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RESEARCH ARTICLE

Expected learning outcomes of medical school graduates

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Abstract

Introduction: Outcome based educational curriculum determine our expectations in graduates with near association to assessment. The purpose of the current study was to evaluate the learning of must know procedures in medical graduates.

Materials and Methods: In a cross-sectional study, 102 medical school graduates' opinions were sought regarding 42 must know learning outcomes documented by Iranian medical curriculum designers by a questionnaire. The study followed the principles of the Declaration of Helsinki and was approved by the Medical Ethics Review Board of Shahid Beheshti University of Medical Sciences.

Results: Graduates declared "teaching" in 79.8%, "practical doing" in 64.2%, "being able to do" in 76% with self-score of 11.5 out of 20. In some of the procedures, "Teaching", "practical doing", "being able to do" and "self-score" were reported to be low. Medical school graduates within the last 2 years were significantly weaker than graduates within 2-4 years. Female graduates revealed significantly higher sense of "being able to do" and "self-score".

Conclusion: Educational methods and assessments are not in consistence with the expected curriculum outcomes. In 4 procedures there is a strong need to re-evaluation. A lot of learning is in post-graduate period. Therefore, re-assessment of must know procedures, learning methods and evaluation methods might be considered.

Key words: Medical education, outcome- based education, procedure learning.

Introduction

There is a famous story regarding a young boy and his dog Fido. The boy says "I taught my dog to whisper", when his dog did not obey whispering order, he explained "I taught my dog, and I did not say he learned!" Most of the teachers focus more on their teachings, instead of the student's learning. Emphasis of outcome-based education is on course learning. These learning outcomes are more than knowledge, describing practical ability. Outcome-based education defines expected abilities of the learners. So, education should be responsive to goal attainment [1]. Progressive understanding of medical schools in the world is focused on outcome-based education [2-4].

Conventional medical education models determine the necessary medical curriculum, teaching methodology, and assessment in the hope of making ideal physicians for future. Outcome-based model moves in the opposite direction. Beginning point is ideal physician. Curriculum planners describe successful graduates as those who meet criteria of outcome achievement. Learning situations are then prepared to make students able to achieve these outcomes. For instance, successful performance of medical procedures is described as recording blood pressure, urine analysis and chest radiography explication."If goal attainment is not defined by criteria, no one could confirm goal attainment". Competency - based evaluation is in close connection to outcome-based education. Teaching, learning and evaluation are integrated in outcome- based education [1,5]. Besides progressing understanding of outcome-based education in the world, there are determined package of outcomes for medical educates in Iran, as well. Regarding determined necessary outcomes for medical educates, ability in 42 procedures are observed [6]. The aim of the present study was to evaluate the learning of these 42 procedures in medical graduates in their own stand point (self-evaluation).

Methods

The Iranian Ministry of Health and Education has defined the learning outcomes of medical graduates into mastering the relevant skills and knowledge in performing 42 procedures. All of must know procedures (42 procedures) were included in this cross-sectional study. These procedures were organized into a questionnaire which was reviewed, revised and approved by 5 medical faculty members. To

determine sample size a pilot was conducted (SD = 15) and average error of 3 units was accepted. Sample size was calculated to be 96. By cluster sampling, medical graduates of 4 medical universities in Tehran, 102 students, answered to 4 questions regarding each 42 procedures by cell phone. They were divided into female and male subgroups and working-experience after graduation of 0-2 and 2-4 years subgroups in data analysis. Graduates with more than 4 years experience were excluded from the study. Four main questions of each procedure were as follow,

1- "Whether the procedure has been taught in his/her courses"

2-"Whether he/she practiced the procedure"

3- "Is he/she able to do the procedure now?"

In all 3 above-mentioned questions answer was yes / no.

4- "In scale of 20, what is his/her own mark for each procedure in his/her standpoint"

In this question, the answer is in a range of 1-20.

Internal consistency assurance was achieved by alpha Chronbakh for each question. In order to control reliability, test-retest was used for 20 respondents. For description of data, mean, standard deviation, frequency and percentage were used. T-Test and Man-Whitney tests were used for between group analyses. Data analysis was done using SPSS 21 software.

The study followed the principles of the Declaration of Helsinki and was approved by the Medical Ethics Review Board of Shahid Beheshti University of Medical Sciences. All information about the students was kept fully confidential. Study participants did not incur any costs and the study protocol did not have any harm to participants.

Results

Alpha Chronbakh test was calculated for each question. Thus α was 0.865 for the first question (existing teaching), 0.817 for the second question (practice the procedure), 0.869 for the third question (ability to do), and 0.866 for the fourth question (mark of his /her standpoint). Finding of $\alpha > 0.8$ in all instances indicated the common direction of all questions. Test-retest of 20 responders revealed no significant difference.

One hundred and two medical graduates responded to oral questionnaire including 56 female and 46 male graduates. Graduates with less than 2 years post graduation work experience included 29 and with 2-4 years included 72. One questionnaire had missing data which was excluded. The graduates believed that %79.8 ± 13.4 out of procedures were "to be taught" (question 1), %64.2 ± 13.3 "were practiced" (question 2), and % 76 ± 13.4 "were able to do". Mean mark of 42 procedures in overall responders (N= 102) was 11.5 ± 2.1.

Almost 25% of the graduates believed that 4 out of 42 procedures were "to be taught", including intraosteal injection (%17.6), circumcision (%23.5), venous cut down (%24.5) and skin KOH test (%23.5).

Almost %50 believed that 12 out of 42 procedures were considered as "practiced it", including primary aids in frostbite, heat exhaustion (%19.6), primary aids in sinking (%17.6), newborn resuscitation (%30.4),intraosteal injection (%3.9), circumcision (%6.9), cerebrospinal fluid aspiration (%40.2), micro tube measurement of hematocrit (%39.2), intraocular pressure measurement (%35.3), venous cut down (%14.7), penomothorax management (%47.1), skin KOH test (%15.7).

Less than %50 believed that 6 out of 42 procedures were in the category as having "their ability to do" including intraosteal injection (%88), circumcision (%11.8), pleural fluid Aspiration (%35.3), micro tube measurement of hematocrit (%42.2), venous cut down (%12.7). In16 out of 42 procedures, responders believed their mark to be less than 10. Mean and median of each procedure marks are presented in [Table 1].

Table 1: Mean and Median of each procedure marks from studied responders stand point.

Row	Procedure	Mean (± SD)	Median (range)
1	Primary aids: suturing-dressing	17.5 ± 2.4	8 (0-20)
2	Primary aids: dislocation, fracture, fixation	15.8 ± 4.1	17 (0-20)
3	Primary aids: Toxication	12.9 ± 5.5	14 (0-20)
4	Primary aids: convulsion	14.1 ± 4.3	15 (0-20)
5	Primary aids: frostbite-heat exhaustion	10.7 ± 6.8	13.5 (0-20)
6	Primary aids: sinking	9.9 ± 6.3	13.5 (0-20)
7	Primary aids: burning	13.4 ± 5	15 (0-20)
8	Adult resuscitation	14.1 ± 3.7	15 (0-20)
9	Newborn resuscitation	9.8 ± 6.4	12 (0-20)
10	Venous- arterial sampling and venous injection	16.3 ± 3	17 (0-20)
11	Intra-muscular, intra dermal and subcutaneous injection	17.4 ± 2.1	18 (0-20)

12	Intraosteal injection	0.8 ± 3.2	0 (0-19)
13	Venous puncture	15.4 ± 4.7	17 (0-20)
14	Microscopic urinary analysis review	9.8 ± 7.1	12 (0-20)
15	Urine culture	9.9 ± 6.9	12 (0-20)
16	Naso-gastric tube application and gastric washing	16.8 ± 2.9	17 (0-20)
17	Skin abscess drainage	13.3 ± 6	15 (0-20)
18	Pap smear	15.7 ± 4.5	16 (0-20)
19	Anterior Nasal Tampon application	13.6 ± 6	16 (0-20)
20	Vaginal delivery	13.7 ± 4.9	15 (0-20)
21	Circumcision	1.5 ± 4.4	0 (0-18)
22	Urinary catheter application	17.2 ± 3.5	18 (0-20)
23	Familiarity to vaccination program	14.6 ± 4.8	15 (0-20)
24	Simple casting	15.4 ± 4.2	16 (0-20)
25	Electro cardiography	16.6 ± 3.5	17 (0-20)
26	Cerebro-spinal fluid aspiration	9.4 ± 7.2	10.5 (0-20)
27	Ascitis fluid aspiration	10.5 ± 6.5	12 (0-20)
28	Pleural fluid aspiration	6.3 ± 4.5	0 (0-20)
29	Staining and microscopic exam of different body fluids	9 ± 6.5	10 (0-20)
30	Microscopic exam of stool smear	7.6 ± 6.1	10 (0-20)
31	Aids-fast staining exam	7.8 ± 6.2	10 (0-20)
32	Micro tube measurement of hematocrit	5.2 ± 6.2	0 (0-18)
33	Intra ocular pressure measurement	6.3 ± 5.9	0 (0-18)
34	Venous cut-down	1.4 ± 4.2	0 (0-19)
35	Tension penomothorax management	8.8 ± 5.9	10 (0-19)
36	(Microscopic exam of peripheral blood smear (malaria	10.1 ± 6.6	12 (0-20)
37	Arterial blood gas sample	16.7 ± 2.7	17 (0-20)
38	Arterial blood gas explanation	15.6 ± 4.2	17 (0-20)
39	PPD test	14.7 ± 5.4	16 (0-20)
40	PPD test explanation	15.4 ± 4.7	16.5 (0-20)
41	KOH skin test	1.6 ± 4.7	0 (0-20)
42	Research	13.3 ± 6.2	15 (0-20)

Comparison of "ability to do" and "mark of procedure" according to sex and duration of graduation are presented in [Table 2].

Table 2: Comparison of "ability to do" and "mark of procedure" according to sex and work experience.

	Sex					Work experience				
	Male		Female			Years 0-2		years 2-4		
Ability to do belief	(SD±) Mean	Median (Range)	(SD±) Mean	Median (Range)	P	(SD±) Mean	Median (Range)	Mean (SD±)	Median (Range)	P
	71.8 ± 15.3	76.2 (31-92.9)	79.5 ± 10.5	81 (42.9-95.2)	0.009	66.5 ± 14.4	69 (38.1-90.5)	79.8 ± 11.1	82.1 (31-95.2)	0.001
Procedure mark	11 ± 2.2	11.1(4.7-16.3)	11.9 ± 1.9	11.9 (7.2-16.7)	0.074	10.4 ± 2	10.9 (6.2-13.6)	12 ± 1.9	11.8 (4.7-16.7)	0.002

Graduate responses in 4 procedures with less than %25 belief of "teaching" according to work experience are presented in [Table 3].

Table 3: Response to 4 main questions in 4 weak learned procedures according to work experience.

	Teaching (Q 1) Total		Practice (Q2) Total		Ability (Q3) Total		Mark (Q4) Total	
	WE= 0-2	WE= 2-4	WE= 0-2	WE= 2-4	WE= 0-2	WE= 2-4	WE= 0-2	WE= 2-4
Intro osteal injection	%17.6		* %3.9		%8.8		3.2 ± 0.8	
	13.8	18.1						
Circumcision	23.5		*6.9		11.8		4.4 ± 1.5	
	34.5	18.1	20.7	1.4	17.2	9.7	5.5 2.3	4 ± 1.2
Venous cut-down	24.5		14.7		12.7		4.2 ± 1.4	
	20.7	26.4	6.9	18.1	6.9	15.3	4.8 ± 1.8	2.2 ± 0.5
Skin KOH test	23.5		*15.7		*10.8		*4.7 ± 1.6	
	34.5	19.4	31	9.7	24.1	5.6	6.5 ± 3.7	3.5 ± 0.8

WE= work experience in years.
*Significant difference In Two groups of 0-2 and more than 2 years work experience is seen.

Discussion

Practice in procedures is an important part of student learning. In the present study in total over view of 42 procedures, %79.8 of responders believed that the procedures were taught. Regarding 4 procedure less than %25 believed they had been taught. The procedures regarding "practice" of the procedures in total over view, %64.2 notified they had practiced the procedures. In 12 out of 42, less than %50 believed they had practiced. This indicates inappropriate teaching method of procedures. Studies confirm that educational outcomes, if measurable, might result in educational change regarding student learning and faculty teaching methods [7]. Change based on learning principles results in medical student learning improvement. Faculty members could guide and support learners in structured, effective learning [8].

In the present study mean score of the total 42 procedures was 11.5 ± 2.1. Otherwise, in 16 out of 42 procedures, self score of responders was less than 10. This finding indicates that procedures are not learned well, outcome based education and evaluations are integrated to each other. Evaluation methods should accommodate to learning methods and students must be exposed to learning experience appropriate to future evaluation [9].

Common mode of all outcome based education programs is what students know and do. So, arrangement of the proper evaluation system is the main part of outcome based education [10].

In the current study in 4 out of 42 procedures, there was no education, no practice and no ability. Mean self score of graduate physicians was less than 2 (out of 20) (Table 1). These 4 procedures are as follow: intraosteal injection, circumcision, venous cut down and KOH skin Test. It seems reasonable to revise these outcomes as necessary procedures for graduates. There are different methods to determine necessary outcomes including expert opinion, medical failure studies, critical case review, task analysis of employees, mortality morbidity statistics, superior people characteristics, review of existing educational programs and graduate opinions, all might help to arrange outcomes [11-15].

Considering "competency in all procedures belief" and "self competency score", recent graduates (within the previous 2 years) achieved fewer score than graduates within 2-4 years (Table 2). This finding indicates that they have learned the procedures after graduation which is inconsistent with outcome based education. Learners should have learned the necessary procedures during attending the course and have passed the final evaluation before graduation. A considerable point in 4 procedures which were evaluated as weak, is shown in Table 3, in that, the procedures were regarded as weaker among graduates graduated within 2-4 years than recent graduates. Improvement of older graduates in other procedures might confirm the probable unnecessary nature of these 4 procedures which graduates are not involved in them during real practice. Extraction of essential weak points in the medical education system of Iran indicated the following items: insufficient competency of faculty members in planned education, suboptimal exposure to common cases, non-Teaching attendance of interns in educational hospitals, no effective educational collaboration, some non-observance of moral codes in teacher-student relationship, shortage in evidence based medicine, deprivation of documentation in clinical education and improper evaluation methods [16].

A limitation of the present study is sampling of graduates of universities just located in Tehran. National classified sampling including most or all universities especially located in smaller towns, would improve generalizability of the study.

Conclusion

Educational methods are not consistent enough with

outcomes. Proper evaluation of outcome achievements before graduation is not done. Some outcomes including 4 weak procedures should be re-evaluated. Most competency improvements of graduates happened after graduation. Therefore, re-assessment of must know procedures, paying attention to more effective learning methods and evaluation methods might be considered.

Conflicts of Interest

There are no conflicts to declare.

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