Evaluation of Problem-Based Learning Education after Clerkship at the Chang Gung University School of Medicine

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Background: The Chang Gung University School of Medicine adopted problem-based learning (PBL) education 3 years ago. A questionnaire was designed to evaluate the effectiveness of this teaching method, and the results were analyzed to determine statistical significance.

Methods: In June 2001, all the interns in the Medical and Surgical departments of the Chang Gung Memorial Hospital were compulsorily assessed using a newly developed questionnaire, which was provided to the residents, chief resident, and attending doctors. The questions involved the interns' ability to perform 10 essential skills, namely (1) problem searching, (2) problem solving, (3) initiative learning, (4) thinking process, (5) establishing the patient-doctor relationship, (6) establishing the doctor-nurse relationship, (7) interaction with peers, (8) professional knowledge, (9) clinical techniques, and (10) medical notes writing. Forty-three completed questionnaires, evaluating 25 interns, were returned. Of these 25 individuals, 14 had participated in PBL education and 11 had been taught using the conventional variant.

Results: No statistically significant differences were demonstrated for gender or average school records between the interns who had been taught using the PBL and conventional methods. Statistically significant superiority was demonstrated for interns educated using PBL in three of 10 areas including, thinking process, professional knowledge, and clinical techniques.

Conclusion: Analysis of the questionnaire results clearly demonstrated that the introduction of the PBL method of teaching at the university was efficacious in terms of the competence demonstrated by the interns when entering clinical practice.

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Key words: problem-based learning, medical education, initiative learning, patient-doctor relationship.

The principal difference between problem-based learning (PBL) and traditional education is more frequent interaction between the tutors and the students. The school, which once supplied only the classroom, plays a more active role in the education of students. It has been proposed that PBL education may offer a new and superior form of education to medical students. PBL is an educational method that can be considered as an alternative to the traditional, discipline-based, approach to teaching.[1-8]

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Problem-based learning was introduced in the 1970s and had become fully developed by the middle of the 1980s. The main emphasis of PBL education is to establish patient-doctor relationships, respect for life, and acknowledgement of the patient as a complete and perfect entity and not a collection of separate organs. Further, a sense of professional duty is impacted to the medical students together with a clear indication of their role of the medical profession. This hope is this will allow doctors to regain lost dignity.[9-11]

The Chang Gung University School of Medicine adopted the PBL teaching method in 1999. The PBL education in Chang Gung University School of Medicine was hybrid curriculum. We adopted a model of parallel progress in the traditional and new curricula in order to protect and develop accuracy and completeness. PBL case conferences have been discussed weekly in the clinical medical PBL small-group tutorials, which we were held during the first class period of every Friday. On Saturday and Sunday, students were allowed to go home. The second class was on Tuesdays, and on Wednesdays, there was a wrap-up hour, at which the faculty member who gave the question presented a general summary. Each case was designed to meet the progressive curriculum of the medical course from the teaching files. The tutors evaluated the students by the degree of their participation, preparation, communication, critical thinking and group skills. Although more than 100 medical students have participated in this new form of education, the clinical efficacy of the new teaching method has been very difficult to assess. Thus, to address this verification problem a questionnaire was designed. Instructing doctors were asked to score each intern's ability across a number of specific skills, as defined in the questionnaire, and the results were analyzed to evaluate the effect of the PBL teaching method in a clinical setting.

METHODS

At the start of the new school year, questionnaires were given to the medical directors a week after the arrival of the new interns for the Departments of Medicine and Surgery at Chang Gung Memorial Hospital. The directors were asked to score the ability of interns on 10 items using a 10 point scale. The items included (1) problem searching, (2) problem solving, (3) initiative learning, (4) thinking process, (5) establishing a patient-doctor relationship, (6) establishing a doctor-nurse relationship, (7) interaction with peers, (8) professional knowledge, (9) clinical techniques, and (10) medical note writing. The score system was divided into five levels, namely excellent (9-10 points), good (7-8 points), fair (5-6 points), poor (3-4 points), and very poor (1-2 points). The instructors evaluated one intern in their term, therefore, they did not rate both PBL and non-PBL groups. The academic department of their school was informed of the assessment score of those students.

Of the 60 questionnaires distributed, 45 were returned. Two were discarded because they were incomplete, and 43 met the required inclusion criteria. In total, 25 interns were evaluated. An average score was obtained where two or three instructors evaluated one intern. The studied interns were divided into two groups consisting of 14 that had participated in PBL education and 11 that had not.

Continuous variables were summarized using means and standard deviations, with comparisons evaluated using the Wilcoxon Rank Sum test. The Fisher's Exact test was used to compare categorical variables. Statistical significance was set at the $p < 0.05$ level. All data were entered into a database and analyzed using the Statistical Package for the Social Sciences (SPSS Version 10.0; Chicago, Ill) for Windows.

RESULTS

Fourteen interns had participated in the PBL education method (M:F, 11:3) and 11 had not, (M:F, 9:2). The average school assessment score for the PBL group was 83.40 ¡ 4.39 compared with 81.17 ¡ 3.56 for conventionally instructed analogs, with no significant difference demonstrated (Table 1).

Table 1. Group Comparison of Study Variables

	PBL group	Non-PBL group	*p*
Gender (M:F)	11:3	9:2	1.000
Average school record	83.40 ¡ 4.39	81.17 ¡ 3.56	0.248

Abbreviations: M: male; F: female; PBL: Problem-Based Learning

Table 2. Comparison of Item Scores between PBL and Non-PBL Groups

	PBL group	Non-PBL group	*p*
Problem searching	7.86 ¡ 0.98	7.26 ¡ 0.78	0.118
Problem solving	7.37 ¡ 1.13	6.92 ¡ 0.57	0.199
Initiative learning	8.07 ¡ 1.03	7.50 ¡ 0.83	0.100
Thinking process	7.96 ¡ 0.92	6.92 ¡ 0.76	0.008 (<0.05)
Patient-doctor relationship	8.15 ¡ 0.98	7.59 ¡ 1.04	0.171
Doctor-nurse relationship	8.36 ¡ 0.65	7.63 ¡ 0.92	0.052
Interaction with the peers	8.49 ¡ 0.94	7.83 ¡ 0.94	0.081
Professional knowledge	7.99 ¡ 0.89	6.97 ¡ 0.84	0.007 (<0.05)
Clinical techniques	7.90 ¡ 0.76	6.74 ¡ 0.75	0.001 (<0.05)
Medical notes writing	7.63 ¡ 0.85	7.30 ¡ 0.99	0.468

Abbreviations: PBL: Problem-Based Learning

Comparison of the mean questionnaire scores (Table 2) revealed that the PBL group was superior to the non-PBL analog for all 10 of the assessed skills; however, statistical significance was demonstrated for only three items. The three were thinking process (7.96 ¡ 0.92 vs. 6.92 ¡ 0.76; $p = 0.008$), professional knowledge (7.99 ¡ 0.89 vs. 6.97 ¡ 0.84; $p = 0.007$), and clinical techniques (7.90 ¡ 0.76 vs. 6.74 ¡ 0.75; $p = 0.001$).

DISCUSSION

Assessment of the medical students by high-ranking residents or other clinical supervisors is usually a valid index for evaluation of teaching methods, as these instructors and supervisors are in regular contact with the students. Further, the experience of the senior members of staff, with respect to assessment of the interns' ability, might reasonably be used as the basis for a reliable comparison of PBL and traditional teaching methods. Some reports have determined that the evaluation of students by high-ranking supervisors is not reliable, however, because the majority of students are given a positive assessment by their teachers. A report on the efficacy of a teaching method used to teach fourth year students at a New Mexico University revealed that the evaluations of internal and auditing students by instructors were negative and statistically insignificant. In our study of interns at the Chang Gung Memorial Hospital, it was demonstrated the adaptation of PBL education was efficacious, with statistical significance demonstrated in three specific areas including, thinking process, professional knowledge, and clinical techniques.[12]

The tendency of clinical instructors to assess PBL students favorably has been demonstrated in this study, and they strongly support the PBL courses. However, the superior assessment of the PBL students was not confirmed statistically in terms of their overall clinical performance.[13-21]

The major advantages of PBL education include allowing for earlier contact with the patients and clinical theory, imposing an initiative learning attitude, letting the student appreciate the practical uses of learning and acknowledging an endless amount of learning to do.[9-11] In our study, the differences between the PBL group and the non-PBL analogs were statistically significant for thinking process, professional knowledge, and clinical techniques. The advantages of the PBL group can be explained by this PBL education which can encourage the students to spend more time on patients' problems. It also encourages them to gather more information about their patients using various methods including detailed history, physical examination, laboratory data and image interpretation.

Our major concerns were that statistical significance was not demonstrated when comparing the average scores of problem searching, problem solving, learning motivation, and interaction with the peers' scores. The achievement of the objectives of motivating students to learn to facilitate the acquisition of higher-quality education, foster the spirit of initiative learning and encourage independent thinking appeared to fail. This is probably a consequence

of the small sample size or the relatively short contact time between the clinical instructors and the students. Thus, in future investigations of this type the statistical verification of analogous questionnaires will require a substantially greater sample size.

We are also concerned about the performance of the interns educated using the PBL method entering the clinic. It seemed that apparent advantages were not seen in writing clinical history and improving patient-doctor and doctor-nurse relationship. This is probably due to the negligence of cultivating students on these two areas during the early stage of designing the PBL teaching method. In the rearrangement of other courses, one should emphasize these areas.

The specific limitations of this study require attention. Firstly, of the 60 questionnaires distributed, 45 were returned, and two were discarded. The sample size was very small which possibly influenced consequences. Secondly, all the students in the PBL group were from Chang Gung University School of Medicine. However, none of the students in the non-PBL group was from the Chang Gung University School of Medicine. Thus, since the Chang Gung medical students had early contact with the instructors of Chang Gung Memorial Hospital and the non-Chang Gung medical students did not, previous interface may have influenced the results of this study. Fortunately, these instructors just evaluated one intern in their term and they did not rate students in both PBL and non-PBL groups. The bias effect of raters was possibly diminished. Finally, questionnaires were given to the medical directors a week after the arrival of the new interns, the relatively short contact time between the clinical instructors and the students was noted.

Despite these limitations, we believe that PBL is an educational method that should be considered as an alternative to the traditional, discipline-based, approach to teaching. Using our newly designed questionnaire, the results of the present study are encouraging. Three years after adopting PBL education at the Chang Gung University School of Medicine, strong evidence has been produced that the PBL teaching method is advantageous in terms of improving the ability to think and deal with patients' problems for interns that are entering their clinical courses.

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長庚大學醫學系臨床見習實施「問題導向學習」教學後的評估

陳永昌　方基存　林仁德　程文俊

背 景： 長庚大學醫學系實施「問題導向學習」教學已有三年，爲評量此一教學方法的良窳，我們利用問卷設計的方式，來評估其成果。

方 法： 針對2001年6月至長庚醫院內外科實習的醫師，發問卷予住院醫師、總醫師和主治醫師評估其跟隨之實習醫師的尋找問題、解決問題、主動學習、思考問題、醫病關係、醫護關係、與醫師間之互動、專業知識、臨床技巧和病歷寫作等十項能力。在回收的43份有效問卷當中，總共評核25位實習醫師，其中曾接受「問題導向學習」教學的實習醫師有14名，未接受「問題導向學習」教學的實習醫師有11名。

結 果： 曾接受及未接受「問題導向學習」教學的實習醫師在性別及在校平均成績上，並未達統計顯著意義。但在於思考問題、專業知識及臨床技巧等三方面，曾接受「問題導向學習」教學的組別，明顯優於未接受「問題導向學習」教學的組別。

結 論： 問卷結果顯示：實施「問題導向學習」教學，有助於醫學生在進入臨床實習階段的思考及處理問題能力的提昇。

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關鍵字： 問題導向學習，新思維醫學教育，主動學習，醫病關係。

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