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Effect of a two-day extensive continuing medical education course on participants' knowledge of clinical and operative urology

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ABSTRACT

Objective: Continuing Medical Education (CME) is an established method for facilitating the lifelong learning and developing knowledge, skills and attitudes to ensure delivery of a medical care which is up-to-date, evidence based, safe and patient-centered. An extensive 2 day urology course was conducted to meet the needs of learners. The purpose of the current study was to measure the effect of this CME activity on the knowledge of the participants.

Material and methods: This quasi-experimental, single group pre-, and post-test study measured the gain in learning as a result of the two-day extensive CME course conducted by the section of Urology at Department of Surgery, the Aga Khan University, Karachi- Pakistan. Gain in knowledge, defined as the difference between the pre-test and the post-test scores, was taken as a measure of course effectiveness. The test comprised of 40 one-best type carefully constructed multiple choice questions (MCQs). Item analyses were also performed.

Results: Forty-five out of a total of 70 participants from within and outside the city completed both pre and post-tests and were included in the study. The mean age of the subjects was 33.3+6.7 years. Of these 45 participants, 68.9% (n=31) of them were trainees at different levels. Mean gain in knowledge was 12.7±6.8% ($p<0.01$; 95% CI: 4.17-5.79). Mean test scores improved significantly from 37.8±11.3% to 50.3±10.8%. Difference in pre and post scores due to age, gender, practice type or years since start of training was not significant. The reliability of the test using Cronbach's α was 0.634.

Conclusion: CME sessions when designed and delivered carefully are effective means of increasing the knowledge significantly. Pre- and post-test is a reliable and valid strategy to measure gain in participants' knowledge.

Keywords: Continuing medical education; pre and post-test; reliability; urology.

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Introduction

Urology is one of the most varied and diverse specialty among all the surgical specialties and constitutes up to 10% of all consultations in general practice and 20% of all acute hospital surgical referrals.[1] With the emergence of newer technologies and constant change in medical knowledge, there is a need for ongoing education.[2,3] Like all medical disciplines, there is a need to keep urologists abreast of the recent advancements in their field.

Continuing medical education (CME) is an established method for facilitating the lifelong learning with a focus on maintaining and developing knowledge, skills and attitudes to ensure delivery of a medical care which is up-to-date, evidence based, safe and patient centered.[4] The underlying belief that the knowledge gain resulting from CME improves practice and patient outcomes, has resulted in increasing emphasis by the certifying bodies that the physicians accrue a certain amount of CME credits annually in order to continue their practice. Unfortunately, literature has

shown that despite a long history of CME programs, the outcomes are far from ideal and evidence is lacking regarding their efficacy. It is therefore essential to evaluate the effectiveness of the CME activities. The most common means of evaluating a CME activity reported in the literature is by obtaining participants' post-CME feedback or satisfaction surveys which may not often be true representative of the CME utility.[5] Studies have also measured the gain in knowledge or skills, but the evidence regarding the validity and reliability of the instruments used for this purpose is lacking.[6]

There is limited literature from Pakistan regarding CME in general and urology in particular. To our knowledge, there is no published study from Pakistan that has objectively evaluated the effectiveness of CME for the specialty of urology.

Aga Khan University is an accredited body by Pakistan Medical and Dental Council (PMDC) which holds regular CME sessions for physicians in various disciplines and specialties including urology. Participants' feedback and satisfaction are the usual evaluation methods for these CME sessions. The objective of this study was to measure improvement in the clinical and operative urology-related knowledge of urologists after a two-day extensive CME course.

Material and methods

This quasi-experimental, one-group pre-test/post-test study was conducted in the department of Urology, Aga Khan university Hospital, Karachi, Pakistan to measure the effect of an intervention (CME) on the knowledge of the participants. An ethics review committee approval was obtained (2691-SUR-ERC-16). The intervention, a two-day extensive CME course 'Conceptual basis of urology course-the art of clinical and operative urology' was designed for urologists. The content of the course was carefully selected based on assessments of educational needs by previous surveys and feedback evaluation forms of previous courses. It focused on common urological presentations and topics addressing practical management aspects.

The curriculum included main topics of functional urology including urodynamics and interpretation of its readings, medical and surgical management options for erectile dysfunction and infertility, pediatric urology, imaging and technology in urology, bladder outflow obstruction, female and reconstructive urology, urolithiasis including stone metaphylaxis and surgical aspects of its treatment like flexible ureterorenoscopy, mini-perc etc. and medical and surgical management of uro-oncology including techniques for orthotopic bladder reconstruction, nerve sparing radical prostatectomy, inferior vena cava (IVC) thrombectomy during radical nephrectomy etc.

The content was delivered using multimodal strategy including peer teaching, case presentations, interactive lectures, panel discussions, sharing real life experiences and operative videos. Course faculty included 18 academic urologists from different public and private sector teaching hospitals/universities across the country and 2 overseas faculty members. They included renowned professors, associate professors and consultants who were experts in their subspecialty i.e. pediatric urology and uro-oncology etc. Two and a half day long CME intervention was approved for 14 AACME credits.

A single-group, pretest-posttest design (O1---X---O2) was used to evaluate the course. The test consisting of 40 one-best type multiple choice questions (MCQs) was developed by 8 course faculty members to be used both as pre and the post-test. An example of one-best type multiple choice question (MCQ):

The return of potency following radical prostatectomy (RP) is strongly correlated to:

a. The patient's age
b. The ability to preserve cavernous nerves
c. The stage of cancer
d. Whether or not a lymph node dissection was performed
e. Patient's pre-operative erectile function

The questions were carefully constructed to assess the clinical judgment, application, and synthesis of knowledge related to basic and operative urology topics covered in the CME. The MCQs were reviewed for clarity and agreement on answer key ensuring face validity by a group of 6 experts including a medical educationist.

The tests were administered to all the course participants as hard copies. Since the completion of the pre and post tests were voluntary, only those participants who completed both pre and the post-test were included in the study. A written informed consent was obtained from all participants prior to administration of the pre-test. A questionnaire was also administered to measure participants' satisfaction with the course.

Statistical analysis

Descriptive analysis including mean, percentages, and standard deviation (SD) was calculated using IBM Statistical Package for the Social Sciences (IBM SPSS Statistics; Armonk, NY, USA) version 20.0. Gain in knowledge defined as difference between the post-test and the pre-test scores was taken as a measure of CME course effectiveness and calculated using paired samples t-test. Percent increase in scores was calculated using the formula (T2-T1)/T1 x 100. One-way ANOVA was used to measure difference in test scores across groups. A p-value of ≤ 0.05 was taken as significant.

Item discrimination and item difficulty analyses were done to measure construct validity of the test instrument. Reliability using Cronbach's alpha was calculated as a measure for internal consistency of the test.

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Results

A total of 70 participants including both urology trainees and independent consultants from both academic and private practice groups attended the course. Only 45 (64.3%) participants completed both pre-, and post-tests and were included in the analysis. Thirty-one (68.9%) out of the total 45 participants, were trainees at different levels. Majority of the participants were males (93.3%). The mean age of the participants was 33.3±6.7 years with minimum being 26 and maximum 57 years. The average time since the participants had started their training in urology was 6.3±5.6 years with minimum time being one year and maximum duration since start of training was 30 years. Twenty six participants were from Karachi while the others were from different cities across Pakistan. The characteristics of the participants are summarized in Table 1.

Table 1. Characteristics of the continuing medical education participants

	n	%
Males	42	93.3
Females	3	6.7
Trainees	31	69
Consultants	14	31
Practice type		
Academic	35	77.8
Non-academic	10	22.2
Years since start of training		
1-5 yrs	26	57.8
6-10 yrs	12	26.7
11-15 yrs	4	8.9
16-20 yrs	2	4.4
>20 yrs	1	2.2
Participants within city	26	57.8
Participants outside city	19	42.2
Total	45	100

Mean gain in knowledge taken as difference between post-test and pre-test scores was 12.7%±6.8 ($p<0.01$; 95% CI 4.17-5.79). Mean test scores improved significantly from 37.8% (±11.3 SD) to 50% (±10.8 SD) (Table 2). An increase in scores of 30% or more was observed in 25 (55.6%) participants while 34 (75.6%) participants showed a ≥20% increase in scores.

Table 2. Continuing medical education participants' test scores and gain in knowledge

	Mean ± SD	%±SD	Min.	Max.
Pre-test scores	15±4.5	37.8±11.3	6	23
Post-test scores	20±4.3	50.3±10.8	8	27
Difference in scores (Gain in knowledge)*	5.0±2.7	12.7±6.8	0	13

*p<0.01. SD: standard deviation; Min: minimum; Max: maximum

Gain in knowledge, as evident by difference in pre-post test scores, was more in some areas such as urinary tract infection, bladder outflow obstruction, imaging and technology, urolithiasis and uro-oncology, while minimal gain in knowledge was noted in the areas of uro-gynecology, pediatric urology, and urodynamics/functional urology.

The improvement in mean test scores (gain in knowledge) was observed across the whole group in the subgroup analysis irrespective of difference in age, gender, practice type (academic

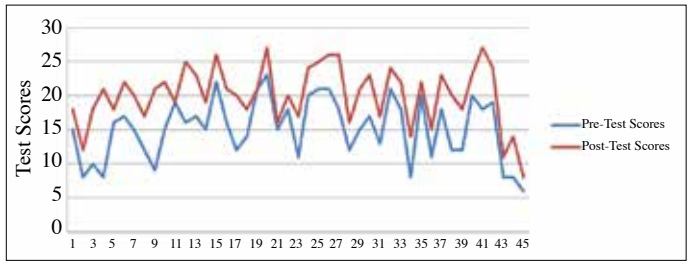

Figure 1. Comparison of pre-test and post-test scores

Table 3. Course evaluation by the participants (%)

	Poor	Average	Good	Very good	Excellent
	1	2	3	4	5
Content covered as per defined objectives	0	2	12	46	39
Sessions were at the participants' level of understanding	0	3	8	38	51
Acquired new knowledge	0	2	5	56	37
Time management	2	7	22	32	37
Queries responded	0	0	5	54	41
Overall assessment of the activity	0	0	10	54	36

Table 4. Participants' responses to the open ended questions in the feedback questionnaire (n=45)

Question	Selected Comments
Q-1: In your opinion what were the strengths of the activity?	• Focused • Useful/essential review of information • Good combination of clinical, theoretical & surgical knowledge • Nice balance of videos, presentations & interactive sessions • Timing near exams • Facilitators' knowledge and attitude • Pre-, and post-test helped us self-assess our knowledge • Diversity of participants
Q-2: What in your opinion were the weaknesses of this activity?	• Too much knowledge in a short span of time • No provision to show live surgeries • No surgical hands-on sessions • Extensive timing of the course • No significant weakness found.
Q-3: Please give suggestions that can help to improve this activity in the future	• Increase time span of the activity to one week • Add other important aspects of urology • Should be conducted regularly; so it would greatly benefit post -graduate trainees and fresh post-graduates • Should include endoscopy, laparoscopy hands-on experience, at least on simulators.

vs. non-academic) or years since start of training (Figure 1). The reliability of the test measured with Cronbach's alpha was calculated as 0.634 which is a moderate and considerably acceptable coefficient. The test discrimination index was 0.25.

A short survey using 5-point Likert type questionnaire was conducted at the end of the activity to evaluate the CME activity as perceived by the participants. Three open-ended questions were also added in the questionnaire to obtain feedback about the course. Majority of the participants graded the activity as very good or excellent. Evaluation scores (%) and comments of the participants are given in Table 3 and Table 4 respectively.

Discussion

Continuing medical education is considered a core component of continuous professional development. With the emergence and rapid change in technology and information in medical sciences, the physicians need ongoing education not only to be up-to-date but to provide optimal care to the patients.[7] Many countries are in a process of refining their CME system. Recently, Pakistan Medical and Dental Council (PMDC) has set guidelines and rules for CME and has made it compulsory for both general practitioners and specialists to maintain their medical licenses-the specialists must gain 150 CME credit points for a period of 5 years, and 30 points per year to be able to continue their career.[8]

Since CME programs are the main source of updating current information, the organizers have considerable responsibility for determining the appropriate curriculum for their meeting which includes selection of appropriate teaching and learning strategies and identification of valid and reliable tools to assess the effectiveness of the CME activity.[9] Literature shows that traditional didactic CME sessions, with participants from diverse educational backgrounds and at different levels, using passive learning strategies often result in less than required outcomes with minimum impact, if any, on the physicians' attitudes and practice. Studies have proven that single method CME intervention has little impact on participants' knowledge while strategy of interactive and mixed method provides application of knowledge and problem solving ability and therefore it has the highest educational impact.[10] While CME interventions designed for a small group of participants from a single discipline focused and directly linked to the practice concerns, using multiple methods ensures active participation and has been shown to result in better outcomes.[11]

These educational principles were applied while designing the CME for our study. Selection of the content for the course was based on the assessment of educational needs, the teaching methodology incorporated using multimedia, multiple instructional techniques with interactive sessions ensuring active participant involvement. All the participants were from the same discipline i.e. urology, and practical aspects were discussed with suggestions and feedback from peers.

Assessing the value of a CME is challenging owing to the methodology used and reliability and validity of the tool employed. The Kirkpatrick's model for CME evaluation has 4 levels-participant satisfaction (level 1), knowledge and attitude change (level 2), physician clinical practice change (level 3), and patient outcomes (level 4).[12]

Because of the time and resource constraints, the most common way to evaluate the effectiveness of a CME course, is to rely

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on post-CME feedback of the participants[13] which only assesses their satisfaction and whether the learners' objectives are mainly met during the activity. Although this may usually be done, this level 1 evaluation does not guarantee learning itself.[14] The level 2 evaluation goes beyond learners' satisfaction and attempts to measure changes in knowledge, attitude and skills as a result of CME activity and hence truly assess learning.[15] One of the methods to measure this change is to carry out a pre-, and post-test analysis. The idea of pre-test is to measure the amount of preexisting knowledge, and of post-test is to measure the learning as a result of CME experience. However it is essential that the tool selected to be used as test is valid and reliable. Validity is concerned with the extent to which an instrument measures what it is intended to measure while reliability analysis reveals the consistency, usefulness and practical value of a test. Besides reliability of a test or tool is closely associated with its validity.[16]

In our study we selected the one best type MCQs to be used as pre-, and post-tests. One-best MCQs, when constructed properly, are an efficient tool to assess higher-order knowledge such as interpretation, application of knowledge, and they can differentiate between students who performed poorly in the test from those who performed well.[17] The MCQs were developed and reviewed by 6 experts for content and construct validities. Content validity was also established by ensuring questions on the key areas covered in the course, and included in the test. We used 40 questions as this is the minimum number of MCQs that is required to obtain a reliable and valid result. We also performed item analysis of the test. Item analysis is performed after the examination to assess the reliability and validity of a test item thus providing evidence for questions that need to be adapted, revised or discarded, and evaluate difficulty level of the test items (difficulty index), as well as ability of the items to differentiate between participants who are, and are not knowledgeable (discrimination index).[5] The discriminatory index of our test was 0.25 which is considered very good discrimination ability of the test provided the number of questions in the test is 40 or more. The difficulty index of a test item is defined as the proportion of a group of test takers who gets that item wrong and higher the difficulty index, easier the questions is. The difficulty index of 37.78 for the pre-test shows that the participants found the test difficult initially, however with gain of knowledge during the CME course, the participants were able to solve more questions with post-test difficulty index of 50.78. This could be taken as another indicator of the increase in their knowledge and effectiveness of the course. Cronbach's alpha, the most widely used objective measure of reliability, is basically a measure of the internal consistency of the items i.e. the extent to which all the items in a test measure the same concept or construct. It is expressed as a number between 0 and 1 and the preferred range is 0.5-0.8. Our tool showed a Cronbach's alpha of 0.634 which is considered as an indicator good internal consistency.[18]

An analysis of 28 studies assessing the knowledge acquired by specialists through CME showed that there was moderate educational effect with 22 (79%) studies demonstrating an improvement in knowledge, while 4 (14%) studies indicated lack of any difference, and 2 (7%) studies displayed mixed results.[19] A significant increase (at least 20%) in learning from pre-to post-test [12] was achieved in 76% of our participants, while ≥ 30% gain in knowledge was achieved in 56% the participants.

To complement these objective measurements, the perceived educational value of the CME session was assessed by analyzing qualitative evaluations and Likert-scale survey measurements from each participant on-site which could further be used to refine learning objectives and revise the program in the future.

To our knowledge, our study is the first from Pakistan which is intended to evaluate the effect of CME on knowledge of urologists. The selection of course content on the basis of needs assessment, use of multiple active teaching and learning strategies, and use of valid and reliable tools to assess the learning outcome of the participants in addition to the participant satisfaction and end-of-course feedback, all added value to the CME activity and strength to our study.

There were a few limitations as well. We did not do analysis of learning preferences and styles of individual participants; however assessment of the the background educational need ensured maximum benefit to the intended participants. The pre-, and post-test assessment and "value-added approach"[20] reflect immediate learning only and measures the ability of participants to retain and recall the facts taught during the course. The improvement on post-test scores therefore does not necessarily indicate improvement in their practice and patient-related outcomes. Also as indicated by the 4 level models, any intervention must be followed up for a minimum of one year in order to measure the effect and sustainability of intervention outcomes. Similarly, lack of a control group implies that the change in the knowledge of the participants as measured by the test scores cannot be attribute to our intervention, and any generalizations can only be made tentatively.

In conclusion, CME sessions when designed and delivered carefully are effective means of significantly increasing the knowledge. The CME evaluation should include reliable and validated instrument in order to investigate change in participants' performance.

Ethics Committee Approval: Ethics committee approval was received for this study from the ethics committee of The Aga Khan University Hospital (2691-SUR-ERC-16).

Informed Consent: Written informed consent was obtained from all participants who participated in this study.

Peer-review: Externally peer-reviewed.

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