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Review Article

Its More than just Simulation. It's a New Paradigm in Acute Care

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Abstract

Acute care is a branch of secondary health care where a patient receives active but short-term treatment for a severe injury or episode of illness, an urgent medical condition, or during recovery from surgery. Simulation based trainingis about repetitive actions and trials, until mastery is achieved. The beauty of this type of training is that errors made are powerful enough, to be the beginning of change in behavior and practice. Simulation has the track record of training and inculcation of both technical skills as well as non-technical skills, such as communications and teamwork. The former is critical in the practice of acute care whereby skills need to be mastered and executed in a timely fashion. Being able to do this could make a difference in saving a patient's life. Non- technical skills on the other hand, need to be developed as well because lapses in this area (eg. wrong identification, poor and inaccurate communications, lack of team work, poor handing over, poor instructions delivery, not using closed loop communications) can happen and can lead to major consequences for our patients.

Simulation is making a strong and significant impact on training and skills development in acute care. Its influence on competency and patient safety too is gaining more traction. Simulation can indeed be a valuable part of the learning and experience gathering process, but eventually it will not completely replace the 'on the shop floor' real life experiences a trainee or resident need to acquire, supported by good and sound trainers and mentors.

Keywords: Acute care; Crew Resource Management; Patient safety; Simulation; Trauma; Teams

Introduction

Simulation is techniques (not technology) which replaces or amplify real life experiences with guided ones, often immersive in nature and helps to evoke or replicate aspects of the real world. Simulation has many applications in various specialties and disciplines and has evolved to become a popular modality of teaching and learning. In its applications, simulation has the ability to inculcate and nurture, knowledge, skills and attitude required in some professions. This also includes training in quality and patient safety when it comes to healthcare [1,2].

With simulation based training, it is about repetitive actions and trials, until mastery is achieved. The beauty of this type of training is that errors made are powerful enough, to be the beginning of change in behavior and practice. Simulation has the track record of training and inculcation of both technical skills as well as non-technical skills, such as communications and teamwork. The former is critical in the practice of acute care, whereby procedures at the front line such as airway management, crico-thyrodotomy, chest tube insertion, focused ultrasound, delivery of a fetus in distress, stabilizing fractures, insertion of central lines and reducing dislocations, amongst others, are skills which need to be mastered and executed in a timely fashion. Being able to do this could make a difference in saving a patient's life. Non- technical skills on the other hand, need to be developed as well because lapses in this area (eg. wrong identification, poor and inaccurate communications, lack of team work, poor handing over, poor instructions delivery, not using closed loop communications) can happen and can lead to major consequences for our patients. Acute care and trauma

leadership skills are known to clinically impact team performance and patient care. [1-3]

Acute care is a branch of secondary health care where a patient receives active but short-term treatment for a severe injury or episode of illness, an urgent medical condition, or during recovery from surgery. It is distinct from chronic care, or longer term care.

With the increasing and more widespread use of simulation-based training, as well as its incorporation and integration into educational curriculum, the thrust is appropriate and relevant. This is in–line with the paradigm shift towards competency-based qualifications. Today, simulation has become a very popular choice of training for acute care teams.

Skills, Tasks and Procedures

a) Simulation has been used in various aspects of acute care training such as:

b) Resuscitation

c) Disaster training

d) Trauma management, especially multiple trauma

e) Human factors training and teams training

f) Assessment tools and

g) Procedural competencies

Simulation is a safe and standardized method for training and assessment. It allows "mistakes to be made", after which the trainees can reflect and understand deeper their actions and performance, without compromising patient safety. There are a variety of tasks and procedures that are highly relevant and necessary in acute care. Some of these would include airway management, cervical spine immobilization, chest tube insertion, fracture reduction and immobilization, insertion of central line and others. Simulation offers training for many of these, utilizing animal models, task trainers and part task trainers, innovative improvised models and many more. These modalities need not be the highest fidelity and the most expensive, as long as the objectives and intent are met, especially for institutions and countries where cost can be a concern. The underlying principle of doing this is for familiarization with the procedures and the ability to have repeated attempts and practice until mastery is reached. In many institutions today, residents and trainees must fulfill a certain number of simulated experiences before being allowed to perform these on 'real' patients. Simulation is also very useful for procedures which are rare and not done very often so that the memory and skills can be up-kept and up to date. All these practices will have either a direct or indirect impact on patient care and patient safety [4-8]

Besides these basic procedures relevant to acute care, there are more complex scenarios such as handling a multiply injured patient, complicated and multiple medical issues in one patient, running a code or cardiac arrest management, managing an acute coronary syndrome presentation requiring percutaneous coronary intervention and activation of the cardiac catheterisation laboratory and others. These more complex scenarios have many steps, multiple procedures and decision making involved and thus, practice via simulated scenarios can help streamline, and smoothen the flow and throughput, as well as reduce delays. Today, established centres conduct simulated scenarios for these and fine-tune their flow and performance to address gaps and lapses [7,9].

Other procedures and techniques in simulation, include wet laboratory training using live animals in laparoscopic procedures and virtual reality programs for interventional procedures. Fine motor skills, psychomotor skills, dexterity, coordination and orientation can be enhanced and elevated with these 'hands-on" time in the simulated environment. The variety of these training can be incorporated and integrated into the curriculum at relevant points to help residents and trainees meet their milestones [7-12].

In the area of pre-hospital care, crises, disasters and other acute care settings, the availability of customized training packages (eg. cricothyrodotomy , chest needle decompression, amputation, burns and even haemorrhage control skills trainers) is useful and more readily available these days.

Non-Technical Skills and Inter-professional Team Training

Non technical skills refer to capabilities in leadership, communications (verbal and non-verbal), delegation, collaboration and cooperation. Being able to identify patients very quickly increases our ability to treat them more efficiently and thus, reduces the chances of mortality and morbidity. In fact, it has been shown that the length of stay in the Emergency Department (ED) is an independent predictor of in-hospital mortality after trauma team activation. Thus, repetitive practice through simulation of common scenarios such as: [12,13] Splenic rupture with rib fractures after road traffic accident

Open book pelvic fracture in a motorcyclist involved in a collision

Penetrating chest injury, Difficult airway management and Shock and ongoing haemorrhage, will be helpful to build up the team dynamics and communications, as well as preparation to handle procedures during acute, stressful encounters. Decision making, thought processes and other plans can be shared during debrief sessions and this will make everyone understand some of the common issues, perceptions of different personnel and align better. This way it is better able to streamline work processes, flow and cross-speciality interaction and communications, which are elements of systems-based practice to be inculcated in our residents and trainees. [10-13]

For example, through simulation training it was discovered that closed loop communications initiated by the team leader is

beneficial for teamwork but, a high number of call-outs and closed loop communications by team members might lead to communications overload [14-17].

Simulation is also a powerful model to train crisis care teams. In the military for example, its applications in battle field triage, management and trauma care is critical. High fidelity medical simulation enable highly immersive simulated environment, suspends disbelief and deliver the highest quality of dynamic learning. Some examples of realistic acute care exercises in the military could be:

- Extrication of casualty or soldier in cardiac arrest
- An improvised explosive device incident or
- Dismemberment and life-threatening haemorrhage

The non-technical skills emphasize the importance of human interaction in these emergencies and acute care settings. The question then is, how do we inculcate concepts like teamwork, good clear communications and leadership, in healthcare personnel? It is probably best taught by "doing" and practicing regularly. Acute and trauma care represents high intensity situations and time-pressured complex decisions have to be made, both by individuals as well as by the team concerned. This calls for the decisions to often be made within seconds or minutes of managing the patient, in order to save lives. High fidelity simulation offers an option to teach and learn these complex skills.

Inter-professional team training is planned and designed based on the desired competencies and specific tasks required. Much of this training is designed after crew resource management principles, such as in the aviation industry. Some of the essential skills taught to teams include adaptability, prioritization of tasks, shared situational awareness, team communications techniques, mobilization and utilization of available resources, leadership and even conflict resolution skills.

Equipment and Technology

The conduct of simulation training is dependent on equipment, devices, technology, innovations and improvisations. The range varies from the simple plastics molds, task trainers, to high fidelity patient simulator and simulated environment. The principle is not to have any higher level of fidelity, than what is really needed to teach the skill or handle the scenario.

The human patient simulator was first introduced to the medical community in 1969 by Denson and Abrahamson, who used a patient anaesthesia simulator to augment resident training. Their study showed a trend towards faster skills acquisition and subjective performance improvement. It was useful to teach technical and crisis management skills [18,19]. From then, the medical community has witnessed the proliferation of computer-based teaching modalities and mannequins which are more interactive. The current models are physiologically based and can react to interventions in real time. This capability allows for high fidelity training and enables reaction to interventions in real time. These capabilities also enables assessment of dynamic interactions as well as decision making processes better [20-22]

For some of the training in acute care, trauma and disasters, more robust and durable mannikins and equipment are required. These equipment are fully autonomous. Ruggedised trauma patients simulators are also available [19]. Moulage, has also become an integral part of simulation based training.

The other technologies available are telemedicine, advanced training robots as well as the use of game-based approaches, focusing on their higher order thinking skills. For some military groups, there is compulsory pre-employment simulation training.

Other newer modalities include cut-suit technology, better software and virtual reality as well as gaming capabilities. Some of these can be downloaded into mobile devices as well [23,24].

The process of developing simulation scenarios is also important. Proper inputs from clinicians and understanding of the application is fundamental. The use of guided templates and software is also popular for this purpose. The scenarios are then aligned and matched with the type of simulation technique (eg. Using standardized patients, high fidelity, lower fidelity simulation, task tainers) which is most appropriate and suited for the training or learning. Many centers also use video-tape review, which allows dynamic capture of performance. Consent from the participants is also important for this purpose. The videographer must also be briefed so that he understands what to capture and focuses on the dynamic interactive communications.

For larger scale situational and environmental simulation, additions and variations to the lights, sounds, available assets and numbers of casualities can be varied and altered to meet the learning objectives. This risk free and reproducible environment can be an ideal modality to help augment training of personnel and multidisciplinary teams for mass casualty and disaster response. Linking simulation together to replicate the almost 'real" situation can help to test leadership skills and decision of larger teams and commanders of operations too.

Patient Safety Issues in Acute Care

Patient safety is at the crux of all we do in healthcare. Today, more and more research and evidence is pointing towards simulation as a modality to improve learning, techniques and teamwork and these are also necessary in meeting the regulatory needs of professional bodies and societies. Of course, clinical practice is complex and can be emotionally challenging and not all of it can be practiced before-hand. However, simulation does offer some level of preparedness to reduce errors and enhance performance and these definitely have links to our patients' safety. Simulation can offer training in functionality, contingency and even dynamic delegation. The repetitive practice can add value and help reduce mistakes and errors. If we take the example of a Formula 1 pit stop,

whereby time is critical, and certain tasks and processes have to be accomplished within a very short interval. Multiple simulated practices, over and over again, with sheer precision and coordination helps the teams achieve everything within seconds.

Simulation does allow for the development of experience prior to performance of procedures. Simulation also provides opportunities for experiential learning, which is very useful in the practice of medicine, which tends to utilize the apprenticeship model. Prior exposure and learning creates awareness and consciousness of issues, potential complications. These 'experiences' developed during simulated training are stored in our neural networks and can be recalled as the need and situation arises, when encountering the real life situation or patient.

Conclusion

Simulation offers tremendous opportunities and promise to enhance further healthcare delivery and management in acute care areas. The application of crisis resource management, a nurturing learning environment to reduce errors and enhance performance, coordination, inter-professional learning and interaction is powerful. Simulation can be an expensive investment and thus, the judicious use and decision has to be made to be as cost efficient as possible. It is certainly a long term investment for teaching institutions and learning organizations.

Availability of these virtual training and suitable environment will hopefully be able to produce the intended 'innoculation" effect (feeling the stress, anxiety and realism, as in real-life situations) on residents and trainees, in order for them to really experience the 'scenario'. Simulation is proving to be a valuable tool for educating healthcare teams and staff involved in the high stakes field of acute care and trauma, with its unpredictable and challenging nature.

References

1. Lateef F (2010) Simulation-based learning: Just like the real thing. J Emerg Trauma Shock 3: 348-352.
2. Steinemann S, Berg B, Skinner A, DiTulio A, Anzelon K, et al. (2011) In-situ multidisciplinary simulation-based teamwork improves early trauma care. J Surg Edu 68: 472-477.
3. Rosenman ED, Branzetti JB, Fernandez R (2016) Assessing team leadership in emergency medicine. The Milestones and beyond. A Review. J Graduate med Education 8: 332-340.
4. Kunzle B, Zala-Mazo E, Wacker J, Kolbe M, Spahn DR, et al. (2010) leadership in anaesthesia teams. The most effective leadership is shared. QualSaf Health care 19: e46.
5. Rosenman ED, Ilgen JS, Shandro JR, Harper AL, Fernandez RA (2015) systematic review of tools used to assess team leadership in healthcare action teams. Acad Med 90: 1408-1422.
6. Sakran JV, Finneman B, MaxwellC, Sonnad SS, Sarani B, et al. (2012) Trauma leadership: does perception drive reality? J Surg Education 69: 236-240.
7. Schull MJ, Ferris LE, Tu JV, Hux JE, Redelmeier DA (2001) Problem for clinical judgement: thinking clearly in an emergency. CMAJ 164: 1170-1175.
8. Agha RA and Fowler AJ (2015) The role and validity of surgical simulation. IntSurg 100: 350-357.
9. Parson BA, Blencowe NS, Hollowood AD, Grant JR (2011) Surgical training: the impact of changes in curriculum and experience. J Surg Edu 68: 44-51.
10. Kneebone R, Kidd J, Nestel D, Barnet A, Lo B, et al. (2005) Blurring the boundaries: scenario-based simulation in a clinical setting. Med Edu 39: 580-587.
11. Kneebone R, Arora S, King D, Bello F, Sevdalis N, et al. (2010) Distributed simulation-accessible immersive training. Med Teach 32: 65-70.
12. Black SA, Nestel DF, Horrocks EJ, Harrison RH, Jones NMA et al. (2006) Evaluation of a framework for core development and simulated patient training for complex procedures. Simul Healthcare 1: 66-71.
13. Mowery NT, Dougherty SD, Hildreth AN, Holmes JH 4th, Chang MC, et al. (2011) Emergency Department length of stay is an independent predictor of hospital mortality in trauma activation patients. J Trauma 70: 1317-13125.
14. Hargestam M, Lindkust M, Jacobsson M, Brulin C, Hultin M et al. (2016) Trauma teams and time to early management during insitu trauma team training. BMJ Open 6: e009911.
15. Shetty R and Nadkarni V (2016) Simulation in acute care paediatrics: new paradigm in care. J paediatric Crit care 3: 35-39.
16. Auerbach M, Roney L, Aysseh A, Gawel M, Koziel J, et al. (2014) In-situ paediatric trauma simulation: assessing the impact and feasibility of an interdisciplinary insitu trauma care QI simulation program. Paediatric Emerg care 30: 884-891.
17. Mullan PC, Kessler DO, Cheng A (2014) Educational opportunities in post event debriefing. JAMA 312: 2333-2334.
18. Abrahamson S, Denson JS, Wolf RM (1969) Effectiveness of a simulation training in anaesthesiology residents. J Med Edu 44: 515-519.
19. Denson JS and Abrahamson S (1969) A computer controlled patient simulator. JAMA 208: 504-508.
20. Patterson MD, Geis GL, Falcone RA, LeMaster T, Wears RL, et al. (2013) Insitu simulation: detection of safety threats and teamwork training in a high risk ED. BMJ QualSaf 22: 468-477.
21. Figueroa FO, Moftakhar Y, Dobbins AL, Khan R, Dasgupta R, et al. (2016) Trauma Boot camp: a simulation based pilot study. Cureus 8: e463.
22. Holcomb JB, Dumire RD, Crommett JW, Stamateris CE, Fagert MA, et al. (2002) Evaluation of trauma team performance in advanced human patient simulator for resuscitation training. J Trauma 52: 1078-1086.
23. Sisson P (2015) Cut suits add realism to trauma training. The San Diego Union Tribune.
24. Surgical cut suit. EMS World.
25. Weaver SJ, Salas E, Lyons R, Lazzara EH, Rosen MA, et al. (2010) Simulation based team training at the sharp end: A qualitative study of simulation based team training, implementation and evaluation in healthcare. J Emerg Trauma Shock 3: 369-377.