

Improving Staff Readiness for Robotic Surgery Codes Through Hi-Fidelity Simulations

* Preparing for the Unexpected *

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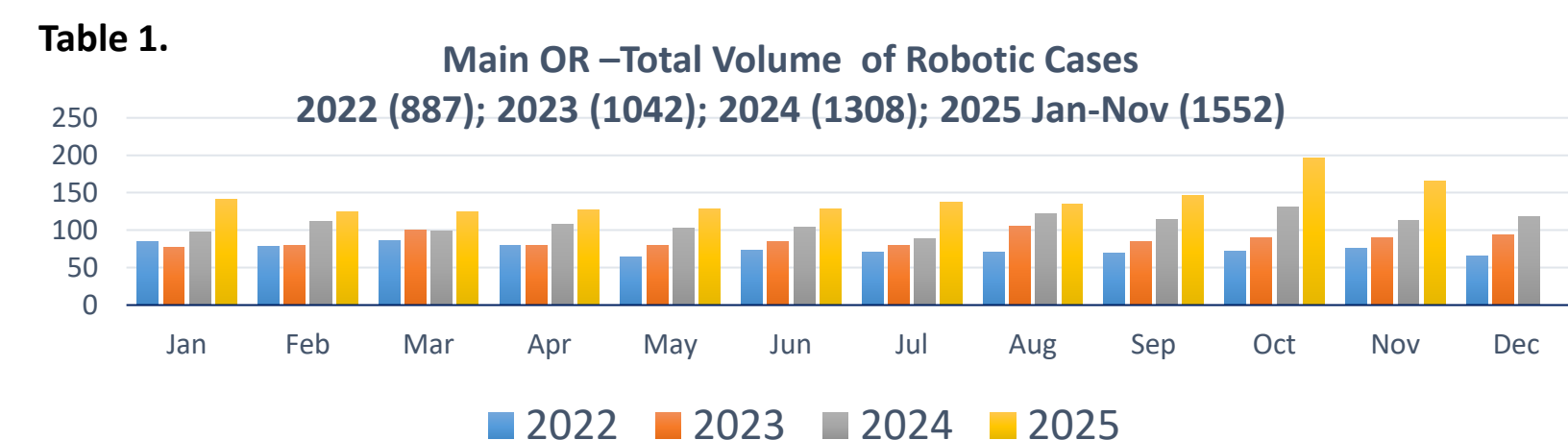


BACKGROUND

- Rapid advances in robotic surgical platforms have increased procedural complexity and introduced new challenges in managing rare but potentially severe intraoperative emergencies.
- Despite the high safety and efficacy of robotic-assisted surgery and its associated reduction in postoperative morbidity and length of stay, emergent conversion to open surgery, especially for uncontrolled hemorrhage, requires immediate and well-coordinated team action.
- Growth of the VHC Health Robotic Assisted Surgery Program has been accompanied by persistent, clinically significant risks despite the low frequency of emergent events (Table 1, 2).
- Staff surveys identified substantial variability in familiarity with roles and responsibilities during robotic surgical emergencies, especially regarding emergent undocking and rapid conversion from robotic to open procedures.
- These findings support the need for a standardized emergency algorithm and assured availability of essential instruments, equipment, and supplies to optimize team performance during robotic surgical emergencies.

OBJECTIVES

- Assess staff knowledge, technical proficiency, confidence, communication, and preparedness before and after high-fidelity, simulation-based training interventions.
- Define and standardize the roles and responsibilities of all surgical team members during activation of a robotic emergency conversion protocol.
- Develop and implement an emergency response algorithm and a standardized emergency robotic conversion cart containing essential surgical supplies, medications, instruments, and equipment.
- Evaluate the impact of the emergency response algorithm and simulation-based training on team confidence and overall readiness during robotic surgery emergencies.



METHODOLOGY

- A need was identified to implement an educational program to enhance team preparedness. An interdisciplinary group, including surgeons, anesthesia providers, scrub personnel, operating room nurses, and surgical assistants, was convened to develop a structured, three-phase approach.
- In Phase 1, an algorithm delineating the sequential tasks and temporal priorities for each operative team member was created. This algorithm underwent review and approval by the surgical and operating room leadership (Fig. 1) ^{2/5}.
- Phase 2 involved assembling an emergent conversion cart containing the essential instruments and supplies required for rapid conversion to an open procedure (Fig. 2).
- Phase 3 consisted of high-fidelity mock code simulation of a robotic emergency open conversion surgery, incorporating a multidisciplinary team that included the robotic operating room team, anesthesia, surgical staff, the Blood Bank, and Central Sterile Processing. The training was subsequently disseminated to the broader operating staff (Fig. 3).
- A before and after simulation survey was administered to evaluate staff confidence and effectiveness of the training intervention.

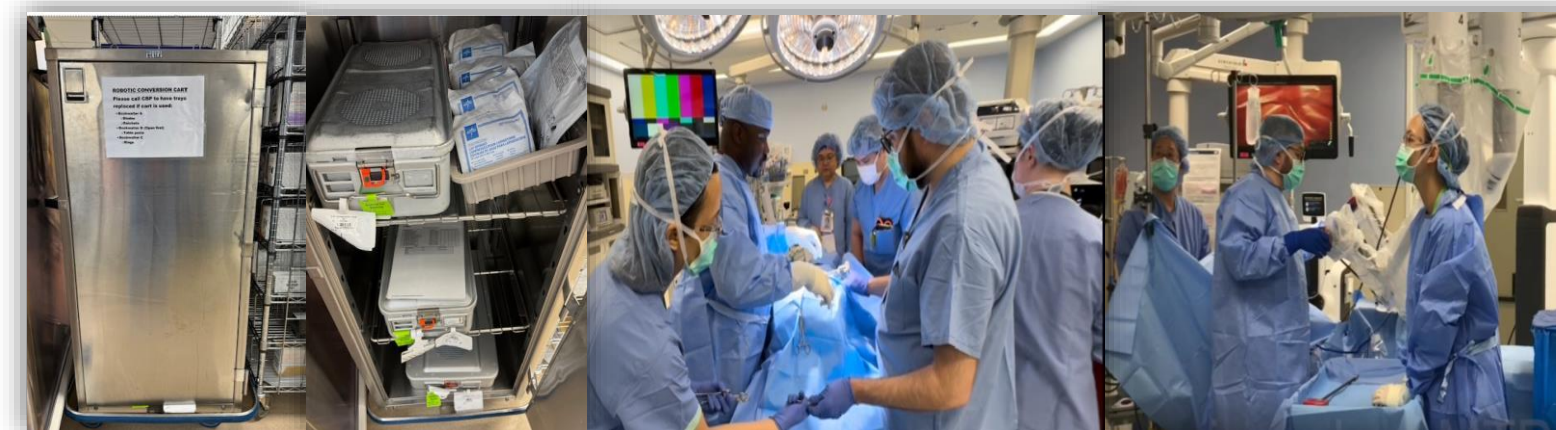
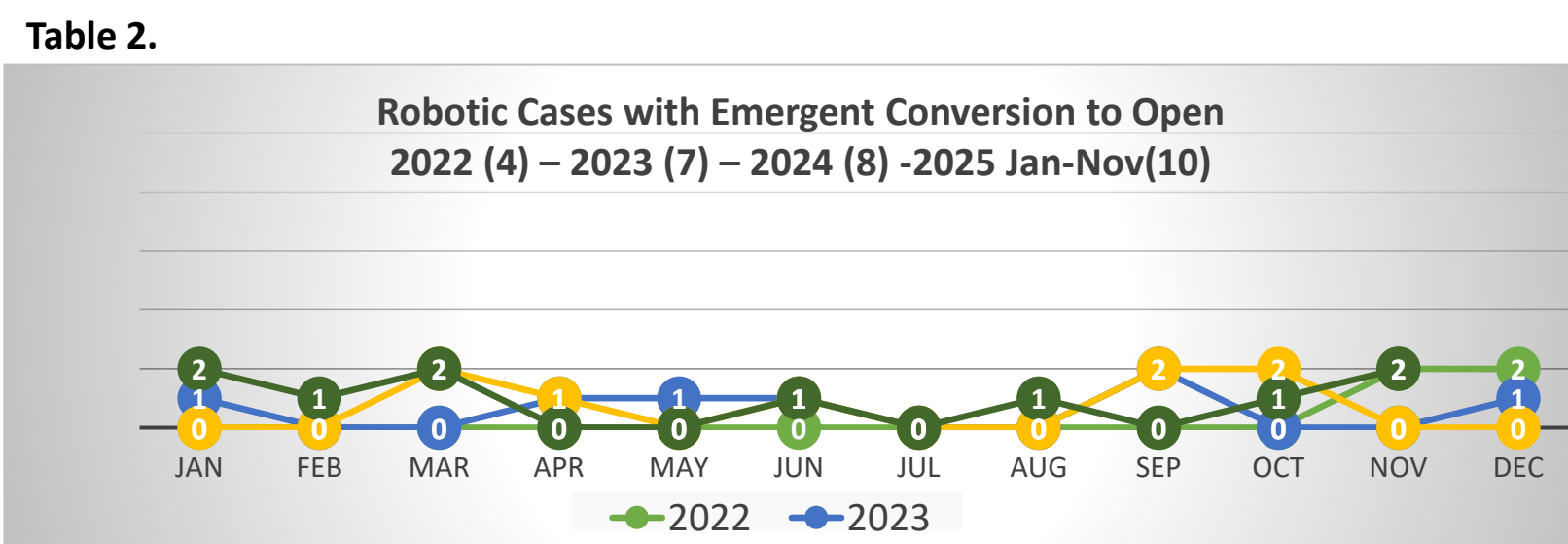


Figure 2. Robotic Emergent Conversion Cart



Figure 3. Interdisciplinary Team



RESULTS

Pre- and post-training staff surveys demonstrated a significant increase in confidence and self-reported preparedness in managing emergencies during robotic surgical procedures. The training also facilitated the development of a standardized emergency response algorithm, delineating specific roles and responsibilities for all team members during emergent conversion scenarios.

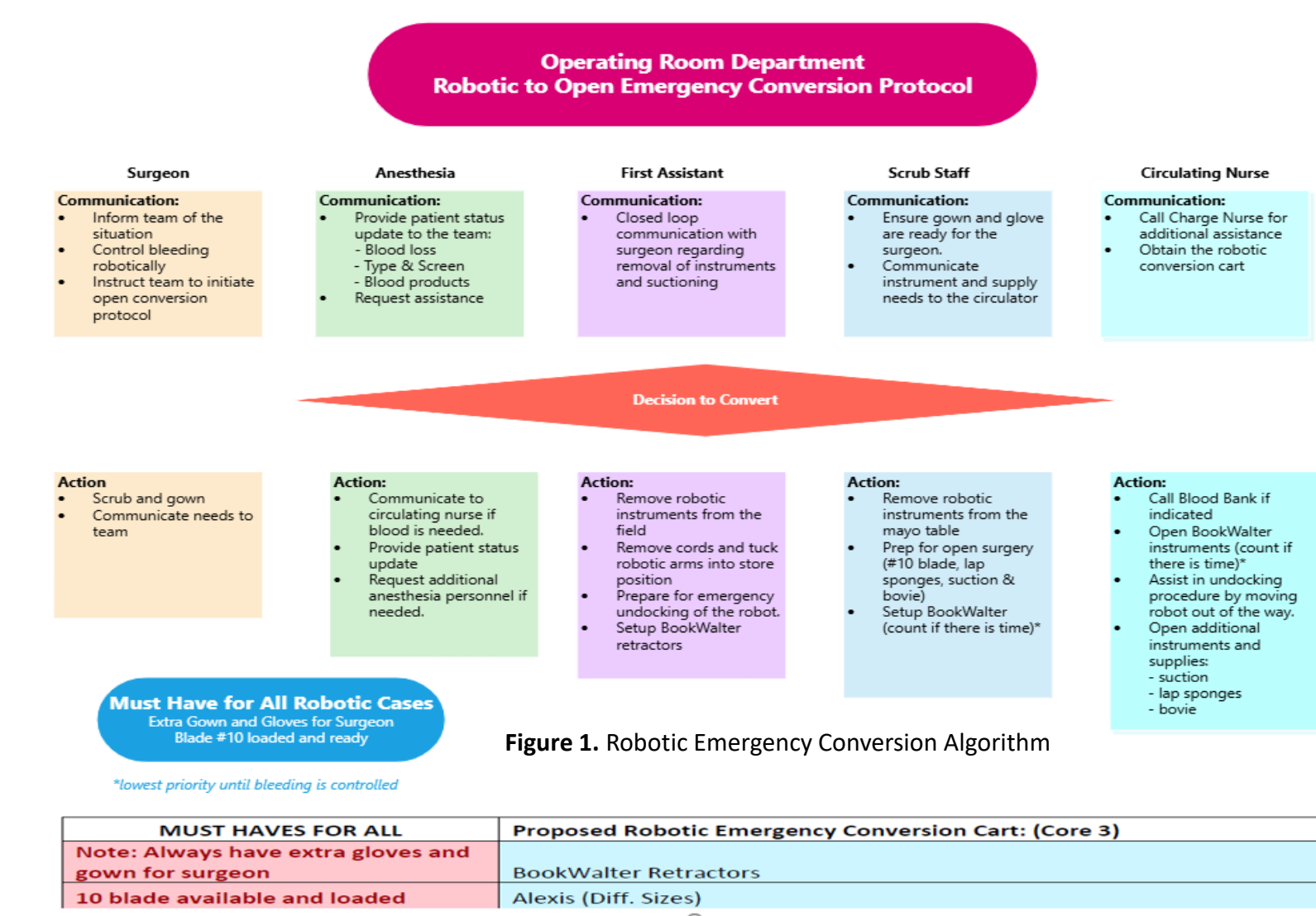
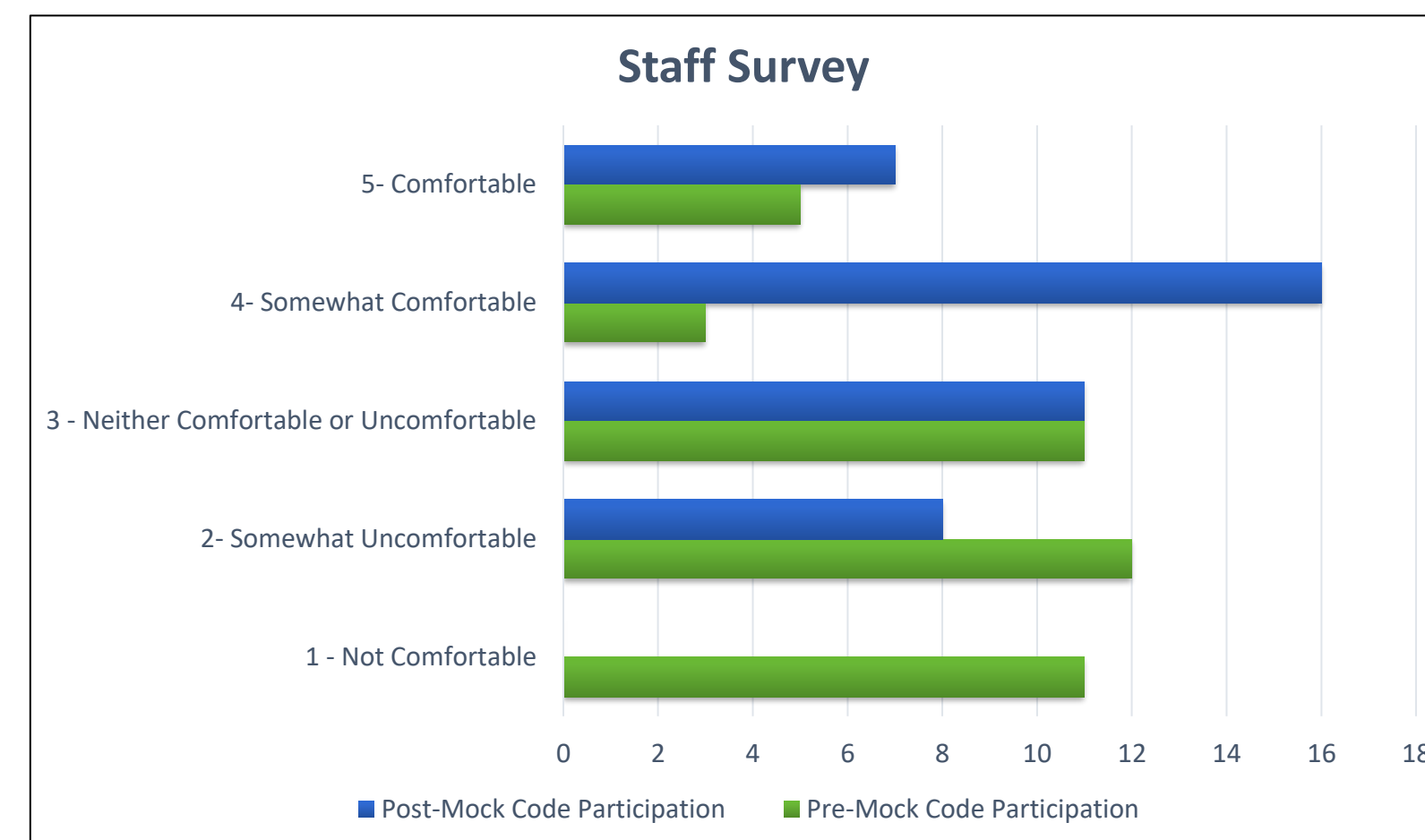


Figure 1. Robotic Emergency Conversion Algorithm

CONCLUSION

- Active engagement and commitment of staff during the training were instrumental in enhancing both their knowledge and practical skills in managing emergencies, not only in robotic surgery but across other minimally invasive procedures.
- The success of the program was largely attributable to the interdisciplinary collaboration among operating room staff, surgeons, anesthesia providers, and supporting departments such as the Blood Bank and Central Sterile Processing, enabling a fully immersive simulation experience.
- The training was particularly effective in translating didactic knowledge into practical skills, allowing staff to confidently perform procedures and responses that are infrequently encountered in routine practice.
- Clearly defined algorithms served as accessible, user-friendly educational tools, facilitating staff comprehension of their roles during crises and supporting structured, rapid responses.
- Ongoing, frequent simulation-based training is essential to maintain and enhance staff competency, and future recommendations include continued integration of didactic instruction with immersive simulations to reinforce preparedness for high-risk, low-frequency emergency scenarios across multiple specialties.

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