

Multidisciplinary in-situ simulation to evaluate a rare but high-risk process at a level 1 trauma centre: the “Mega-Sim” approach

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SUMMARY

Multidisciplinary simulation has been used to successfully teach crisis resource management in operating room and emergency department settings. This article describes a “Mega-Sim” approach using an in-situ simulation that moves among multiple hospital departments to enhance multidisciplinary training and assess institutional response to a rare but high-risk event: trauma in a pregnant patient. It appears that a Mega-Sim can be used to identify systems issues, increase medical knowledge and improve perceptions of teamwork and communication within and among hospital departments.

All trauma systems consider trauma in pregnancy (TIP) to be a critical challenge. Successful outcomes for two lives depend on rapid, seamless integration of interventions from multidisciplinary teams along a complex continuum of care. We applied principles of in-situ simulation to assess our institution’s ability to provide high-quality care in this rare but high-risk situation.

QUALITY IMPROVEMENT APPROACH

Vancouver General Hospital (VGH) is a level 1 adult trauma centre but lacks on-site obstetrics and neonatal/pediatric services. Trauma patients with viable pregnancies account for 2%–3% of our trauma team activations. Our current approach to TIP includes a formalized partnership with the maternal-fetal medicine (MFM) department at BC Women’s and Children’s Hospitals (BCWCH), 2.1 km away. To assess this process, we used quality-improvement (QI) principles: engage stakeholders, align with organizational needs and implement a recognized QI process. Stakeholders included physicians, nurses, managers and educators from VGH trauma services, emergency department (ED), operating room (OR), intensive care unit (ICU), trauma high acuity unit (THAU), and representatives from BCWCH MFM (including obstetrics) and neonatology (including neonatal ICU). Quality assessments and discussion revealed that our ability to respond to an obstetric emergency had room for improvement.

Organizationally, VGH strives to “improve clinical integration and quality by building programs ... and processes.”¹ We reviewed our TIP clinical practice guideline (CPG) and drafted a new “Code Pink” algorithm to formalize VGH’s role in an obstetrical emergency.

Our primary objective was to assess the TIP CPG and Code Pink algorithm in clinical practice. Our secondary objective was to introduce crisis resource management (CRM) to multidisciplinary and multidepartmental clinical staff. We chose in-situ simulation as our QI approach; it provides greater learning at the organizational level to identify latent safety hazards than off-site simulation, and is equally effective for team and individual learning.² Multidisciplinary

simulation courses have successfully taught CRM and teamwork to integrated ER³ and OR teams,⁴ and positive changes in communication, culture and collaboration were sustained.⁴ We designed a multidisciplinary, multidepartmental in-situ simulation (“Mega-Sim”) extending from prehospital through the ED to OR management to meet our objectives.

INTERVENTION

Our Mega-Sim model was a one-day in-situ event, including serial simulations and debriefings, working through a complex scenario involving clinical staff from multiple sites. Participants performed their usual clinical roles as the scenario unfolded in their usual clinical environment. Volunteers were identified before the event. They were informed of the nature of their participation, but not the scenario details. Embedded confederates ensured proper flow and guided participants if necessary.

The day began with a pre-briefing for all participants and a CRM lecture. The Mega-Sim was divided into two parts based on transition of care between departments (ED to OR) and was subdivided into sections and stages. Debriefing occurred after each part. Debriefers focused on execution of the CPG/Code Pink, medical principles and the previously introduced CRM skills: communication (closed-loop, nonmitigating language), leadership (shared mental model, flattened hierarchy), resource utilization (appropriate task delegation) and situational awareness (maintaining “bird’s eye” view).⁵ The day concluded with a final summary and evaluation by participants. Simulation totalled 60–70 minutes, followed by 60 minutes for debriefing. Over four months, approximately 25 people prepared and executed the Mega-Sim.

MEGA-SIM CLINICAL SCENARIO

A 32-year-old healthy woman in her first pregnancy (38 + 2 wk) presented to the ED via emergency health services as a pedestrian struck by a car. She was tachycardic and had a low-normal blood pressure. Her left leg was deformed. She initially stabilized with resuscitation, but then mother and fetus decompensated from a placental abruption, requiring immediate operative intervention without onsite obstetrics or neonatology support. The fetus was born without respiratory effort secondary to maternal narcotic levels, leading to Code Pink activation. Full simulation details are in Appendix 1, available at canjsurg.ca/005417-a1.

EVALUATION

The Mega-Sim was evaluated objectively and subjectively. Adherence to the CPG and Code Pink algorithm was recorded as components were performed (or not performed). Participant perceptions of the process and non-

technical skills were evaluated subjectively using a survey with Likert scale questions with ratings of 1 (strongly disagree) to 5 (strongly agree), yes/no questions and free-form comments. Figure 1 collates responses from 15 participants across disciplines. Objective measurement of nontechnical skills was deferred to mitigate concerns regarding individual performance evaluation and to promote buy-in of a new process at our institution.

QUALITY ISSUES

The Mega-Sim was clinically successful, but latent safety hazards were unmasked during both simulation and facilitated debriefing. This prompted policy updates and working groups to achieve change interventions. A summary of the process/results was disseminated at our multidisciplinary trauma academic rounds (Table 1).

PARTICIPANT PERCEPTIONS

Overall, participants rated the day as very good or outstanding (14/15). All felt the simulation objectives were clear and relevant to individual and hospital needs. Most indicated they behaved as they normally would in their clinical environment and that the simulation/model was realistic.

Almost all agreed or strongly agreed that Mega-Sim improved their nontechnical skills, teamwork, knowledge and approach to patient safety. All would recommend participation in future simulations to coworkers (Fig. 1). The relevance of CRM skills was also highlighted in free-form comments, such as “Discussing interdepartmental communication allowed me to see things from the perspective of other participants and will impact my practice,” and “It was useful to hear issues brought up by other participants; even if not directly relevant to me, it helped establish the big picture.”

Debriefing was generally reported as inclusive and respectful. Participants found it useful to identify systems gaps, improve communication and protocols, and understand the roles of other disciplines/departments.

Challenges were identified, including the presence of the film crew (debriefing support) and limitations of the mannequin (e.g., unable to instill fluids). Additional targeted debriefing for individual disciplines (e.g., physician, nursing) was highlighted for improvement.

CONCLUSION

We successfully simulated a complex clinical scenario in situ, involving multiple disciplines and departments, to assess our management of a high-risk event: TIP requiring immediate operative management. The Mega-Sim identified systems issues resulting in change interventions. We feel the Mega-Sim model is a dynamic tool to

encourage organizational learning while positively affecting perceptions of institutional teamwork and communication. Our ongoing Mega-Sim program will allow for

participation of more providers, team permutations and system assessments. As institutional buy-in grows, objective evaluation of nontechnical skills will be included.

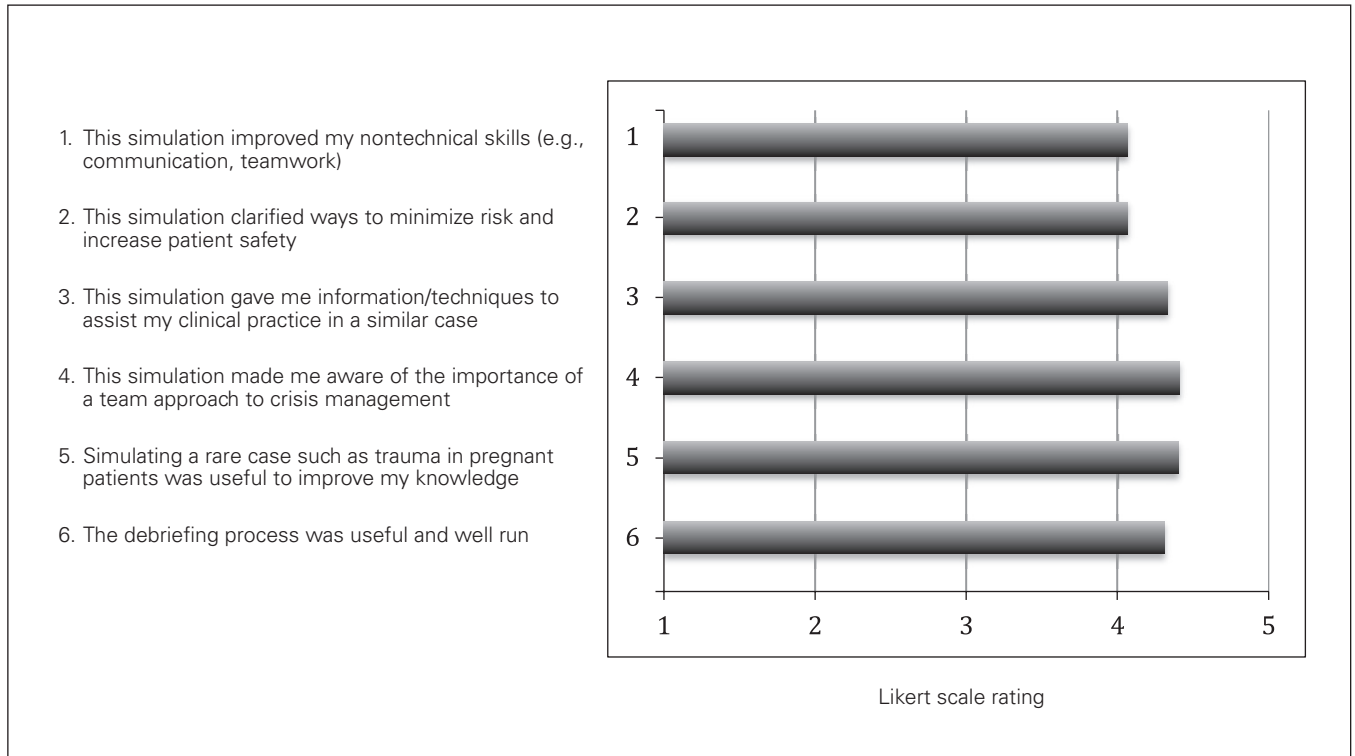


Fig. 1. Average response score to Likert scale questions (1 = strongly disagree, 5 = strongly agree).

Table 1. Pre-identified quality issues: successes, latent safety hazards, and change interventions

Component	Successes	Latent safety hazards (identified by direct observation or debriefing)	Change interventions
TIP CPG: Pre-hospital and ED care	Appropriate implementation of Pre-hospital TTA Maternal positioning, investigations Fetal assessment equipment Appropriate use of CPG Switchboard support to call consultants	Unclear TTA criteria Drug doses in pregnancy not specified Physician CPG not specific enough	Clarification of TTA criteria on CPG Pregnancy-appropriate drug doses added to CPG Physician CPG revised
TIP CPG: OR care	Appropriate support of BCWCH MFM/neonatology Accessible by phone in a timely manner THAU nurses to bring supplies/medications	Unclear maternal/neonatal hospital transfer criteria Difficulty accessing all delivery medications Inconsistent caesarean section training among all trauma surgeons	Clarification of transfer criteria on CPG Delivery medication “kits” now stocked in ED, ICU, OR and THAU Trauma surgeons to develop strategy for skill maintenance
Code Pink algorithm	Appropriate use of Algorithm to guide care of unfamiliar situation Multidisciplinary consultants as recommended	Improperly stocked infant warmer Inconsistent neonatal resuscitation training among Code Pink nurses Lack of clarity about anesthesia involvement at Code Pink	Monthly checks by Code Pink team On-site neonatal resuscitation training program implemented for Code Pink nurses Multi-departmental commitment for anesthesia at all Code Pink

BCWCH = British Columbia Women’s and Children’s Hospital; CPG = clinical practice guideline; ED = emergency department; ICU = intensive care unit; MFM = maternal-fetal medicine; OR = operating room; THAU = trauma high-acuity unit; TIP = trauma in pregnancy; TTA = trauma team activation.

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