Exploring the experience of medical students as peer teachers in clinical ultrasonography: why do they do it and how do they perform?

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Categories: Teaching and Learning, Clinical Skills, Undergraduate/Graduate

Abstract

Background

A pilot project aimed to understand the experience and performance of medical students as peer tutors (Student In Medical Education Program, SIME) in the undergraduate ultrasound module at the University of Hong Kong.

Methods

Four SIME tutors contributed to teaching of third year medical students (*n*=184) via a 3-hour hands-on session. Pre-module training was given to SIME tutors. Students were divided into small groups to practise abdominal ultrasound scanning on each other under the guidance of senior tutors (radiologists/sonographers) or SIME tutors.

Learning outcomes were assessed through pre- and post-module quizzes. Qualitative exploration was undertaken through thematic coding of dedicated observers' notes from teaching sessions and the round table discussion conducted with SIME tutors to discuss the project effectiveness.

Results

Seventy-five percent (*n*=138) of the medical students submitted both pre- and post-module quizzes. The senior tutors' and the SIME tutors' groups scored similarly on the post-module quiz, 8.26 and 7.93 respectively.

Themes emerging from the qualitative analysis included SIME tutors motivations for teaching such as giving them insight to the limitations of their own knowledge. They valued the proximity of age to their students and understood the learning needs of the students. Some barriers to peer-teaching were also identified such as concerns over sufficiency of knowledge to teach, and logistic arrangements.

Discussion

SIME program was successfully introduced in the ultrasound module, improving SIME tutors' self-confidence in teaching and better understanding of ultrasound without affecting the quality of teaching.

Keywords: Curriculum; learning; teaching; medical students; ultrasonography.

Introduction

Engaging medical students as peer-teachers can have benefits for both teachers and students at multiple levels (Bene and Bergus, 2014), (Rees *et al.*, 2016), through creating a friendly learning environment leading to improved confidence in performing a clinically orientated skill or task. Peer-teachers offer education to students at their own cognitive level, without any pressure and thus enhancing their motivation and interest (Lockspeiser *et al.*, 2008). The free flow discussion between the students and their peers improves communication skills (Rees *et al.*, 2016), builds collaborative relationships with better understanding of the challenges for exam success.

As the practice of point-of-care ultrasound increases since the 1990s, integration of ultrasound teaching into the undergraduate medical curriculum is important to ensure its early exposure and safe use (Moore and Copel, 2011), (Bahner *et al.*, 2014). A new ultrasound module was implemented in the undergraduate medical curriculum at the University of Hong Kong (HKU) resulting in improved awareness and better understanding of this bedside technique (Coiffier *et al.*, 2019).

The aim of this study was to explore the experience of newly-trained peer-teachers in the ultrasound module, and to assess the educational benefits to themselves as well as the students they teach.

Methods

The pilot project involving medical students as peer-teachers through the Student In Medical Education (SIME) program was introduced in the ultrasound module at HKU in September 2018, aimed to improve the learning and teaching experience during a 3-hour hands-on session. This implementation of peer-teaching was adapted from the Association of Medical Education in Europe (AMEE) guidance document (Ross and Cameron, 2007). Participation in the SIME program was voluntary, but students must have previously joined the Special Study Module (SSM) from the Department of Diagnostic Radiology, in year 3. The 4-week SSM offered training in ultrasound acquisition techniques, Focused Assessment with Sonography with Trauma and upper abdominal ultrasound imaging. Pre-module training was organized for SIME tutors for more hands-on experience and teaching guidance. They shadowed the senior tutors (experienced radiologists or sonographers) during the first session for pedagogy training.

The undergraduate ultrasound module was run four times in the academic year for all third year medical students. A total of 184 students, 4 SIME tutors and 12 senior tutors participated in the project. During each session, the students were randomly divided into 4 small groups of 12-13 students, led by either a senior tutor or a SIME tutor supervised by a senior tutor.

The learning outcomes of the module were: (1) to understand the important considerations before and during scanning and (2) to recognize normal abdominal anatomy. Tutors received guidance notes prior the session and were instructed to follow a standardized approach starting with an explanation of the imaging planes and knobology, followed by demonstration of the use of ultrasound apparatus on a volunteer student, to provide hands-on tips and to explain how to recognize the different appearances of normal abdominal anatomy on ultrasound. Each student then practiced upper abdominal scanning on each other under the tutor's supervision.

Learning outcomes were evaluated using a quiz, before and after the module. The pre-module quiz contained 5 questions on basic ultrasound to assess baseline knowledge on ultrasound. The post-module quiz consisted of the same 5 questions to assess knowledge improvement and 5 additional questions to evaluate the acquired ultrasound skills.

A research assistant not involved in teaching observed the different peer-teachers during the training session, took notes on their behaviors and collected feedbacks from the students after the session and through 8 questions sent by email. A round table discussion was conducted with project investigator and SIME tutors after the sessions to discuss the effectiveness and challenges of this pilot project. The notes taken by the observer and during the round table discussion were entered into qualitative analysis software (Nvivo 9) and thematic coding was undertaken to identify common themes relating to the motivations and experiences of the SIME tutors.

Results

Among the 221 students enrolled into the program, 83% of them participated in the ultrasound training sessions (n=184), leading to a 1:12 tutor to student ratio. 75% (n=138) submitted both pre- and post-module quizzes. The average grade for the pre-module quiz was 3.95 and 3.70 out of total score of 5 respectively for the senior tutor groups and SIME groups, showing a reasonable sound knowledge of ultrasound. The groups with senior tutors and those with SIME tutors both performed highly on the post-module quiz with mean grading of 8.25 and 7.93 (out of total score of 10), respectively (*Table 1*).

Table 1: Average score of the pre- and post-module quizzes for *n*=138 quizzes.

	Pre-module quiz (total score 5)		Post-module quiz (total score 10)	
	Average Tutor's groups	Average SIME's groups	Average Tutor's groups	Average SIME's groups
Session 1	3.90	/	8.30	/
Session 2	3.88	4.25	9.00	8.70
Session 3	3.52	3.05	7.53	6.95
Session 4	4.59	3.80	8.18	8.13
Total Mean	**3.95**	**3.70**	**8.26**	**7.93**
Variance	1.44	1.31	1.59	2.94
P value	0.23		0.19	

A two-sample t test assuming equal variances was performed to assess the P-Value of each group.

Four qualitative themes were identified: (1) Peer-tutors motivations to teach, (2) Positive teaching and learning behaviors, (3) Facilitators of peer-teaching, and (4) Barriers to peer teaching. SIME tutors reported positive experiences such as the opportunity to have interactive discussions with the students. Benefits to SIME tutors themselves were also identified in their motivation for themselves, for example:

"Teaching is also a great way for me to learn and revise."

"Questions raised by students often inspire me to think more and have new insights into the limitations in my understanding."

They felt more confident in teaching after these sessions and improved their own ultrasound skills responding to the students' questions. Analysis of observer notes showed that students in the groups with the SIME tutor were engaged

and enthusiatic with more verbal participation. This triangulated with statements by SIME tutors that close age and empathy were facilitators of teaching. Barriers to peer teaching identified by SIME tutors include the feelings of insufficient knowledge and the request of more independence in teaching during the sessions, as they were supervised by senior tutors. SIME tutors reported the desire to teach without supervision and to develop additionnal sessions outside the module.

Discussion

The study demonstrated that SIME tutors trained through a 4-week SSM and a pre-module training performed as well as senior tutors in helping students learn basic ultrasound knowledge and techniques. Our training is consistent with the effective approach highlighted by Celebi *et al.* who described three ways to train peer-tutors: course, internship or both (Celebi *et al.*, 2019).

Our observational findings of increased interactivity between tutors and students and establishment of a friendly learning environment match the putative benefits of peer-teaching put forward by other authors (Ten Cate and Durning, 2007). The benefits to SIME tutors' such as improved self-reported confidence in using ultrasound came without compromising on the teaching quality.

As a pilot study, this study has several limitations. First, only 4 SIME tutors were enrolled to teach in the ultrasound module. However, with these positive results, there will be scope to expand the project to enlist more volunteered SIME tutors for future sessions. Second, the post-module results were not based on a competency-based assessment. We are gradually introducing this evaluation (Kumar, Kugler and Jensen, 2019) into the module to better evaluate students' performance.

Conclusion

In conclusion, the SIME program successfully trained peer-teachers who were equally effective teaching ultrasound as senior tutors, and demonstrated additional benefits such as improving self-confidence among the SIME tutors and increased interactivity amongst students.

Take Home Messages

- Senior students as adjunct tutors through the Student In Medical Education (SIME) program.

- Engaging peer-teaching in the ultrasound curriculum does not affect the quality of teaching.

- SIME tutors reported positive experience in teaching.

- SIME tutors felt more confident in teaching after this program and improved their own ultrasound skills.

Notes On Contributors

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Acknowledgements

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Appendices

None.

Declarations

Ethics Statement

Ethics approval was sought and granted by the local Institutional Review Board. Name of committee approving the research: Institutional Review Board of the University of Hong Kong/Hospital Authority Hong Kong West Cluster (HKU/HA HKW IRB). Reference number: UW 18-439.

External Funding