International Journal of Research in Orthopaedics
Pereira J et al. Int J Res Orthop. 2019 Sep;5(5):805-810
http://www.ijoro.org

Original Research Article

DOI: http://dx.doi.org/10.18203/issn.2455-4510.IntJResOrthop20193619

Outcome of triage results between two groups of interns subjected to different model of simulation

Jeevan Pereira[1], Aswini Dutt Raghavendra[2]*, Eknath Jayapalan[3]

[1]Department of Orthopaedics, [2]Department of Physiology, Yenepoya Medical College, Deralakatte, Mangalore, Karnataka, India
[3]Department of Orthopaedics, Kanachur Institute of Medical Sciences, Mangalore, Karnataka, India

Received: 14 July 2019
Revised: 02 August 2019
Accepted: 03 August 2019

***Correspondence:**
Dr. Aswini Dutt Raghavendra,
E-mail: drdutt23@yahoo.com

ABSTRACT

Background: In the emergency department, triaging is a very important for mass casualties and should not lead to any errors while doing so. In spite of subjecting interns to triaging theory classes in their final year of MBBS, they are not confident in triaging when need comes. To address this, we designed this study which aims at understanding the efficacy and type of triage based simulation education for medical interns during their 1 year internship programme.
Methods: A cross sectional study with 186 intern students of a Yenepoya Medical College Hospital of Karnataka was selected for the triage simulation. The interns who could attend the entire programme were randomly divided into 2 groups of n=91 each. One group underwent desktop based triage simulation (n1=91) and the other group faced enacted patient based triage simulation training followed by test. Evaluation comprised of tests to 2 groups of interns. The first group were subjected to test following desktop triage simulation and the second group were subjected to test following enacted patient simulation based triaging.
Results: The test result showed that there was significant improvement in the result obtained from the group that underwent high fidelity simulation ($p<0.05$).
Conclusions: Simulation based training which is closed to reality leads to a significant increase in learning and recalling output compared to the traditional method.

Keywords: Triage, Simulation, Emergency, Interns

INTRODUCTION

‘Good judgement comes from experience and experience comes from bad judgement’, one among the pinnacle concepts in the journey of a medical student. The aviation industry was one of the first to implement simulation as an educational tool to reduce the mishaps due to human error. This experience provided insights to how simulation based education are successfully incorporated into medicine. Simulation-based educational methods are recognized as an established component of medical training for medical students, residents, and fellows.[1] for applying theoretical knowledge in a better way reducing the human errors. Triage is defined as the initial clinical sorting process in hospital Emergency department. Especially in high risk scenarios such as triaging. The patient has to be sorted out to the right code without any delay for the appropriate treatment to begin.

Hence proper coding in the shortest available time is of prime importance. A watershed study in the simulation fidelity realm specifically identified studies that compared performance outcomes associated with low- and high-fidelity simulators vs. No intervention controls.[2]

Alessi's foundational paper addressed not whether high fidelity is a critical, but whether for particular levels or categories of learners or instructional goals, different levels of fidelity might be more or less appropriate and beneficial.[3]

Many studies showed no significant advantage of high fidelity simulation over low fidelity simulation, with average difference ranging from 1% to 2%.[2] Practically it is difficult and dangerous to subject the interns to triaging in real scenarios. Although simulation is identified for its contribution to learning, critics claim this doesn't portray the complexities of the actual pre hospital environment and question how effective assessment is when undertaken in a controlled setting. Hence the objectives of this study were to subject medical interns of tertiary care hospital to two models of (low fidelity– desktop and high fidelity enacting subjects) simulation on triaging to compare the outcome. Also, to understand the efficacy of such teaching methodologies to integrate it with the curriculum, and to modify it periodically for achieving the best possible outcome.

METHODS

A cross sectional study using complete enumeration sampling method, the interns of Yenepoya Medical College Hospital, Mangalore, Karnataka, India (n=186) were selected who were randomly allocated into two groups of desktop based triage simulation (Group 1, n=91) and enacted patient based triage simulation training (Group 2, n=91) during October 2018 to January 2019. Interns who could participate in both pre and post-test of triage simulation were included in the study. Four interns were excluded as they could not participate in both the simulation and the test. To avoid inconvenience to the operation of the emergency department and interns postings, this intervention was done over the span of 2 weeks. The Institutional Ethics committee approval was obtained for the study. There were no health risks, discomforts, or inconveniences reported due to participation. Both groups underwent a simulation pretest to compare the differences between the two groups. The first group simulation was conducted at Advanced Comprehensive Clinical Training and Simulation Centre (ACTS-YEN), Yenepoya Deemed to be University, Mangalore, Karnataka.

The second group simulation was conducted in the emergency department of hospital. Moulage was applied to each patient actor to create lifelike injuries. They were wheeled/brought on stretchers into the emergency department from the ambulances (Figure 1 and 2). They had their vitals and injury details mentioned on a placard which was tagged in the front of their clothes. The interns who were able to attend the both scenario and the test were included in the study. Paediatric triaging was excluded. Each participant read and noted his/her response according to instructions in the self-administered questionnaire. The collected data was compiled and kept under safe custody of the principal investigator in our simulation centre and confidentially was maintained.

Figure 1: Multiple lacerated wounds with tachycardia on left and unresponsive person on the stretcher on the right.

Figure 2: (a) Pregnant lady being wheeled into casualty, (b) unconscious girl with vitals in normal limits.

Both the groups were subjected randomly coded specific question paper set before and after simulation. Same set of questions were repeated to the candidates in the pre- and post-test amongst both the groups. There were a total of six question papers each having 5 set of questions about triage, with two separate columns for answering. First column to specify the triage code and the second column to justify the code based on vitals/conscious status.

Simple triage and rapid treatment (START) is currently the most widely used triage system in the United States for mass casualty incidents.[4-7] It was developed in 1983 by staff at Hoag Hospital and Newport Beach Fire and Marine Department in California for rescuers with basic first-aid skills.[8] First, responders delegate the movement of injured victims to a designated collection point as directed by using four main categories based on injury severity:

Black: (Deceased/expectant) injuries incompatible with life or without spontaneous respiration; should not be moved forward to the collection point.

Red: (Immediate) severe injuries but high potential for survival with treatment; taken to collection point first.

Yellow: (Delayed) serious injuries but not immediately life-threatening.

Green: (Walking wounded) minor injuries.

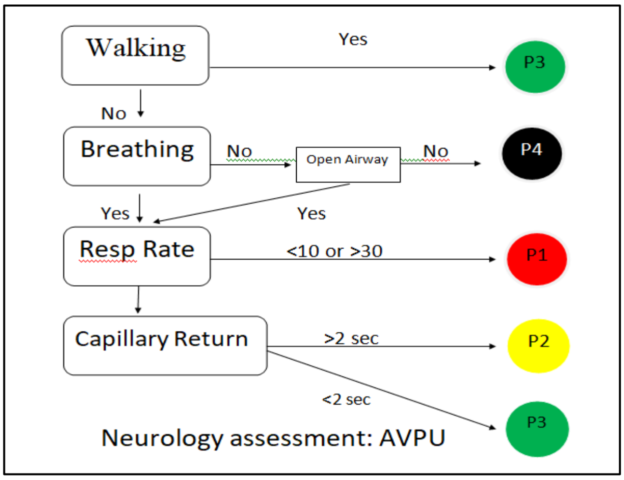

Figure 3: Table for sorting out the patients into different designed areas.

The triage colours were assigned by giving triage tags to patients or simply by physically sorting patients into different designated areas (Figure 3). "Green" patients were assigned by asking all victims who can walk to a designated area. All non-ambulatory patients were then assessed. Black tags were assigned to victims who are not breathing even after attempts are made to open airway. Red tags were assigned to any victim with respiratory rate greater than 30, absent radial pulse or cap refill greater than 2 sec and unable to follow simple commands. Yellow tags were then assigned to all others.

Neurological assessment was done using the mnemonic AVPU (Alert, responds to verbal stimuli, responds to painful stimuli, and unresponsive).

The interns were given a list of victims of different types of injury, assuming that all walking wounded have moved away from the area and that the findings are after they have repositioned the airway of any non-breathing patients. They were asked to categorise them with appropriate reason based on vital parameters and AVPU (Table 1).[8]

Table 1: Questionnaire items selected for all 6 sets for simulation.

Victim	Type of injury	Pertinent information
#1	Compound fracture, left femur	Respiratory rate over 30/minute; radial pulse absent; awake
#2	Sudden onset of chest pain with shortness of breath	Respiratory rate under 30/minute; capillary refill under 2 seconds; awake
#3	90% second degree burns	Respiratory rate none on arrival, spontaneous after repositioning; radial pulse present; unconscious
#4	Facial Injury	Respiratory rate over 30/minute; capillary refill under 2 seconds; awake
#5	Unable to move legs	Respiratory rate <30/min; radial pulse present; awake
#6	No apparent injuries	Respiratory rate normal; capillary refill <2 seconds; awake
#7	Sucking chest wound	Respiratory rate >30/min; radial pulse present; unconscious
#8	Dislocated right shoulder	Respiratory rate <30/min; radial pulse present; awake
#9	No visible wounds	Respiratory rate none; radial pulse absent; unconscious
#10	Scalp wound, estimated blood loss 500 cc	Respiratory rate >30/min; capillary refill <2 seconds; awake
#11	Massive head injury	Respiratory rate <30/min; radial pulse absent; unconscious
#12	Bruising over abdomen, complaining of abdominal pain	Respiratory rate >30/min; capillary refill <2 seconds; awake
#13	Impaled, 1 foot piece of shrapnel in right eye	Respiratory rate <30/min; radial pulse present; awake
#14	Female six months pregnant; broken left, lower leg	Respiratory rate <30/min; capillary refill <2 seconds; awake
#15	Severe difficulty breathing, chest sinks in on inspiration	Respiratory rate >30/min; radial pulse present; awake
#16	Unable to move, no verbal response	Respiratory rate <30/min; radial pulse present; awake and staring
#17	Amputated left arm, bleeding controlled	Respiratory rate <30/min; capillary refill <2 seconds; awake
#18	Large head wound, brain matter showing	Respiratory rate absent; radial absent; unconscious
#19	Minor abrasions	Respiratory rate <30/min; capillary refill <2 seconds; awake
#20	Bruise on forehead, blood in ears and nose	Respiratory rate <30/min; radial pulse present; unconscious
#21	Third degree burns over front of both legs	Respiratory rate <30/min; capillary refill <2 seconds; awake
#22	Compound fracture, left arm	Respiratory rate <30/min; radial pulse present; awake
#23	Impaled stick in right chest	Respiratory rate <30/min; capillary refill <2 seconds; awake

Continued.

Victim	Type of injury	Pertinent information
#24	Second degree burns, legs	Respiratory rate >30/min; radial pulse present; awake
#25	Blood in right eye	Respiratory rate <30/min; capillary refill <2 seconds; awake
#26	Eighteen year old adolescent, no visible injury	Respiratory rate absent; radial pulse absent; unconscious
#27	Impaled object, RUQ abdomen; difficulty breathing	Respiratory rate >30/min; radial pulse present; awake
#28	Patient saying same words over and over, "what happened?	Respiratory rate <30/min; capillary refill <2 seconds; awake
#29	Spurting blood from neck injury	Respiratory rate >30/min; radial pulse present; awake
#30	Patient states she is a diabetic; skin, moist and clammy; feels shaky	Respiratory rate <30/min; capillary refill >2 seconds; awake

The study was assessed based on the comparison of post test results between both the groups. The data of tests were collected and tabulated in excel sheet. Statistical analysis was done using independent t-test with IBM SPSS software ver.23. Data were represented as Mean±Standard deviation. P<0.05 was considered statistically significant. The final results were graphically represented and conclusions were drawn.

RESULTS

About 186 interns were selected for this study amongst 2 groups of interns over 2 weeks' time span. There was significant difference noted in the post test results of the second group (Group 2, n=91) who were subjected to high fidelity simulation than the first group (Group 1, n=91) (Table 2). There was no statistical significant difference in pre-test scores of these two groups.

Table 2: Pre-test and post-test results following simulation sessions.

	Group 1 (n=91)	Group 2 (n=91)	t
Pre-test (Mean±SD)	4.160±2.111	4.000±2.057	0.53800 p=0.591 ns
Post simulation test (Mean±SD)	7.022±2.108	7.637±1.710	2.163 p=0.032

Table 3: Feedback from the interns following simulation sessions.

Item	N (%)	Strongly agree	Agree	Undecided	Disagree
I feel the simulation session was realistic	N1 (%)	5 (5.5)	15 (16.5)	40 (43.9)	31 (34.1)
	N2 (%)	68 (74.7)	21 (23.1)	2 (2.2)	
The simulation session was an interesting learning experience	N1 (%)	4 (4.4)	20 (21.9)	52 (57.1)	15 (16.5)
	N2 (%)	60 (65.9)	25 (27.5)	6 (6.6)	-
I feel it was easier to recollect following the simulation	N1 (%)	68 (74.7)	14 (15.4)	9 (9.9)	-
	N2 (%)	80 (87.9)	11 (12.1)	-	-
I feel that I am confident in executing decisions post simulation	N1 (%)	45 (49.4)	25 (27.5)	21 (23.1)	-
	N2 (%)	59 (64.8)	28 (30.8)	4 (4.4)	
I would like to have similar simulation sessions in future	N1 (%)	5 (5.5)	23 (25.3)	40 (43.9)	23 (25.3)
	N2 (%)	79 (86.8)	8 (8.8)	4 (4.4)	
I would like to suggest the next batch of interns to actively participate in simulation sessions	N1 (%)	20 (21.9)	25 (27.5)	11 (12.1)	35 (38.5)
	N2 (%)	88 (96.7)	3 (3.3)	-	-

N1=numbers in group 1, N2=numbers in group 2.

Feedback was collected from both the group participants which showed that, interns liked the high fidelity simulation session in terms of experience, reality, recollection of the steps, confident levels and they preferred this mode of training to them (Table 3).

DISCUSSION

Simulation in medical education is gaining more importance in the backdrop of competency based medical education curriculum by the Medical Council of India. It has been proved by earlier studies the effectiveness of students gaining skills and cognitive enrichment in simulated environment. We had subjected our previous batch interns to desktop simulation with a positive feedback and results. We introduced the present batch of interns to the high fidelity simulation and wanted to know the outcome in comparison with the desktop simulation. Our study was designed to subject the medical interns to two different models of simulation on triaging to compare the outcome. The results showed that students exposed to high fidelity simulation scored better compared to the second group who had low fidelity desktop simulation sessions.

Experiential learning theory serves as the endoskeleton of simulation-based education.[9]

Advanced comprehensive clinical training and simulation centre (ACTS-YEN) of our university is equipped with the state of the art high and low fidelity simulators with task trainers for undergraduate and post graduate training for health sciences students.

Kolb characterize learning as a four-stage cycle. A learner engages in a "concrete experience," in our context, a simulated medical procedure or patient encounter, and the components of that experience form the basis for the second step of the cycle, "observation and reflection."[9-11] As a result of this second step, learners develop their internalized operational model for working through a procedure or encounter. In the third step, learners test their operational model in a new situation (another simulation or actual clinical encounter), resulting in additional concrete experience, and the cycle repeats itself, until if and when a learner achieves mastery.[12-14] According to Iputo et al, the introduction of the problem-based learning/community-based education (PBL/CBE) curriculum coincided with improved academic performance.[15]

In this study we found that, simulation close to reality leads to a significant increase in learning and recalling output compared to the desktop simulation. There was significant statistical improvement in the results following simulation. High-fidelity patient simulation is already integrated into medical training in couple of centres and their results are in accordance with ours.[16-18] The solution to the dilemma lies in "ascertaining the correct level of fidelity based on the student's current instructional level. As a student progresses, the appropriate level of fidelity should increase." Then, as now, this guidance is derived from cognitive-load theory.[19,20] Early learning should occur in relatively low-fidelity environments to reduce cognitive load.[20] Later learning can involve increased fidelity and resultant load, while approaching clinical practice.

In our study both the groups were not from same fidelity which forms the limitation of the study. Future scope of this study would be to compare high fidelity mannequins and human actors than using desktop simulation.

CONCLUSION

Simulation based training gives better results than compared to traditional teachings. High fidelity simulation is readily acceptable by the students for the close to reality experience and visual and audio remembrance. It's an advantageous educational tool with the potential to influence a student's feelings, beliefs and behaviours in relation to patient care. Although there are challenges surrounding the management of student anxiety, assessment and cost, careful preparation and planning for these issues are manageable.

ACKNOWLEDGEMENTS

We would like to acknowledge the contributions of Staff from the ACTS YEN Simulation Centre, the students from the hospital administration for enacting as patients and the emergency department of Yenepoya medical college hospital, Mangalore for handling the situation wisely.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the institutional ethics committee

REFERENCES

1. Deering S, Auguste T, Lockrow E. Obstetric simulation for medical student, resident, and fellow education. Semin Perinatol. 2013;37(3):143–5.
2. Norman G, Dore K, Grierson L. The minimal relationship between simulation fidelity and transfer of learning. Med Educ. 2012;46(7):636–47.
3. Alessi SM. Fidelity in the design of instructional simulations. J Comput-Based Ins. 1988;15:40–7.
4. Justice J, Gossman WG. EMS Reverse Triage. Treasure Island (FL): Stat Pearls Publishing; 2018.
5. Ryan K, George D, Liu J, Mitchell P, Nelson K, Kue R. The Use of Field Triage in Disaster and Mass Casualty Incidents: A Survey of Current Practices by EMS Personnel. Prehosp Emerg Care. 2018;22(4):520-6.
6. Hoff JJ, Carroll G, Hong R. Presence of undertriage and overtriage in simple triage and rapid treatment. Am J Disaster Med. 2017;12(3):147-54.
7. Shartar SE, Moore BL, Wood LM. Developing a Mass Casualty Surge Capacity Protocol for Emergency Medical Services to Use for Patient Distribution. South. Med. J. 2017;110(12):792-5.
8. Benson M, Koenig KL, Schultz CH. Disaster triage: START, then SAVE-a new method of dynamic triage for victims of a catastrophic earthquake. Prehospital Disaster Med. 1996;11(2):117-24.
9. Kolb DA. Experiential learning: experience as the source of learning and development. 2nd ed. Saddle River: Pearson Education; 2015.
10. Kolb DA. Management and the learning process. Calif Manag Rev. 1976;18(3):21–31.
11. Kolb DA. Experiential learning. Englewood Cliffs: Prentice-Hall; 1984.
12. Dreyfus SE, Dreyfus HL. A five-stage model of the mental activities involved in directed skill acquisition. Berkeley: DTIC Document; 1980.
13. Dreyfus SE. The five-stage model of adult skill acquisition. Bull SciTechnol Soc. 2004;24(3):177–81.

14. Ericsson KA. The influence of experience and deliberate practice on the development of superior expert performance. In: Ericsson KA, Charness N, Feltovich PJ, Hoffman RR, editors. The Cambridge handbook of expertise and expert performance. Cambridge: Cambridge University Press; 2006: 683–704.
15. Iputo JE, Kwizera E. Problem-based learning improves the academic performance of medical students in South Africa. Med Educ. 2005;39(4):388-93.
16. McLaughlin SA, Doezema D, Sklar DP. Human simulation in emergency medicine training: a model curriculum. Acad Emerg Med. 2002;9:1310–18.
17. Binstadt ES, Walls RM, White BA. A comprehensive medical simulation education curriculum for emergency medicine residents. Ann Emerg Med. 2007;49:495–507.
18. Small SD, Wuerz RC, Simon R. Demonstration of high-fidelity simulation team training for emergency medicine. Acad Emerg Med. 1999;6:312–23.
19. Van Merrienboer JJG, Sweller J. Cognitive load theory and complex learning: recent developments and future directions. Educ Psychol Rev. 2005;17(2):147–77.
20. Reedy GB. Using cognitive load theory to inform simulation design and practice. Clin Simul Nurs. 2015;11(8):355–60.

Cite this article as: Pereira J, Raghavendra AD, Jayapalan E. Outcome of triage results between two groups of interns subjected to different model of simulation. Int J Res Orthop 2019;5:805-10.