



Original Research Article

Are Anatomical Sciences Adequately Represented in the Problems-Based Learning Clinical Cases?

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ABSTRACT

Problem-based learning (PBL) is a relatively new teaching method, which was introduced in medical education as an alternative to the traditional method of teaching. One of the major advantages of the PBL method was that, it allows integration between the basic medical and clinical sciences. In the process of learning anatomy, in a PBL setting, the level of anatomy knowledge depends upon the number of the PBL cases, the number of learning objectives relevant to the clinical case and the distribution of the teaching material. Earlier studies reported that, in the PBL curriculum, the anatomical sciences (gross anatomy, histology and embryology) were insufficiently covered and the subjects were poorly understood by the students. The aim of this project was to study the preclinical curriculum at the Medical Faculty of the University of Botswana, with references to the number of the PBL cases and the amount and distribution of the anatomy learning objectives in them. To achieve the objective, a data collection and analysis method was used. The results indicated that, in the preclinical part of the curriculum, 123 PBL cases were discussed, in which 94 anatomy learning objectives were identified (63 in gross anatomy, 26 in histology and 5 in embryology). The gross anatomy learning objectives were absent in 44 PBL cases, histology in 51 and embryology in 98. In conclusion, the PBL component of the curriculum had a good number of PBL clinical cases. However, the histological and particularly the embryological components of the anatomical sciences were grossly underrepresented, in the PBL cases.

Key words: problem based learning, anatomy, histology, embryology.

INTRODUCTION

Anatomy or anatomical sciences consists of three sub-divisions, namely, gross anatomy, histology and embryology. Anatomy is a fundamental discipline in medical education and a good knowledge of the subject helps medical students to better understand the other basic medical sciences and the concepts of clinical disciplines. Over the centuries, anatomy and the other basic

medical sciences has been taught by a traditional method, which is based on believe that the traditional method of teaching is sequential and logical and gives a good level of anatomical knowledge. ^[1-5] In other studies, however, this teaching method is described as non-relevant, passive and boring, which requires memorization of facts. ^[2,6]

The newly developed and introduced problem-based learning (PBL) method quickly gained popularity in medical education,^[7] because it integrates the basic medical and clinical subjects from the early years. In addition, it was reported that this method has a number of other advantages over the traditional one. Among these are that it encourages self-directed learning, reduces the factual knowledge, allows students to learn by applying reasoning rather than memorization of facts and helps students to become life-long learners with analytical skills.^[1,2,7-12]

The advantages and disadvantages of the two teaching methods are still a matter of hot debate. Some authors believe that, in the traditional curriculum, the medical students have a greater level of anatomical knowledge than those taught with the PBL curriculum.^[3,4,13] Other papers, however, report that the students taught in a PBL curriculum apply their anatomical knowledge more successfully.^[1,2,6] Recent studies, however, found that there are no significant differences in the level of knowledge between the students using a traditional curriculum and those taught in a PBL curriculum.^[1,4]

Because of the above contradictory reports, a group of researchers suggested the introduction of a hybrid method of teaching, which is a combination between the traditional and the PBL method. These authors believe that the new method will provide the most effective training for undergraduate medical students.^[2,5,9-11,14] In the reviewed research papers, we found a few publications that make a quantitative evaluation of the anatomy learning objectives in the clinical problems given to students.^[5,14]

In the newly established Faculty of Medicine, University of Botswana, a hybrid curriculum with a PBL and a traditional component was introduced. The aim of this

project was to make a comprehensive study of the PBL component of the curriculum. Special emphasis was put on the number of the PBL cases and the amount and distribution of the anatomical sciences learning objectives, in the PBL clinical cases given to students.

MATERIALS AND METHODS

To achieve the aim, we used a non-experimental, data collection and analysis method. The data were gathered through “documentary analysis”, which included a survey of the PBL clinical cases, timetables and facilitator guides. The PBL cases, for each block of the first and second year of the preclinical curriculum, were counted and analyzed, with special reference to the number of the learning objectives (LO) in gross anatomy, histology and embryology. The PBL cases were divided into 4 groups, namely, with absent, minimal (1-3), moderate(4-6) and maximal(7+)number of LO, similar to the division reported earlier.^[5] Our hybrid curriculum is divided into a pre-clinical part or phase I and a clinical part or phase II. The former consists of the first two years of the medical program, while the latter comprises the remaining three years. In the first year of phase I, 7 teaching blocks are included, while in the second year 8 teaching blocks are covered. During the phase I integrated curriculum anatomy, physiology, biochemistry, pathology, immunology, pharmacology, microbiology, family medicine, public health, radiology, some neurosciences and psychology are studied. In the phase I, there are two PBL sessions per week. In the first session, the students discuss 2 PBL clinical cases, while in the second session, they report the acquired knowledge.

RESULTS

The phase I curriculum(first and second year) consisted of 60 teaching

weeks, during which 123 PBL cases were discussed and 94 anatomy LO were identified (63 in gross anatomy, 26 in

histology and 5 in embryology, Table 1). The number and distribution of the anatomy LO, in the PBL cases are given in Table 2.

TABLE 1: Distribution of PBL cases and anatomical sciences LO, during the phase I curriculum (first and second year).

	FIRST YEAR OF PHASE I							SECOND YEAR OF PHASE I								Total
	Block 1- Foundation of medicine	Block 2- Cardio-respiratory systems	Block 3-Gastro-intestin. Urinary systems	Block 4-Growth, reproduction endocrine	Block 5-Blood and immune systems	Block 6-Musc.-skeletal , nervous system	Block 7-Psychological health	Block 1-Skin, pathol. atheroscler. Cancer	Block 2- Microbiol., infectious diseases	Block 3-Pregnancy, birth, child health	Block 4-Kidney and urinary tract	Block 5-Cardio-respiratory systems-2	Block 6-Musculo-skeletal system	Block 7-Nervous syst., special senses	Block 8-Gastro-intestinal diseases	
Duration	5	4	4	5	3	5	4	4	5	4	2	4	4	3	4	60
PBL cases	9	8	8	12	9	9	8	8	10	8	4	8	8	6	8	123
Gross LO	0	6	8	3	0	18	0	0	0	4	2	1	13	5	3	63
Histo. LO	3	4	6	2	0	4	0	1	0	0	4	0	1	1	0	26
Embryo. LO	0	1	0	0	0	1	0	0	0	3	0	0	0	0	0	5

TABLE 2: Number of PBL cases with absent, minimal, moderate and maximal number of anatomical sciences LO, during the phase I curriculum (year one and two).

SUBJECT	PHASE I(FIRST AND SECOND YEAR)				TOTAL
	ABSENT	MINIMAL	MODERATE	MAXIMAL	
Gross anatomy	44	32	22	25	123
Histology	51	43	29	0	
Embryology	98	25	0	0	

The first year of phase I consisted of 30 teaching weeks, during which 63 PBL cases were discussed and 56 anatomy LO were identified (35 in gross anatomy, 19 in

histology and 2 in embryology, Table 3). The variations in the number of the anatomy LO, in the PBL cases are given in Table 4.

TABLE 3: Distribution of PBL cases and anatomical sciences LO, during the first year of phase I curriculum.

	FIRST YEAR OF PHASE I							Total
	Block 1- Foundation of medicine	Block 2- Cardio-respiratory systems	Block 3-Gastro-intest. and urinary systems	Block 4-Growth, reproduction, endocrine	Block 5-Blood and immune systems	Block 6-Musculo-skelet. and nervous systems	Block 7-Psychological health	
Duration-weeks	5	4	4	5	3	5	4	30
PBL cases	9	8	8	12	9	9	8	63
Gross anatomy LO	0	6	8	3	0	18	0	35
Histology LO	3	4	6	2	0	4	0	19
Embryology LO	0	1	0	0	0	1	0	2

TABLE 4: Number of PBL cases with absent, minimal, moderate and maximal number of anatomical sciences LO, during the first year of phase I.

FIRST YEAR OF PHASE I					
SUBJECT	ABSENT	MINIMAL	MODERATE	MAXIMAL	TOTAL
Gross anatomy	26	12	8	17	63
Histology	17	21	25	0	
Embryology	46	17	0	0	

The second year of phase I also consisted of 30 weeks, in which 60 PBL cases were discussed and 38 anatomy LO were identified (28 in gross anatomy, 7 in

histology and 3 in embryology, Table 5). The variations in the number of the anatomy LO, in the PBL cases during the second year are given in Table 6.

TABLE 5: Distribution of PBL cases and anatomical sciences LO, during the second year of phase I curriculum.

SECOND YEAR OF PHASE I									
	Block 1-Skin, pathol. atheroscler., cancer.	Block 2- Microbiology, infectious diseases.	Block 3-Pregnancy, birth and child health	Block 4-Kidney and urinary tract	Block 5-Cardio-respiratory systems-2	Block 6-Musculo-skeletal system	Block 7-Nervous system, special senses	Block 8-Gastro-intestinal diseases	TOTAL
Duration-weeks	4	5	4	2	4	4	3	4	30
PBL cases	8	10	8	4	8	8	6	8	60
Gross anatomy LO	0	0	4	2	1	13	5	3	28
Histology LO	1	0	0	4	0	1	1	0	7
Embryology LO	0	0	3	0	0	0	0	0	3

TABLE 6: Number of PBL cases with absent, minimal, moderate and maximal number of anatomical sciences LO, during the second year of phase I.

SECOND YEAR OF PHASE I					
SUBJECT	ABSENT	MINIMAL	MODERATE	MAXIMAL	TOTAL
Gross anatomy	18	20	14	8	60
Histology	34	22	4	0	
Embryology	52	8	0	0	

DISCUSSION

Medical education has changed significantly with the introduction of the PBL method of teaching. This method quickly became popular and was introduced in a number of medical schools, throughout the world. We agree with the conclusion of previous authors that one of the major advantages of the PBL method is that it allows integration between the basic medical and clinical sciences. At present, however, the dispute over the superiority of the PBL

method over the traditional one is still unresolved.

Anatomical sciences are a corner stone in medical education and, therefore, should be taught and learned effectively. We believe that, in a PBL setting, an efficient learning of anatomy depends, to a great extent, upon the number of PBL cases, the number and content of the LO as well as the manner in which the latter are distributed.

The analysis of our results indicated that the total number of the PBL clinical

cases, studied by the students, during the 60 weeks of the phase I was 123, which were distributed equally between the first and second year of the curriculum. The satisfactory number of the PBL cases and the manner of their distribution, made us assume that some aspects of our integrated curriculum were well designed and will allow a good coverage of the subjects included in it. Our findings differ significantly from the results reported in similar study, ^[5] in which 91 clinical problems were counted, covered in 93 teaching weeks. Furthermore, in another similar paper, ^[14] the authors reported the presence of only 29 problems, which were covered in 59 weeks. These differences could probably be explained with the differences in the preclinical curricula used by the medical schools.

Further calculations and analysis of our results revealed significant differences in the number and distribution of the anatomy LO. The differences were present between the first and second year of the phase I; between the three components of the anatomical sciences as well as between the individual teaching blocks. For example, during the first year of the curriculum, the total number of the LO were 56, which were distributed as follows: gross anatomy-35, histology-19 and embryology-2. During the second year, however, the total number of the LO was 38, of which, 28 were in gross anatomy, 7 in histology and 3 in embryology. A calculation of the results from the first and second year (phase I curriculum) indicated that the total number of the anatomy LO was 94, of which, 63 were in gross anatomy, 26 in histology and 5 in embryology.

The number of the LO, reported by us, were significantly higher than those found in an earlier paper, ^[5] in which the authors reported a total of 53 anatomy LO, which were distributed as follows: gross

anatomy-37, histology-10, embryology-3 and osteology-1. A comparison of our results with those of another similar study ^[14] indicated that the number of our anatomy LO was several times higher than the number reported by these authors. We assume that the bigger number of our anatomy LO, was due mainly to the bigger number of the PBL cases in our phase I curriculum. We also assume that, an additional factor for the bigger number of our LO, could be the content of a LO itself, which means that, a LO could consist of a single organ, or could comprise a group of organs or even a system.

We fully agree with the conclusion of the other researchers ^[5,14] that, the PBL method of teaching does not allow a uniform distribution of the anatomy LO, throughout the curriculum. This conclusion was also supported by our results, which showed that in a great number of our PBL cases, the anatomical sciences were either absent or were minimal in number. Further analysis of our results indicated that, in our curriculum, among the anatomical sciences only gross anatomy was relatively well covered. Contrary to that, histology and especially embryology were poorly taught, which undoubtedly will result in gaps in the anatomical knowledge of the students.

In order to overcome these deficiencies, we suggest a careful revision of the PBL cases by a team of senior staff members of the faculty, representing the subjects included in the integrated phase I curriculum. As far as the anatomical sciences are concerned, the representative/s should be adequately qualified with a background in applied anatomy and clinical experience. Secondly, we share the opinion of other researchers that the anatomical sciences should be vertically integrated, which means a continuous revision of relevant anatomical regions, during the phase II curriculum. Thirdly, we strongly

believe, like some other authors [2,5,9] in the introduction of an *amalgamated phase I curriculum*. According to us, it should combine the best positive qualities of the traditional and PBL curricula. The new method will definitely ensure an effective teaching and learning of anatomical sciences.

CONCLUSION

The PBL component of the phase I curriculum, at the Medical Faculty of the University of Botswana, has a good number of PBL clinical cases. However, the anatomical sciences and particularly the histology and embryology are underrepresented and unevenly distributed. To overcome this deficiency, we suggest the incorporation, in the curriculum, of more components from the traditional method of teaching.

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