring to Andres' chart, "assured him that Andres would feel better in a couple of days."

Andres began to choke the next morning. His mother opened a window and screamed for help. Someone called for an ambulance, and Andres was transported to a local ED. On the way to the hospital, Andres stopped breathing and was intubated. The EMTs did not allow his mother to accompany him to the hospital, and by the time she arrived in the ED, Andres had been pronounced dead.

At autopsy, Andres was found to have suffered from pneumonia secondary to an inhaled foreign body. The pathologist recovered a firm, uncooked kidney bean from the trachea, just above the carina. Because he saw no evidence of mucosal erosion, he concluded that the bean had traveled up and down within the trachea over several days, and that Andres had choked when the bean became lodged in the glottic opening. The pathologist speculated that the bean had been pushed into the lower part of the trachea during intubation.

Andres' parents brought suit against the pediatrician and her practice group. Pathologists and pediatricians appeared as expert witnesses for both sides. The plaintiffs' expert criticized the pediatrician for dismissing the child's condition as gastroenteritis—a condition, he said, that must be diagnosed by exclusion. The pathologist who testified for the plaintiffs felt that Andres had died from aspiration pneumonia, and that the death could have been prevented if the foreign body had been detected sooner. The defendants' pathologist suggested that the bean had lodged in Andres' glottis at the moment he began to choke, and that this, rather than pneumonia, had caused the child's death. The jury accepted the plaintiffs' contention, and awarded them \$500,000.³⁵

In neither of these cases was airway obstruction obvious at the onset of care. One patient suffered only from intoxication, and the other may have had a foreign body lodged in his airway for as long as four days. In both cases, though, there existed a seri-

ous risk of obstruction that went unappreciated. In *Feeney*, the triage nurse's decision to let the patient "sleep off" his intoxication in an out-of-the-way bed was understandable to some extent; most intoxicated patients recover without incident in such an environment. Unfortunately, patients with a diminished level of consciousness from any source cannot be trusted to keep their own airways open and to continue breathing without assistance. Similarly, the patient in *Arenas* would have stood a much greater chance of recovery if the presence of a foreign body had been included in the differential diagnosis from the beginning of the child's illness. These cases stand as reminders that airway patency must not be taken for granted, and that all patients—particularly those who present with conditions that place them at risk for occlusion—deserve careful and continuous airway monitoring. Airway problems usually can be resolved in the ED, but first they must be identified.

The following case provides an example of the worst kind of airway management outcome: misdiagnosis leading to unexpected airway compromise, followed by treatment that not only failed to correct the problem, but actually made it worse.

Case #3. Baptist Memorial Hospital System v. Smith.³⁶ Evan Smith, Jr. (a 55-year-old telephone lineman) arrived at San Antonio's Northeast Baptist Hospital shortly before noon, complaining of a sore throat, difficulty swallowing, a 102°F fever, and chills. The physician on duty in the ED, Dr. Harry Henderson, thought that Mr. Smith looked pale and that his voice was muffled. Mr. Smith also had a tender anterior neck. Thinking that the patient appeared septic, Dr. Henderson looked into his throat with a tongue blade and light. There he observed exudate, inflammation, and swelling.

Dr. Henderson made a diagnosis of acute pharyngitis and ordered a throat culture, blood work, and injections of penicillin and bicillin. He did include epiglottitis in his differential diagnosis, and he realized that epiglottitis, if present, may have posed a threat to Mr. Smith's life. He later admitted that he took no steps to rule out this condition in the ED, however. He did not perform laryngoscopy. Ear, nose, and throat specialists were available for consultation, but he never contacted them. An x-ray of the upper airway could have been performed in the ED, but Dr. Henderson did not order one.

Five minutes after Mr. Smith received the antibi-

otics, he abruptly went into respiratory arrest. Dr. Henderson ordered an oropharyngeal airway inserted, and when he attempted to ventilate Mr. Smith with a bag-valve-mask, he encountered significant physiological resistance. Laryngoscopy revealed a red, swollen epiglottis with complete airway occlusion. After an attempt to insert an endotracheal tube failed, Dr. Henderson decided to perform a tracheostomy.

By this time, the patient had become profoundly hypoxic, but he remained conscious. Dr. Henderson did not order Mr. Smith restrained, and when he cut into the trachea, Mr. Smith flailed about, resulting in a jagged wound that lacerated the jugular vein. With blood pouring from the hole in the patient's neck, Dr. Henderson ligated the vein. Meanwhile, the patient was not being ventilated, and he slipped further into hypoxia. Once the bleeding had been stopped, Dr. Henderson found that the wound was too wide to support the tracheostomy tube, and a nurse had to hold it in place. By the time the tube was secured and ventilation initiated, the patient had gone without oxygen for five to seven minutes. Reviewing the incident later, a professor of medicine characterized the resuscitation effort as "disorganized and not well run, with misdirected priorities."

These events left Mr. Smith severely and permanently brain damaged. Blind, barely able to speak, and unable to walk, he became a "total bed patient" in a nursing home, requiring, in the words of a caregiver, "maximal assistance in everything." When Mr. Smith appeared in court nine years after the incident, his extremities remained twisted and contracted, and he occasionally he cried out in pain, using the word "hurt."

Mr. Smith's guardian brought suit against Dr. Henderson, his practice group, and the corporation that owned and operated the hospital. After the practice group was dismissed as a defendant, a jury found in favor of Mr. Smith against both remaining defendants. The award, representing pain and suffering, physical impairment, lost wages, lost earning capacity, disfigurement, and medical expenses, totaled more than \$11 million. It was upheld on appeal.

Not every sore throat is caused by epiglottitis, of course. Sometimes a sore throat is just a sore throat. It is a mistake, though, to attribute this symptom to an ordinary viral syndrome without ruling out the possibility of epiglottitis, bacterial tracheitis, or other conditions that lead to airway compromise.

When treating a patient with fever, difficulty swallowing, and a coarse, muffled voice—the same signs manifested by Mr. Smith—a large majority of practitioners routinely perform direct laryngoscopy and order a lateral neck radiograph.³⁷ An overwhelming majority of ED practitioners also consult with an otolaryngologist whenever one is available. Repeated intubation attempts in the presence of epiglottitis increase the risk of periepiglottal swelling and subsequent airway obstruction—problems that are better tackled by specialists.³⁸ In failing to take advantage of these services, the treating physician in *Smith* fell below the standard of care. He included epiglottitis in his differential diagnosis, but as with any life-threatening condition, it is not enough to merely consider the possibility that a particular disease process may be present. The practitioner has an obligation to go further, to either rule out the condition or treat it.

Traumatic airway occlusion, too, may be overlooked. As the following case illustrates, airway burns, in particular, require aggressive management, for it is difficult to gauge at the onset of care the extent of the swelling and occlusion that ultimately may occur.

Case #4. Campbell v. Williams.³⁹ Willie Mae Sumpter, a worker in an Alabama steel mill, received second- and third-degree burns on her face after molten steel spewed from an ingot mold. She was rushed to nearby Holy Name of Jesus Hospital, where she received treatment in the ED. The emergency physician on duty contacted a physician with admitting privileges, Dr. John Campbell, and described her condition. Rather than ordering Ms. Sumpter transferred to the burn center at the University of Alabama at Birmingham, Dr. Campbell admitted her to Holy Name of Jesus as his patient. He did not elect to intubate Ms. Sumpter, and he declined to perform bronchoscopic examination of the airway.

During the early morning hours after her admission, Ms. Sumpter's airway began to swell. Her breathing grew increasingly labored, and she began to make a "crowing" sound. Soon her eyes had swollen shut, and the inside of her mouth was too swollen to permit examination. A nurse telephoned Dr. Campbell, who ordered intubation. Because the airway had already closed partially, hospital technicians found it impossible to pass the endotracheal

tube. The nurse reported this by phone to Dr. Campbell, who was already on his way to the hospital. He instructed her to send out an emergency page for any physician in the hospital to come and perform a tracheostomy.

Dr. Wifredo Grana responded to Ms. Sumpter's room from the ED. When he learned about the nature of the problem, he told the nurse that he was not capable of performing emergency tracheostomy. Shortly thereafter, Dr. Campbell arrived at the hospital and performed the procedure himself. Ms. Sumpter had already lapsed into a coma from hypoxia, however, and she died a month later.

A relative of Ms. Sumpter brought negligence and wrongful death actions against Dr. Campbell, Dr. Grana, and the hospital. The claim against Dr. Grana alleged that he had breached his duty to perform an emergency tracheostomy. The claim against Dr. Campbell alleged that he had failed to transfer his patient to a burn unit as required by hospital protocol, and that he had failed to intubate Ms. Sumpter and to perform a bronchoscopic airway examination to determine the extent of her airway damage. The claim against the hospital advanced three theories of liability: negligence in failing to ensure that Dr. Grana was qualified to manage airway emergencies, vicarious liability for Dr. Grana's failure to perform emergency tracheostomy, and vicarious liability for its nurses' failure to enforce the hospital's policies pertaining to the transfer of major burn patients.

At trial, Dr. Campbell argued that he had done nothing wrong in declining to transfer Ms. Sumpter. Endotracheal intubation had not been necessary, he told the jury, and the risk of bronchoscopy had outweighed the benefits. Dr. Campbell painted a picture of sudden demise, in which Ms. Sumpter had experienced a violent "coughing spell" while choking on a mucous plug, thereby suggesting that her respiratory distress had come on so suddenly that it could not have been anticipated.

A nurse who had cared for Ms. Sumpter testified that no such coughing spell ever occurred. The trial took a bizarre turn when the plaintiff produced evidence that showed an attempt by Dr. Campbell to have Ms. Sumpter's medical records altered. One of Dr. Campbell's colleagues, Dr. Richard Gallo, had written a note in which he described the closure of Ms. Sumpter's airway as a gradual process. Dr. Campbell asked Dr. Gallo to change this note to reflect sudden airway closure. A summary in Dr.

Campbell's own hand also was produced, describing Ms. Sumpter's "coughing spell" and immediate respiratory arrest—events that, according to Ms. Sumpter's nurse, "did not exist."

While the jury was deliberating, and just moments before it returned its verdict, the plaintiff and the hospital agreed to a settlement of \$1 million. The jury found no liability on the part of Dr. Grana. It returned a verdict against Dr. Campbell and the hospital, and awarded \$4 million in damages to the plaintiff. After crediting the amount the hospital had agreed to pay, the court ordered Dr. Campbell to pay the remaining \$3 million. Dr. Campbell objected on grounds that this huge award would ruin him financially. But the Alabama Supreme Court affirmed the decision, holding that the "punitive damages award in this case does not exceed an amount necessary to punish Dr. Campbell for his action and to deter him and others from committing similar acts in the future."

Pitfalls in the Correction of Airway Occlusion

Once a threatened or actual airway occlusion has been recognized, the practitioner has an obligation to resolve it. This can require significant decision-making. At what point does intervention become necessary? Can definitive treatment, such as the administration of antibiotics or corticosteroids, avert the need for airway management, or is aggressive intervention, such as RSI, necessary to prevent a later tragedy? If an airway must be established, what type of device should be used? Can ED personnel perform the procedure, or should a specialist, such as an anesthesiologist or otolaryngologist, be called? Is there time to perform diagnostic procedures, such as a radiograph or blood work, to firm up the diagnosis, or does an airway need to be established immediately?

The following case provides an example of the kind of dilemma ED practitioners face when deciding how best to handle a potential airway problem.

Case #5. Smith v. Central Vermont Hospital, Inc.⁴⁰ Eighteen-year-old Shaun Smith was injured when he struck a car door while bicycling. EMTs arrived to find him seated by the side of the road, suffering from facial trauma and complaining of pain in his back and mouth. As an ambulance transported him to Central Vermont Hospital, he became extremely combative. A specialist in emergency

medicine, Dr. Gary Goldberg, obtained a history from the EMTs and examined Mr. Smith in the ED. Dr. Goldberg did not request consultation with a surgeon or anesthesiologist, but instead ordered the patient restrained and sedated.

Ninety minutes later, Mr. Smith was sent for an x-ray. Upon returning to the ED, his breathing was labored. Dr. Goldberg decided that the patient required intubation, and he called in a team of two surgeons and an anesthesiologist for this purpose. After several failed attempts, the intubation was accomplished. By that time, the patient had aspirated so much blood that he remained hypoxic in spite of the endotracheal tube. He died soon thereafter.

The administratrix of Mr. Smith's estate brought a medical malpractice action against Dr. Goldberg and the hospital. Prior to trial, several expert witnesses gave deposition testimony. A specialist in emergency medicine, Dr. Andrew Sumner, believed that Dr. Goldberg should have called an anesthesiologist immediately to paralyze and intubate Mr. Smith. "Here's this kid," Dr. Sumner said, "he hits a door, he's wild, he's agitated, he's got a head injury, you call anesthesia in, surgery, you intubate this kid then and there." Dr. Sumner later supplemented this testimony with an affidavit in which he expressed an opinion that Dr. Goldberg's failure to perform RSI immediately had been a proximate cause of Mr. Smith's death.

The surgeons and anesthesiologist who had been involved with Mr. Smith's intubation also gave depositions. All three indicated that they would not have recommended intubation if they had been consulted as soon as the patient arrived in the ED. The surgeon admitted on cross-examination that he was not an expert in intubation, however, and the anesthesiologist admitted that it was difficult to evaluate Mr. Smith's ED treatment without having been there.

The trial court excluded the affidavit of Dr. Sumner on grounds that it contained impermissible new material that conflicted with his previous deposition. Without the affidavit, there existed insufficient evidence of a connection between Dr. Goldberg's actions and Mr. Smith's death, and the court granted summary judgment to the defendants for want of proximate cause. This decision was reversed, thereby paving the way for trial, after the Vermont Supreme Court found that the affidavit and deposition contained substantially the same opinions.

What happened to Dr. Goldberg could have happened to any ED practitioner. When making treatment-related decisions, one can easily focus too much on the “here and now,” looking no further than existing circumstances and the patient’s current condition. In a matter as crucial as airway management, this approach is not sufficient. Airway patency is easily disrupted by a wide variety of conditions. The practitioner must anticipate potential complications and address them as fully as possible before the need for intervention becomes urgent. Shaun Smith did not appear to have an airway problem when he entered the ED. He did have a diminished level of consciousness, however, and in the setting of significant head trauma, this should have triggered early, serious consideration of endotracheal intubation. Had this been done, the patient’s aspiration and death may have been averted. Mr. Smith, in fact, did have an airway problem—specifically, an unprotected airway that permitted lethal aspiration of blood—but his airway compromise went unrecognized and untreated until it was too late to correct the resulting damage.

As the treating physician learned in *Smith*, delaying airway management can have catastrophic results. Conversely, early intervention can significantly reduce the risk of civil liability. A California case, *Stoll v. Bush*,⁴¹ illustrates this principle well. There, a Los Angeles ED physician faced a malpractice action from a patient he had treated for anaphylaxis. The patient had come to the ED with airway swelling after eating walnuts, and the physician attempted intubation twice. When this failed, he called an anesthesiologist to the ED. The ED physician thought about performing cricothyroidotomy, but with the airway landmarks obscured by swelling, he hesitated out of concern that he would make the incision in the wrong location and render fiberoptic intubation impossible. The physician was just about to make the incision when the anesthesiologist arrived and performed successful nasotracheal intubation with a fiberoptic bronchoscope. By that time, the patient had suffered hypoxic brain damage.

Like the physician in *Smith*, the ED physician in *Stoll* withheld invasive airway treatment. This time, though, the jury thought that the physician had made the right decision, and he was held not liable. In affirming the decision, the California Court of Appeals wrote, “This was not a situation in which [the ED physician] simply failed to act until the

arrival of the anesthesiologist. In fact, before then, Dr. Bush tried twice to intubate appellant, and he repeatedly testified that he was going through a mental checklist of the various options available, which included a cricothyrotomy and fiberoptic intubation. Indeed, Dr. Bush testified that he was preparing to perform a cricothyrotomy at the time the anesthesiologist arrived with the fiberoptic equipment.”⁴¹

Management of an airway emergency requires not only decisiveness, but also the ability to perform the required procedures properly. Inadequate training, inexperience, poor technique, or simple misfortune can lead to a number of complications, some of which are just as dangerous as the airway problem they were meant to resolve (*Table 2*).

Unrecognized esophageal intubation produces more litigation than any other complication of airway management. While endotracheal intubation is not a particularly difficult technique to learn, it can be a tricky procedure to perform, especially in the setting of the ED, where vomiting, bleeding, traumatic disruption of the airway structures, and concomitant injuries often interfere. In most instances, esophageal intubation does not, by itself, cause a great deal of harm to the patient. Unless the patient suffers from a rapidly closing airway that will preclude additional intubation attempts, the practitioner generally can remove the laryngoscope, insert an oropharyngeal airway, and ventilate the patient until he or she is ready to make another attempt. Unrecognized esophageal intubation is an entirely different matter. The longer the tube remains in the esophagus, the greater the risk of gastric insufflation, vomiting, and aspiration. Hypoventilation soon follows, accompanied by hypoxia and death.

Case #6. *Banks v. Climaco*.⁴³ On the evening of October 28, 1991, Jeffrey Banks came by ambulance to St. Anthony’s Memorial Hospital in Effingham, Illinois. Mr. Banks had stabbed himself in the abdomen, and he arrived in the ED combative, with his arms and legs restrained, and the knife still impaled. The attending physician in the ED, Dr. Ramon Climaco, decided that the knife should be removed in the operating room. When it became obvious that a surgical team could not be assembled in a timely fashion, Dr. Climaco ordered the patient transferred to another hospital. Mr. Banks’ blood pressure was normal, but because his breathing

TABLE 2. Complications of Airway Management⁴²

- Esophageal or bronchial intubation
- Aspiration
- Cervical spine trauma
- Vocal cord paralysis
- Perforation of endotracheal tube cuff
- Kinking or occlusion of endotracheal tube
- Bronchospasm and laryngospasm
- Displacement of teeth
- Perforation of tongue, lip, palate, or esophagus
- Bradycardia and hypotension
- Tachycardia and hypertension
- Tracheal damage
- Pneumonia
- Subcutaneous emphysema
- Gastric insufflation and rupture
- Prolonged interruption of ventilation

appeared labored and his heart rate was high, Dr. Climaco elected to intubate Mr. Banks before the transfer. Believing that the patient had lost massive amounts of blood from the stab wound, Dr. Climaco also administered large quantities of intravenous fluids. All of these decisions were made within 35 minutes of Banks' arrival at the hospital.

The procedure proved more difficult than Dr. Climaco had anticipated. Mr. Banks remained conscious and combative, and Dr. Climaco found it impossible to intubate him. In response to Dr. Climaco's call to the anesthesia department, a nurse anesthetist, James Kinney, came to the ED. Mr. Kinney, too, found it impossible to intubate Mr. Banks. Dr. Climaco ordered the administration of diazepam, and a respiratory therapist, Jeffrey Pietrzyk, ventilated Mr. Banks with a bag-valve-mask device until an anesthesiologist became available.

The anesthesiologist, Dr. Ashokkumar Shah, arrived 30 minutes later. Dr. Shah preoxygenated the patient, ordered the administration of succinylcholine, and intubated him. Mr. Pietrzyk auscultated the chest. Hearing no air movement, he reported to Dr. Shah that the tube was in the wrong place. Dr. Shah insisted that the tube had gone into the trachea. Oxygen monitoring equipment was not used.

As Mr. Pietrzyk ventilated with a bag-valve-mask device, he observed that the patient's abdomen was becoming noticeably distended. He again questioned the placement of the tube, and he told Dr. Shah that he thought the tube was in the esophagus, rather

than the trachea. According to Mr. Pietrzyk, Dr. Shah did not reply, and instead walked out of the room. The patient's heart rate dropped to 30 bpm, and Mr. Pietrzyk called a code. The nurse anesthetist listened for breath sounds, determined that the tube was not properly placed, removed it, and intubated the patient correctly. Mr. Pietrzyk later estimated that about six minutes had elapsed since Dr. Shah's intubation attempt. Atropine was given, and Mr. Banks made feeble attempts to breathe, but he died a short time later.

Mr. Banks' wife brought a medical malpractice action against Drs. Climaco and Shah, James Kinney, and the hospital. Mr. Kinney and the hospital settled quickly for an undisclosed amount. Dr. Shah settled just before the case went to trial. The plaintiffs proceeded against Dr. Climaco as the sole defendant.

The evidence showed that Dr. Climaco had left the room prior to Dr. Shah's intubation attempt, and that he had not returned until the code was called. Five expert witnesses testified. The first, a forensic pathologist, believed that Mr. Banks had died from pulmonary edema, brought about by intravenous fluid overload. Another forensic pathologist contradicted the first one, saying that it was hypoxia from the misplaced tube, not pulmonary edema, that killed Mr. Banks. Another physician testified that Dr. Climaco had deviated from the standard of care for ED specialists by giving the patient too much fluid, and by not being present during the intubation. A fourth expert witness, an anesthesiologist, testified that the patient had died from a combination of hypoxia and fluid overload. The fifth expert witness was an ED physician called by the defense, who testified that Mr. Banks had gone into cardiac arrest either from the succinylcholine or the esophageal intubation, and that Dr. Climaco had acted within the standard of care.

After listening to this conflicting testimony, the jury concluded that Dr. Shah's esophageal intubation had been the sole cause of Mr. Banks' death, and that Dr. Climaco was not liable. The Illinois Appellate Court upheld the decision.

Esophageal intubation does not go undetected as frequently now as it once did, thanks largely to the widespread use of monitoring devices such as disposable colorimetric end-tidal carbon dioxide detectors, portable capnography recorders, and pulse

oximeters. These innovations do not take the place of blood-gas determinations, but they do provide rapid feedback, and from a liability standpoint, it is a huge mistake not to utilize them during every intubation attempt. Continuous quantitative capnometry monitors provide more reliable data than colorimetric sensors,^{44,45} and the use of these devices is now recommended for the confirmation of every endotracheal tube placement, in all age groups, by both the American College of Emergency Physicians⁴⁶ and the international medical community.⁴⁷ Physicians like Dr. Shah, who place so much confidence in their own skills that they have no use for such devices, risk lawsuits for themselves and death for their patients.

Endotracheal intubation poses a risk of liability even when performed correctly. In *Giangrasso v. Tenet Healthsystem Hospitals, Inc.*, a hospital and its ED and inpatient personnel were sued after a 10-year-old had to undergo 20 operations in an attempt to correct subglottic stenosis that occurred as a result of his intubation.⁴⁸ Similarly, in *Kent v. Baptist Memorial Hospital*, a physician who intubated a 16-year-old diabetic “without difficulty” defended against a claim that he had used an endotracheal tube that was too large, thereby damaging the patient’s vocal cords.⁴⁹

Endotracheal intubation is not the only airway issue to cause legal difficulties for ED practitioners. A Washington pediatric hospital faced a medical malpractice claim after a respiratory therapist, called to the ED to administer oxygen to an infant, allegedly “stared” at the patient, rather than suctioning her, as she aspirated to death.⁵⁰ An ED physician in Texas was accused of causing barotrauma to a near-drowning patient by administering too much positive end-expiratory pressure (PEEP).⁵¹ The following case highlights a serious problem that has led to remarkably few lawsuits—airway management of patients with cervical injuries.

Case #7. Ellis v. Niles.^{52,53} Paramedics responding to the scene of a collision in South Carolina found Michael Ellis’ car upside down, with Ellis outside the vehicle. They wrapped his neck in a collar, rolled him onto a spineboard, and transported him to Richard Memorial Hospital, a Level I trauma center. One of the paramedics observed that Mr. Ellis could move his extremities in the ED, and a physician reported the presence of rectal tone.

A trauma team, consisting of three residents and several nurses, provided most of Mr. Ellis’ care. An x-ray revealed cervical spine injury. Intubation was attempted a total of five times by a resident and an anesthesiologist, first nasotracheally, and then orotracheally. When these attempts failed, cricothyroidotomy was performed.

The following day, Mr. Ellis was found to be paralyzed in three of his extremities, allegedly as a result of cervical spine movement during the intubation attempts. A malpractice action was brought against two Advanced Trauma Life Support-certified doctors who had been on the duty in the ED, and against the hospital. The hospital settled before trial, but because the physicians had been involved in the patient’s care only peripherally, they were held not liable.

Cervical injury must be suspected in every patient exposed to significant trauma. At the same time, the airways of these patients must be kept patent. For the ED practitioner, this poses yet another dilemma: How can the airway best be kept open without exacerbating a potential or existing cervical spinal injury?

Studies have shown that orotracheal intubation can be accomplished safely in patients with injuries of the cervical spine.⁵⁴ Manual in-line stabilization allows significantly less cervical movement than a collar does, and studies on cadavers suggest that the use of a straight laryngoscope blade produces less axial distraction than other types.⁵⁵ Flexible laryngoscopes, too, have been shown to work well. As long as meticulous attention is paid to cervical immobilization, the liability associated with the necessary intubation of trauma patients appears to be minimal.

Education and Training

ED practitioners must be prepared to handle airway emergencies. This is particularly true in small community hospitals and rural facilities, where the assistance of specialists, such as otolaryngologists and anesthesiologists, may not be immediately available. Accepting an ED post with insufficient training in airway management invites malpractice litigation. Practitioners with limited training in this area should consider enrolling in a course that teaches advanced-level airway maneuvers, as should those who lack recent practical experience in this area.

Hospitals have an obligation to ensure that their

personnel are qualified to perform the duties for which have been hired. In one Rhode Island case, a hospital incurred vicarious liability in the amount of \$2.8 million after one of its ED physicians refused to perform a tracheostomy, saying that he had not performed one in many years.⁵⁶ Hospitals can limit their liability exposure in this regard by granting staff privileges only to well-qualified individuals.

Conclusion

Airway occlusion is a serious emergency. ED practitioners must take swift, decisive action to recognize and resolve airway problems. They must be prepared to perform endotracheal intubation, secure a surgical airway, and utilize other airway-management devices quickly and properly. Inadequate training poses a liability risk not only for practitioners, but also for the hospitals in which they work.

Endnotes

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Participants who complete this activity will be able to:

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- cite methods of minimizing risk in the ED setting.

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Physicians and nurses participate in this continuing medical education/continuing education program by reading the article, using the provided references for further research, and studying the questions at the end of the article. Participants should select what they believe to be the correct answers, then refer to the list of correct answers to test their knowledge. To clarify confusion surrounding any questions answered incorrectly, please consult the source material.

At the conclusion of this semester, you must complete the evaluation form that will be provided at that time, and return it in the reply envelope that will be provided to receive a certificate of completion. When your evaluation is received, a certificate will be mailed to you.

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13. Which of the following should always be used during intubation?
 - A. Pulse oximetry and capnography
 - B. In-line stabilization and straight laryngoscope blade
 - C. Radiography
 - D. Lighted stylet
 14. Which of the following intubation complications produces the most litigation?
 - A. Kinked tube
 - B. Tongue and palate perforations
 - C. Unrecognized esophageal intubation
 - D. Vocal cord injury
 15. In *Smith v. Central Vermont Hospital*, what action formed the basis of the alleged malpractice?
 - A. Failure to intubate immediately
 - B. Unnecessary restraint of the patient
 - C. Failure to obtain a pre-intubation x-ray
 - D. Performing RSI with the wrong agent

Answers:

12. C
13. A
14. C
15. A

CE/CME Questions

12. Which of the following devices is designed to work in either the trachea or esophagus?
 - A. Endotracheal tube
 - B. Laryngeal mask airway
 - C. Combitube

In Future Issues:

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