Combining Anesthesia Non-Technical Skills and peer learning in the operating room

Mary Therese Keating-Biltucci[1], Zahraa Majeed[1], Raymond Zollo[1], Denham Ward[1]

Corresponding author: Mrs Mary Therese Keating-Biltucci mtkb@outlook.com
Institution: 1. University of Rochester
Categories: Educational Strategies, Medical Education (General), Research in Medical Education

Received: 02/06/2017
Published: 07/06/2017

Abstract

In high-risk work environments, such as nuclear power plants, the aviation industry and healthcare, expertise in non-technical skills are vital when ensuring the safety of employees and patients. Although these skills are often exhibited by residents, these concepts are taught and learned as tacit but not explicit models of learning. Our research goals with this project were to discover how best to teach non-technical skills to beginner anesthesiologists using the methodology of peer learning. We used two groups (transcript analysis of interviews and focus group methodologies) of residents to gather pilot data so we could begin to understand how peer learning could be implemented when teaching new anesthesiology residents non-technical skills. Interviews were transcribed and the following themes were prevalent: the fast pace between cases and during the case, their role as an autonomous provider or working in teams, dealing with the unexpected and anticipating situations. They also spoke about missing steps and advocating for the use of lists to remember all key points necessary during a case, reacting to changes and interpreting data from the monitor, and reasoning through why a patient would suddenly start to decompensate. Focus group analysis provided a summative debriefing script that can be utilized to train senior residents to provide peer learning for new anesthesiology residents when teaching Anesthesia Non-Technical Skills. Data from both groups showed evidence of how peer learning could be used to teach ANTS.

Keywords: Peer Learning, Anesthesiologists Non-Technical Skills

Introduction In high-risk work environments, such as nuclear power plants, the aviation industry (Flin, Martin, Goeters, Hörmann, & Amalberti, 2003) and healthcare (Hadi, Griffin, & McCulloch, 2015), expertise in non-technical skills are vital when e
Each new class of anesthesiologists provides challenges for teaching new skills to function as an anesthesiologist. Yet, technical skills necessary for anesthesia delivery are not enough as we are still missing cognitive thinking skills or non-technical skills needed for becoming a proficient anesthesiologist (Fletcher, McGeorge, Flin, Glavin & Maran, 2002). Fletcher, McGeorge, Flin, Glavin and Maran (2002) named this; anesthetists non-technical skills (ANTS) and divided this concept into four broad categories, includes situation awareness, decision-making, task management, and team working. This system could allow educators in anesthesia through deliberate practice (Hastings & Rickard, 2015), a method of measuring resident's anesthesia technical performance as well as non-technical skills such as situation awareness and decision-making (Flin, Patey, Glavin, & Maran, 2010). Expertise for anesthesiologists, we believed, could be achieved by increasing anesthesia performance to higher levels, when residents deliberately practice cognitive thinking competences with non-technical skills (Hastings & Rickard, 2015).

In 2015, anesthesiology educators from our department attempted to improve the process of how we train and evaluate new residents to the operating room with a skill based orientation system. Skill based training was developed by isolating seventeen technical tasks, repeated seven times with observation and sign-off by an attending when the skill was practiced proficiently. This system established technical skills with verification by faculty to authenticate and document competencies for novice anesthesiologists (Breneman, & Karan, 2015). Around the same time, in our residency program, Karan (Karan, Berger, & Wajda, 2015) instituted a series called "confessions" which revealed anonymous concerns of residents regarding the stresses of the OR environment. While both interventions improved the process of training novice anesthesiologist, we believed that a cognitive thinking process might also prove invaluable at providing safer and a more efficient delivery of anesthesia. To accomplish this, we exploreded the notion of peer learning to teach ANTS to beginner anesthesiologists.

Non-Technical Skills

Cognitive or task analysis skills such as those developed by Flin, Patey, Glavin, and Maran, (2010) are behavioral or human factors often developed by residents as tacit skills, that we wished to develop as an explicit set of criteria for assessment. In addition, once trainees were in the OR, they were more likely to provide emergent care that we addressed with Acute Crisis Resource Management sessions, but the need for deliberate teaching and practice of non-technical skills early on in their training indicated a sense of urgency. ANTS, as a teaching and learning concept provides a non-tangible behavioral system that we believed was simply not the same as teaching and learning a new skill. Teaching ANTS provided a challenge to us as we sought to construct a model of learning that new residents would find easy to practice in real time (and not a simulator) in a non-threatening learning environment. Our goal was to use the pilot data on ANTS and peer learning to begin to understand how to teach, develop and assess non-technical skills for new anesthesiology residents. We hypothesized, ANTS skills could be better taught and assessed by another resident (peer) who had one to two years’ experience than an attending.

Methods

Currently, we have sixty-five residents in our program and we began by collecting pilot data from two groups of PGY 1 anesthesiology residents. For the first group, we took 8 residents who began their orientation to the OR, and conducted a series of de-briefing sessions, and with audio transcripts, qualitatively assessed if residents recognized the need for more than technical skills to deliver anesthesia. Over a period of 5 weeks, pairs of residents (4 dyads) who spent a week working together during orientation met at the end of the day, with our non-clinical education specialist to debrief on cases residents participated in that day. We divided the remainder into different pairs so that each week residents were matched with a different person. Debriefings sessions for each pair was transcribed. Data was collected from 3 hours of transcripts that suggested certain themes developed from their experiences during
their first 5 weeks as anesthesiologists.

The second group to provide pilot data included four fourth year anesthesiology residents in a focus group format that was audio recorded, and then qualitatively analyzed for themes to indicate recognition of ANTS skills and how and why they are taught to first year residents.

The University of Rochester RSRB office reviewed the information provided and determined that the activities proposed do not require RSRB review or oversight.

**Results**

In group one, our non-clinical education specialist began the discussion by asking residents; "tell me about your day". Topics that residents repeated or talked over in depth were: the fast pace between cases and during the case, their role as an autonomous provider or working in teams, dealing with the unexpected and anticipating situations. They also spoke about missing steps and advocating for the use of lists to remember all key points necessary during a case, reacting to changes and interpreting data from the monitor, and reasoning through why a patient would suddenly start to decompensate. Much of the discussion could be categorized into themes shown in Figure 1.

| Themes from Pilot Data | Examples |
|------------------------|----------|
| Autonomy & teamwork    | working alone, splitting the work, flying solo, & developing together, working in cramped area, dealing with personalities, sharing responsibilities |
| Reactions & reasoning  | anaphylaxis during procedure, patient de-saturated, almost called code, stopped Tylenol IV drip, reasoned why pt. was de-saturating, questioned allergy, did internet search, questioned causes of Tylenol allergies |
| Organization & details | making sure, not missing steps, not ready, using list, committing to memory, remember to do, doesn't make list, use others list, worries about forgetting, gets in early |
| Anticipating & planning| looked up information, wanted to know prevalence, LMA came out, already started, checking details, preparing for unexpected, critiquing self, going to happen |
| Time                   | scheduled for 45 minutes, no sooner induced, quick turnover, fast pace, time to come in, coming in early |

**Figure 1. Group one debriefing (interview) data**

In summary, debriefing interview analysis indicates the feasibility of peer learning and that themes from transcripts include concepts of non-technical skills noted in Figure 1.

The second group to provide pilot data included fourth year level anesthesiology residents. Through a facilitated focus group format, we sought to explore the notion that fourth year anesthesia residents could recognize the need for non-technical skills and could teach this to less experienced residents. The following represents open-ended questions asked during the focus group session and Figure 2 includes responses to these six questions.
1. How do you plan and prepare for your cases? What works? What doesn’t?
2. How do you prioritize intra-operative activities? Do you re-prioritize?
3. How do you react to poor communication in the operating room team?
4. How can you initiate the exchange of information within the operating room team?
5. How do you maximize or monitor your situational awareness? How do you know when to slow down?
6. How do you balance risks and sort options when the case isn’t going as planned?
1. How do you plan and prepare for your cases? What works? What doesn’t?
   • You learn everything you can about the patient
   • Ask patients for clarification
   • Knowing what the surgeon wants
   • Knowing what others in OR want
   • In the beginning, it was difficult to understand the difference between best practices and attending preferences
   • We have to be flexible about doing things
   • You have to talk to other anesthesia residents to know how others work in the OR

1. How do you prioritize intra-operative activities? Do you re-prioritize?
   • My process is vigilance every couple of seconds and constantly thinking about what I need to do
   • I was taught by another resident to always do scans—or sweeps that review the whole room to check that everything is as should be e.g. maintenance, monitors, meds, I learned how to do this from other residents
   • Constantly re-evaluating the patient
   • Routine sweeps of patient and monitors
   • Sweeps or scans are usually taught by other anesthesiologist residents
   • Many of the maintenance aspects of being an anesthesiologist are taught by our fellow residents and not usually by an attending

1. How do you react to poor communication in the operating room team?
   • Most of the time surgeons don’t know if there are problems with the anesthesia process and if we are good enough we just take care of the problems that arise-
   • We preempt issues or problems
   • Surgeons are very busy and what they do is very complicated so they are very focused on what they need to do
   • There are many times when the surgeon doesn’t tell you things that you need to know
   • Yesterday, I was in a room and noticed pts hemodynamics were changing so I had to ask “hey what’s going on over there?” and the surgeon informed me that they were tugging on the pericardium so that might have caused the changes

1. How can you initiate the exchange of information within the operating room team?
   • You have to be able to speak up in the OR-you develop a voice with greater confidence and experience to voice what you need
   • This can be stressful with a surgeon that is intimidating because you need to tell them to pause what they are doing because you are having a problem ventilating so we have to learning to speak up
   • It’s not always natural for some of us to speak up but we have to learn especially as we become more vested in the patient outcomes
   • I learn from watching my attending’s on how to speak up or in the beginning I would call my attending to speak for me if I found it difficult but at this point I know I have to do this
   • I learned how to do this by imitating their (attending) actions
   • When teaching a CBY we need to tell them that they have to learn to speak up or call their attending to do this

1. How do you maximize or monitor your situational awareness? How do you know when to slow down?
   • You have some limited exposure to these kinds of things but we learn as they happen
   • When an unexpected event happens during a case, there is always the feeling that "this cannot be happening” or ”there is just something wrong with the monitor” but that denial is always there but the re-action time changes and becomes quicker with more experience
   • We learn about some things in real time
   • I had a case on Saturday where we had to flip the patient and everything became disconnected and once I connected things, everything was screwed up and I couldn’t re-ventilate the patient so I called in my attending so I could trouble-shoot with him to figure out what was going on and he helped as a second pair of hands
   • We use differentials as a way to think through problems
   • My attending helped me think everything out so we could problem solve. We both thought out loud together

1. How do you balance risks and sort options when the case is not going as planned?
   • One of the important things to remember is to call an attending or sometimes this means calling a stat but with experience we know the sequence of events that needs to happen like:
     Say; “Dr. _____ please stop the procedure”
     Verbalize; “I have no pulse”
     Verbalize; ”Please call a stat”
     Verbalize “I will start chest compressions”
   • We prioritize based on the patient needs
Figure 2. Group two focus interview data

Overall themes collected from the focus group session were preparation, finding your voice (speaking up), vigilance, and taking care of business (prioritizing). Also, important to the focus meeting results were two statements made by participants. The first one; "Anesthesiology is like learning how to run; "An attending can teach you how to tie your shoes but the person running next to you teaches the mechanics of running" and the second participant when asked "who is the best person to teach you all of the skills we talked about here today?" She responded; "Sometimes it comes better from a resident because they remember feeling that way".

In summary, focus group analysis provides a summative debriefing script that can be utilized to train senior residents to provide peer learning for new anesthesiology residents when teaching Anesthesia Non-Technical Skills.

Discussion

Recognizing that technical skills are not enough when teaching new anesthesiologists, we sought to use the education theory of peer learning (peer teaching), to instruct residents in deliberate practice of anesthesia non-technical skills (ANTS). Each new class of anesthesiologist residents provided new challenges to our departmental educators for teaching cognitive and hands-on skills as novice anesthesiologists. Technical or hands-on skills necessary for anesthesia delivery was not enough and we believed we were still missing cognitive thinking or behavioral skills (non-technical skills) needed for becoming a proficient anesthesiologist. To assist with the teaching of non-technical skills, we looked to peer learning as a method to apply the principles of non-technical skills in real time operating room environments between a beginner and a more senior resident. We used the notion of a "peer" as teacher and as someone who has more experience than the beginner but was not in the position of faculty or attending. This was important, we felt, because someone who had recently achieved these skills might be a better teacher than a more experienced anesthesiologist might. We believed that a seasoned anesthesiologist knew what to do in the OR but could not always recall the thought process they learned or how they came to know what to do to become an expert clinician. Statements made during the focus group session that provided evidence of peer learning were: "I was taught by another resident to always do scans-or sweeps that review the whole room to check that everything is as it should be (e.g. maintenance, monitors, meds). I learned how to do this from other residents" and this statement: "Many of the maintenance aspects of being an anesthesiologist are taught by our fellow residents and not usually by an attending" Senior residents were also asked during the focus group meeting: "Do beginners need to learn this?" and their responses were: "Yes and some do this well and others need to learn it" and "We have to teach residents to ask an attending about what they feel is needed or say: let's talk about the "red flags". Another statement by a senior resident summarized the importance of peer learning with: "An attending can teach you how to tie your running shoes but the person running next to you, teaches you the mechanics of running".

Take Home Messages

Competency in anesthesiology requires learning proficiency in both technical and non-technical (cognitive) skills.

Notes On Contributors

Mary Therese Keating-Biltucci is a non-clinical Education Specialist with CP Rochester.
Zahraa Majeed is a Project Manager with University of Rochester, Department of Anesthesiology.

Dr's Ray Zollo and Denham Ward are both faculty members of University of Rochester, Department of Anesthesiology.

Ms. Biltucci, Dr's Ward and Zollo are recent recipients of Foundations for Anesthesia Education and Research (FAER) Research Education Grant (01/01/2017) titled: "Does facilitated peer learning and coaching improve learning in the first six weeks of training for anesthesia non-technical skills?"

Acknowledgements

In many thanks to my friend and writing partner, Zahraa.

Bibliography/References

Biltucci M.T. (2015). Peer learning in higher and medical education: A literature review. MedEdPublish, 6:7.

https://doi.org/10.15694/mep.2015.006.0007

Breneman, S., & Karan S., (2015) Standardized Cards for Orientation- Resident Evaluation (SCORE). Society for Education in Anesthesiology. Spring Meeting/Seattle WA.

Boud, D., Cohen, R., & Sampson, J. (1999). Peer learning and assessment. Assessment & Evaluation in Higher Education, 24(4), 413-426.

https://doi.org/10.1080/0260293990240405

Colvin, J.W. (2007). Peer tutoring and social dynamics in higher education. Mentor. Tutor. Partnership Learn. 15:165–181.

https://doi.org/10.1080/13611260601086345

Fletcher, G., McGeorge, P., Flin, R, Glavin, R., & Maran, N. (2002). The role of non-technical skills in anaesthesia: a review of current literature. Br J Anaesth. 88: 418–29.

https://doi.org/10.1093/bja/88.3.418

Flin, R., Martin, L., Goeters, K., Hörmann, H-J., & Amalberti, R. (2003). The development of the NOTECHS system for evaluating pilots' CRM skills. Hum Factors Aero Saf. 3:95-117.

Flin, R., Patey, R., Glavin, R., & Maran, N. (2010). Anaesthetists' non-technical skills. British journal of anaesthesia, 105(1), 38-44.

https://doi.org/10.1093/bja/aeq134
Flin, R., O'Connor, P., Crichton, M. (2008). Safety at the Sharp End: A Guide to Non-Technical Skills. Aldershot: Ashgate Publishing Limited.

Glavin, R. J. (2009). Excellence in Anesthesiology The Role of Nontechnical Skills. The Journal of the American Society of Anesthesiologists, 110(2), 201-203.

Gaba, D., Howard, S., Fish, K, et al. (2001). Simulation-based training in anesthesia crisis resource management (ACRM): a decade of experience. Simulation Gaming 32:175–93.

https://doi.org/10.1177/104687810103200206

Groves, P. S. (2014). The Relationship between Safety Culture and Patient Outcomes Results from Pilot Meta-Analyses. Western journal of nursing research, 36(1), 66-83.

https://doi.org/10.1177/0193945913490080

Hadi, M., Griffin, D., & McCulloch, P. (2015, January). Can good non-technical skills during surgery improve patient outcomes? A prospective observational study. In British Journal of Surgery. Vol. 102, pp. 283-283.

Hart, G. (1990). 'Peer learning and support via audio-teleconferencing in continuing education for nurses', Distance Education, 11(2), 308–319.

https://doi.org/10.1080/0158791900110209

Hastings, R. H., & Rickard, T. C. (2015). Deliberate practice for achieving and maintaining expertise in anesthesiology. Anesthesia & Analgesia, 120(2), 449-459.

https://doi.org/10.1213/ANE.00000000000000526

Johnson, D.W., Johnson, R.T., & Smith, K. (2007). The state of cooperative learning in postsecondary and professional settings. Educational Psychology Review, 19:15–29.

https://doi.org/10.1007/s10648-006-9038-8

Karan, S.B., Berger, J.S., & Wajda M. (2015). Confessions of Physicians: What Systemic Reporting Does Not Uncover. Journal of graduate medical education, 7: 528-30.

https://doi.org/10.4300/JGME-D-15-00054.1

Krueger, R.A., & Casey, M.A. (2009). Focus groups: A practical guide for applied research. (4th Ed.). Thousand Oaks, CA: Sage Publications.

Ladyshewsky, R. K., & Gardner, P. (2008). Peer assisted learning and blogging: A strategy to promote reflective practice during clinical fieldwork. Australasian Journal of Educational Technology, 24(3), 241-257.

https://doi.org/10.14742/ajet.1207

Lockspeiser, T. M., O'Sullivan, P., Teherani, A., & Muller, J. (2008). Understanding the experience of being taught by peers: the value of social and cognitive congruence. Advances in Health Sciences Education, 13(3), 361-372.
Henriksen, K., Battles, J. B., Marks, E. S., & Lewin, D. I. (2005). Developing a Taxonomy of Anesthetists' Nontechnical Skills (ANTS)--Advances in Patient Safety: From Research to Implementation (Volume 4: Programs, Tools, and Products).

Matveevskii, A. S., & Gravenstein, N. (2008). Role of simulators, educational programs, and nontechnical skills in anesthesia resident selection, education, and competency assessment. J Crit Care, 23: 167-172.

Murray, D. J., Boulet, J. R., Kras, J. F., Woodhouse, J. A., Cox, T., & McAllister, J. D. (2004). Acute care skills in anesthesia practice: a simulation-based resident performance assessment. Anesthesiology, 101: 1084-1095.

Scavone, B. M., Sproviero, M. T., McCarthy, R. J., Wong, C. A., Sullivan, J. T., & Siddall, V. J., et al. (2006). Development of an objective scoring system for measurement of resident performance on the human patient simulator. Anesthesiology, 105: 260-266.

Schwid, H. A., Rooke, G. A., Carline, J., Steadman, R. H., Murray, W. B., & Olympio, M., et al. (2002). Evaluation of anesthesia residents using mannequin-based simulation: a multiinstitutional study. Anesthesiology, 97: 1434-1444.

Sidi, A. (2014). Challenges in Learning and Assessing Anesthesia Cognitive and Non-technical Skills. Austin J Anesthesia and Analgesia, (4): 1023.

Wadoodi, A., & Crosby, J. R. (2002). Twelve tips for peer-assisted learning: a classic concept revisited. Medical Teacher, 24(3), 241-244.

Wilson, R. M., Michel, P., Olsen, S., Gibberd, R. W., Vincent, C., El-Assady, R., & Larizgoitia, I. (2012). Patient safety in developing countries: Retrospective estimation of scale and nature of harm to patients in hospital. British Medical Journal, 344, e832.

Appendices

Declarations

The author has declared that there are no conflicts of interest.

This has been published under Creative Commons "CC BY 4.0" (https://creativecommons.org/licenses/by-sa/4.0/)