Achieving Procedural Competency during Neonatal Fellowship Training: Can Trainees Teach Us How to Teach?

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The ability to manage the airway, including competency with tracheal intubation, is a critical aspect of neonatal care. Not surprisingly, the American Council for Graduate Medical Education (ACGME) Program Requirements for Graduate Medical Education in Neonatal-Perinatal Medicine include intubation as one of the general principles necessary to competently manage critically ill neonates [1]. Unfortunately, multiple factors have placed achieving competency in neonatal tracheal intubation (nTI) during fellowship training at risk. Potential contributing factors include – but are not limited to – work hour restrictions during training, a change in practice in the management of meconium-stained newborns, and increasing use of CPAP in premature infants. Furthermore, as work hour restrictions have been implemented for both pediatric residents and neonatology fellows, it has been necessary to fill those “missing hours” with advance care practitioners, primarily neonatal nurse practitioners [2, 3]. These neonatal care providers also require training, further diluting intubation attempts available to the fellow. Additionally, there are no clinically equivalent training grounds for nTI beyond the delivery room and NICU. This is in contrast to pediatric critical care, where trainees can increase their exposure to pediatric intubations in pediatric operative arenas under

mentorship from anesthesiologists. At present, realistic, simulated newborn airways are not readily available to supplement learner training. Thus, we find ourselves at a crossroads: can we successfully train our learners in a highly technical skill, when procedures are simultaneously increasingly rare and highly sought after?

One innovative way to address this issue would be to improve the effectiveness of how we teach nTI. With that in mind, perhaps a meaningful first step in that process would be to identify the factors current trainees think are the most helpful in achieving competency in nTI. In this issue of *Neonatology*, Brady et al. [4] report these factors, thematically derived from phone interviews, internet surveys, and procedure logs of 42 NPM fellows at 5 ACGME-accredited fellowship programs across the United States. The authors have grouped these reported factors to develop the “5 Ps” – procedure, practice, perceptual environment, personnel, and preparation. They conclude that these themes may aid in the development of validated curriculums aimed at increasing the effectiveness of nTI education.

The “5 Ps” provide guidance to medical educators regarding what trainees have determined to be advantageous to learning nTI. (1) Practice: Ideally, the trainee has become familiar with the procedure through simulated exercises or observation. (2) Perceptual Environment:

This process has also been detailed in other procedural training approaches, which also emphasize the importance of feedback and trainee reflection [5]. Despite potential benefit from these non-patient practice experiences, though, participants in this study noted that real-life repetition of intubations was the most constructive experience for them. NPM fellows also noted that a supportive and calm environment instilled a sense of self-efficacy. (3) Preparation Environment: In the best circumstances, prior to an intubation attempt, necessary equipment and personnel were confirmed, bed height was appropriate, and premedication was administered. (4) Personnel: The importance of premedication prior to the intubation attempt has also been demonstrated in a quantitative fashion previously as increasing procedural success [6, 7]. Additionally, having adequate supervision that maximizes that trainee's attempt at intubation and feedback provision, all in a tranquil environment, was regarded as helpful. (5) Procedure: Interestingly, feedback during the procedure was described as "distracting," in the personnel section; however, the use of direct laryngoscopy and provision of step-by-step guidance regarding technical aspects of performance was felt to be helpful. Furthermore, the use of video laryngoscopy was identified as a beneficial educational tool. Several studies [8–10], including the present study, highlight video laryngoscopy as an educational innovation which is promising.

Some thematic elements described in the study by Brady et al. [4] fit into previously described didactic perspectives on medical procedure education, while others are novel. Organization of procedural education in a standardized framework has been described. For example, Miller's pyramidal hierarchy expanded upon the historic and frequently lacking "see one, do one, teach one" method by acknowledging that appropriate cognitive knowledge should be in place first by "knowing" of and "knowing how" to perform the procedure prior to advancing to the behavioral skills of "showing" how, when the skill is first established, and eventually advancing to "does," meaning the skill is now performed and implemented within the patient care arena [11]. As psychomotor skills expanded outside of the operative suite, a new framework that focused on additional cognitive knowledge incorporation, allowing for more self-reflection and continual improvement, as opposed to delineating skills as acceptable or unacceptable, was developed and evolved to "learn, see, practice, and do" [12].

While we applaud the authors for taking this important first step to improve the training process for nTI, the limitations of the current study must be acknowledged. The "5

Ps" were derived from trainees and based on their perception of what is necessary to achieve competence, but simultaneously assumes that they have not yet achieved it. There is concern that trainees might more readily recall factors associated with the unsuccessful intubations, thus biasing the results. It also would be interesting to know if the themes identified as beneficial evolve as the NPM fellow progresses through training. Furthermore, fellows are likely biased to identify "beneficial" items if they had previously been exposed to that item (for example, video laryngoscopy). There would be no way to identify these beneficial items if the fellow had not previously encountered them in a training situation. Lastly, discrete stages of psychomotor competence have been described, beginning with "unconsciously incompetent," meaning the learner lacks insight into their own skill level, potentially invalidating factors that they feel are necessary for competence [13]. The definition of competence, even when limited to nTI, is uniformly ambiguous and is not formally delineated in this study. To be fair, current training environments for NPM fellows often quantify by self-report the number of intubations performed or attempted, and along with the broad ACGME mandate that fellows must be deemed competent in endotracheal intubation, fellows are eventually entrusted with the responsibility to intubate neonates. This occurs without an agreed upon definition of "competence." What is missing within this decision is a broader discussion of competence, such as the implication of team dynamics, setting-specificity, or permanence on procedural success. The themes described by Brady et al. [4] may possibly be getting at steps that will increase trainee confidence, but do not provide a baseline threshold or measurement of success to determine that these steps will make trainees more competent. There is also no evidence that their increased confidence is correlated with subsequent intubation success. In fact, at least one study in neonatal intubation demonstrates that "excellent" confidence is not associated with equivalent procedural success, and therefore one has to be cautious when conflating the two, though this may be one accessible pathway toward competency [14].

To compliment these data, we posit that it would be useful to incorporate themes derived from a similar study of the trainer/teacher. It is quite likely that the perception about what is beneficial of an experienced teacher, who has mastered the skill of nTI, would be quite different from an inexperienced NPM fellow with a limited number of successful intubations. Would gathering these data from teachers – who by definition are more experienced – get us any closer to knowing what *is actually helpful* compared to what we *think is beneficial*? There may be something to learn

from what the trainee and the teacher simultaneously indicate as important, as well as the items they identify in isolation. Perhaps, only prospective data collection on curricula incorporating “the 5 Ps” can answer whether what NPM fellows *think* is beneficial is *actually* helpful. In fact, other studies have used the starting point of describing current processes for intubation and their overall success, including provider, patient, and procedural characteristics, concluding that success can fluctuate widely [15]. Due to this finding, some potential solutions suggested for advancing procedural education include specific critical care tracks to increase procedural exposure, the use of smartphone technology, optimizing procedural exposure of house staff, and simulation, including “just in time” training and deliberate practice, especially in light of overall decreasing attendance at deliveries during training periods [2, 15–18]. These approaches would likely compliment the “5 Ps” and provide meaningful input from both the trainer and the trainee.

Finally, the implications are likely limited to US-styled training programs where a 3-year NPM fellowship follows a 3-year pediatric residency training period. Whether the same themes and concerns are shared by neonatal trainees that enter their subspecialty training with a different level of experience is unknown. It would be helpful to know whether these same themes exist among other profession-

al groups requiring training in nTI, including anesthesiology, pediatric critical care, neonatal nurse practitioners, respiratory therapists, and physician assistants.

Innovation in medical education is necessary to improve the effectiveness of training. Historically, and in most aspects of current training, experiential learning is the mainstay in medical education. Our learners learn and improve through experience and reflection. Previous studies have determined that many intubation exposures are required for an individual to become competent in the procedure. Until now, little has been studied to help us better understand if an intubation experience can be enriched to make trainee learning more effective. The findings presented by Brady et al. [4] open up the discussion on how we improve our procedural training for NPM fellows. These are critically important issues, and in a way, unique to neonatal training. Diminishing opportunities for procedures are a reality for today’s NPM fellow. The onus is therefore on the educator to become more effective in that role, and perhaps listening to the trainee is the first step in the successful implementation of that goal.

Disclosure Statement

The authors report no conflicts of interest.

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