A pilot study of integrating standardized patients in problem-based learning tutorial in Taiwan

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Abstract

Background: Problem-based learning (PBL) has been widely adopted in medical education; however, its application has been questioned due to the lack of interaction with a real patient. Standardized patients (SPs) might solve this problem. Herein, we tested the impact of integrating SPs in a PBL tutorial.

Methods: In 2017, a total of 313 students, 66 facilitators, and 36 SPs were enrolled at National Yang-Ming University, Taiwan. The SPs presented the symptoms/signs of the cases then the students interviewed them to obtain the detail history. All students, facilitators, and SPs were invited to complete the questionnaires before and after this program.

Results: Most SPs considered that both the second-year dental medical student and third-year medical students participated actively and were competent enough but students and facilitators considered that the fourth-year medical students might be more prepared. Overall, the students thought highly of the interactions with the SPs. Only about one-fifth felt that this design caused unnecessary pressure among the students and facilitators. They agreed that this program significantly inspired the student's learning motivation (pre- vs post-course: 4.1 ± 0.7 vs 4.3 ± 0.7, $p < 0.001$), increased their confidence level in interviewing patients (4.0 ± 0.8 vs 4.2 ± 0.7, $p < 0.001$), and encouraging critical thinking (4.0 ± 0.7 vs 4.2 ± 0.7, $p < 0.001$).

Conclusion: The SPs, facilitators, and students had different viewpoints with regards to integrating SPs in the PBL tutorial. However, a majority agreed that this design enhanced the motivation of students and supported such an application in PBL tutorials.

Keywords: Medical education; Problem-based learning; Standardized patients

1. INTRODUCTION

Problem-based learning (PBL) is a student-centered, self-directing, and collaborative learning method, which has been widely adopted in medical education in Asian countries.[1,2] The core concept of PBL is problem-based with small group tutorial, aiming to facilitate deep learning.[3] Despite widespread attempts to introduce PBL in Asia, the implementation has plateaued at 20% to 30% of medical curricula.[4] The skepticism about PBL comes from the following: (1) student-centered learning is to some degree against the main stream of medical education focusing on patient-centered learning; (2) self-directing learning requires a strong driving force; however, some Asian medical students have been used to learning from lecturing and memorizing knowledge passively; (3) the discussion of a PBL case is usually based on clues from a virtual case in the form of a "script", but not shown with a real clinical scenario. Traditional PBL case is a paper format describing the details of a structured case. To enhance the authenticity, some researchers use video-case instead of paper-case to elicit the brainstorming of participants. The video-case may be a better medium because it preserves the original language, encourages the active extraction of information, avoids depersonalization of patients, and allows direct observation.[5] The majority of students and facilitators consider that video-case triggers the student's capabilities of observation and clinical reasoning, helping them integrate different information, and elicits their motivation. Nevertheless, video-cases in PBL still lack dynamic interaction. A real patient, actually, can be a more potent trigger in PBL tutorial. Dammers et al have reported the use of real patients in a PBL module in general practice.[6] They pointed out five advantages of using real patients in PBL tutorial, including (1) strengthening motivation of student, (2) fostering the responsibility of students, (3) elaboration of learning, (4) training of empathy, and (5) creating the concept of medical humanity. However, the major limitations of using real patients in PBL module include the following: (1) it is difficult to enroll many patients with the same diagnosis and

disease severity at the same time, (2) issues of infection control and patient safety, and (3) complexities of real patients' comorbidities. Accordingly, using a standardized patient (SP) is an ideally alternative method.

SPs are volunteers with various backgrounds who participate actively in the teaching and evaluation of medical students. After appropriate training, they can show different clinical scenarios preciously and repeatedly. SP-based tests are among the most reliable methods for assessment of a trainer's proficiency of history taking, physical examination, and communication skill.[7] On the basis of these features, SP may play a crucial role in helping students build competencies before they receive clinical training.[8] Barlow et al reported that the integration of SP interview in extended PBL cases can reinvigorate and rejuvenate the dynamics of PBL.[9] The Japanese researcher has also reported the experience of integrating SP in PBL tutorial at Hokkaido Pharmaceutical University in Japan, in which students interviewed the SP to obtain detailed information and design a care plan.[10] According to this report, students considered this program very helpful in understanding how to design a patient care plan and knowing the importance of communication skills.

Therefore, introducing SP in PBL tutorial seems to be promising in enhancing the motivation of students and strengthening the authenticity of PBL cases. In the present study, we tested the impacts of integrating SP in the PBL tutorial in a National University of Taiwan and evaluated the feedbacks from students, SPs, and facilitators.

2. METHODS

2.1. Research setting and participants

National Yang-Ming University School of Medicine is one of the leading medical schools in Taiwan, which has actively advocated and implemented PBL in medical education since 2002. In 2017, a total of 313 students including the second-year dental medical students (n = 45), third-year medical students (n = 141), and fourth-year medical students (n = 127) were enrolled. The second-year dental medical students and third-year medical students studied and cooperated together. The PBL curriculum was composed of 10 to 11 system-based blocks. Each block consisted of lectures in the fields of basic and clinical sciences, clinical skills, and PBL tutorials. In this study, we chose two cases for the second-year dental medical students and the third-year medical students and another one case for the fourth-year medical students to test the impacts of integrating SP in PBL tutorial. Each PBL group consisted of eight to nine students and was facilitated by one or two facilitators. A total of 66 facilitators and 36 SPs participated in this program. All students, facilitators, and SPs were invited to complete the questionnaires for this program. The participation was voluntary and the participants have signed the informed consents. The retrieved questionnaires were coded with numbers and de-identification. The study was conducted in accordance with the Declaration of Helsinki (Seoul 2008). This study has been approved by the Research Ethics Committee of Yang-Ming University (YM106073W). A total of 36 questionnaires were collected from SPs (36/36, 100% retrieved rate), 219 precourse, and 220 postcourse questionnaires were retrieved from students (219/313, 70%; 220/313, 70%, respectively), and a total 60 questionnaires were retrieved from facilitators (60/66, 91%).

2.2. Training of students, facilitators, and SPs

Since the third, fourth-year medical students, and the second-year dental medical students had not encountered real patients, the video-demonstration of history taking and communication skill with a patient was provided before they encountered the SP integrated-PBL tutorial. For facilitators, an integrated-SP PBL tutorial was demonstrated in the tutorial training course and tutor meeting. The SPs were trained by the case writer, investigator, and SP trainers.

2.3. Intervention

Three cases including a musculoskeletal case and a cardiovascular case for the second-year dental medical students and third-year medical students and a cardiovascular case for the fourth-year medical students were chosen. At the beginning, the participants read the basic information of the PBL case. Then a 10-minute interview of SP was conducted by students to obtain the detailed history and to observe the symptoms/signs directly. The students were asked to list the problems and discussed these issues. After that, the more detailed information of the case was provided, paper-based. Then the SPs, students, and facilitators were asked to give feedbacks. In the SP-integrated PBL session, the participants were asked to complete questionnaires on a 1 to 5 Likert scale, in which score 1 meant strongly disagree and 5 meant strongly agree. The final results were expressed by mean ± SD. Besides, the proportion of participants who answered score 4 and 5 among total participants indicated the agreement of this question for these participants.

2.4. Analysis

Paired *t*-tests were employed to compare the difference between the results of pretest and post-test. For the group comparisons, one-way ANOVA with post-hoc Tukey analysis or the Student's *t* test were used as appropriate. The SPSS Statistics version 21.0 program (IBM Corp., Armonk, USA) was used for statistical analysis.

3. RESULTS

3.1. Overviews of the integration of SP in PBL tutorial

Table 1 demonstrates the overview of opinions from the students, SPs, and facilitators. Most of them agreed with the timing of the appearance of SPs and the timing for history taking (Questions 1 and 2). Compared with the facilitators, the agreement for satisfactions of facility and place was higher among the SPs (Question 3). Most SPs agreed to enroll the second-year dental medical students and the third-year and fourth-year medical students into this program. However, students and facilitators regarded that the fourth-year medical student were more feasible for this program (Questions 4 and 5). Most of the SPs, students, and facilitators agreed that the early engagement in clinical scenario could help the student in their future clinical tasks and they favored this program to be continuing in the future (Questions 6, 8, and 9). Among them, the SPs expressed a higher degree of agreement compared to the students and facilitators (Questions 6, 8, and 9). In addition, most of the student and facilitator agreed that this program could elicit more discussions (Question 7).

3.2. Viewpoints of SP and facilitator about the impact of SP in PBL tutorial

Table 2 figures out the viewpoints of SPs and facilitators about the impacts of integrating SP into the PBL tutorial. Compared with the facilitators, a higher proportion of SPs would like to actively alleviate the embarrassment among SPs and students (Question 1). The SPs as well as facilitators did not feel nervous about the interaction among SPs and students. In addition, they did not disturb by pointing out the student's mistakes when he encountered the SP (Questions 2 and 3). Compared with the facilitators, more SPs would guide the students when they needed help (Question 4). Most of the SPs and facilitators agreed that the students' performance was good but only two thirds (66.6%

Table 1

Overview of the integration of SP in PBL tutorial

Questions	Student Mean ± SD (agreement)	SP Mean ± SD (agreement)	Facilitator Mean ± SD (agreement)	Significance
1. I think the timing of SP appearance in PBL tutorial is proper.	4.2 ± 0.7 (87.6%)	4.2 ± 0.7 (86.1%)	4.3 ± 0.6 (93.3%)	$p > 0.05$
2. I think the timing for history taking by students is proper.	4.1 ± 0.7 (81.6%)	4.2 ± 0.6 (86.1%)	4.2 ± 0.6 (90.0%)	$p > 0.05$
3. I think the place and facility for integration of SP in PBL tutorial is proper.	NA	4.4 ± 0.6 (94.4%)	4.0 ± 0.7 (86.6%)	$p = 0.01$
4. I think the third-year medical students and second-year dental medical students are feasible for this program.	3.6 ± 1.2 (71.8%)	4.4 ± 0.5 (100%)	3.7 ± 0.9 (61.4%)	Student and facilitator vs SP, $p < 0.001$; student vs facilitator, $p > 0.05$
5. I think the fourth-year medical students are feasible for this program.	4.3 ± 0.6 (90.1%)	4.5 ± 0.6 (97.2%)	4.4 ± 0.5 (96.6%)	$p > 0.05$
6. I think early engagement with clinical scenario can help students' in their future clinical training.	4.3 ± 0.7 (92.6%)	4.8 ± 0.4 (100%)	4.4 ± 0.6 (94.6%)	Student and facilitator vs SP, $p < 0.001$; student vs facilitator, $p > 0.05$
7. I think the integration of SP in the PBL tutorial could elicit more discussions.	4.2 ± 0.9 (84.2%)	NA	4.3 ± 0.7 (91.5%)	$p > 0.05$
8. I agree to introduce the SP in the PBL tutorial.	4.2 ± 0.9 (87.6%)	4.7 ± 0.5 (97.1%)	4.3 ± 0.7 (88.1%)	Student and facilitator vs SP, $p < 0.001$; student vs facilitator, $p > 0.05$
9. I hope to continue this program in the future.	4.2 ± 0.9 (85.0%)	4.7 ± 0.5 (97.1%)	4.3 ± 0.7 (89.8%)	Student and facilitator vs SP, $p < 0.001$; student vs facilitator, $p > 0.05$

PBL = problem-based learning; SP = standardized patient.

in SP and 66.7% in facilitator) of them agreed that every student had communicated with SP (Questions 5 and 6). From the viewpoint of SPs, 88.8% of them agreed that the facilitators could intervene at the proper moment but only 54.2% of facilitators agreed that they would point out the mistake when the SP presented in a wrong way. Nevertheless, 79.7% of facilitators agreed that the performance of SPs was proper.

3.3. Viewpoints of students about the impacts of SP in PBL tutorial

Table 3 points out the viewpoints of students about this program. Most of them understood the PBL tutorial and the design of integrating SP in the PBL tutorial (Questions 1 and 2, 92.7% and 87.3% agreement, respectively). Most of them had a good experience of interaction with SPs (Questions 3 and 4, 77.9% and 89.9% agreement, respectively). Only about one-fifth of them felt that the integration of SP in PBL tutorial caused unnecessary pressure among the group members and facilitators (Questions 5 and 6, 20.7% and 18.4% agreement, respectively). In addition, most of them agreed that the performance of SPs was proper and the SPs could guide them when they were in trouble (Questions 7 and 8, 95.7% and 85.7% agreement, respectively). Besides, they also agreed that the facilitators could

guide the team members when they met difficulty in communicating with SP (Question 9, 87.6% agreement).

3.4. The students' expectation about integrating SP in PBL tutorial before and after the program

Fig. 1 depicts the before and after program expectations from the students. After the students experienced this program, they thought this program significantly inspired their learning motivation (precourse vs postcourse: 3.8 ± 0.9 vs 4.2 ± 0.7, $p < 0.001$); elicited their interests in contacting a real patient (precourse vs postcourse: 4.1 ± 0.7 vs 4.3 ± 0.7, $p < 0.001$); and trained them to encounter a real patient (precourse vs postcourse: 4.0 ± 0.8 vs 4.2 ± 0.7, $p < 0.001$). They agreed more toward the integration of SP in PBL tutorial after the course (precourse vs postcourse: 3.9 ± 0.8 vs 4.1 ± 0.8, $p < 0.001$) and agreed that this program strengthened their capability of critical thinking (precourse vs postcourse: 4.0 ± 0.7 vs 4.2 ± 0.7, $p < 0.001$).

4. DISCUSSION

In this study, we highlight the different viewpoints of integrating SP in the PBL tutorial from SPs, facilitators, and students. We found that SPs had a more positive attitude in the benefits

Table 2

The impacts of SP in PBL tutorial from SPs' and facilitators' viewpoint

Questions	SP Mean ± SD (agreement)	Facilitator Mean ± SD (agreement)	Significance
1. I would like to relieve the embarrassment between students and SPs if necessary.	4.2 ± 0.8 (86.1%)	3.2 ± 1.2 (48.3%)	$p < 0.001$
2. I feel nervous when the students have trouble in interacting with the SPs.	2.3 ± 0.9 (8.3%)	2.4 ± 1.2 (18.3%)	$p > 0.05$
3. I did not point out the mistake of students when they interact with SP.	3.9 ± 1.0 (71.4%)	3.9 ± 1.0 (76.7%)	$p > 0.05$
4. I would guide the students when they needed help.	4.2 ± 0.7 (77.7%)	3.1 ± 1.1 (46.6%)	$p < 0.001$
5. I think the student's performance was good.	4.2 ± 0.7 (86.1%)	4.1 ± 0.9 (85.0%)	$p > 0.05$
6. Every student has communicated with SP.	3.8 ± 1.1 (66.6%)	3.7 ± 0.9 (66.7%)	$p > 0.05$
7. I think the facilitator can interfere with the tutorial in the proper moment.	4.2 ± 0.9 (88.8%)	NA	NA
8. I would point it out immediately when SP presented in a wrong way.	NA	3.4 ± 1.2 (54.2%)	NA
9. I think the performance of SP was proper.	NA	4.2 ± 1.0 (79.7%)	NA

PBL = problem-based learning; SP = standardized patient.

Table 3

The impacts of SPs in PBL tutorial from students' viewpoint

Questions	Mean	SD	Agreement
1. I understand the program of PBL tutorial.	4.3	0.6	92.7%
2. I understand the program of integration of SP in the PBL tutorial.	4.3	0.7	87.3%
3. I can immerse the interaction with the SP.	4.0	0.8	77.9%
4. Most of the members in the group can enjoy the interaction with SP.	4.2	0.7	89.9%
5. Interaction with the SP can be stressful among group members.	2.4	1.1	20.7%
6. The facilitator felt somewhat stressful by the integration of SP in PBL tutorial.	2.5	1.2	18.4%
7. The performance of SP was proper.	4.5	0.6	95.7%
8. The SPs guided group members when they fell into difficulty.	4.3	0.7	85.7%
9. The facilitator guided group members when they encountered difficulty in communicating with the SP.	4.2	0.7	87.6%

PBL = problem-based learning; SP = standardized patient.

of early clinical engagement for medical student and they were more enthusiastic in integrating SP in the PBL tutorial, compared with the facilitators and students. Regarding the feasible participants for interacting with SPs in PBL tutorial, facilitators and students considered that the fourth-year medical students were better candidates, because they have experienced lectures and PBL discussions for one more year than their juniors. However, all the SPs (100%) considered that the student should encounter the SPs earlier, even at the second-year of dental medical students and third-year of medical students. In addition, when the students had a trouble in interacting with SPs, in contrast to facilitators, more SPs would like to actively alleviate the embarrassed condition and to guide the students. The different perspectives of SPs, facilitators, and students may originate from their different roles but contribute a lot in understanding the group dynamics and modifying the program.

The most significant benefit of inviting SP in the PBL tutorial comes from the enhancement of authenticity of PBL case. Interestingly, the online PBL model using interactive multimedia has also been designed to enhance the authenticity of the case and to inspire the students' enthusiasm in learning.[11] Using interactive online virtual patients, the researchers of St George's University of London found that the ability of online PBL to explore options and consequences created a more engaging experiences than traditional PBL.[12] Nevertheless, the virtual patient is still different from the real patient in clinical setting, especially in the training of communication skills and the

establishment of empathy. The benefits of using SPs as a training method in practicing history, clinical skills, and communication skills have been documented in several reports.[13–15] The SP is different from virtual patient in many ways. Among them, authenticity and in time feedback are most important. A research has shown that students develop clinical reasoning skills by actively engaging in problem solving and receiving sufficient feedback.[16] The feedback from a well-trained SP can encourage the medical students to improve their communication skills and professionalism. In the present study, many students felt that the SP could guide them when they fell into difficulties. In addition, early clinical exposure in medical education can make students be familiar with the physician's expected role and responsibilities they should take in the future, which help them build up the empathy and improve clinical competences.[17] Our study shows that there is a good consensus among SPs, students, and facilitators in this regard.

PBL has been considered an effective instructional tool to foster critical thinking and problem solving capacities among medical students.[18] However, the traditional paper-based PBL tutorial had been criticized for the lack of authenticity and interactivity with a real patient. Yoon et al showed that the interaction with SP in PBL tutorial engaged medical student in deeper thinking and discussion, strengthening communication skills, developing proper attitudes toward patients, and motivating learning.[19] In agreement with Yoon's study, we also found that the integration of SP in the PBL tutorial could enhance the students' learning motivation and critical thinking in Taiwan.

Although our data showed that the integration of SP in the PBL tutorial could be promising, several limitations should be taken into account. First, for each case, the SPs only participated in the tutorial for 10 minutes that some students might not have the chance to encounter the SP. Therefore, the feedback from those who did not interact with the SPs may be questionable, even though they gave feedback based on their observations of the interactions. Second, most of students and facilitators stated that the presence of SP did not elicit unnecessary pressure in the PBL tutorial. However, a precise scale was not applied to detect the degree of pressure. Further quantitative and qualitative studies, therefore, are warranted. Third, the integration of SPs in the PBL tutorial is time- and money-consuming, because vigorous training and additional payments are required. The benefit and cost should be balanced in such a design. And last, the consequent impact on the academic and clinical competence of students deserves follow-up and future investigation.

In this study, a majority of students enjoyed interacting with SP in the PBL tutorial and agreed that such an intervention enhanced the depth of discussion in PBL tutorial. They did not consider the appearance of SP were stressful for the facilitators and team members. Instead, more than 85% of students, SPs,
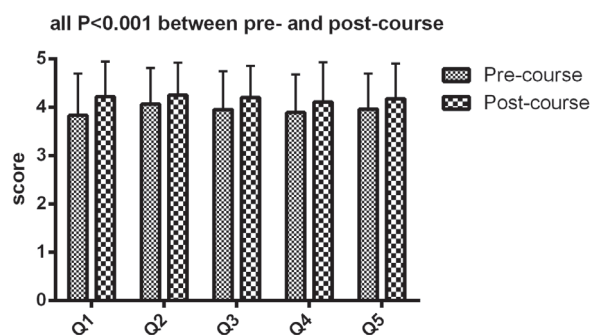
Fig. 1 The students' expectation before and after this program. Q1: This program inspires my learning motivation (precourse vs postcourse score: 3.8 ± 0.9 vs 4.2 ± 0.7, *p* < 0.001). Q2: This program makes me want to contact a real patient (precourse vs postcourse score: 4.1 ± 0.7 vs 4.3 ± 0.7, *p* < 0.001). Q3: This program trains me to encounter a real patient (precourse vs postcourse score: 4.0 ± 0.8 vs 4.2 ± 0.7, *p* < 0.001). Q4: I think the integration of SP in PBL tutorial is appropriate (precourse vs postcourse score: 3.9 ± 0.8 vs 4.1 ± 0.8, *p* < 0.001). Q5: This program improves the critical thinking (precourse vs postcourse score: 4.0 ± 0.7 vs 4.2 ± 0.7, *p* < 0.001).

and facilitators agreed that this program is worthy of continuing in the future. The awareness and positive attitudes among them support the integration of SP in PBL tutorial in an undergraduate medical curriculum. We conclude that the integration of SPs in PBL tutorial can improve the authenticity of PBL case and inspire the learning motivation of students.

ACKNOWLEDGMENTS

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