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# Stress to Success: Leveraging Crisis Resource Management to Enhance Non-Technical Skills in Anesthesia Training



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## Abstract

Simulation has become a fundamental educational tool in medical training since the creation of the first simulator in the mid-20<sup>th</sup> century. Initially focused on technical skills, the introduction of Anesthesia Crisis Resource Management (ACRM) in the 1980s shifted the focus to non-technical skills responsible for much of the medical error, emphasizing crisis management, decision making, and team communication. The Anesthesiology Residency Program at the University of Toronto incorporates these principles to enhance the non-technical skills of anesthesia residents. The program features three main pillars: high-fidelity simulation, focus on anesthesia non-technical skills (ANTS), and debriefing. High-fidelity simulations expose residents to critical scenarios with a focus on improving clinical performance and reducing errors. ANTS training addresses situational awareness, teamwork, task management and decision making, all factors that play a critical role in patient safety and error reduction. Debriefing sessions, based on the PEARLS framework and the “debriefing with good judgment” model, promote reflective learning and cognitive reframing, allowing residents to hone their decision-making and emotional management in high-pressure situations. The program’s consistency across the four years of residency ensures continued development of non-technical skills, enhancing competency and readiness for national assessments such as the Canadian National Anesthesia Simulation Curriculum (CanNASC). This structured, longitudinal, crisis-focused approach can serve as a global benchmark. By aligning with the CanMEDS framework and national standards, the program exemplifies the effectiveness of simulation-based education in preparing the next generation of anesthesiologists.

**Keywords:** Simulation; Crisis Resource Management; Non-Technical Skills; Debriefing with Good Judgement

**Abbreviations:** ACRM: Anesthesia Crisis Resource Management; ANTS: Anesthetist Non-Technical Skills; PGY: Postgraduate year; CanNASC: Canadian National Anesthesia Simulation Curriculum; UHT: Unity Health Toronto; CRM: Crew Resource Management; RCPSC: Royal College of Physicians and Surgeons of Canada

## Introduction

In the 1980s, Dr. David Gaba introduced the concept of Anesthesia Crisis Resource Management (ACRM) [1], and paved the path for how simulation could be used to teach non-technical skills within medicine. Since then, the number of simulation centers has not stopped growing and most current anesthesia training include ACRM into their curriculum [2]. Adapted from aviation crew resource management (CRM) principles, ACRM focuses on improving team communication, leadership, and situational awareness in crisis situations [1]. It enables residents to sharpen their critical thinking and decision-making skills under high-pressure conditions without placing patients at risk, while

also protecting residents from potentially damaging psychological stress [1].

Additionally, growing literature on simulation-based medical education suggests that it can effectively enhance four out of the seven competencies outlined on the CanMeds framework: medical expert, collaborator, communicator and professionalism [3]. The CanMEDS framework, developed by the Royal College of Physicians and Surgeons of Canada (RCPSC), outlines seven core competencies that are essential for effective medical practice and has served as foundation for medical education curriculum and professional development. Our ACRM program at the Department

of Anesthesiology and Pain Medicine, University of Toronto and Department of Anesthesia, Unity Health Toronto is part of the anesthesia training at the University of Toronto, and has been in place for several years [4].

It has become an invaluable tool for the education of our residents and fellows, providing a robust and structured means of developing both technical and non-technical skills, with a stronger focus on the latter [5]. Through consistent crisis-based training, comprehensive briefing, and structured debriefing, our program is not only aligned with national education and assessment standards, but also improves residents' ability to respond efficiently in a crisis, thereby increasing patient safety [3]. We base our ACRM program in three main pillars: high fidelity simulation, anesthetist non-technical skills training and debriefing. Our first pillar, high fidelity simulation, allows the creation of both common, uncommon and extremely rare scenarios that an anesthesiologist may only face once-or never-in a lifetime, allowing those who face them to perform better, reduce their errors, and improve their results. In addition, since the scenarios are easily controllable, multiple residents can be exposed to the same conditions repeatedly, allowing for a standardized approach towards training.

Anesthetist non-technical skills (ANTS) training, the second pillar of our ACRM program, play an indispensable role in the safe practice of anesthesia, encompassing situational awareness, teamwork, task management and decision making [6]. Studies indicate that a significant percentage of anesthesia-related errors are due to failures in these non-technical domains rather than technical incompetence [7], suggesting that training in these skills would decrease the number of evitable mistakes. Our program is heavily focused on ANTS since it's been shown that improved performance in this domain in a simulated setting translates to excellence in interdisciplinary communication and teamwork in the operating room [8].

Finally, the third pillar of our simulation program is the debriefing process, which usually takes approximately twice the time the resident encountered in the simulation scenario. In our simulation center, we use the "debriefing with good judgement" model [9], within the PEARLS debriefing framework [10], which encourages reflective learning and cognitive reframing rather than mere critique of observed actions. Through a four-stage process, we create a psychologically safe environment in which residents can vent their emotions, explore their decision-making processes, uncover cognitive biases, and improve their future performance. The emphasis on understanding thought processes rather than simply addressing errors aligns with the Adult Learning Theory [11]. It assumes that everyone in the room is a capable and intelligent person, making it important to understand the origin of their decision-making [9]. Thus, when the learner's reasoning doesn't produce the expected results, we aim to understand his initial reasoning and mental frame so it can be modified. That way, long-term retention of learning objectives can be increased.

In terms of structure, one of the key aspects of our program is its consistency and long-term implementation throughout the resident's time in training. Our goal is to provide our residents at the University of Toronto with four dedicated simulation training sessions throughout their training period (PGY1 to PGY4) [5]. This consistent exposure allows for the progressive development of their non-technical skills, mitigating the well-documented phenomenon of non-technical skills deteriorating over time. Research supports the notion that without regular reinforcement, non-technical skills can decline, leading to base-line performance in high-risk situations. Our program ensures that residents are not only exposed to crisis scenarios, but also improve and maintain their non-technical skills throughout their training [12].

In addition to preparing residents to handle critical situations, our program aligns with national assessment standards such as the Canadian National Anesthesia Simulation Curriculum (CanNASC), with our center being one of the sites where residents are assessed. Since the anesthesia residency has become competency-based rather than time-based, residents must be assessed periodically and according to their level of training [13]. Through the use of high-fidelity simulation and non-technical skills training, our residents gain experience, improve their competency, and are well prepared for these types of examinations, mandatory to complete their training and be eligible for the specialty board examinations.

Beyond its individual impact on residents, we believe our simulation program can serve as a model for global anesthesia education. As healthcare institutions around the world recognize the importance of structured simulation programs [7], our experience suggests that the benefits of sustained investment in anesthesia simulation programs outweigh the costs. A well-developed simulation infrastructure supports training and improvement of non-technical skills. It also serves as a foundation for other teaching activities, including lectures, standardized patient simulations, and technical skills workshops. These opportunities benefit both anesthesia and non-anesthesia specialties, helping participants refine their teaching skills in a realistic yet controlled environment [7].

### Conclusion

Ultimately, we believe our ACRM program exemplifies the transformative impact and benefits of investing in systematic, longitudinal, and carefully designed crisis-focused training centered on high-stakes scenario practice. By emphasizing non-technical skills, aligning with national standards, and fostering a culture of reflective learning, we prepare our residents to excel in the complex and challenging world of anesthesia. Additionally, through ongoing research and collaboration, we continue to improve our program, ensuring its relevance and effectiveness in educating the next generation of anesthesiologists. Finally, we believe that by sharing our model, we encourage structured training in high-risk medical specialties and contribute to a

broader conversation about best practices in simulation-based medical education, particularly in the fields of Anesthesiology and Intensive Care.

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