

**Perioperative Ventilatory Management:  
Strategies for Preventing Postoperative Pulmonary Complications**

**2016**

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Dr. Alan Schwartz: Hello. This is Alan Jay Schwartz, Editor-in-Chief of the American Society of Anesthesiologists' 2016 *Refresher Courses in Anesthesiology*, the latest research and education information. The focus of the new online format of the *Refresher Courses in Anesthesiology's* CME program, and the modules featured, is to educate learners on current developments in the science and clinical practice of the specialty of anesthesiology, critical care medicine and pain management. For the first time ever, we will be speaking directly with individual authors to learn about their expertise, perspective and insight regarding their featured module.

Today, we are pleased to present the following one-on-one conversation with fellow *Refresher Courses in Anesthesiology* Editor, Dr. Laurence Torsher, and author Dr. Samuel Galvagno. They will be highlighting the module titled, "Perioperative Ventilator Management: Strategies for Preventing Postoperative Pulmonary Complications."

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Dr. Laurence Torsher: My name is Laurence Torsher, and I am an anesthesiologist at the Mayo Clinic Rochester, and one of the editors of the ASA Refresher Course series. Our guest today is Dr. Sam Galvagno, a trauma anesthesiologist and intensivist from the R. Adams Cowley Shock Trauma Center and the

Department of Anesthesiology at the University of Maryland School of Medicine. He was a contributor to the ASA 2015 Annual Meeting Refresher Course, with a presentation entitled, “Perioperative Ventilatory Management: Strategies for Preventing Postoperative Pulmonary Complications.” Dr. Galvagno, I’d like to ask you, as we begin, what are some of the things that are associated with postop pulmonary complications?

Dr. Samuel Galvagno: Postoperative pulmonary complications are actually much more common than we probably realize. They actually occur with the same incidence as cardiac complications, at least in general surgical patients. So, it’s really important to understand some of the risk factors that play into the development of these complications.

There’s a couple of ways to break it down. There’s various risk stratification schemes, which we talked about in our lecture. One is to look at the ability to predict really bad stuff, like ARDS—the acute respiratory distress syndrome—or acute lung injury. And for that, there’s the SCIP scoring system, which has a lot of very common-sense type of risk factors that are either patient-related, procedure-related, or related to a few perioperative tests or preoperative tests.

The patient-related factors are things that would come as no surprise to the practicing anesthesiologist: advanced age; a higher ASA classification; congestive heart failure; or if the patient does not have a very good functional dependence at baseline. Chronic obstructive pulmonary disease is another risk factor that has fairly good evidence that predicts postoperative pulmonary complications.

Procedure-related factors also come as no surprise to the practicing anesthesiologist: thoracic surgery; aortic surgery; abdominal surgery. Higher-risk surgery procedure-related factors are also associated with a higher odds of developing postoperative pulmonary complications.

And finally, there's not much in the way of laboratory testing, and even pulmonary function testing is not necessarily very helpful in most cases. There have been some studies; and again, the use of this SCIP scoring stratification, that looks at albumin levels that are very low; an abnormal chest x-ray; or a BUN that's elevated. Those could be other risk factors in terms of labs.

In terms of just looking at patient-related risk predictors for just general postoperative pulmonary complications other than things like ARDS or acute lung injury, again, age plays into the equation; preoperative oxygenation—less than 90% increases the score. And this is all off of the ARISCAT score, which was looked at in surgical patients in Catalonia, validated. And also respiratory infections; anemia; if it's an upper abdominal intrathoracic or intrathoracic incision, these are higher risk factors; duration of surgery over three hours; and an emergency procedure. Many of these risk factors are the same risk factors we see for cardiac complications. Many of them overlap.

Dr. Laurence Torsher:           So, Dr. Galvagno, are there some things we can do with our intraoperative management to decrease the likelihood of postop pulmonary complications?

Dr. Samuel Galvagno:           We believe that there are a few things we can do, and these would be more best practices, and based off of some of the limited literature out there. But we do believe that an intraoperative ventilatory strategy can be beneficial to prevent postoperative pulmonary complications. It's worth noting some of the literature, without going into detail; we do talk about this in our course. But we do know that patients who do not receive any PEEP—positive end-expiratory pressure—intraop, may be at risk for more pulmonary complications. And so, that's been shown, as well, in a 2012 study.

There's also literature out there that suggests a higher tidal volume can be injurious to the lung. And so, a best practice that we recommend, based off of literature, is really to select—at least in a patient who does not have injured lungs to start with—a reasonable tidal volume of six to eight milliliters per kilogram. And that's based off predicted body weight, which is calculated by height. So, predicted body weight is a key factor in looking at the patient's height, not their weight, to actually derive the – and select the correct tidal volume. We believe in starting everybody off with a little bit of PEEP, usually about two centimeters of water, titrated accordingly, and trying to keep oxygen level down as low as possible.

These data, or these suggestions, are actually derived from a series of studies, several of which have shown certainly no harm from selecting a lower tidal volume, and indeed a lower incidence of postoperative pulmonary complications when a reasonable six to eight milliliters per kilogram by predicted body weight tidal volume is selected.

PEEP is a little bit more up for grabs. There's some conflicting data. There was at least one study that did not show really any benefit to higher PEEP versus lower PEEP. And we believe that at least a little bit of PEEP is a good place to start, certainly in a patient who has ARDS and is going into the operating room with ARDS, should be placed on an ARDSNet-like lung strategy: six mils per kig predicted body weight, PEEP and FiO<sub>2</sub> titrated according to the ARDSNet table, and also aiming for a PaO<sub>2</sub> that's in the 55 to 80 range. Those are some general recommendations for how to manage these patients intraoperatively, with the intention of hopefully decreasing their hospital length of stay; decreasing costs; decreasing the postoperative pulmonary complications that can cause these adverse outcomes.

Dr. Laurence Torsher: Well, thank you very much, Dr. Galvagno. Today, he shared with us some criteria or risk factors for postop pulmonary complications, as well as

some strategies for mitigating and managing them. And now, back to you, Dr. Schwartz.

Dr. Alan Schwartz: Thank you for joining us today, and participating in this insightful conversation with this month's featured author. Be sure to join us for next month's one-on-one author interview, presented in this new, exciting format.

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