and the Vigileo system showed a bias of 1.3 l/min and 95% limits of agreement of −1.5–4.1 l/min.[9] The percentage error was 54%. Also, there was increased bias when systemic vascular resistance was low. In only 68% of readings did the direction of change agree between the two monitors. The view was expressed by the authors of this article that only 2 out of 13 published studies on the Vigileo system fulfill the recommended criteria; namely, that the combined agreement error should be <30% for a new monitoring device to be accepted for clinical practice.[10]

In terms of response time, a study showing a decrease in cardiac output after phenylephrine administration as measured by continuous thermodilution, as compared with an increase using the Vigileo system, remains a concern.[11] Particularly in the setting of basic research in obstetric anesthesia, the measurement of rapid changes after the use of vasoactive agents contributes knowledge impacting on clinical management. The recalculation of the proportionality constant relating stroke volume to pulsatility in the Vigileo algorithm, as described in a lucid editorial[12] and by Raghunathan *et al.*, takes place every minute. Such a delay would be problematic if one was interested in a beat-by-beat depiction of hemodynamic changes in circumstances where systemic vascular resistance was changing rapidly. Indeed, the authors own comments that "waiting a few minutes for auto-recalibration and the recalculation of κ is appropriate before relying on Vigileo-reported measurements" totally supports our editorial view that this instrument "may not be suitable for the study of rapid hemodynamic changes associated with obstetric anesthesia."

We agree that studying systolic pressure variation, pulse pressure variation, and stroke volume variation in spontaneously breathing patients could be of great clinical benefit in the future in the prediction of fluid responsiveness, should the algorithm and software of the particular cardiac output device allow it.

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Muscle Relaxants and Airway Management

To the Editor:—The article by Schmidt *et al.* and the accompanying editorial by Boylan and Kavanagh raise a very important issue, which is the place of neuromuscular blocking drugs (NMBDs) in anesthetic practice.[1,2] Schmidt *et al.* state that "The use of muscle relaxants can cause severe hypoxia if the trachea cannot be intubated and the patient cannot be ventilated."[1] We would be grateful if they could tell us on what evidence they base this statement. With respect, we think they may be falling into the well-known medical trap of confusing subsequence with consequence.[3] In our opinion a more realistic and up-to-date statement would be "If mask ventilation is impossible, the evidence suggests that an NMBD will permit ventilation or intubation."

The large study of Kheterpal *et al.* has confirmed that the nonevidence-based practice of not administering an NMBD until ventilation has been demonstrated is unsound. Of the patients in whom ventilation by face mask was impossible, all but one received an NMBD to facilitate intubation.[4,5] The option of waking the patient up if ventilation is impossible is often put forward as the reason for not administering an NMBD, but none of the patients with difficult or impossible mask ventilation in Kheterpal *et al.*'s study were woken up. In practice it seems that this is not an option anesthetists find expedient.

In their editorial, Drs. Boylan and Kavanagh refer to the use of NMBDs in Schmidt *et al.*'s study, writing that "The finding that their use was not associated with more complications is not surprising because they were used in the presence of the more experienced attending physicians."[2] The impression given is that NMBDs are tricky substances that might cause harm to the patient if used by an inexperienced anesthetist (in fact, Schmidt *et al.*'s study found a *decrease* (odds ratio [OR] 0.66) in complications associated with their use, albeit nonsignificant (95% CI 0.33–1.33), independent of any effect of the attending physician's presence).[1] We would like to know why Boylan and Kavanagh seem to believe that the use of NMBDs by less experienced anesthetists is hazardous. As far as we can see, the evidence shows that when NMBDs are used, mask ventilation is facilitated,[6] tracheal intubation is easier and less traumatic,[7] more successful in less experienced hands,[8] and facilitated when mask ventilation is impossible.[5] We wonder whether any of the respiratory emergency patients in Schmidt *et al.*'s study had stridor as a result of laryngo-tracheal stenosis? Nouraei *et al.* have shown that these patients achieve better gas flows than they can manage while awake if they are given an NMBD.[9]

Schmidt *et al.* found that opioid use was associated with an increased risk of complications and wrote that *"this is difficult to explain."*[1] An obvious explanation occurs to us, which is the phenomenon of muscle rigidity associated with opioid use.[10] We guess that one or other of the fentanyl-type analgesics is used in the vast majority of induction regimes in the United Kingdom, and it is our experience that the timely use of an NMBD is sometimes vital. If junior anesthetists receive messages that might inhibit their use of muscle relaxants in this not uncommon situation, we, the seniors, have failed them and their patients.

We have no problem with the proposition that tracheal intubation *can* be performed in an apneic patient without the use of NMBDs. However, we are alarmed by the message that we perceive (mistakenly we hope) to be implicit in Schmidt *et al.* and Boylan and Kavanagh's

articles. They make no comment on the fact that residents did not use a NMBD to facilitate *emergency* intubation in 83% of patients. This makes us wonder whether the authors believe that it is in some way virtuous for residents to avoid their use. An inexperienced anesthetist could conclude that he or she might be criticized for giving an NMBD, which raises the awful prospect of a patient perishing while the anesthetist hesitates.

Of course there are patients to whom it is unwise to give an NMBD, but these are mainly those to whom it is unwise to give any sedative drug, plus those with allergies or certain neuromuscular diseases. However, when general anesthesia has been induced we believe that it is more dangerous to inhibit trainees from using NMBDs than to encourage them to use them if they think it might help.[11] In airway management under general anesthesia, NMBDs are much more often the answer than the problem.

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Is Faculty Presence during Emergent Tracheal Intubations Justified?

To the Editor:—We read with interest the prospective trial by Schmidt *et al.*[1] and the accompanying editorial,[2] which suggest that faculty supervision during emergency endotracheal intubations decreases the rate of airway complications. However, as with any observational study, confounders must be considered.

First, several variables suggest that the set of intubations supervised by faculty anesthesiologists may have been slightly less emergent than those accomplished without faculty supervision. The reasons for intubation in the supervised group were more commonly airway protection and "other." The supervised group was more likely to use neuromuscular blockade to accomplish tracheal intubation. The supervised group performed a higher proportion of intubations in the intensive care unit, a setting in which decompensating patients are more likely to be recognized before complete physiologic deterioration. Moreover, unlike some floor settings, intensive care unit beds are uniformly equipped with functioning suction, oxygen, and devices to deliver positive pressure mask ventilation and staffed by support personnel who are more experienced in identifying, mobilizing and participating in emergent clinical scenarios. Regardless of location, urgent and semiemergent intubations are more likely to allow time to assemble a full complement of personnel and equipment, to optimize patient position, and to consider aspiration prophylaxis, all of which should minimize risk of various complications.

Second, as the authors suggest, the presence of a second anesthesia provider, irrespective of the level of training or experience, may facilitate safer tracheal intubation. Based on a multivariate logistic regression analysis of data collected in a prospective multicenter study,[3] tracheal intubation managed by an anesthesia team (including a junior and a senior provider) as opposed to a single senior provider, was shown to protect against airway complications. Our institution's experience and data support the conclusion that a second anesthesia provider, as opposed to a faculty anesthesiologist, is the process characteristic responsible for improved outcomes. The emergency intubation team at our institution includes a junior (CA-1 or CA-2) and senior anesthesiology resident (CA-3 with at least 24 months of laryngoscopic experience). Typically, a faculty member is present when difficult intubation is anticipated. Preliminary analysis of the electronic medical records for 2,460 emergent intubations over a 4-yr period revealed a 2.3% composite complication rate, with no differences based on faculty presence. Operator-reported complications included aspiration (n = 37), dental injury (n = 4), and esophageal intubation (n = 15). Of note, 8.4% of tracheal intubations were accomplished with the aid of a bougie introducer. The availability of this adjunct or providers' experience in its use was not presented by Schmidt *et al.* This may be responsible for the rate of frequent esophageal intubation in their studied population.

Finally, time of day has been shown to affect survival to discharge after cardiopulmonary arrest.[4] The data collection sheet used by Schmidt *et al.*, which was presented in previous work,[5] includes the date and time of intubation. An analysis to evaluate the effect of nighttime or weekend intubations would be helpful. If nighttime intubations, or weekend intubations, or both, result in more complications, the explanation may be decreased faculty presence, but may also be a result of decreased nursing vigilance delaying the recognition of a need for emergency intubation, increased time from code activation to presence of the anesthesiology team, or circadian biologic factors in both patients and staff attempting the intubation.

Faculty presence is the standard of care for intubations in the operating room. Extending this standard to emergency intubations would be desirable if it were to improve patient safety. However, undesirable effects on perioperative patient safety and healthcare costs must also be considered. During nights, weekends, and other periods of limited staffing, emergency intubations may pull on-call faculty away from the operating room or intensive care unit. Dedicated faculty to cover emergent intubations will entail increased on-call commitments and economic costs in many centers. These concerns justify a prospective study in either the intensive care unit or the floor with systematic or even randomized allocation of faculty presence to clarify the con-