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Article abstract

Background: Rehearsal simulations are patient-specific case-matched tasks performed immediately prior to the actual task, with the objective of improving performance.

Objective: How does rehearsal simulation for antenatal consults impact how residents learn to engage in difficult conversations with families?

Study Design: Residents in the NICU performed case-matched video recorded rehearsal simulations, followed by actual antenatal consults. The purpose of antenatal consults is to prepare parents expecting a complication with their baby before birth. Questionnaires assessed changes in resident confidence and self-assessment of communication skills. Residents were interviewed for qualitative data to explore the overall impact of rehearsal simulation on their learning and performance.

Results: Thirteen residents participated. Rehearsal simulation improved confidence with a more organized approach of medical content and better communication techniques, allowing for a shift of focus from a checklist approach to building rapport and displaying empathy.

Conclusions: While rehearsal simulation did not prepare residents for unexpected parent responses, trainees' increased confidence with medical content organization and communication techniques created space for reflection-in-action and compassionate approaches.



Rehearsal simulation for antenatal consults

Les simulations préparatoires aux consultations prénatales

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Abstract

Background: Rehearsal simulations are patient-specific case-matched tasks performed immediately prior to the actual task, with the objective of improving performance.

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Résumé

Contexte : Les simulations préparatoires correspondent à des cas spécifiques de patients et elles sont effectuées immédiatement avant l'intervention réelle, dans le but d'améliorer la performance.

Objectif : Comment la simulation préparatoire pratiquée avant une consultation prénatale influence-t-elle la manière dont les résidents apprennent à engager une conversation difficile avec les familles?

Méthodes : Les résidents de l'unité de soins intensifs néonataux ont effectué des simulations préparatoires adaptées à la situation clinique à venir, qui ont été filmées. Ils ont par la suite effectué les consultations prénatales réelles. L'objet des consultations prénatales est de préparer les parents lorsque des complications sont anticipées, et ce avant la naissance de leur bébé. Nous avons évalué les changements au niveau de la confiance des résidents et l'autoévaluation par ces derniers de leurs compétences en communication par le biais de questionnaires. Les résidents ont participé à une entrevue, qui a fourni les données qualitatives afin d'explorer l'impact global de la simulation sur leur apprentissage et leur performance.

Résultats : Treize résidents ont participé à l'étude. La simulation préparatoire a rehaussé leur confiance en eux, car elle les a aidés à adopter une approche plus organisée du contenu médical et de meilleures techniques de communication, permettant de passer d'une approche par « cases à cocher » à une approche basée sur l'établissement d'un lien avec les parents et à la manifestation d'empathie.

Conclusions : Bien que la simulation préparatoire n'ait pas préparé les résidents aux réactions inattendues des parents, la confiance accrue des stagiaires en leur capacité à organiser le contenu médical et en leurs techniques de communication a laissé place à la réflexion dans l'action et aux approches compatissantes.

Introduction

Whether it is breaking bad news about a sick infant, or preparing for extreme prematurity, residents often feel challenged by difficult conversations with parents in the newborn intensive care unit (NICU). Anxiety with inexperience, limited practical communication techniques, and high intensity situations are often contributing factors.^{1,2} Trainees tend to fall back on protocols and checklists, which, though well-intentioned, can hinder compassionate communication.³

There are many examples of using simulation training for teaching communication skills.⁴⁻⁷ However, simulation training is often limited by high time and resource requirements, a lack of realism, and limited relevant and transferrable knowledge or skills into actual clinical practice, which also decay with time.³ This had led to the development of different types of simulations designed to overcome some of the limitations of previous simulations. For example, *warm-up* simulations, akin to an athlete stretching before a race, are exercises performed immediately prior to an actual task, but are neither patient nor skill specific. Warm-up exercises using simulations of generic laparoscopic tasks such as virtually placing a ring on a peg were promising for improving surgical performance;^{8,9} even a generic balance video game on mobile phones was associated with better laparoscopic surgery skills (10). Other studies have used warm-up exercises that match the actual task, such as simulations for fibre optic intubation in the anesthesia literature,¹¹ or a virtual reality simulation of a laparoscopic colectomy.¹²

Similar to how educators need to rehearse a simulation scenario to ensure it runs smoothly, learners can rehearse complex tasks to improve performance.¹³ *Rehearsal* simulation is also performed immediately prior to an actual task and is both task and patient matched. For example, surgeons who participated in rehearsal simulation based on patient specific imaging data to map carotid artery branches performed better during the actual carotid artery stenting.¹⁴⁻¹⁷ Since rehearsal simulations are performed immediately prior to the actual task, this limits decay of knowledge or skills over time;¹⁸ and being in situ, there is the benefit of being familiar with the actual clinical environment and space, which adds realism.¹⁹ Congruent with principles of learning sciences, where effective feedback and practice improve performance, it follows that rehearsal simulation of a complex task with immediate feedback before the actual task should improve

performance of the actual task.²⁰ Surgeons simply mentally rehearsing an impending surgery, without performing any physical simulation, also benefited from improved skills, decreased stress for the actual surgical task, and improved communication with their team.²¹⁻²³

If rehearsal simulation is effective for procedural skills and team communication, can it be applied to patient and family communication skills? The objective of our study was to explore how rehearsal simulations for antenatal consults affect how residents learn to engage in difficult conversations with families in the NICU. This initial study was a feasibility study that focused on the trainee experience with rehearsal simulation, with the possibility of more objective measures of the impact of rehearsal simulation on communication and empathy in future studies.

Methods

We conducted this study in the NICU context, where difficult conversations with families occur frequently. Using convenience sampling,²⁴ all pediatric, obstetrical, and junior neonatal-perinatal medicine sub-specialty residents completing an NICU rotation at one Canadian academic institution were invited to participate, all of whom would be considered relatively novice to antenatal consults. Antenatal consults are usually requested of the Neonatology team from the Obstetrical team before delivery for families expecting complications with their baby. For example, the team may be asked to counsel regarding a congenital anomaly identified or discuss goals of care with a family expecting an extremely premature infant at the limits of viability. The study protocol is outlined in Figure 1. Once a requested antenatal consult was identified and participant consent was obtained, the patient chart was reviewed for relevant medical and social history, as per standard clinical practice. Participants completed the Pre-Simulation written questionnaire for a self-assessment of communication skills and level of confidence entering the consult. The questionnaire was developed for this study and aimed to explore how rehearsal simulation can impact the trainee's self-perception. The questionnaire consisted of Likert scales that described the trainee's self-assessment of preparedness, communication skills, rapport building skills, confidence, and anxiety.



Figure 1. Study protocol

A research team member, who was a senior sub-specialty resident or nurse practitioner in the NICU who would normally supervise residents to perform such antenatal consults, then conducted a video recorded rehearsal simulation with the resident based on the details of the anticipated antenatal consult. If the consult involved a teenage mother with threatened preterm labour at 26 weeks gestation, for example, the rehearsal simulation would match these details as much as possible, with a research team member role-playing the character of the mother. While some actual antenatal consults involved partners and family members of the pregnant woman, for logistical convenience, all rehearsal simulations only involved a simulated mother. The entire consultation was rehearsed during the simulation, which usually lasted 15-20 minutes. The resident and research team member then debriefed using the recorded video, discussing constructive feedback and self-assessment, which took another 15-20 minutes.

Immediately after the video debrief, the residents then conducted the actual antenatal consult with parents, under direct observation by the same research team member. Residents only performed consults at the level of complexity that they would normally be expected to complete. For example, high stakes decision making consults for peri-viability would not be performed by junior residents. Once the actual consult was complete, the Post-Simulation questionnaire, which was identical to the Pre-

Simulation questionnaire, was completed by the resident. These steps in the study protocol are similar to the essential elements for cognitive rehearsal for stressful encounters as described by Clark et al., where there is pre-briefing through the chart review, identifying potential challenges, deliberate practice through the rehearsal simulation, and debriefing; all prior to the actual consult.²⁵

A final wrap-up in-person interview between the research team member and resident explored the experience of the rehearsal simulation, how it affected the actual antenatal consult with parents, and how it contributed to learning. The answers to the post-simulation questionnaire were used as a starting point, exploring how the experience may have changed the trainee's perception of preparedness, confidence, anxiety. This final wrap-up interview lasted 20-30 minutes, was audio-recorded and transcribed, and field notes were made. Of note, only the wrap-up interview data were retained, transcribed, and coded. The video-recorded rehearsal simulations and debriefing sessions were not retained or analyzed. All data were collected over the course of one year.

Data analysis of the Pre and Post-simulation questionnaires looked for trends of changes in self-assessment of communication skills and level of confidence. Due to small numbers, we were not focused on a statistically significant quantitative result but looked at any changes in self-assessments and used the questionnaire responses to stimulate discussion during the interview. For example, if residents reported an improvement in skills, we explored how they felt the rehearsal simulation could have contributed to this improvement. Qualitative data from wrap-up interviews were analyzed thematically²⁶ for how the rehearsal simulation experience impacted residents' learning and actual consult performance, using a constant comparison approach, where initial findings shaped questions explored at subsequent interviews.²⁴ Data analysis started with *initial coding* to identify preliminary codes, then developed *focused codes* by grouping recurrent initial codes into themes. The coding of the transcripts was completed initially by the primary investigator (AC). Coding that required further depth and clarification was discussed amongst the research team until consensus was met. The team debriefed at each stage of the analytical process to ensure rigor, credibility, originality, resonance and usefulness of the data generated.²⁴ We ceased data collection when data analysis reached thematic sufficiency; that is, although we recognized that we might learn new information by

interviewing additional participants, we determined that the data collected were sufficient to inform our research question.²⁷

All research procedures were approved by the Health Sciences Research Ethics Board of the University of Western Ontario.

Results

Fourteen residents were invited and consented to participate in the study. One resident did not actually undergo rehearsal simulation due to unexpected time constraints. Data for 13 residents doing 13 rehearsal simulations and antenatal consults were collected. Ten residents were in their 1st year, two were in 2nd year, and one was in 3rd year of training. The rehearsal simulation and video debrief added approximately 30-40 minutes to the typical time required to complete the actual consult. During the wrap-up interview, rehearsal simulation was reported to be worthwhile, and a positive experience overall by all residents, and would be recommended to other residents. However, one participant commented on the emotional toil of rehearsal simulation in addition to the extra time required: "It's an exhaustive process, emotionally draining to have a difficult conversation twice." (Participant 10).

The Pre-Simulation questionnaire indicated that most residents were initially positive about their skills: they felt somewhat prepared, reported good skills in communication and building relationships, were somewhat confident and yet still anxious. In the Post-Simulation Questionnaire, most reported that they had improved in those same areas. Residents who had reported initial higher levels of confidence and skill still perceived improvement after the rehearsal simulation. When we explored reasons for why there was this perceived improvement, participants described that the video recorded rehearsal simulation was helpful for learning medical content and its organization and gave them insight about specific communication techniques. With both of these learning points fresh in their minds, they then described a shift of focus from a checklist approach to a relational and rapport building approach with actual families. We will describe each of these findings.

When asked how trainees usually prepared for antenatal consults, most had a checklist of information they reviewed and memorized. In the context of antenatal consults, "I would review the gestational age, and the statistics associated with outcome for that age so that I could answer

the parents' questions. I would also go over the most likely problems that would occur at that gestational age so I could prepare parents." (Participant 11). Despite already reviewing this checklist in preparation, actually performing the rehearsal simulation allowed residents to practice delivering that content in an organized approach: "Prior to the rehearsal simulation, we had already discussed the medical facts, so I felt somewhat ready. But it improved after the simulation because the debriefing helped me improve how I structure my conversation. I felt more prepared." (Participant 2). Participants described the rehearsal simulation and debriefing session being helpful for "organizing" and "streamlining" the content, leading to "better flow" of the conversation. This included decisions about what content to discuss first: "The simulation helped me be more organized, stepwise, addressing the big elephants in the room first (mortality and morbidity), getting them out of the way." (Participant 11). This improved organization and prioritizing medical content then led to decreased anxiety going into the actual conversation with parents; "Simulation helped me arrange my thoughts, planning my points, to stress the important points, starting with the introduction. I was more confident after, clearer ideas now. I'm less anxious." (Participant 9). Rehearsal simulation, therefore, served not only as a review of the checklist of content, but helped residents plan an organized approach to deliver that content, which led to increased confidence.

Residents also reported that rehearsal simulation offered them insight about their communication techniques. Akin to athletes watching their own performance with the aim to improve each movement, residents found the video debriefing portion of the rehearsal simulation most helpful. While most were aware of what constitutes as good general communication skills, watching themselves perform those skills on video helped them see what parents see. Participants often felt awkward seeing themselves on a screen initially, but later realized its usefulness:

"The video made me more aware of my mannerisms with parents. I was a lot less anxious seeing the video and being happy with the results...it was a bit awkward to watch the video, but it is helpful to see your body language and expressions, in case there is something you want to change if you're coming across differently than you thought." (Participant 12).

While this resident was reassured in watching her own performance, other residents realized through the video

that they were not happy with what they saw and needed to improve how they communicate:

“Rehearsal simulation helps you see yourself, like a mirror. I realized my communication needed improvement, I wasn’t at par. I had low or average skills. Simulation was helpful to correct some of those skills, to make yourself more aware right before the actual consult, because you know you’re about to do the actual consult!” (Participant 4).

By looking into this “mirror”, residents were able to identify specific communication techniques they learned, such as “better phrasing that was more clear (sic), so I communicated to mom with more clarity” (Participant 11) and using simpler lay language to explain nuanced information to parents; “...to practice how to word things, especially difficult pieces of information, such as chances of survival, and discussing possible things that could go wrong...using less medical words and better phrasing.” (Participant 12). The video offered opportunities for self-awareness of these communication techniques, which were “fresh on my mind,” and allowed residents to enact these learning points in the imminent actual conversation with the family: “The video helped me be more self-aware of my skills...I realized I didn’t sound confident, so I improved that during the actual consult.” (Participant 6). Whether it was reassurance that they were communicating well, or realization of shortfalls in their skills, the rehearsal simulation helped residents learn specific communication techniques.

Having just rehearsed the medical content and its organization, along with new insights on how to improve communication techniques, participants described the ability to then shift their focus from their initial checklist to building rapport with the family: “Knowing the medical facts, I was able to focus more on the relationship with mom, I was more relaxed and more empathetic.” (Participant 6). This ability to feel more “relaxed” in the conversation often stemmed from increased confidence; “I just had a checklist at first, but I learned to be more personable...my confidence improved...I built better rapport in the actual conversation than in the simulation.” (Participant 3). This shift from a more technical to relational approach was the reason most residents felt they performed better in the actual consult.

This relational approach is required because interpersonal challenges and intense parent emotions cannot be predicted, and therefore, could not be case matched and

specifically rehearsed; “Simulation can’t address how parents will react; you could have different responses. Simulation may be more straightforward than the actual parents. Anxiety is improved but will always be there because of unexpected parent responses.” (Participant 8). Another participant described difficult conversations as “volatile” because of all the unanticipated responses and questions that could arise. In addition to emotional responses, other unplanned events could not be predicted in rehearsal simulation; “I felt worse in the actual consult than the simulation. I didn’t follow the structure I had planned because of all the unexpected patient questions and nursing interruptions.” (Participant 2). Trainees recognized that they “still need to adapt to the actual situation. However, the simulation helps you learn to adapt.” (Participant 3).

Discussion

While the literature is supportive of rehearsal simulations for technical or surgical tasks, its impact on non-technical tasks, such as communicating with patients and families, has not been well described. *Mental imagery practice*, defined as “symbolic rehearsal of an activity in the absence of any gross-muscular movements”, to rehearse a cognitive task has been reported to be limited in its effectiveness.²² For example, mental imagery practice to rehearse for crisis management and resuscitation in anesthesia did not yield objective improvements in performance, especially in the novice.^{28,29}

While difficult conversations with families does not involve any procedural or hands-on skills in a traditional sense, it does involve components that are routine and recurrent, as well as aspects that require reflective, nuanced decision making. Routine and recurrent components can be learned through a checklist, algorithm, or guideline. This would include medical content knowledge, mapping the agenda or organization of the consult, generic communication techniques such as asking parents if they have questions or ensuring confidentiality, and specific communication techniques, such as word phrasing of sensitive topics and limiting medical jargon.³¹ Reflective and nuanced decision-making aspects include navigating unexpected responses and questions from parents, dealing with uncertainty and intense emotions, changing one’s communication style, word choices, or enactment of compassion and empathy to match different parents’ needs. These aspects cannot be learned through reading only and require more active learning activities. These reflective and nuanced decision-

making skills are needed to astutely ask how the conversation is currently going to make decisions about how to proceed in real time, resonating with *reflection-in-action*, or “thinking on your feet.”³²⁻³⁴

Our study suggests that rehearsal simulation can be useful for preparing trainees for the routine and recurrent aspects of difficult conversations, and may be facilitative towards allowing for reflection-in-action. The benefits of a medical case matched simulation was not extended to match the unexpected questions and emotional reactions parents may exhibit, which have been identified by residents as what causes anxiety.³⁵ While the participant comment regarding the emotional toil may infer there was realism of the rehearsal simulation, the emotional strain needs to be considered. Despite these limitations, our participants suggested that increased confidence in the routine and recurrent aspects allowed for greater focus on their relationship with the family.

While parents desire for health care providers to be more willing to abandon their agenda to be more “human”, compassionate, and respectful, trainees can be unwilling to let go of their checklist approach when uncertain about medical content details.^{3,36} Rehearsal simulation may be helpful as a source of *just-in-time information*, defined as information needed for recurrent aspects of a task,³⁷⁻³⁹ in this case, the medical content and its organization and communication techniques. When reviewed immediately prior to the actual consult, there is less decay of learning. This enabled trainees in our study to feel confident enough about these routine aspects to be able to focus on the reflective aspects of building rapport with families, navigating emotions and questions, deviating from the checklist when appropriate. Just-in-time information, such as specific word phrasing choices, explaining medical jargon, general techniques to express empathy, were reported by our participants to contribute to improved confidence in the actual consult. Practicing out loud and hearing oneself speak, rather than just reviewing medical information mentally, helped organize and prioritize that information, which decreased anxiety. Improving these skills can have an indirect impact on creating the space required for reflective skills and nuanced decision making.

Future studies can explore the efficacy of various elements of rehearsal simulations objectively using standardized empathy and communication assessment tools and parental feedback,⁴⁰⁻⁴² and can be expanded beyond the NICU context. Using standardized patients trained in displaying realistic emotional reactions instead of NICU

colleagues known to the trainee would add realism to the simulation, which was a limitation in our study. Given the added time burden, it would not be feasible to routinely implement rehearsal simulations for all trainees and all antenatal consults, but it can be used selectively for more junior trainees. Instead of creating a blueprint to cover every possible challenge that could arise in difficult conversations, we need to teach trainees to practice reflection-in-action that will help them to navigate successfully each unique challenging situation and respond to worried parents with compassion.^{35,43}

Conclusions

Rehearsal simulation for antenatal consults provided to residents just-in-time information about medical content, its organization, and communication techniques. This led to increased confidence and decreased anxiety during NICU consults with parents, which created space for reflection-in-action, thus fostering an empathetic and compassionate approach in difficult conversations.

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References

1. Kersun L, Gyi L, Morrison WE. Training in difficult conversations: a national survey of pediatric hematology-oncology and pediatric critical care physicians. *J Palliat Med*. 2009;12(6):525-30. <https://doi.org/10.1089/jpm.2008.0251>
2. Orgel E, McCarter R, Jacobs S. A failing medical educational model: a self-assessment by physicians at all levels of training of ability and comfort to deliver bad news. *J Palliat Med*. 2010;13(6):677-83. <https://doi.org/10.1089/jpm.2009.0338>
3. Mazor KM, Ockene JK, Rogers HJ, Carlin MM, Quirk ME. The relationship between checklist scores on a communication OSCE and analogue patients' perceptions of communication. *Adv Health Sci Educ Theory Pract*. 2005;10(1):37-51. <https://doi.org/10.1007/s10459-004-1790-2>
4. Colletti L, Gruppen L, Barclay M, Stern D. Teaching students to break bad news. *Am J Surg*. 2001;182(1):20-3. [https://doi.org/10.1016/S0002-9610\(01\)00651-1](https://doi.org/10.1016/S0002-9610(01)00651-1)
5. Garg A, Buckman R, Kason Y. Teaching medical students how to break bad news. *CMAJ*. 1997;156(8):1159-64.

6. Rosenbaum ME, Kreiter C. Teaching delivery of bad news using experiential sessions with standardized patients. *Teach Learn Med.* 2002;14(3):144-9. https://doi.org/10.1207/S15328015TLM1403_2
7. Bosse HM, Nickel M, Huwendiek S, Junger J, Schultz JH, Nikendei C. Peer role-play and standardised patients in communication training: a comparative study on the student perspective on acceptability, realism, and perceived effect. *BMC Med Educ.* 2010;10:27. <https://doi.org/10.1186/1472-6920-10-27>
8. Lee JY, Mucksavage P, Kerbl DC, Osann KE, Winfield HN, Kahol K, et al. Laparoscopic warm-up exercises improve performance of senior-level trainees during laparoscopic renal surgery. *J Endourol.* 2012;26(5):545-50. <https://doi.org/10.1089/end.2011.0418>
9. Kanav Kahol RMS, John Ferrara, Marshall L Smith. Effect of short-term pretrial practice on surgical proficiency in simulated environments: a randomized trial of the "preoperative warm-up" effect. *J Am Coll Surg.* 2009;208:255-68. <https://doi.org/10.1016/j.jamcollsurg.2008.09.029>
10. Plerhoples TA, Zak Y, Hernandez-Boussard T, Lau J. Another use of the mobile device: warm-up for laparoscopic surgery. *J Surg Res.* 2011;170(2):185-8. <https://doi.org/10.1016/j.jss.2011.03.015>
11. Samuelson ST, Burnett G, Sim AJ, et al. Simulation as a set-up for technical proficiency: can a virtual warm-up improve live fibre-optic intubation? *Br J Anaesth.* 2016;116(3):398-404. <https://doi.org/10.1093/bja/aev436>
12. Araujo SE, Delaney CP, Seid VE, et al. Short-duration virtual reality simulation training positively impacts performance during laparoscopic colectomy in animal model: results of a single-blinded randomized trial : VR warm-up for laparoscopic colectomy. *Surg Endosc.* 2014;28(9):2547-54. <https://doi.org/10.1007/s00464-014-3500-3>
13. Ahmed RA, Hughes PG, Gardner AK. Simulation scenario rehearsal: the key to successful and effective simulations. *BMJ simulation & technology enhanced learning.* 2018;4(4):157-8. <https://doi.org/10.1136/bmjstel-2018-000343>
14. Hislop SJ, Hedrick JH, Singh MJ, et al. Simulation case rehearsals for carotid artery stenting. *Eur J Vasc Endovasc Surg.* 2009;38(6):750-4. <https://doi.org/10.1016/j.ejvs.2009.08.011>
15. Willaert WI, Aggarwal R, Van Herzele I, et al. Role of patient-specific virtual reality rehearsal in carotid artery stenting. *Br J Surg.* 2012;99(9):1304-13. <https://doi.org/10.1002/bjs.8858>
16. Roguin A, Beyar R. Real case virtual reality training prior to carotid artery stenting. *Catheter Cardiovasc Interv.* 2010;75(2):279-82. <https://doi.org/10.1002/ccd.22211>
17. Patel AD, Gallagher AG, Nicholson WJ, Cates CU. Learning curves and reliability measures for virtual reality simulation in the performance assessment of carotid angiography. *J Am Coll Cardiol.* 2006;47(9):1796-802. <https://doi.org/10.1016/j.jacc.2005.12.053>
18. Wang EE, Quinones J, Fitch MT, et al. Developing technical expertise in emergency medicine--the role of simulation in procedural skill acquisition. *Acad Emerg Med.* 2008;15(11):1046-57. <https://doi.org/10.1111/j.1553-2712.2008.00218.x>
19. Kurup V, Matei V, Ray J. Role of in-situ simulation for training in healthcare: opportunities and challenges. *Curr Opin Anaesthesiol.* 2017;30(6):755-60. <https://doi.org/10.1097/ACO.0000000000000514>
20. Bing-You R, Hayes V, Varaklis K, Trowbridge R, Kemp H, McKelvy D. Feedback for learners in medical education: what is known? a scoping review. *Acad Med.* 2017;92(9):1346-54. <https://doi.org/10.1097/ACM.0000000000001578>
21. Immenroth M, Burger T, Brenner J, Nagelschmidt M, Eberspacher H, Troidl H. Mental training in surgical education: a randomized controlled trial. *Ann Surg.* 2007;245(3):385-91. <https://doi.org/10.1097/01.sla.00000251575.95171.b3>
22. Weller JM. Improving procedural performance through warm-up and mental imagery. *Br J Anaesth.* 116. England 2016. p. 315-7. <https://doi.org/10.1093/bja/aev543>
23. Sanders CW, Sadoski M, Bramson R, Wiprud R, Van Walsum K. Comparing the effects of physical practice and mental imagery rehearsal on learning basic surgical skills by medical students. *Am J Obstet Gynecol.* 2004;191(5):1811-4. <https://doi.org/10.1016/j.ajog.2004.07.075>
24. Charmaz K. Constructing grounded theory: a practical guide through qualitative analysis. 2006.
25. Clark CM. Combining Cognitive Rehearsal, Simulation, and Evidence-Based Scripting to Address Incivility. *Nurse Educ.* 2019;44(2):64-8. <https://doi.org/10.1097/NNE.0000000000000563>
26. Gareth Terry NH, Victoria Clarke & Virginia Braun. The SAGE handbook of qualitative research in psychology. 2017 2020/05/07. 55 City Road 55 City Road, London: SAGE Publications Ltd Thematic Analysis. Available from: <http://sk.sagepub.com/reference/the-sage-handbook-of-qualitative-research-in-psychology>.
27. Watling CJ, Lingard L. Grounded theory in medical education research: AMEE Guide No. 70. *Med Teach.* 2012;34(10):850-61. <https://doi.org/10.3109/0142159X.2012.704439>
28. Hayter MA, Afsari BM, Riem N, Chiu M, Boet S. Does warm-up using mental practice improve crisis resource management performance? A simulation study. *British Journal of Anaesthesia.* 2013;100(2):299-304. <https://doi.org/10.1093/bja/aes351>
29. Gabbott B, Tennent D, Snelgrove H. Effect of mental rehearsal on team performance and non-technical skills in

- surgical teams: systematic review. *BJS open*. 2020;4(6):1062-71. <https://doi.org/10.1002/bjs5.50343>
30. Moppett I, Sevdalis N. From pilots to Olympians: enhancing performance in anaesthesia through mental practice. *Br J Anaesth*. 110. England 2013. p. 169-72. <https://doi.org/10.1093/bja/aes472>
 31. Boss RD, Donohue PK, Larson SM, Arnold RM, Roter DL. Family conferences in the neonatal ICU: observation of communication dynamics and contributions. *Pediatr Crit Care Med*. 2016;17(3):223-30. <https://doi.org/10.1097/PCC.0000000000000617>
 32. Epstein RM, Siegel DJ, Silberman J. Self-monitoring in clinical practice: a challenge for medical educators. *J Contin Educ Health Prof*. 2008;28(1):5-13. <https://doi.org/10.1002/chp.149>
 33. Schön D. The reflective practitioner how professionals think in action 1983.
 34. Kinsella EA. Professional knowledge and the epistemology of reflective practice. *Nurs Philos*. 2010;11(1):3-14. <https://doi.org/10.1111/j.1466-769X.2009.00428.x>
 35. Cheng A, LaDonna K, Cristancho S, Ng S. Navigating difficult conversations: the role of self-monitoring and reflection-in-action. *Med Educ*. 2017;51(12):1220-31. <https://doi.org/10.1111/medu.13448>
 36. Armentrout D, Cates LA. Informing parents about the actual or impending death of their infant in a newborn intensive care unit. *J Perinat Neonatal Nurs*. 2011;25(3):261-7. <https://doi.org/10.1097/JPN.0b013e3182259943>
 37. Vandewaetere M, Manhaeve D, Aertgeerts B, Clarebout G, Van Merriënboer JJ, Roex A. 4C/ID in medical education: How to design an educational program based on whole-task learning: AMEE Guide No. 93. *Med Teach*. 2015;37(1):4-20. <https://doi.org/10.3109/0142159X.2014.928407>
 38. Susilo AP, van Merriënboer J, van Dalen J, Claramita M, Scherpbier A. From lecture to learning tasks: use of the 4C/ID model in a communication skills course in a continuing professional education context. *J Contin Educ Nurs*. 2013;44(6):278-84. <https://doi.org/10.3928/00220124-20130501-78>
 39. Janssen-Noordman AM, Merriënboer JJ, van der Vleuten CP, Scherpbier AJ. Design of integrated practice for learning professional competences. *Med Teach*. 2006;28(5):447-52. <https://doi.org/10.1080/01421590600825276>
 40. Myerholtz L. Assessing family medicine residents' communication skills from the patient's perspective: evaluating the communication assessment tool. *J Grad Med Educ*. 2014;6(3):495-500. <https://doi.org/10.4300/JGME-D-13-00347.1>
 41. Katsari V, Tyritidou A, Domeyer P-R. Physicians' self-assessed empathy and patients' perceptions of physicians' empathy: validation of the greek jefferson scale of patient perception of physician empathy. *BioMed research international*. 2020;2020:9379756- <https://doi.org/10.1155/2020/9379756>
 42. De Haes JCJM, Oort FJ, Hulsman RL. Summative assessment of medical students' communication skills and professional attitudes through observation in clinical practice. *Med Teach*. 2005;27(7):583-9. <https://doi.org/10.1080/01421590500061378>
 43. Fryer N, Boot M. Beyond you and I: role play and reflection-in-action in communication training. *Reflective practice*. 2017;18(1):112-22. <https://doi.org/10.1080/14623943.2016.1251413>