Abstract

Given that perioperative patient care is fundamental knowledge for medical and nursing students, an interprofessional education (IPE) perioperative care training course will be developed to allow surgical and anesthesiology residents and nursing students an opportunity to work together with multiple simulation modalities. Standardized patients, high fidelity mannequins, and task trainers will be employed to ensure trainees have an immersive experience. An integrated, patient-centered evaluation strategy will evaluate individual clinical performance and knowledge as well as team collaboration and communication. In addition, the team's awareness of patient safety and collective responses when unexpected events occur will also be appraised. The project is collaborated by educators and simulation experts from several healthcare science faculties at the University of Alberta. We anticipate the proposed IPE project will produce win-win opportunities to improve our quality of education using newly-emerged and rapidly growing education modalities.

Research Description

Introduction

Most healthcare services are delivered by a healthcare team comprising of individuals from different healthcare professions[1,2]. While a pregnant woman is assisted to delivery her baby by an obstetrician, anesthesiologist, and several nurses, the patient with cardiac arrest is resuscitated by a healthcare team including cardiologists, respiratory therapists, and emergency room nurses. Needless to say, a series of interconnected perioperative care is performed daily by a team composed of different healthcare professionals, including surgeons, anesthesiologists, their assistants, and scrub and circulating nurses. When they are assigned to a team, often just a few hours or even a few minutes before meeting the patient, team members experience frustration and anxiety due to a lack of confidence in the team. Stress among the team may result in a mishap slipping past the eyes of the team and resulting in an unwanted consequence for the patient[3,4]. This has been interpreted as the root cause of many adverse events by several healthcare advocates[5,6]. To improve the quality of healthcare service, IPE and collaborative practice are viewed as proper prescriptions to the current crisis in the healthcare service system[1,2,7]. As healthcare educators, we are aware of the urgent need to develop educational opportunities for interprofessional healthcare students, during which they have a chance to work together, learn to support each other and form an effective team for care delivery.

However under the current education system, each healthcare professional is trained by a separate program. They seldom have a chance to work together until they enter the clinical reality. At the University of Alberta, IPE has been adopted across healthcare programs. However, healthcare sciences students are introduced to IPE via different disciplines, under different clinical contexts and with differing educational goals. For an effective IPE that leads to collaborative practice, a more integrated, patient-centred approach is required. The proposed project is designed to create an educational scenario that allows trainees from medicine (surgery, anesthesiology) and nursing to be educated together during the perioperative period of care. The goal is set to allow trainees to develop shared team cognition and cooperative team behaviors.

Perioperative patient care is a fundamental course for the majority of medical and nursing students[8]. Perioperative care is given around the operative room, a highly restricted area, where educational activities are often prohibited due to time constraints and the concern for patient safety[8]. In this project, the perioperative IPE education will be conducted purely in a simulated environment. The designed simulation scenario allows trainees from three different disciplines (surgery, anesthesiology, and nursing) to learn about, from and with each other to improve collaboration and the quality of care. While trainees practice in the simulated environment, multiple audio-visual devices will capture their verbal communication and performance. Based on these videos, we will extract team collaboration behavior, communication strategies and awareness of patient safety to assess team collaboration competencies. Team members will also be evaluated on their responses to unexpected events. Together with comments collected from a qualitative analysis, we will comprehensively assess the educational outcomes.

IPE Perioperative Training Scenario (Summary in Table 1)

The proposed perioperative IPE course will be conducted at the venue combining the Surgical Simulation Research Lab (SSRL) and the Surgical Medical Research Institutes (SMRI) located in the Heritage Medical Research Centre. The entire training session will include 3 interconnected phases during perioperative care: pre-operative phase, intra-operative and post-operative care.

The patient is characterized as a 52 year old male (Mr. Smith), with a 16-year history of chronic obstructive pulmonary disease (COPD), who complains of acute abdominal pain in his upper right quadrant for the previous three days. Emergency cholecystectomy (removal of the gall bladder) is performed to eliminate the pain.

During the pre-operative phase, members of the healthcare team are required to a) confirm previous surgery, medication, and allergy history b) collect detailed information about the COPD c) obtain a consent form and provide information about the operation d) give an appropriate response/treatment to the anxiety of the patient and e) transfer patient safely to the operating room. A standardized patient will be the simulation modality used in this phase.

The intra-operative phase beings when the patient is moved to the simulated operating room. The healthcare team will be required to a) complete the operating room safety check list b) initiate intravenous (IV) therapy and urethral catheterization procedures c) give general anesthesia, monitor vital signs and give an appropriate treatment to changes in vital signs during the operation d) remove the gall bladder and e) adhere to aseptic and sterile rules in the operating room. The SimMan mannequin will be used to create patient vital signs throughout the entire surgical procedure. However, each particular task will be performed on different task trainers (IV, urethral catheterization). The cholecystectomy will be performed inside a training box placed on top of the abdominal area of the SimMan, where a piece of pig liver with the gall bladder still attached will be used. Our previous experience has shown that this hybrid model (animal piece plus training box) has created equitable outcomes for cholecystectomy training but with a lower cost.

The post-operative care phase starts once the gall bladder is removed from the liver. The healthcare team will be required to a) complete the surgical count b) label and send specimen for pathology c) recover patient from anesthesia and maintain vital signs during patient transportation d) transfer patient to the recovery room and talk to the family e) communicate with the health care members upon transfer to an acute care area and f) complete documentation regarding the operation. The SimMan will be the primary simulation model used in the post-operative care phases, with a standardized patient acting as a family member at the end.

In addition to routine events unfolding during the simulation session, unexpected events will be introduced in each phase, including severe anxiety of the patient, decreases in patient's blood pressure and oxygen saturation levels and an instrument miscount. The healthcare team will be required to give an appropriate response to the unexpected events in an appropriate time period.

Relationship of Educational Theory to Practice

The theoretical framework of designing any IPE course in healthcare, as highlighted by World Health Organization, is the *adult learning theory* proposed by Baxter Magolda[9,10]. On the journey toward self-authorship on a compound healthcare skill, the health student moves from externally focused (dependent on others' feedback and comments) to internally focused (forming own sense of values and views). The adult learning is characterized by synthesizing expert opinions and performance outcomes throughout a learning process, before the learners gradually develop their values and views to guide performance and make decisions[9,10]. Aligned to the adult learning theory, debriefing sessions will be implemented for each perioperative training phase to facilitate the learners in building self-authorship. Research indicates that IPE is more effective when the principles of adult learning are applied.

The proposed perioperative IPE course will train healthcare trainees in a team setting. The *shared mental developing theory* postulated by Cannon-Bower and Salas is also applied for this

project[11,12]. Studies on military teams has found each team member in those elite teams possessed both the knowledge of the task (know how to perform at their own) as well as the knowledge of the team (roles and responsibilities of teammates, resources available for the entire team, and the team's objectives). The level of shared knowledge regarding team task and team goal are tightly correlated with the effectiveness of the team[11,12]. In the proposed perioperative IPE course, we will address the team knowledge as well as individual performance. We will clearly state at the beginning of the IPE training that the goal of the healthcare team is to ensure a safe and comfortable outcome for the patient undergoing the surgical procedure. Each team member will be educated of his/her role in the team while understanding the responsibilities of others in the team, and develop skills to support their teammates to fulfill the team goal.

The above theoretical frameworks not only guide us to design the course structure, they also help to regulate our evaluation strategy. The integrated evaluation will combine aspects of individual performance, and team collaborative behavior and awareness of patient safety.

Innovation

The first innovation in this proposed project is the use of multiple simulation models. As mentioned in the previous section, we will use standardized patients to create the scenario for patient interaction in the pre-operative assessment and post-operative care. A Laerdal SimMan mannequin will be used to create the vital signs of the patient throughout the training. Several task trainers for IV and urethral catheterization, and the hybrid animal model will be combined to create the cholecystectomy setting during the intraoperative phase. The combined simulation models will significantly improve the reality of perioperative experience, which will serve our core education goal of improving the quality of care to patients undergoing surgical procedures.

The second innovation is the development of an integrated, patient-centered evaluation strategy for the healthcare team. Learners' knowledge improvement and clinical performance will be evaluated by multiple steps, including knowledge tests, standardized patient's comments, self-reports, and objective behavior changes captured by videos throughout the simulation sessions. In addition to the individual's performance, evaluation will also focus on the team's cooperation and collaborative behavior and their communication strategies as part of the surgical procedure. The team's awareness of safety events and their collective responses when unexpected events occur will also be judged.

Sustainability

We expect that IPE will be adopted by more healthcare science faculties in the University of Alberta and benefit students in different healthcare education programs. We have designed this project to make use of available resources of teaching devices (simulators) and technology (performance recording and analysis), and plan to make the device and technologies utilized available to all of our healthcare education programs for future IPE activities. External sources of funding will be sought from healthcare education organizations, including the Canadian Association of Medical Education, the Canadian Institute for Patient Safety, and the Royal College of Physician and Surgeons of Canada.

Collaboration

Although developing IPE curricula is a complex process, the project involves staff from different faculties, work settings and locations. This research project has been developed by investigators from the Faculty of Medicine & Dentistry, the Faculty of Nursing, and simulation educators from Alberta Health System. The principal investigator and the co-principle investigator in the proposed project are simulation experts with a shared vision and understanding of the benefits of introducing a

new IPE curriculum. We understand the barriers and challenges and are willing to work together to overcome the problems. We are confident that such an interprofessional collaboration will provide win-win opportunities to all of us for improving our quality of education in this newly-emerged and rapidly growing area.

Evaluation (Summary in Table 1)

During each phase of the proposed perioperative IPE training, we will evaluate the learners' knowledge gains about the patient, procedure, and team. The assessment data will be collected from a pen and paper survey (multiple choice and open-ended questions) and feedback and comments from the standardized patient. The surveillance videos will allow an objective evaluation of team and individual performances as well as team collaborative and cooperative behaviors. Evaluation during each phase has a slightly different focus (please see Evaluation Summary Table). An integrated score will be calculated at the end of the entire training to provide a compressive evaluation to each team. Specific feedback will be provided to learners and teams.

To ensure the quality of this newly designed IPE course, one focus group will be held prior to introducing the course to collect comments and feedback from experts city-wide in the field of simulation, education, and assessment. Qualitative analysis based on data collected from experts will be used to improve the design for the course, particularly on simulation usage, debriefing format, training contents, and evaluation schema.

We aim to educate 10 perioperative teams in one academic year. At the end of the project, another focus group will be held to collect comments and feedback from learners who underwent the perioperative IPE course. Qualitative analysis on data collected from our learners will be used to improve task and simulation design, learning objectives, and evaluation format.

Dissemination

Although the current version of perioperative IPE course is developed using a case from general surgery, the teaching content can go beyond the surgical specialty, such as critical or emergency care. The combined simulation model and the multi-step evaluation formats can be applied to other IPE course scenarios. We anticipate simulation-based IPE may be adopted by educators from other healthcare science faculties across on a city-wide, provincial and inter-provincial basis.

We will present the results of this work at local, national and international meetings. Locally, our results will be of interest to the educators involved in Undergraduate Medical Education and the monthly Faculty of Nursing's Lunch and Learn Series. We intend to meet with these individuals to communicate our results. We also plan to disseminate our results to other Faculties (Nursing, Education, etc.) through the Festival of Teaching, Save Stan (IPE simulation day) and the Olive Young Teaching Learning Scholarship Day. We will convey our results to other medical and nursing schools nationally and internationally, through distributive means by posting results to the University Teaching Program website and by presentation at major meetings (CCME, AAMC, AAME, INASCL, SSHI). Publications in healthcare education journals (e.g. Academic Medicine, Medical Education, Clinical Simulation in Nursing, and Research in Nursing) will be sought.

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