Clinical Clerkship Education Improves With Implementing a System of Internal Program Evaluation Using Medical Students' Feedbacks

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Abstract- Quality of clinical education for medical students has always been a concern in academic medicine. This concern has increased in today's time-squeeze while faculty members have to fulfill their complementary roles as a teacher, researcher, and practitioner. One of the strategies for program evaluation is obtaining trainees' feedbacks since they are the main customers of educational programs; however, there are debates about the efficacy of student feedback as a reliable source for reforms. We gathered Likert scores on a 16-item questionnaire from 2,771 medical students participating in all clerkship programs in a multidisciplinary teaching hospital. An expert panel consisting of 8 attending physicians established content validity of the questionnaire while a high Cronbach's Alpha (0.93) proved its reliability. Summary reports of these feedbacks were presented to heads of departments, clerkship program directors, and hospital administrators, at the end of each semester. Analysis of variance was used for comparing hospital scores across different time periods and different departments. Significant changes (P<0.001) were observed in mean scores between different semesters (partial $\eta 2$=0.090), different departments (partial $\eta 2$=0.149) as well as the interaction term between departments and semesters (partial $\eta 2$=0.111). A significant improvement in mean clinical education score is noticeable after three semesters from the beginning of the survey. Periodic, systematic trainee's feedback to program directors can lead to an improved educational performance in teaching hospitals.

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Introduction

Medical Students receive a major part of their clinical education at university hospitals. This model of academic medicine was conceptualized in an era when teaching, research, and clinical work were seen as complementing (and not competing) tasks relying on rich funds from diverse sources. Today, "patient care" is the main source of teaching hospital's income. Research is also better compensated than educational activities. Therefore, "clinical education" is left as the only task still relying on a non-commercial ethic of professionalism, making it more vulnerable to the time-squeeze felt by faculty, and also harder to quantify (1).

The presence of reliable, valid and practical methods of internal program evaluation is essential to ensure efficacy, efficiency, high quality of education, and continuous improvement at any institution (2,3). One of the most common evaluation strategy used in clinical education is gathering feedbacks from medical students and residents as the main customers of clinical education programs (4-7). However, many debates exist regarding the efficacy of student feedbacks on teaching activities, the best way for gathering feedbacks from students and passing them to the faculty, the time needed for a change from feedback to the effect on clinical education, and the durability of that effect. Baker has presented effect if feedback on residency training and showed a positive effect of feedbacks on clinical education scores, reaching to a higher plateau after 5-6 periods of feedbacks (6).

We developed a continuous periodic opinion poll for

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gathering medical students' feedback on various aspects of the clinical education. We followed the impact of implementing this feedback system as an administrative monitoring and evaluation system in a long-term (4 yr) study.

Materials and Methods

Preparation of survey instrument

We designed an 18-item questionnaire based on World Federation of Medical Education (WFME) global standards (Table 1) (7), considering clinical education in the setting of our hospital departments. Each question was rated on a 5-point Likert scale (ranging from 1 to 5; very weak, weak, moderate, good, and excellent respectively). After performing a pilot study, content validity of questions was evaluated by an expert panel; two questions were deleted, and four questions were revised.

Table 1. List of questions in the final questionnaire

No	Questions
1	Presence of specific weekly timetable for students' education
2	Presence of "essential educational objectives" for students to study
3	Clarified objectives for clinical skills
4	Prioritize common diseases as objectives (versus rare diseases)
5	Education with emphasis on clinical practice (which is different from theoretical classes)
6	Focus on emergency condition of the discipline
7	Attention to student's opinion
8	teaching necessary clinical skills
9	Involving students in presenting conferences, lectures, and cases
10	Clinical teaching at patients' bedside (bedside rounds)
11	Clinical education in ambulatory setting
12	Following clerkship curriculum during the course
13	Specific supervisor for each group of students in all educational environments
14	Assessment of log books and providing feedbacks to students
15	Clarifying methods of student assessment during the course
16	Congruity of student assessments and given educations

Validity and reliability

Content validity of the questionnaire was established by an expert panel consisting of 8 attending physicians who had passed Medical Education Fellowship. None of the questionnaire items correlated too highly or minimally with other items (correlation coefficients ranging from 0.41 to 0.69), and Factor analysis yielded a single factor with eigenvalue more than one (factor1's eigenvalue=8.5) that accounted for 94% of the common variance. Both Split-Half Reliability and Cronbach's Alpha proved the high reliability of the questionnaire (Split-Half Reliability: r=0.91 and Cronbach's Alpha=0.93). The high Cronbach α and the single factor retained after factor analysis strongly suggest the internal consistency of the questionnaire with all questions cumulatively scoring a single entity (clinical education score) that could not be partitioned into meaningful sub-scores based on our questionnaire.

Data collection procedure

After approval of the survey protocol by the hospital's Education Council, data collection was conducted from September 2008 to September 2012, at Shariati Hospital, affiliated with Tehran University of Medical Sciences. All medical students who were taking formal clerkship courses in educational departments (urology, orthopedics, general surgery, gynecology, neurology, cardiology, pulmonary, rheumatology, endocrinology, gastroenterology, hematology, nephrology) were enrolled in the study. Each department's clerkship education program administrator administered questionnaires to students at the end of the course in accordance with the study protocol.

Giving feedbacks to departments

After analyzing collected data in each semester (6-month period), summarized results were prepared. The reports contained each department's total and subtotal score along with changes in each question score compared with previous semesters. The department's mean score and questions' scores were compared with the corresponding scores of the entire hospital by One-Sample T test. *A.* The value <0.05 was considered statistically significant. These reports were then

presented at a meeting of the hospital education council consisting of heads of departments, clerkship program directors, and hospital administrators. Reports were sent to every department and their faculty members as well.

Data analysis

We calculated each question's scores, each department's, and the hospital's total scores and tracked score change trends during the study period as well as each department's action plans to improve their educational program. Analysis of variance (ANOVA) was used to compare departments and hospital scores through the time period under the study. Postestimation linear contrasts were used to determine the relative contribution of each semester's change to the overall change in mean clinical education score using custom vectors and Scheffe's correction for multiple comparisons. A *P*.value<0.05 was considered statistically significant. Effect size calculations were performed using partial Eta squared for F test and were classified as small (partial η^2=0.01), medium (partial η^2=0.06) or large (partial η^2=0.138) using Cohen's conventions. The analysis was done with STATA version 13 software.

Results

Number of 2,771 medical students enrolled in this study. Mean clinical education scores of the hospital (including all departments) and each department are shown in Figure 1, in sequential semesters. ANOVA test showed significant changes in mean scores for different semesters (*P*<0.001, partial η^2=0.090), different hospital departments (*P*<0.001, partial η^2 =0.149) as well as the interaction term between different departments and different semesters (*P*<0.001, partial η^2 =0.111).

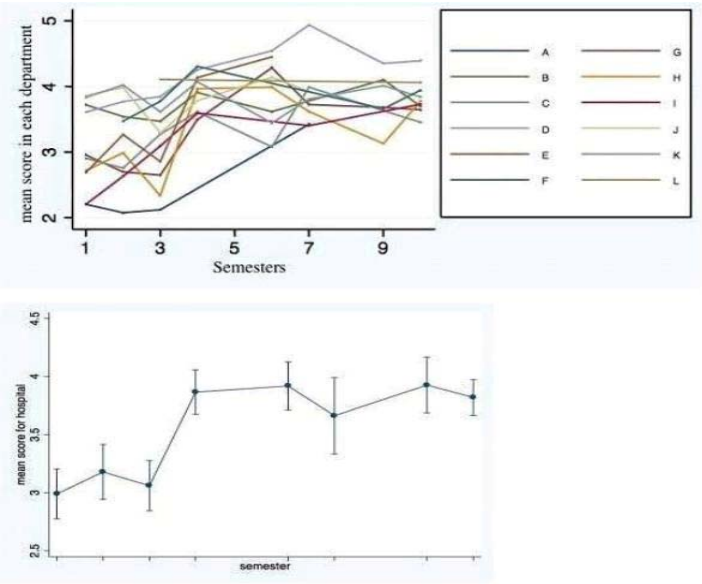

Figure 1. A. Trends of mean dinical education score for each department across semesters. B. Mean hospital scores with Scheffe-adjusted confidence intervals across semesters

A significant improvement in mean clinical education score is noticeable after three semesters (1.5 years) from the beginning of the survey. We could arbitrarily divide the 8 semesters of this study into 3 pre-improvement periods and 5 post-improvement periods. Post-hoc custom linear contrasts were used to test the Scheffe-adjusted significance of the most notable bumps in the graph displaying hospital's mean scores across semesters. The mean score for the post-improvement semesters was improved by 0.72 compared to the pre-improvement semesters (*P*<0.001). The difference between the second semester with the other two pre-improvement semesters and the difference between the 5th semester with the other 4 post-improvement semesters were not significant.

Table 2 showed that mean scores for most departments were incremental. ANOVA test and Scheffe multicomparison test showed that all of these differences were significant except for departments C, J, and L. As shown in table 2, the three most score increases were for

departments A, I, and F that had the lowest initial scores. There also was a significant increase in mean score for all items of the questionnaire during the study period (P<0.001).

Oral feedbacks received by clerkship education program administrators in each department confirmed this noticeable leap in educational satisfaction after 1.5 years of the commencement of survey. Table 3 summarizes the changes that were made to different departments after receiving the study's feedbacks.

Table 2. Mean score of each department during study period

Departments	2007-2008-I	2007-2008-II	2008-2009-I	2008-2009-II	2009-2010-I	2009-2010-II	2010-2011-I	2010-2011-II	Total	Score changes during study
Department A	35.4	33.15	33.97	NS	NS	54.86	NS	NS	42	19.47
Department B	47.3	43.1	42.38	55.94	68.6	59.63	58.9	58.44	56.9	11.15
Department C	59.6	56.63	55.56	62.55	57.9	NS	65.6	59.19	60	-0.37
Department D	43.4	47.83	37.38	63.27	63.9	57.93	50.1	60.44	55.6	17
Department E	46.6	44.05	52.41	57.72	49.3	63.88	NS	55.29	52.3	8.73
Department F	35.4	42.12	49.5	57.56	NS	54.43	NS	59.74	51.6	24.36
Department G	57.7	60.27	61.53	67.98	72.8	79	69.7	70.31	67.4	12.57
Department H	61.8	63.7	52.73	60.5	66.3	62.86	NS	NS	62.3	1.09
Department I	43.1	52.26	46.11	66.13	71.2	NS	NS	NS	54.6	28.12
Department J	61.4	64.37	58.09	65	55.1	61.38	64.3	61.41	61.4	0.03
Department K	NS	55.56	60.58	68.9	NS	NS	58.6	63.1	61.4	7.54
Department L	NS	NS	65.5	NS	NS	NS	NS	64.88	65.1	-0.62

NS=No student in the department at that semester

Table 3. Reforms performed by different departments in response to feedbacks

Reforms
Preparation of a consolidated educational timetable for students' education
Assigning a newly committed supervisor for clerkship education
Revision of the existing programs and educational goals
Introduction of specific programs for teaching clinical skills (e.g. in the hospital skill lab)
Exclusion of training beyond general medical practice
Defining educational activities in Emergency Department
Establishment of regular training rounds in Emergency Department by attending faculties including full professors
Attention to students requests in terms of educational activities
Assigning more active roles to students
Enhancement and strengthening of clinical rounds (particularly in surgical departments)
Establishment of structured ambulatory education
Implementing defined curriculums
Assessment of students' logbooks with appropriate feedback
Revision in methods of student assessment during (formative) and at the end of the course (summative)

Discussion

Clinical education is a complex process that needs a suitable environment, well-designed program and motivated teachers and staff. Continuous monitoring and program evaluation is essential to assure the desired outcome. Attending physicians, as clinical teachers and

mentors, are the most important resources for clinical training. They have a critical role in the quality of education (8-10). Due to possible differences between expectations of medical students and the training methods which are already in place, students' feedbacks are critical for attending physicians to revise their educational goals and their methods of teaching (2,4,11). Providing feedback to attending physicians has shown to be an effective measure to improve teaching methods (12). However, some studies have shown that there is a limited promise in improvement gained via short-lived feedbacks as many other factors may restrict its effectiveness (13,14). On the other hand, changes in educational programs will not necessarily lead to the desired improvement in the final outcomes including students' knowledge, skills, and attitude, as shown by Kirshner *et al*., Possible reasons can be ineffective changes in teaching styles, and not considering student's needs based on their future job analysis (15).

Available data suggests that improvement of teaching skills of faculty members may not be possible in short time. Many short-term studies have failed to show significant effects, and longer-term studies have demonstrated a minimum of one year for significant behavioral changes to take place regardless of the frequency of feedbacks (6). In this study, the major part of behavioral changes with positive impact on the outcome took place after 1.5 years of implementing the feedback system. Our study confirms the results from prior studies regarding the helpful effect of feedback, especially for the faculties with ratings below average, to improve their teaching effectiveness. Thus, feedbacks to below-average departments are stronger incentives for change than positive feedbacks to the above-average ones (6,16).

The present study shows that a continuous feedback system using a standard questionnaire could be a feasible and effective method for educational administrators to monitor departments' educational activities, especially in a multidisciplinary teaching hospital with numerous medical students. Prior studies using only numerical scores of the faculty as feedback have mostly failed to show improvement in teaching scores while more demanding methods like qualitative feedbacks (e.g. questionnaires with a written comments section or focus group studies) have been more promising (6). Our method of program evaluation can be implemented with minimal effort as a continuous measurement over time. This feedback system not only provides comparative reports of different departments but also provides "trend analysis" of the whole hospital and each department for each educational standard. Educational directors and administrators can use these reports in order to detect current weaknesses, reinforce strengths, and plan for promoting educational activities. Establishing such feedback systems can push departments towards reforms that finally result in higher students' satisfaction.

Similar to Downing's study (16), our findings show some fluctuation in clinical education ratings across time and in some departments, e.g. a slight reduction after an increase. This reduction might be due to increased students' expectations or a true drop in the performance of that department. Implementing different types of incentives for the improved departments can possibly solve this issue. Another way to mitigate this issue can be achieved by providing regular reports of feedbacks on departments' performances to hospital and university administrators.

Dividing the mean score by the Likert span (5 in our study) can normalize the scores and allows for comparison with similar studies. Baker has calculated a 99% confidence interval of 0.774-0.820 for normalized teaching scores from a variety of different teaching venues (6). Our normalized score at the beginning of our study fell well below this interval (0.596) and after implementing the feedback system reached the vicinity of it (0.764). Thus, implementing this feedback system has probably been an essential need of our educational system. Studies have shown that attending physicians prefer to be evaluated by students through measurable variables (12,16-20). The main obstacle we encountered was the initial rigidity of departments for accepting this feedback system as a valid and reliable method to collect students' opinions. Some departments with initial low scores also denied the value of students' feedback on their performances. Approval by hospital administrators helped to establish the feedback system as a fixed part of educational administrative protocols in the hospital, and resistant departments tried to get higher scores by the establishment of reform and changes, compatible with objectives of the questionnaire. Attending physicians' resentment towards the feedback system has occasionally been observed in prior studies (2); however, more commonly, instructors' attitude towards the feedback system has been reported as welcoming (21).

Limitations of the current study include the absence of a control group to account for the impact of other initiatives that might have helped improve the hospital's teaching scores, and lack of a gold standard for evaluation of improvement in educational outcomes. But

this study differs from most similar studies in its large sample size and long-term sequential follow-up of departments' scores.

In conclusion, regular quantitative and qualitative surveys of students' feedback and evaluation can provide appropriate feedbacks for internal program evaluation in teaching hospitals. In educational centers, this can be a promising tool to induce educational reforms, improve students' satisfaction, and may eventually promote the quality of education.

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