



Learning From Others:

Anesthesia
Quality Institute 
ANESTHESIA INCIDENT
REPORTING SYSTEM (AIRS)

A Case Report From the Anesthesia Incident Reporting System

Review of unusual patient care experiences is a cornerstone of medical education. Each month, the AQI-AIRS Steering Committee abstracts a patient history submitted to the Anesthesia Incident Reporting System (AIRS) and authors a discussion of the safety and human factors challenges involved. Real-life case histories often include multiple clinical decisions, only some of which can be discussed in the space available. Absence of commentary should not be construed as agreement with the clinical decisions described. Feedback regarding this article can be sent by email to airs@asahq.org. Report incidents or download the AIRS mobile app at www.aqiairs.org.

Case 2018-5

A 56-year-old woman presented for debridement and dressing change of chronic wounds, following an episode of septic shock due to necrotizing fasciitis. Her uncuffed tracheostomy appliance was replaced with a cuffed tracheostomy for the procedure. The patient was somnolent at the end of the procedure, and was brought to the PACU on pressure support ventilation with the tracheostomy tube cuff inflated. She was transferred to a surgical ward two hours later, with the tracheostomy cuff still inflated. In response to an order from the surgical team, a Passy-Muir device was placed on the tracheostomy to facilitate communication. The patient was unable to phonate with the device in place. Shortly thereafter, the patient became agitated and subsequently pulseless, requiring activation of the code team, epinephrine administration and several minutes of cardiopulmonary resuscitation before return of spontaneous circulation.

Discussion

The Passy-Muir valve was invented by a patient named David Muir.¹ It is a simple one-way valve intended for use on an uncuffed tracheostomy tube. It permits unchecked inhalation through the tracheostomy but directs the majority of exhalation through the vocal cords and upper-airway, thus enabling phonation. The Passy-Muir valve is commonly used to facilitate communication with alert patients with the ongoing need for a tracheostomy appliance.

If the upper-airway is blocked, as by an inflated tracheostomy tube cuff, the Passy-Muir valve will obstruct exhalation. Breath stacking ensues, with rapid hyperinflation of the lungs, loss of tidal air flow and impairment of myocardial filling. Pneumothorax may also occur. In extreme cases, as illustrated here, respiratory distress can progress to cardiac arrest. Removal of the valve, deflation of the tracheostomy cuff or removal of the entire appliance will rapidly relieve the problem. It is likely this occurred immediately in the case described, as the Passy-Muir valve is designed so that it cannot be connected to a resuscitation bag; application of positive pressure through the one-way valve would rapidly aggravate the situation.



How might a complication such as this one be prevented? Education is the first step. The nurse or respiratory therapist who placed the valve should understand how it works and be aware of the need to deflate the tracheostomy cuff. The surgical team should recognize the potential for this complication to occur and should either change the tracheostomy to an uncuffed model or include an order that the cuff be deflated before placing the valve. The anesthesia team and PACU nurses should be mindful of the latent safety hazard caused by sending this patient to a surgical ward with the cuff inflated. Hospital administration might impose policies restricting tracheotomized patients to certain units. The most meaningful intervention, however, would be education of the patient herself. The Passy-Muir valve is intended to facilitate communications with an awake patient; education at the time the valve was placed would have allowed the patient to correct the issue herself, either by removing the valve or deflating the tracheostomy cuff.

Education is important but remains a weak intervention. Since Passy-Muir valves are only one of thousands of pieces of dangerous technology in the average hospital, and are used relatively rarely, prospective education is unlikely to be perfectly effective. Instead, just-in-time education would be more likely to prevent this complication, in the form of an effective handoff of patient care from the O.R. to the PACU to the ward. The anesthesia team, mindful of the potential for complications associated with any tracheostomy, should include the status of the device (cuff up) and the future plan (deflate cuff when patient awake) in their handoff to the PACU. The PACU nurse should include these same elements in the handoff to the ward. If the patient came to the O.R. with the Passy-Muir valve in place, the detached device would have accompanied the patient back to the ward, perhaps prompting a specific discussion during the hand-off process. Efficient communication would have allowed knowledge to flow down the education gradient from O.R. to ward at the time it was most relevant.

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Handoffs have long been recognized as a risk factor for complications, and minimizing handoffs whenever possible is an obvious goal for quality improvement.² Handoffs can never be eliminated, however, because of the specialization of medical care. The team that manages the patient in the O.R. has more expertise than the team managing the patient on the ward, and a primary care physician has very different skills than a surgeon. Handovers between medical services and between different regions of the hospital are inevitable.

Intra-service handoffs, e.g., between one anesthesia provider or team and another, have recently been identified as a risk factor for adverse outcomes in a large population of patients experiencing major surgery.³ This is consistent with some previous studies, but inconsistent with at least

one recent report.^{4,5} Editorialists have consistently noted that some intra-anesthetic handovers are inevitable – for example, in very long anesthetics and when an on-call team begins a case after working all night – and have suggested that handoffs not be banned, but should rather be improved.^{6,7} Proposed mechanisms – now implemented in some sites – include a formal handover script supported by electronic documentation and prompting, formal education early in training, and audit and feedback as part of the institutional quality improvement program.⁴

Other system improvements could also mitigate this complication. Labelling of the Passy-Muir device with a warning is one way. Another would be a sign in the patient's room noting the presence of the Passy-Muir valve and the corresponding risks; this intervention was actually in place in the ICUs of the site where the complication occurred, but not on the ward. Finally, electronic documentation could force a check of the inflated/deflated status of the tracheostomy cuff when a Passy-Muir valve is ordered.

The complexity of medical care, both in devices and services, makes complications resulting from lack of knowledge almost inevitable. The best mitigating strategy is clear communication across all personnel who interact with the patient. This month's case illustrates how a breakdown in communication can lead to an unintended adverse event from a rarely-used device intended to improve patient function.

References:

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