**The First Attempt at Initiating Problem-based Learning as a Method of Teaching–Learning at the University of Medical Sciences in Poznan, Poland**

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The main objective of problem-based learning (PBL) is to provoke students to solve a new problem by themselves. The aim of this study was to investigate whether PBL was a better method of teaching basic and advanced life support to medical students compared with the classical method. The research was undertaken in 2002 in accordance with the European Guidelines 2000 and involved 36 medical students in year 4. The students were divided into two groups: experimental PBL group (17 students) and the control-classical method group (19 students). After the advanced life support course, the students wrote two tests to assess their knowledge on how to open the airway and how to perform basic and advanced resuscitation. The questions contained true or false answers. The students’ skills of basic and advanced methods of opening the airway and advanced resuscitation were checked by practical tests. The Mann-Whitney test was used for statistical analysis. The experimental PBL group received significantly better results: 30–45 points (mean, 38.29 points) and 30–47 points (mean, 40.94 points) for the written and practical tests, respectively, compared with the control-classical group (22–34 points [mean, 29.36 points] and 22–35 points [mean, 28.63 points], respectively). Therefore, PBL offers a better method for teaching basic and advanced life support to medical students compared with the classical method.

**Key Words:** advanced life support, basic life support, cardiopulmonary resuscitation, problem-based learning

needed more teachers than the normal teaching methods. The initiation of new teaching practices is always difficult. Despite these difficulties, the teachers of the Department of Teaching Anesthesiology and Intensive Therapy prepared and initiated a schedule of teaching basic and advanced life support to medical students with the use of PBL [9,10].

The aim of the study was to determine whether PBL is a better method for teaching basic and advanced life support to medical students than the classical method.

**Methods**

The research was undertaken in 2002. After agreeing to participate, 36 medical students in year 4 were chosen. They were divided into two groups: the first group (17 students) was called the experimental group and received the PBL method; the second group (19 students) was called the control group and received the classical method of teaching. All of the students who participated in this study attended the same courses for basic life support in their 1st (22 hours) and 3rd (16 hours) years at the university.

The classes in year 4 were mainly advanced life support and they lasted 22 hours (4 days for 5.5 hours per day). The program included the following topics: advanced methods of opening the airway and providing ventilation; drug administration methods and a list of drugs that can be given to resuscitate the patient; and technique and recommendations for defibrillation. In contrast to the control group, the students in the experimental group received a syllabus 2 weeks ahead of the classes, including a detailed schedule and a list of literature necessary for the course. They were also allowed to become familiar with the PBL method. Each day, they began classes by solving a problem connected to the day’s topic. At the beginning the students solved a problem individually and later in groups. They discussed developing an answer to the main problem. A teacher, as a tutor, observed the students and did not interrupt the discussion. Once the students had solved the problem, they went to another room for demonstration of the equipment (according to the main topic of the classes e.g. for intubation, intravenous access and defibrillation). During the demonstration slides, videos were shown and the equipment was used. Next, the students were allowed to learn by themselves using models of the upper airway or larynx, or from posters, for example. Later, the students completed a test that assessed their knowledge. After completing the test, the students practiced with the use of the equipment. Their skills were assessed before they left the department.

The students in the experimental and control groups completed two tests. Each one contained 55 questions. The first test on “basic and advanced methods of opening the airway” included questions from the following areas: the anatomy of upper airway (6 questions); basic methods of opening the airway (6 questions); advanced methods of opening the airway using, for example, the oropharyngeal airway, nasopharyngeal airway or laryngeal masks (13 questions); the necessary equipment for intubation, intubation techniques and their respective advantages (23 questions); intubation in children (3 questions); the distinction between a tracheo puncture and cricothyroid puncture (2 questions); and the fundamentals of ventilation in emergency (2 questions). The second test on “basic and advanced resuscitation” included questions from the following areas: mechanisms of cardiac arrest (2 questions); basic methods of performing cardiopulmonary resuscitation (9 questions); algorithms of advanced resuscitation (2 questions); drugs used during resuscitation (19 questions); routes of drug administration during resuscitation and techniques of intravenous access (8 questions); resuscitation of children and infants (9 questions); recommendations and techniques of defibrillation (5 questions); and emergency telephone numbers (1 question). The tests contained questions and true or false answers. The students’ skills were assessed as follows: basic and advanced methods of opening the airway (15 questions); intravenous access; defibrillation; and providing resuscitation according to the algorithm (5 questions). Both the written and practical tests were assessed by giving 1 point for each correct answer, −1 point for each incorrect answer, and 0 points for no answer. Negative points were given to prevent students gaining points by guessing the answers.

This study was conducted to assess medical students’ knowledge and skills of performing cardiopulmonary resuscitation according to the European Guidelines 2000 [11,12].

Statistical analysis was performed using the non-parametric Mann-Whitney U rank sum test to
to determine any differences between the groups. A $p$ value $<0.05$ was considered statistically significant.

**RESULTS**

The experimental group taught using the PBL method obtained better results in written and practical tests compared with the control group taught by the classical method. The results of the written test on “basic and advanced methods of opening the airway” are presented in Figure 1. The experimental group scored 30–45 points (mean, 38.29 points) compared with 22–34 points (mean, 29.36) for the control group—a statistically significant difference ($p<0.05$).

The results of the written test on “basic and advanced resuscitation” are presented in Figure 2. The experimental group scored 30–47 points (mean, 40.94 points) compared with 22–35 points (mean, 28.63 points) for the control group—a statistically significant difference ($p<0.05$).

The results of the practical test assessing the opening of the airway by basic and advanced methods were higher in the experimental group. The maximum score of 15 points was obtained by 23.52% of students in the experimental group compared with 0% in the control group. We assessed the practical test by counting the number of correct skills not acquired. Skills not acquired were recorded when the student did not perform the skill correctly. The results achieved in this test are presented in Figure 3. The number of skills not acquired by students was significantly higher in the control group compared with the experimental group ($p<0.05$).

The results of the practical test assessing advanced cardiopulmonary resuscitation were also higher in the experimental group. The maximum score of 6 points was obtained by 82.35% of students in the experimental group compared with 25.0% of the control group. We also assessed the practical test by counting the number of skills not acquired. The results achieved in this test are presented in Figure 4. Again,
the number of skills not acquired by students was significantly higher in the control group compared with the experimental group ($p < 0.05$).

**DISCUSSION**

The results obtained in our study by students in the experimental group were significantly higher than students in the control group. Students involved in the PBL method of teaching were better equipped with the knowledge and skills to perform cardiopulmonary resuscitation. The current research provides very interesting results regarding the use of the PBL method. Abraham et al compared partially PBL-oriented and non-PBL-oriented physiology classes for medical students. The mean scores for deep and strategic approaches were significantly higher for the partially PBL-oriented group [13]. Accordingly, the PBL method improves test results but also influences other areas of the teaching process. Lancaster et al investigated the influence of the curriculum on the perceptions of 341 medical students (from two public medical schools) given either PBL or conventional learning. The results showed that the attitudes were significantly more positive in the PBL group after the 1st year [14]. Similarly, other research studies have shown that PBL is superior to the conventional method of teaching [15,16].

Another study has demonstrated no advantages of PBL among medical students, where results indicated that PBL and non-PBL had similar effects on medical factual knowledge [17].

PBL as a method of teaching is spreading worldwide. It is becoming particularly popular and is recommended in medical schools and universities because students attending PBL classes achieve very good results [18,19].

**CONCLUSION**

On the basis of our results, it can be concluded that PBL offers a better method for teaching basic and advanced life support to medical students than the classical method. There are some limitations of our study—our research involved only 36 medical students, divided into two groups: the experimental PBL group (17 students) and the control group (19 students). However, the results obtained were very promising, and further research with a greater number of students is needed.

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**REFERENCES**