

**COMPARATIVE ANALYSIS OF THE ACQUIRED
CLINICAL SKILLS ASSESSMENT OF
UNDERGRADUATE MEDICAL STUDENTS IN A
PROBLEM-BASED LEARNING AND TRADITIONAL
CURRICULA**

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Abstract: The article describes the results from the comparative analysis of the acquired clinical skills' assessment of undergraduate medical students in an innovative problem-based learning (PBL) and traditional curriculum. Attention is paid on the fact that even partially introduced in part of the early phases of the curriculum the PBL format of education has its impact on the future clinical functioning of the medical students. The PBL students performed better in comparison with their peers from the traditional track in regard to: the complete history taking as gathering data for the family history, available contacts with acute infectious diseases and known allergies to foods, drugs and other substances; and the use of more laboratory and other tests for building a diagnostic plan.

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Introduction

The Faculty of Medicine, Medical University - Pleven, Bulgaria, introduced experimentally a hybrid Problem-based learning (PBL) curriculum in a parallel track of students in the 2000-2001 academic year (Radionova and Narlieva, 2002). Integrated case-based approach is the principal teaching/learning strategy for the experimental PBL track of students. The innovative PBL curriculum is implemented during the first two years of education. It is partially horizontally integrated and structured in organ-system blocks. The weekly schedule of a block includes a variety of educational activities as lectures, PBL sessions, laboratories, seminars, gross anatomy classes, and independent studies. Problem-based learning sessions twice a week are the main focus of the block. The basic sciences' concepts are learned repeatedly in clinical disciplines at higher degrees of complexity at higher levels of undergraduate medical education (Harden and Stamper, 1999). This approach assures smooth transition from the preclinical to the clinical years and increases students' confidence.

The aim of the present study is to comparatively analyse the results from the assessment of the acquired clinical skills of undergraduate medical students in both curricula – PBL and traditional.

Materials and methods

A total of 65 undergraduate medical students (fourth and fifth year), divided into two groups – experimental and control, participated in the study. The experimental group comprised 25 students in the PBL curriculum (innovative track), and the control group consisted of 40 students in the traditional curriculum (traditional track). The acquired clinical skills of the students were assessed through their work on a practical task in real clinical settings of traditionally studied clinical disciplines. The study was accomplished during the term practical examinations in Pulmology for the fourth year students and in Paediatrics for the fifth year students. The examiners were department faculty members of the respective clinics with or without academic ranks. Preliminary prepared checklists, consistent

with the requirements of the disciplines were used for students' assessment. The checklists served for objective evaluation of the acquired clinical skills of each student for history taking, physical exam, and communication with the patient according to defined criteria, preliminary discussed with the academic staff of the respective clinical departments. The examiners filled in the checklists either during the practical examination or immediately after its conclusion with the particular student, while their observations and impressions were fresh. Two-step ("yes", "not done") or three-step ("yes", "partly/wrong" and "not done") assessment sheets were used for each criterion, which evaluated precisely whether and how the specific activity was done. Students' clinical skills were assessed according to the fields in the checklists as follows:

- focused history taking;
- focused physical examination;
- forming a differential diagnosis;
- focused diagnostic testing;
- forming the most likely final diagnosis;
- formulating a management/treatment plan;
- communication with patients.

Statgraphics Plus for Windows was used for data processing and analysis. Chi-square test of Pearson, with Yates correction carried out by necessity, was used to determine statistical significance of categorical variables and *t*-test of Student was applied to compare means of normally distributed variables with $p < 0,05$ defining statistical significance for comparison of the results in any pair of groups.

The investigation results and their discussion

Students' clinical functioning at the practical examinations in the disciplines Pulmology and Paediatrics shows that both studied groups performed equally well in the history taking with regard to the history of the present illness, treatment carried out, past medical history and risk factors ($p > 0,05$). Considerable difference ($p < 0,05$) between

the experimental and the control group of students was observed in the data gathering about the family history, available contacts with acute infectious diseases (AID) and allergies to food, medicines, and other substances (Table 1). Most of the students (92%) in the PBL curriculum and 55% from the traditionally taught asked the patients for family history ($p = 0,002$). Two thirds (68%) of the PBL students and 32,5% of the traditional curriculum asked the patients for contacts with AID ($p = 0,01$). Over half of the students from the experimental group (56%) and a quarter from the control asked for known food, drug and other allergies ($p =$

0,017). The existing statistically significant differences between both studied groups according to the indicated criteria might be due to the history taking skills built by the students from the innovative curriculum during their work in the PBL tutorials. Through the paper cases presented to them the students acquire to automation information gathering skills for the present illness, past history, conducted tests and treatment, family history, fixed and acquired risk factors, contacts with AID and known food and drug allergies.

TABLE 1. HISTORY TAKING AT THE PRACTICAL EXAMINATION IN PULMOLOGY AND PAEDIATRICS

Outcome items	PBL students N = 25		Students in the traditional track N = 40		Significance P value
	Yes	No	Yes	No	
Treatment carried out	17 (68%)	8 (32%)	28 (70%)	12 (30%)	NS
Past medical history	25(100%)	-	38 (95%)	2 (5%)	NS
Family history	23 (92%)	2 (8%)	22 (55%)	18 (45%)	0,002*
Contact with AID	17 (68%)	8 (32%)	13 (32,5%)	27 (67,5%)	0,01*
Risk factors	16 (64%)	9 (36%)	24 (60%)	16 (40%)	NS
Allergies	14 (56%)	11 (44%)	10 (25%)	30 (75%)	0,017*

Note: * Statistically significant

Both groups of students performed equally well at the physical exam. No significant differences ($p>0,05$) between the experimental and the control group of students regarding the assessment of the patient's general appearance, level of consciousness, head and neck examination, skin and visible mucous membranes' inspection and subcutaneous lymph nodes examination were observed. No significant difference in the work of both students' groups in the respiratory, gastrointestinal, renal system and extremities examinations was established, however, a substantial difference ($p = 0,009$) in the cardiovascular (CV) exam was found. A considerable part of the students (92%) from the innovative PBL curriculum and 62,5% from the traditional examined the CV system while 8% and 37,5% respectively did not.

The comparative analysis of the results from the specific pulmonary exam carried out with the IV-th year medical students in Pulmology is of a great interest. The complete pulmonary exam included determination of the respiratory rate, type of breathing, signs of respiratory insufficiency, shape of the chest and its deviations, palpation of vocal fremitus, percussion and auscultation of lungs. The signs of respiratory insufficiency were correctly determined by the predominant part of the PBL students (91,67%) and by 46,15% of the traditionally taught students ($p = 0,011$). Respiratory rate determined 83,33% of the students from the experimental group and considerably less students (23,08%) from the control group ($p = 0,001$). Type of breathing was equally well determined by both studied groups. Chest inspection with determination of the chest shape was done by all students from both observed groups. Pathological deviations in the chest shape were determined by all students from the innovative PBL track and by 84,62% of the students from the control group, as no statistical difference was found ($p>0,05$). All students from both investigated groups palpated vocal fremitus and correctly percussed the lungs. Both groups of students performed equally well in: forming a hypothesis (working diagnosis), rating the symptoms by their importance, forming the syndromes and explaining the pathogenetic mechanisms. No significant difference was found between both studied groups in formulating a differential diagnosis.

The students were expected to form a diagnostic plan for accepting or rejecting the hypothesis in defining the final diagnosis. Results from diagnostic tests were used by the students but were presented to them only on request. No significant difference between the experimental and the control group of students was found regarding the use of paraclinical tests. Results from microbiological tests and lung volumes, arterial blood gas analysis (ABG), electrocardiography (ECG), X-ray images and other additional tests were used in Pulmology in view of the specificity of the respiratory diseases. The fourth-year medical students from the PBL curriculum performed better in comparison with their peers from the traditional curriculum in using data, presented by the patients' diagnostic tests while considering the final diagnosis. They performed considerably better in Pulmology and used correctly four out of six possible diagnostic tests for confirming the working diagnosis: lung volumes ($p = 0,006$), ECG ($p = 0,028$), ABG ($p = 0,003$), and additional tests ($p = 0,001$) (Table 2). No substantial difference between both groups of students was found in regard to the use of data from the microbiology and X-ray tests. The percentage of students from both studied groups that used partly or wrong the diagnostic tests' data was comparatively high. It varied from 58,33% to 75% for the experimental group and from 38,46% to 84,62% for the control. Only 8,33% from the experimental and considerably more students from the control group (15,38% - 61,54%) did not use the results from the diagnostic tests in forming a diagnosis. The results from the comparative analysis support the data from the literature that the students from the innovative PBL curriculum, exposed early in their education to clinical cases, acquire not only knowledge in the basic biomedical disciplines but skills in the history taking, physical examination and potentialities of the diagnostic tests as well (Barrows, 2000; Barrows and Tamblyn, 1980). During the clinical education they practice, accumulate, develop and automate what they have already learned, while the students from the traditional curriculum begin acquiring clinical skills and build clinical reasoning a year later in the course of "Propaedeutics of the Internal Diseases" and "Propaedeutics of the Surgical Diseases".

TABLE 2. BUILDING A DIAGNOSTIC PLAN IN PULMOLOGY BY USING DIAGNOSTIC TESTS DATA

Outcome items	PBL students N = 12			Students in the traditional track N = 26			Significance
	Yes	Partly/Wrong	Not done	Yes	Partly/Wrong	Not done	P value
Microbiological tests	5 (41.67%)	7(58.33%)	-	12(46.15%)	10(38.46%)	4 (15.38%)	NS
Lung volumes	3 (25%)	9 (75%)	-	-	18(69.23%)	8 (30.77%)	0,006*
Arterial blood gases	2 (16.67%)	9 (75%)	1 (8.33%)	-	10(38.46%)	16(61.54%)	0,003*
ECG	3 (25%)	8(66.67%)	1 (8.33%)	-	22(84.62%)	4 (15.38%)	0,028*
X-ray	3 (25%)	9 (75%)	-	10(38.46%)	12(46.15%)	4 (15.38%)	NS
Others	4(33.33%)	7(58.33%)	1 (8.33%)	-	12(46.15%)	14(53.85%)	0,001*

Note: * Statistically significant

A considerable part of the students from both investigated groups correctly formulated a final diagnosis and built a treatment plan. The students from both studied groups performed equally well in prescribing the necessary medication but a considerable difference was found in regard to determination the correct doses and the side effects contraindicated for the accompanying diseases. The students from the experimental group, which did not determine the prescribed medicines' doses were considerably less (12%) than those from the control group - 42,5% (p = 0,012). The drugs' side effects, contraindicated for the accompanying diseases were not taken in consideration by 16% of the students from the PBL track and over half of the students from the traditional (55%) (p = 0,0074). The students from both studied groups performed equally well in prescribing another type of treatment in addition to the medicines' therapy and recommended a specific regimen and lifestyle to the patient.

The comparative analysis of the communication skills assessment shows that the students from both studied groups were highly assessed in regard to the opening of the medical interview with appropriate greeting and self-presentation. Over half of the students from both studied groups did not explain the maneuvers they performed on the patients during the physical examination. Highly assessed were the students from both groups in regard to giving satisfactory replies to the patients and the polite conclusion of the medical interview. Considerably more students from the PBL curriculum (92%) in comparison with the traditional (65%) satisfactory replied to patients' questions (p = 0,018) and concluded politely the history taking - 96% from the PBL students and 70% from the traditionally taught (p = 0,011).

Our results for the clinical performance of the PBL students are consistent with those reported previously in the literature (Albanese and Mitchell, 1993; Mennin et al., 1993; Regan-Smith et al., 1993; Vernon and Blake, 1993).

Conclusions

1. A considerable part of the students from both studied groups perform equally well on the basic items of taking a medical interview, in physical examination, generating a working diagnosis and differential diagnosis, building a treatment plan, and communicating with the patient.
2. The comparative analysis of the students' clinical skills assessment shows that the students from the PBL curriculum performed better in comparison with their peers from the traditional curriculum in regard to some more specific items as follows:

- the complete history taking as gathering data for the family history, available contacts with acute infectious diseases and known allergies to foods, drugs and other substances;
- the use of more laboratory and other tests for building a diagnostic plan;
- determination of the signs of respiratory insufficiency and respiratory rate as part of the complete pulmonary exam;
- determination of the correct treatment drug dose and taking in consideration the side effects of the prescribed drugs, contraindicated for the accompanying diseases.

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