

2020-12-01

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Recommended Citation

Au, Alberto; Palmer, Louise; and Carbery, Catherine (2020) "MED-E-SIM: Inspiring Healthcare Career through Simulated Learning in Australian Senior Secondary School Students," *Health Professions Education*: Vol. 6: Iss. 4, Article 5.

DOI: 10.1016/j.hpe.2020.11.002

Available at: <https://hpe.researchcommons.org/journal/vol6/iss4/5>

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MED-E-SIM: Inspiring Healthcare Career through Simulated Learning in Australian Senior Secondary School Students

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Received 24 February 2020; accepted 18 November 2020

Available online 28 November 2020

Abstract

Purpose: Previous studies have demonstrated that a motivational programme can have positive effects in inspiring secondary school students in pursuing a career in health. However, majority of studies were conducted in the United States and were delivered in the multiple sessions and attendances format. MED-E-SIM is a one-day educational pilot programme designed for Australian secondary school students interested in pursuing a career in healthcare.

Method: MED-E-SIM's aim is to increase participants' interest and certainty in pursuing the healthcare professions through participation in mannequin-based simulated clinical exercises, procedural workshops using part-task simulation trainers, and active engagement in an 'ask the expert' style masterclass hosted by healthcare clinicians. In order to evaluate the impact of MED-E-SIM, 66 senior secondary school students who participated in the programme were invited to complete the post programme evaluation survey.

Results: We observed increases in both students' self-perceived understanding of health profession and knowledge about Basic Life Support after the participation in MED-E-SIM programme. Furthermore, our study also showed that MED-E-SIM programme participation could help improve participants' decision in pursuing future career in health ($P < 0.001$).

Discussion: Implementing programmes like MED-E-SIM can be a feasible strategy to help increase awareness and interest of pursuit in health-related career amongst our younger generation.

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Keywords: Career pursuit; Education; Healthcare; Secondary school; Simulation

Abbreviations: ABCDE, Airway, Breathing, Circulation, Disability, Exposure; AED, Automated External Defibrillator; BLS, Basic Life Support; CPR, cardiopulmonary resuscitation; ED, Emergency Department; ICU, Intensive Care Unit; IVC, Intravenous cannulation; NGT, Nasogastric tube; SI, Situational interest.

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Peer review under responsibility of AMEEMR: the Association for Medical Education in the Eastern Mediterranean Region.

1. Introduction

Globally, the shortage of healthcare workers is projected to be greater than 14.5 million in year 2030.¹ Similarly, Australia's health workforce shortage is projected to continue to increase exponentially, with a deficit of 109,500 nurses and 2700 doctors by year 2025.²

Research has demonstrated that a motivational programme can have positive effects in inspiring

secondary school students in pursuing a career in the healthcare profession.^{3,4} However, majority of studies were conducted in the United States and were delivered in multiple sessions and attendances over an approximate 13-week period. Hence, the format of this United States course may be viewed by many participants as being commitment intensive.

The idea for a day programme surfaced when two high school students (H.B. and E.P.) from Victoria, Australia, made us aware of the difficulties that they and their peers have in accessing meaningful insight and advice in the healthcare fields. To address this gap, through the collaboration between The Royal Melbourne Hospital and The University of Melbourne Medical School, MED-E-SIM programme was designed and implemented. MED-E-SIM is a unique one-day educational programme designed for Australian senior secondary school students interested in pursuing a career in health sciences.

1.1. Theoretical framework

Harackiewicz et al.⁵ argued that promoting interest is essential to guide academic and career pursuits. The MED-E-SIM programme design is centred on the intent to inspire healthcare career pursuit in senior secondary school students through participation in computerised mannequin-based simulated clinical exercises, clinical skill workshops using part-task simulation trainers such as venepuncture training arm, as well as active dialogue with multi-professional health experts. Simulated experiences were specifically designed not only to introduce students' interests in clinical practice but also to enable them to learn basic clinical skills in a safe, interactive, hands-on and cognitively engaging format.

Given the foreseeable critical shortage of healthcare professionals in the upcoming future nationally and internationally,^{1,2} programmes such as MED-E-SIM could be a valuable strategy to raise awareness and interest of pursuit in health-related career amongst our younger generation.

2. Methods

2.1. Participant selection and study setting

Between September 2018 and September 2019, three MED-E-SIM programmes were delivered. Enrolled participants included both metropolitan and rural senior secondary school students (Year 10–12) residing in Victoria, Australia. Parental/legal guardian

informed consent for programme participation and evaluation were obtained prior programme commencement. The number of senior secondary school students enrolled in each MED-E-SIM programme ranged from 21 to 24 participants. Ethics approval was obtained from the Human Research Ethics Committee at the Melbourne Health, Australia.

2.2. MED-E-SIM programme

MED-E-SIM is a not-for-profit, one-day educational programme held at a major tertiary trauma hospital in Melbourne, Australia. The programme was designed for Australian senior secondary school students interested in pursuing a career in healthcare. The programme normally started at 9:00 AM and adjourned by 2:30 PM and consisted of six major activities. The following are brief descriptions of the format and content of each activity covered during the MED-E-SIM.

2.2.1. Hospital guided tours

Participants were taken on a tour of the Intensive Care Unit (ICU) and the Emergency Department (ED). All tours were guided by an ICU consultant and an ED consultant respectively, and participants were given opportunity to ask questions and explore the unique clinical characteristics of an ICU setting in contrast to an ED setting.

2.2.2. Clinical skill workshop A - basic life support (BLS)

Students worked in small groups (3–4 participants per group) in providing BLS by using the cardiopulmonary resuscitation (CPR) training mannequin and automated external defibrillator (AED) simulator. The students were also taught to use the Airway, Breathing, Circulation, Disability, Exposure (ABCDE) structured approach⁶ to the immediate assessment and treatment of the critically ill or unresponsive patients.

2.2.3. Clinical skill workshop B - intravenous cannulation (IVC)

In this activity, students examined the clinical indications for IVC and participated in cannula insertion and blood sampling procedure by using the venepuncture training arms.

2.2.4. Clinical skill workshop C - nasogastric tube (NGT) insertion

Participants examined the human nasogastric anatomy and clinical indications for nasogastric tube

insertion. Participants then performed the NGT insertion procedure by using the NGT training mannequins.

2.2.5. Anaphylaxis simulation exercise

Students participated in a high-fidelity medical simulation scenario. With the use of a computerised mannequin (Laerdal SimMan® 3G) and simulation confederate, the students learned the management of acute anaphylaxis in the public setting and practiced the administration of EpiPen® (adrenaline auto-injector).

2.2.6. “Ask the expert” masterclass

This masterclass enabled students to converse with a diverse group of health professionals ranging from entry to practice to specialty consultant levels. A typical master class panel would consist of the following personnel: a medical student; a junior doctor; a medical consultant; a registered nurse; a clinical educator; a health director; an academic teaching specialist and a member from the allied health team. The students were encouraged to ask the panel questions about their typical workday, academic experiences, and professional rewards and challenges.

2.3. Evaluation form design

The evaluation form was designed to evaluate the self-perception of the participating students in three areas of interest: (1) participants’ health profession preference, (2) programme’s content suitability, and (3) programme’s impact and recommendability.

The evaluation form consisted of a set of 10 multiple-choice questions. No personal data were collected, and the results were analysed only as a group, not individually. The list of evaluation questions relevant to this study can be found in Appendix.

2.4. Data analysis

Post-programme evaluation surveys were successfully obtained from all 66 participants in the programme. Data were collected in an anonymous

fashion. Each survey is assigned a unique code that is not associated with any personal information.

The weight of responses was measured using a 5-point Likert scale,⁷ ranging from “strongly disagree” to “strongly agree” or “very uncertain” to “very certain”, and was presented in terms of count and percentage of total respondents. A Wilcoxon signed-rank test was performed to compare the participants’ certainty in pursuing health profession where P values of <0.05 signalled statistical significance between pre- to post-programme participation. IBM SPSS® software version 24 for Windows was used for the statistical analyses.

3. Results

3.1. Health profession preference

In the evaluation survey, participants were asked to select which health profession they were interested in pursuing. The vast majority indicated their preference to be nursing (42%) followed by medicine (28%). A small number of participants (10%) also indicated dual (Medical-Nursing and Nursing-Allied Health) and multiple preferences (Medical, Nursing and Allied Health).

3.2. Programme content suitability

Firstly, the participants were asked to rate the programme’s content suitability. When asked about whether the content of MED-E-SIM was pitched at an appropriate level, 83% of participants responded “strongly agree” and 17% of participants responded “agree”. This was followed by the vast majority of participants indicating that the programme has improved their understanding about the health profession (Table 1).

Subsequently, the participants evaluated the clinical content covered in the programme, which encompassed BLS skills and EpiPen® administration during anaphylaxis (Table 2). Survey results indicated that majority of students in this sample “agreed” or

Table 1
Participants’ evaluation regarding programme content suitability.

Item	Response	Count	Percentage
The content of the programme was pitched at an appropriate level for my learning.	Agree	11	17%
	Strongly Agree	55	83%
The programme has improved my understanding about the health profession.	Agree	20	30%
	Strongly Agree	46	70%

Table 2
Participants' evaluation of MED-E-SIM clinical content.

Item	Response	Count	Percentage
The programme has improved my knowledge about EpiPen [®] .	Neutral	4	6%
	Agree	27	41%
	Strongly Agree	35	53%
The programme has improved my confidence in using EpiPen [®] .	Neutral	5	8%
	Agree	20	30%
	Strongly Agree	41	62%
The programme has improved my knowledge about BLS.	Neutral	3	5%
	Agree	25	38%
	Strongly Agree	38	58%
The programme has improved my confidence in performing BLS.	Disagree	1	2%
	Neutral	3	5%
	Agree	19	29%
	Strongly Agree	43	65%

“strongly agreed” (Table 2) that the clinical content covered improved their knowledge and increased their confidence in both performing BLS and using EpiPen[®].

3.3. Programme impact and recommendability

Participants were asked to rate their level of certainty in pursuing their nominated healthcare career of interest before and after attending the MED-E-SIM programme (Table 3). A Wilcoxon signed-ranked test detected a statistically significant difference ($Z = -4.670$, $p < 0.001$). This data indicated that the participation in MED-E-SIM could strengthen the students' decision in pursuing future healthcare study and career.

Furthermore, the programme also received an explicit level of endorsement with 100% of participants indicating that they would recommend MED-E-SIM to other students wishing to pursue a career in the health industry.

4. Discussion

This paper demonstrated that an immersive education programme like MED-E-SIM could help strengthen

senior secondary school students' decision to pursue a health-related career. The effect of MED-E-SIM is aligned with most international studies.^{3,4} Berk et al.³ has reported the impact of a 13-week period of medical simulation programme on secondary school students and indicated that programme graduates experienced elevated interest in science- or health-related career post programme completion ($P < 0.05$). Similarly, Karpa et al.⁴ observed that the majority of programme graduates suggested that participation in the outreach programme influenced their decision to pursue a medical- or science-related career.

It is well recognised that interest is a powerful motivational tool to promote learning and career trajectories for students.^{8,9} The core curriculum of MED-E-SIM involves promoting interest in healthcare amongst participants, with situational interest (SI) in particular. SI is defined as the interest experienced in a particular circumstance or moment, and it fosters both affective and cognitive qualities to the learners.¹⁰ Therefore, experiencing SI can in turn promote fascination, increased attention, engagement and persistence.^{11–13}

There are four main interventions that can be used to help promote students' SI: (1) Novelty (aka

Table 3
Participants' evaluation of their level of certainty in pursuing their nominated health career of interest before and after attending the MED-E-SIM.

	Before attending MED-E-SIM		After attending MED-E-SIM	
	Count	Percentage	Count	Percentage
Uncertain	8	12%	1	2%
Neutral	12	18%	9	14%
Certain	31	48%	27	42%
Very Certain	14	22%	28	43%

One participant did not provide response to this item.

Structural Features); (2) Context Personalisation; (3) Problem-Based Instruction; and (4) Integrating Individual Interest Processes.^{9,10} The content design of the six major activities within the MED-E-SIM programme incorporated these four interventions to help promote SI.

One way to trigger SI is by offering novelty that catches participants' attention. Both Hospital Guided Tours and Clinical Skill Workshops (A, B and C) aimed to promote not only excitement but also visual, audio and tactile stimuli to the participants within the educational context to achieve SI. Furthermore, given that all MED-E-SIM participants shared an existing interest in human physiology, the Anaphylaxis Simulation Exercise was a carefully designed simulated scenario to trigger the students' SI through context personalisation and problem-based instruction. With the use of a high fidelity computerised mannequin and health professional confederates, the students learned the clinical signs and symptoms commonly associated with an anaphylactic reaction in a relatable daily-life scenario. The students were then guided by confederates on how to problem solve and implement appropriate first aid response, and practiced the administration of EpiPen®.

Lastly, interest theory suggested that individuals who see the reason and value of a field of study display greater engagement, motivation and persistence in academic and career trajectories.^{14–16} MED-E-SIM also intended to trigger SI by integrating individual interest processes through the “ask the expert” masterclass setting. In a “question and answer” plenary format, the multidisciplinary health expert panel helped the students to understand the meaning, value, challenge and reward in becoming a health professional. The panel also helped the students to identify the essential short term and long term goals.

As opposed to the longer programme format (i.e., multiple sessions and attendances over an approximate 13-week period) found in many international studies,^{3,4} MED-E-SIM's one day programme format offered the additional benefits of being more cost effective, less time commitment intensive for both the students and parents/legal guardians, and easily embeddable into the school curriculum. Having all content delivered in one day may also offer better connectivity between learning contents to the participants and avoid issues such as poor attendance and dropouts commonly experienced in multiple sessions/attendances programme.

The current study also highlighted that MED-E-SIM not only introduced students to aspects of clinical

practice, but enabled them to have improved knowledge and confidence in performing crucial life-saving skills such as BLS and first aid techniques.

With respect to health profession preference, majority of participants indicated their preference for nursing. This is somewhat not surprising, as according to the latest demographic data, nursing profession is still the largest chosen health profession in Australia.¹⁷

Implementing programmes like MED-E-SIM can offer multilevel of benefits. Locally, MED-E-SIM fosters a collaborative partnership between the hospital, the university, the secondary school and the greater community as a whole. Globally, given the alarming shortage of healthcare providers projected in the upcoming future,¹ programmes such as this could be a feasible strategy to help increase the number of future pursuit in health-related careers.

4.1. Limitations

Although the current study showed evidence to support that this type of educational programme could improve students' certainty in pursuing future healthcare career, there are a few limitations associated with this study that should be taken into account in future research. Firstly, the participants in this study were recruited from only one Australian state (Victoria) and thus may not be representative of other states in Australia and/or internationally. Secondly, the current study lacks longitudinal analysis and hence it is not possible to evaluate whether the influence that MED-E-SIM programme had on the participants would have a long term effect. For example, it is not known whether these students have actually chosen to enter the healthcare-related degrees post completion of secondary school certificate. Future studies should take this into account and incorporate longitudinal analyses into their study design.

5. Conclusion

Based on the findings from the current study we recommend that the programme like MED-E-SIM, a one-day educational programme incorporating simulated learning, is implemented into the senior secondary school curriculum. Programme such as this may be used as a strategy to increase young people pursuit in health-related field and help address the global shortage of health care providers within the next decade.

Appendix
MED-E-SIM Programme Evaluation Questions.

Question	Response Options
1. The content of the programme was pitched at an appropriate level for my learning.	Strongly Agree
2a. The programme has improved my knowledge about EpiPen®.	Agree
2b. The programme has improved my confidence in using EpiPen®.	Neutral
3a. The programme has improved my knowledge about BLS.	Disagree
3b. The programme has improved my confidence in performing BLS.	Strongly Disagree
4. The programme has improved my understanding about the health profession.	
5a. Which health profession are you interested in pursuing?	Medical
	Nursing
	Allied Health
	Other
5b. Please rate your level of certainty in pursuing the health profession indicated in 5a, before attending MED-E-SIM.	Very Certain
5c. Please rate your level of certainty in pursuing the health profession indicated in 5a, after attending MED-E-SIM.	Certain
	Neutral
	Uncertain
	Very Uncertain
6. I would recommend this programme to other students wishing to pursue a career in the health industry.	Agree
	Disagree

Funding

None.

Other disclosure

None.

Ethical approval

Ethical approval was obtained from the Human Research Ethics Committee at the Melbourne Health, Australia (6 September 2018, QA2018110).

Acknowledgements

The authors thank Mr. Hugo Bogdan, Miss Emilie Page, Dr Vanessa Morgan, Dr Catherine Seymour, Dr Jennifer Keast, the students, teachers, administrators and collaborating health professionals who made this project possible. The authors specially thank Ms Roshani Prematunga for her statistical expertise and support. The authors are also immensely grateful to Dr Snezana Kusljic for her helpful feedback.

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