

# ANESTHESIOLOGY NEWS

Clinical Anesthesiology

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## High Morbidity and Mortality Rates in Children With Multiple Intubation Attempts

Phoenix—There is a disturbingly high rate of morbidity and mortality in children with difficult airways who have undergone multiple intubation attempts, according to a database analysis by a multicenter research team. Severe complications in the cohort were also associated with body weight less than 10 kg and difficult airways that were unanticipated.

At the heart of the analysis is the PeDI (Pediatric Difficult Intubation) registry, a multicenter database of 14 tertiary care pediatric institutions with practice data relating to difficult direct laryngoscopy events in children aged less than 18 years. “We formed the registry to collect outcome data in these patients because there aren’t very good data in airway management in children, and most of what we know comes from single-center reports and case series,” explained John Fiadjoe, MD, assistant professor of anesthesiology and critical care, Children’s Hospital of Philadelphia. “So we decided to look at the devices used, the numbers of attempts, the providers managing the airway and the complications that occurred.”

Nine hundred cases, all presenting between August 2012 and November 2014, were analyzed. Difficult direct laryngoscopy was defined by at least one of the following four criteria:

- Direct laryngoscopy by faculty fails to visualize any part of the vocal cords.



- Direct laryngoscopy was impossible due to physical limitations (mouth opening and other factors).
- Direct laryngoscopy has failed within a six-month period.
- Direct laryngoscopy is deferred because the patient was expected to be challenging to intubate with conventional direct laryngoscopy, and there was concern for potential harm.

“Severe complications” were defined as pneumothorax, severe airway trauma, aspiration, cardiac arrest, death and delayed recognition of esophageal intubation. Other complications included minor airway trauma, arrhythmia, bronchospasm, epistaxis, hypoxia, laryngospasm and immediately recognized esophageal intubation.

In this study reported at Pediatric Anesthesiology 2015 (abstract A17), univariate analysis revealed that patients who had severe complications weighed less (15.3 vs. 24.2 kg;  $P=0.016$ ), more frequently had airway management outside of the operating room (7.9% vs. 2.0%;  $P=0.005$ ), had more unanticipated difficult airways (5.5% vs. 1.7%;  $P=0.009$ ) and required more intubation attempts (four vs. two;  $P<0.001$ ) than their counterparts who did not have severe complications. Multivariate analysis found similar results, except for weight.

“It makes sense that the number of intubation attempts correlated with increasing complications,” Dr. Fiadjoe said in an interview with *Anesthesiology News*. “This has been shown in the past, but it has not been demonstrated for a difficult airway pediatric population.”

The analysis also showed that clinicians turned to direct laryngoscopy frequently, and persistently. “Folks were using direct laryngoscopy more often than you’d expect in a patient who was known or suspected to be difficult,” he noted. “The success rate of direct laryngoscopy was only 12% in our patient population. But it’s the thing we’re most familiar with, so we continue to use it. In fact, 20% of our fifth intubation attempts were with direct laryngoscopy.”

### **Cardiac Arrest Rate Troubling**

Yet the most troubling finding of the analysis was the overall complication rate. “The shocking thing was that one in 75 of our patients had a cardiac arrest,” he said. “Now if you look at the pediatric anesthesia literature on cardiac arrest, the number that’s assumed in general anesthetic cases in children is around 1.4 in 10,000. But in our difficult airway



patients, it's one in 75, and that's astounding. And I'd venture to say that most of the cardiac arrests we observed are preventable, because for the vast majority of these patients, they were hypoxic cardiac arrests."

Helping improve outcomes such as this, he continued, might be possible with educational efforts. "Our next step is to create an intervention to improve these complications," Dr. Fiadjoe said. "We want to create a Web-based educational portal for practitioners to be able to review videos of the various techniques they can use in these patients." Hands-on workshops will also play a part in institutions' efforts to reduce complication rates.

There are other steps that anesthesiologists can take when they treat children with difficult airways, beginning with reducing the total number of intubation attempts. "It's important that we move away from direct laryngoscopy if it fails after the first couple of attempts. We should quickly move to something else that gives us a higher success rate," Dr. Fiadjoe said. Limiting the number of attempts performed by trainee anesthesiologists is also recommended.

Finally, the researchers recommended oxygenation during intubation in pediatric patients as another way to reduce possible complications. "This gives more time to secure the airway, especially if you're working with a trainee," Dr. Fiadjoe added.

"Most of us oxygenate prior to but not during intubation. But in these small children, the oxygen consumption is very high and they consequently desaturate quickly, even when they're breathing spontaneously. You need a way to give them oxygen throughout. We think [a] high-flow nasal cannula may be a way, or using a modified nasal airway with oxygen flowing through it."

—Michael Vlessides

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*The researchers reported no relevant financial conflicts of interest.*