Received: 15 October 2021, Accepted: 10 December 2021, Published 20 December 2021

STUDENTS' PERSPECTIVE ON SIMULATION-BASED LEARNING FOR UNDERGRADUATE PAEDIATRICS MODULE

Farin Masra, Joyce Soo Synn Hong, Sie Chong Doris Lau*

Department of Paediatrics, Faculty of Medicine, Universiti Kebangsaan Malaysia Medical Centre, 56000 Kuala Lumpur, Malaysia

Corresponding author: Sie Chong Doris Lau (doris@ppukm.ukm.edu.my)

Abstract

The emergence of COVID-19 has greatly disrupted most areas of student lives and medical students are perhaps among those who have been greatly affected, especially in their clinical training. Due to restrictions, bedside teachings and interactions between students and patients were limited, consequently reducing their clinical experience. Thus, simulation-based learning has been incorporated into the Year 4 undergraduate paediatric rotation using various methods such as paediatric mannequin simulators and simulated patients as well as online simulated case discussions. A total of 91 Year 4 undergraduate medical students who participated in this simulation-based teaching and learning method answered a quick survey at the end of their semester to evaluate their acceptance on these newly introduced methods. The students accepted online simulation-based case discussion and role-play using simulated patients as effective teaching and learning methods. However, they ultimately expressed that direct encounter with patients remained the best modality to learn examination skills in paediatric posting. Although simulation-based learning cannot fully replace bedside teaching, it can be incorporated into the undergraduate medical curriculum to complement each other, especially in unprecedented times like this.

Keywords: medical student, paediatric, simulation-based, teaching and learning

Abstrak

Pandemik COVID-19 telah membawa kesan yang ketara kepada kehidupan para pelajar, dan pelajar perubatan antara mereka yang amat terjejas, terutamanya dalam pembelajaran klinikal. Sekatan yang dikenakan telah menghadkan pengajaran di sisi katil dan interaksi

antara pelajar dan pesakit. Akibatnya, pembelajaran klinikal mereka telah berkurangan. Justeru itu, pembelajaran berasaskan simulasi telah diintegrasikan ke dalam program prasiswazah pelajar tahun 4 yang menjalani rotasi pediatrik dengan menggunakan pelbagai kaedah seperti simulator patung manikin pediatrik dan pesakit simulasi serta perbincangan kes simulasi dalam talian. Seramai 91 pelajar perubatan tahun 4 yang mengikuti kaedah pengajaran dan pembelajaran berasaskan simulasi menjawab soal selidik ringkas pada akhir semester mereka yang bertujuan untuk menilai penerimaan mereka terhadap kaedah yang baru diperkenalkan ini. Para pelajar menerima pakai perbincangan kes berasaskan simulasi atas talian dan penggunaan pesakit simulasi sebagai kaedah pengajaran dan pembelajaran yang berkesan. Walau bagaimanapun, mereka merasakan bahawa perjumpaan langsung dengan pesakit tetap merupakan kaedah terbaik untuk mempelajari kemahiran klinikal untuk rotasi pediatrik. Walaupun pembelajaran berdasarkan simulasi tidak dapat menggantikan sepenuhnya pengajaran di sisi katil, ia boleh diintegrasikan ke dalam kurikulum perubatan sarjana muda untuk menyokong pengajaran di sisi katil, terutamanya dalam keadaan yang tidak dijangkakan seperti era pandemik sekarang.

Kata kunci: *pelajar perubatan, pediatrik, simulasi, pengajaran dan pembelajaran*

1.0 INTRODUCTION

"To study the phenomena of disease without books is to sail an uncharted sea, while to study without patients is not to go to sea at all - Sir William Osler (1849-1919)" (Stone 1995). The importance of bedside teaching in undergraduate medical education cannot be disputed (Peters & ten Cate 2014). While the foundation of medical knowledge was built using books and lectures, clinical skills can only be acquired effectively at the patients' bedside. This is especially so for paediatric posting, a unique clinical rotation where bedside teaching is pivotal. During the posting, students are exposed to children as young as newborn babies to toddlers and even adolescents or young adults. They are taught on approaches to patients of varying ages with differing temperament, allowing them to learn not only history taking, examination techniques and clinical reasoning, but also good communication skills with both the child as well as the parents.

In year 2020, COVID-19 pandemic has caused major disruption to the education system worldwide and significantly affected the medical students' teaching programme (Papaioannou 2021; Alsoufi 2020). For the past one year, since the start of movement control order (MCO) on 18 March 2020, bedside teachings have been mostly replaced by online

teaching and learning activities. Students were allowed back to the institution when MCO was lifted periodically, however bedside teachings were severely limited. Students were not allowed access to majority of the wards which are now filled with the highly contagious COVID-19 patients. This had significantly reduced their clinical exposure and affected their training. Hence, new measures were adopted by clinicians in order to continue imparting knowledge and ensuring that the medical students were able to acquire the skills required to become a competent doctor upon graduation.

1.1 Simulation-Based Learning (SBL)

The concept of simulation has existed for centuries. From knights simulating jousting battles in the medieval times to fighter jet pilots using simulation in training, it is a learning tool that enables acquisition of knowledge and skills in scenarios that mimic real-world situations but in a safe environment. SBL in the field of medicine is a process where medical students can learn a new skill or practice an already acquired one in a simulated learning (controlled) environment before performing it on actual patients (Sarfati et al. 2019, Al-Elq 2010). Simulation functions by replacing and amplifying real experiences with guided ones, mimicking scenarios in the real world in a fully interactive fashion. An important aspect of using SBL is to ensure that clinical skill competencies such as history taking, physical examination, clinical reasoning and management skills as well as communication skills were attained by the students.

Simulation can be done using either human being as simulated patients, or with mannequin simulators. Simulated patients (SPs) are currently being used in different healthcare professionals' education and training programme (Williams & Song 2016, Jabeen 2013, Lin et al. 2013, Lane & Rollnick 2007, Watson et al. 2006). SPs can be trained to present a constellation of symptoms during history taking just like an actual patient. This allows the medical students to clerk varying paediatric cases, covering both common, and uncommon but important clinical cases. These SPs are readily available and can be asked to run a scenario multiple times, tailored to match the students' level of experience (Ker et al. 2005). However, the process of training these SPs are time-consuming and can be exhausting.

SBL using mannequin began in 1958 when Resuci Anne was "born" (Tjomsland & Baskett 2002). Since then, the use of mannequin has grown leaps and bounds, especially in paediatrics with the advent of Baby Anne (Lopreiato & Sawyer 2015; Cheng, Duff & Grant, 2007). Certain specialties, for example anesthesia and critical care, have used full-body mannequin simulators to train medical professionals in intubation and cardiopulmonary

resuscitation (CPR) for both adults and children (Dhawan, Kapoor & Choudhury 2016; Tjomsland & Baskett 2002). The use is however limited as these mannequins are expensive, thus it is rarely used by the clinicians to teach basic examination techniques for the undergraduate module.

For the past one year, with the repeated lockdown and restrictions due to COVID-19 pandemic, the Department of Paediatrics, Universiti Kebangsaan Malaysia Medical Centre has incorporated the use of SBL into the undergraduate medical curriculum. Questions arise whether SBL is a suitable way to teach the medical students on the different aspects of paediatric module. A quick survey was done to obtain feedback from the students regarding this newly adopted learning method.

2.0 MATERIALS AND METHODS

2.1 Subjects

Year 4 undergraduate medical students affected by the COVID-19 pandemic were initiated into this new teaching and learning method. A total of 171 students from 3 different semesters were divided into small groups consisting of 5-6 students each. These groups were led by a lecturer or clinical specialist who had more than 5 years' of teaching experience. Bedside teachings were conducted only when face-to-face sessions were allowed by the university; however the restrictions imposed allowed limited number of students in the wards or clinic each time. At other times, online teaching and learning sessions were conducted using role-play between the students and their group supervisors or SPs. Commonly encountered real-life scenarios were used during these teaching sessions to mimic history taking and clinical reasoning in real life.

A simulation lab was also set up in the department's tutorial room, equipped with both low and high fidelity paediatric mannequin simulators (Figure 1). Students were given dedicated schedule for SBL using these mannequins with their supervisors, during which they were taught basic physical examination techniques relevant to paediatric patients. They were allowed free access to the simulation lab for group practices after class. All these were complemented by self-directed learning, where the students watched pre-recorded videos on history taking and physical examination. End of semester OSCE assessments were also modified to include paediatric mannequin simulators as part of their clinical summative assessment.

Figure 1: (a) Setting up simulation lab, (b) Teaching physical examination techniques using low-fidelity paediatric mannequin

2.2 Survey method

All the students were invited to participate in a quick online survey using Google Form after the end of semester exam to evaluate their acceptance using the SBL method. The survey consisted of two sections: (1) basic demographic information (5 questions) and (2) feedback regarding SBL (19 questions) (including history taking, physical examination, planning investigations and management). Students were also asked to rate their responses using a Likert scale on the best methods to teach history taking and physical examination in paediatric posting. All the responses were then recorded and transferred to Statistical Package for the Social Sciences (SPSS) for analysis. Categorical data was presented in frequency (n) and percentage (%). Continuous data (non-normal distribution) was presented in median and interquartile range (IQR).

3.0 RESULTS AND DISCUSSION

Out of the 171 students, ninety-one of them participated in the online survey. The students' median age was 23.91 years (IQR 25th 22.53; 75th 25.85). Thirty-three (36%) of them were male while 58 (64%) were female. Almost half of the group were Malays (n=44; 48.4%), while the rest were Chinese (n=25; 27.4%), Indian (n=19; 20.9%) and others (n=3; 3.3%). Majority of them (89.7%) have good internet access for online teaching.

Based on our survey, majority of the students agreed that SBL is a suitable method to teach them how to plan simple and complex investigations [n=88 (96.7%) and n=80 (87.9%) respectively] as well as management for different paediatric diseases [n=83 (91.2%) and n=75 (82.4%) respectively] (Figure 2). Eighty-three students (91.2%) also concurred that teaching sessions using simulated patients allowed them to practice communication skills, learning the dos and don'ts before they have real-life encounter with parents in the ward. However, only half [n=45 (49.1%)] of the students think that the skill of history taking can be taught effectively using simulated patients; only twenty-eight students (30.8%) agreed that physical examination techniques can be learnt using mannequin.

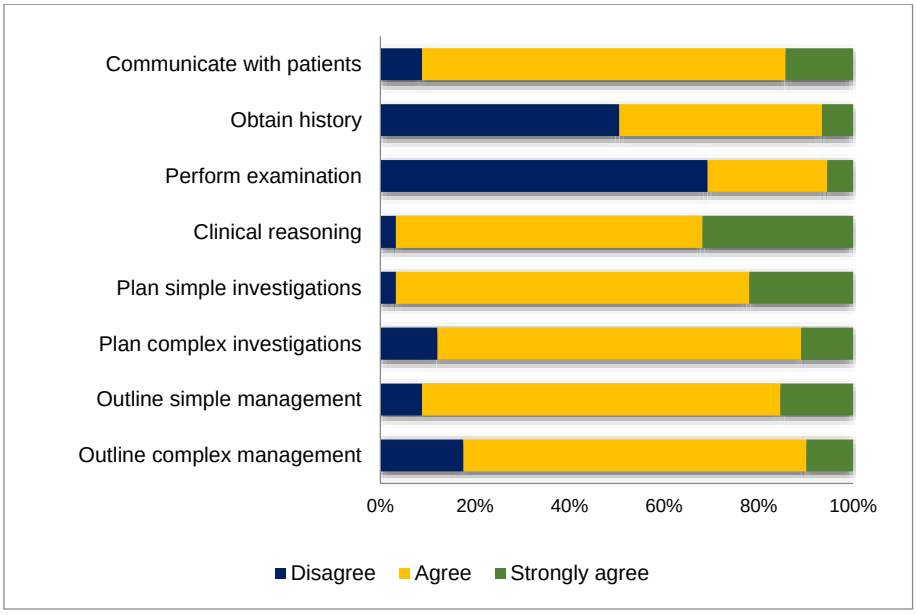

Figure 2: Students' feedback on the suitability of simulation-based learning in teaching the medical students various clinical skills

Apart from using simulated patients and mannequins, pre-recorded videos on history taking and physical examination were also used to complement the traditional bedside

teaching during the COVID-19 pandemic. Based on the students' feedback, only two-third [n=58 (63.7%)] of them found face-to-face session with simulated patients a useful method to teach history taking compared to session with real patients [n=86 (94.5%)] (Figure 3). Meanwhile, the use of mannequin to teach physical examination techniques was found to be more helpful if it was guided by the lecturers compared to students' self-directed session [n=70 (76.9%) versus n=48 (52.7%)] (Figure 4). Pre-recorded video on history taking and physical examination was perceived as the least helpful method in this survey.

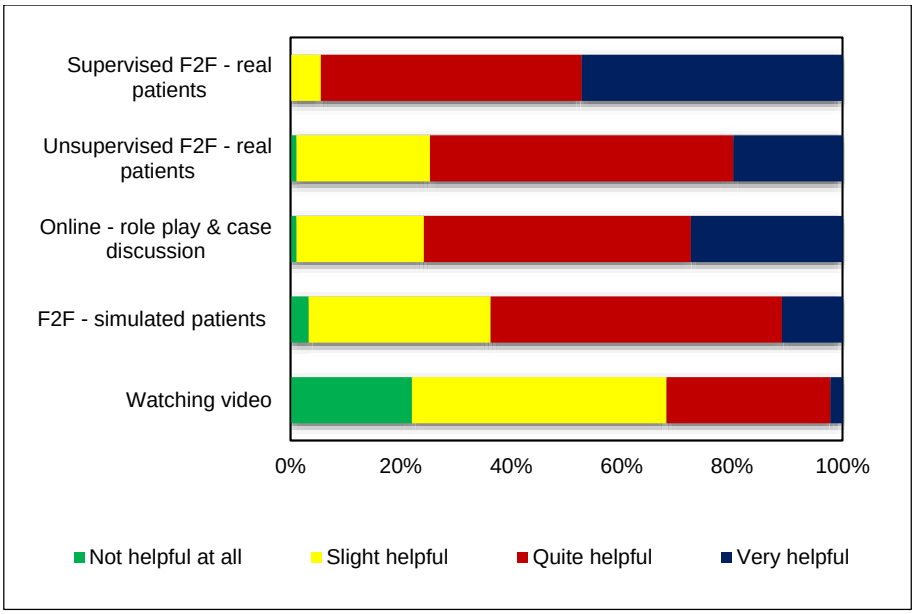

Figure 3: Students' perception on the usefulness of different methods to teach history taking

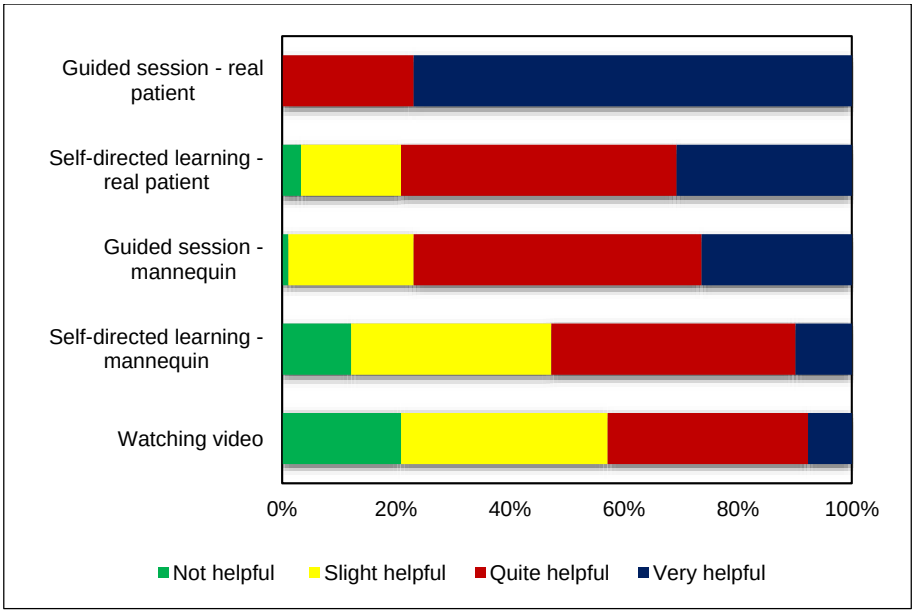

Figure 4: Students' perception on the usefulness of different methods to teach physical examination techniques

Traditionally, face-to-face history taking and guided physical examination session with real patients are conducted in one sitting followed by group discussion - each session can last up to 1-2 hours. However, in the era of COVID-19 pandemic, students' contact time with patients is limited and the numbers of cooperative or suitable patients have significantly reduced. To overcome this, small group SBL and role-play using SPs were utilized as a substitute to face-to-face history taking. Several studies reported that SP interviews were an effective teaching method with regards to history taking and communication skills (Qureshi & Zehra 2020, Williams & Song 2016, Von Lengerke 2011, Fortin et al. 2002). However, these sessions must be accompanied by constructive feedbacks from both the SPs as well as the lecturers in order for the students to benefit from the sessions (Keifenheim et al. 2015).

Eliciting clinical signs is one of the major skills medical students need to master during their clinical years (Bordage 1995). Based on the students' feedback, guided physical examination sessions using mannequins are comparable to self-directed learning with real patients. The mannequins used by us were mostly low fidelity and had limited clinical signs, but they can be a useful tool for the students to practice basic examination techniques under the lecturers' supervision. Although mannequins cannot replace bedside teachings with real patients, with proper planning and clear learning objectives, it's integration into clinical teaching can actually complement and strengthen the current medical curriculum (Lopreiato & Sawyer 2015). Certainly, with the advancement of technologies, a more complex high-fidelity mannequins with various functionality and physical signs may be made available to medical educators in the near future.

4.0 CONCLUSION

Historically, simulation-based learning was used to complement bedside learning. However, emergence of COVID-19 pandemic has pushed us to rely more on simulation based-learning as a teaching and learning tool. In the era of evolving technology and artificial intelligence, there is perhaps great potential for clinical educators to embark on an improved simulation-based learning tool in their quest to teach medical students both the science and the art of medicine.

5.0 ACKNOWLEDGEMENT

We thank the Department of Paediatrics, Universiti Kebangsaan Malaysia Medical Centre for their support.

6.0 REFERENCES

Al-Elq, A.H. (2010). Simulation-based medical teaching and learning. *Journal of Family & Community Medicine.* 17,35-40. doi:10.4103/1319-1683.68787

Alsoufi, A., Alsuyihili, A., Msherghi, A., Elhadi, A., Atiyah, H., Ashini, A., Ashwieb, A., Ghula, M., Ben Hasan, H., Abudabuos, S., Alameen, H., Abokhdhir, T., Anaiba, M., Nagib, T., Shuwayyah, A., Benothman, R., Arrefae, G., Alkhwayildi, A., Alhadi, A., Zaid, A. & Elhadi, M. (2020). Impact of the COVID-19 pandemic on medical education: Medical students' knowledge, attitudes, and practices regarding electronic learning. *PLoS One*. 15(11),e0242905. doi:10.1371/journal.pone.0242905

Bordage, G. (1995). Where are the history and the physical? *Canadian Medical Association Journal.* 152(10):1595-8.

Cheng, A., Duff, J., Grant, E., Kissoon, N. & Grant, V.J. (2007). Simulation in paediatrics: An educational revolution. *Paediatrics & Child Health*. 12(6),465-468. doi: 10.1093/pch/12.6.465

Dhawan, I., Kapoor, P.M. & Choudhury, A. (2016). Simulation in critical care. *Annals of Cardiac Anaesthesia.* 19(3),537-538. doi:10.4103/0971-9784.185558

Fortin, A.H., Haeseler, F.D., Angoff, N., Cariaga-Lo, L., Ellman, M.S., Vasquez, L., & Bridger, L. (2002). Teaching pre-clinical medical students an integrated approach to medical interviewing. *Journal of General Internal Medicine*. 17(9),704-708. doi: 10.1046/j.1525-1497.2002.00628.x

Jabeen, D. (2013). Use of simulated patients for assessment of communication skills in undergraduate medical education in obstetrics and gynaecology. *Journal of College of Physicians and Surgeons Pakistan.* 23(1),16-9.

Keifenheim, K.E., Teufel, M., Ip, J., Speiser, N., Leehr, E.J., Zipfel, S., & Herrmann-Werner, A. (2015). Teaching history taking to medical students: a systematic review. *BMC Medical Education.* 15,159. doi.org/10.1186/s12909-015-0443-x

Ker, J.S., Dowie, A., Dowell, J., Dewar, G., Dent, J.A., Ramsay, J., Benvie, S., Bracher, L. &

Jackson, C. (2005). Twelve tips for developing and maintaining a simulated patient bank. *Medical Teacher*. 27(1),4-9.

Lane, C. & Rollnick, S. (2007). The use of simulated patients and role play in communication skills training: A review of the literature to August 2005. *Patient Education and Counselling.* 67(1-2),13-20.

Lin, E.C., Chen, S.L., Chao, S.Y. & Chen, Y.C. (2013). Using standardized patient with immediate feedback and group discussion to teach interpersonal and communication skills to advanced practice nursing students. *Nurse Education Today*. 34(5),677-83.

Lopreiato, J.O. & Sawyer, T. (2015). Simulation-based medical education in pediatrics. *Academic Pediatrics*. 15(2),134-42. doi: 10.1016/j.acap.2014.10.010

Lopreiato, J.O., Sawyer, T. (2015). Simulation-based medical education in pediatrics. *Academic Pediatrics*. 15(2),134-42. doi:10.1016/j.acap.2014.10.010

Papapanou, M., Routsi, E., Tsamakis, K., Fotis, L., Marinos, G., Lidoriki, I., Karamanou, M., Papaioannou, T.G., Tsiptsios, D., Smyrnis, N., Rizos, E. & Schizas, D. (2021). Medical education challenges and innovations during COVID-19 pandemic*. Postgraduate Medical Journal.* Epub ahead of print. doi:10.1136/postgradmedj-2021-140032

Peters, M. & ten Cate, O. (2014). Bedside teaching in medical education: a literature review. *Perspectives on Medical Education*. 3(2),76-88. doi:10.1007/s40037-013-0083-y

Qureshi, A.A. & Zehra, T. (2020). Simulated patient's feedback to improve communication skills of clerkship students. *BMC Medical Education* 20,15. doi.org/10.1186/s12909-019-1914-2

Sarfati, L., Ranchon, F., Vantard, N., Schwiertz, V., Larbre, V., Parat, S., Faudel, A. & Rioufol, C. (2019). Human-simulation-based learning to prevent medication error: A systematic review. *Journal of Evaluation in Clinical Practice.* 25(1),11-20. doi: 10.1111/jep.12883

Stone, M.J. (1995). The wisdom of Sir William Osler. *The American Journal of Cardiology.*75,269-76. doi: 10.1016/0002-9149(95)80034-p

Tjomsland, N. & Baskett, P. (2002). Asmund S. Lærdal. *Resuscitation.* 53(2),115-9. doi:10.1016/s0300-9572(02)00033-3

Von Lengerke, T., Kursch, A., Lange, K., & APG-Lehrteam MHH. (2011). The communication skills course for second year medical students at Hannover Medical School: an evaluation study based on students' self-assessments. *GMS Zeitschrift für Medizinische Ausbildung,* 28(4),54. doi: 10.3205/zma000766

Watson, M.C., Norris, P. & Granas, A.G. (2006). A systematic review of the use of simulated patients and pharmacy practice research. *International Journal of Pharmacy Practice*. 14,83-93.

Williams, B. & Song, J.J.Y. (2016). Are simulated patients effective in facilitating development of clinical competence for healthcare students? A scoping review. *Advances in Simulation* 1,6. doi.org/10.1186/s41077-016-0006-1