

# Educational evaluation of cardiothoracic courses: can we do it justice?

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## Abstract

### Objectives

Educational evaluation is the systematic appraisal of the quality of teaching and learning. It drives the development and changes the content and delivery of educational encounters. Our aim was to examine the feasibility to evaluate a European Association of Cardiothoracic Surgery (EACTS) course using Kirkpatrick's 4 levels of evaluation.

### Methods

The Open and Endovascular Aortic Therapy Course delivered in March 2012 was evaluated using Kirkpatrick's four levels of evaluation.

### Results

The evaluation of the Aortic Therapy Course at level I demonstrated the satisfaction of the participants with the course and content in general as well as each lecture individually. Evaluation at Level II demonstrated an improvement in post course multiple choice questions pretest scores compared with scores of the same test ( $68 \pm 7.8$  vs  $58 \pm 9.2$ ;  $p < 0.1$ ). Level III involved a follow up questionnaire to all the participants 1 year following attendance of the course. 71.4% of the participants felt that attending the course changed their practice while 53.3% felt it allowed them to introduce a new procedure into their practice and in 93.3% it allowed them to better deal with more complex cases. For the Level IV evaluation, a questionnaire was sent to the participants' supervisors 1 year post course completion. 100% of the respondents ( $n=2$ ) answered that there was no change in the trainee's practice, a more complex procedure wasn't introduced into common practice and the trainee did not better deal with a more complex case following the attendance of the Open & Endovascular Aortic therapy course.

### Conclusion

A comprehensive evaluation of an educational course is feasible although Level IV was only evaluated indirectly and superficially.

## Introduction

Educational evaluation is the systematic appraisal of the quality of teaching and learning<sup>(1)</sup>. In many ways evaluation drives the development and change of curricula and educational courses. At its core, evaluation may have a formative role to help educators improve education by identifying areas where methods and content of teaching can be improved, or a summative role, judging the effectiveness of teaching.

The aims of this study was to evaluate the Open and Endovascular Aortic Therapy Course using Kirkpatrick's four levels of evaluation<sup>(2,3)</sup>.

## Methods

The Open and Endovascular Aortic Therapy Course was delivered March 2012 at the European Association for Cardiothoracic Surgery House in Windsor (UK). The course directors and

participants agreed for the course to be evaluated using the Kirkpatrick's Four Levels of Evaluation.

## Statistics

All data was presented as mean or as figures and %.

### Level I Evaluation: Reactions

Measures how participants in a training programme react to the content and delivery of the course. This was evaluated by designing a detailed although not validated evaluation sheet and having scores for content and delivery. It also included an overall satisfaction question and space for comments by the participants as well as a direct question as to whether they would recommend the course to colleagues.

### Level II Evaluation: Learning

Assesses the amount of learning that has occurred due to the training programme. Faculty

members were asked to submit multiple choice questions relating to the content of their lectures. This was administered to the participants before the start of the course and at the end of the course.

### Level III Evaluation: Transfer

Measures the transfer that has occurred in learners' behaviour due to the training program. A survey was submitted to all the participants using Survey Monkey one year following the course. The questionnaire although not validated included three questions shown in Table 2.

### Level IV Evaluation: Results

Attempts to assess training by measuring improvements in the workplace after training. A questionnaire was sent to the supervisors listed by the participants through Survey Monkey enquiring about their opinion on the participants' skill level after attending the course as seen in Table 2. This has not been validated. This arguably may not represent a comprehensive evaluation at Level IV although it was felt to be a good attempt at measuring the long term impact of attending the course on learner's performance in the workplace.

### Results

There were 20 participants who attended the course. All had favourable scores for their Level I evaluation of the Open and Endovascular Therapy Course with 14 Lectures scoring above good and 20 lectures scoring above Excellent as seen in Table 1. The scores for content and presentation given by the participants had good correlation. In Level II evaluation, there was a significant improvement in the multiple choice questions scores administered at the end of the course compared to the scores from before the course as seen in Figure 1.

For the level III evaluation, 15 of the 20 course attendees responded to the questionnaires (Table 2). 71.4% of the respondents felt that attending the course changed their practice while 53.3% felt they could introduce a new procedure into their practice. 93.3% agreed that the course allowed them to better deal with a more complex case.

For level IV evaluation, questionnaires were sent to the participants' supervisors, 9 in total as only 9 course participants supplied a supervisor's name. Only 2 of the 9 supervisors completed the questionnaire, results displayed in Table 2. The two respondents answered no to all the questions asked in the survey.

### Discussion

According to the Kirkpatrick's model <sup>(2)</sup>, evaluation should always begin with level one, and as time and resources allows, move sequentially to level four. Each successive level represents a more precise measure of the effectiveness of the training program, but at the same time requires a more rigorous and time-consuming analysis.

Evaluation at level I examines the participants' perceptions of the training and if the material taught was relevant to their work. This "smile sheet" evaluation according to Kirkpatrick should be applied to every training program. The participants' reactions have important consequences for learning. Although a positive reaction does not guarantee learning, a negative reaction almost certainly reduces its possibility.

The evaluation of satisfaction has more recently been administered electronically allowing quicker analysis and presentation of the data. These questionnaires should evaluate the content of a course, the methods used, the use of information technology and media, the trainer style, facilities and course materials and is best administered immediately after the event as the educational experience is still fresh in the trainee's minds.

Assessing the amount of learning in skills, knowledge or attitude is more difficult and laborious with methods ranging from formal to informal testing to team assessment and self-assessment. This can be measured by interviews, surveys, pre and post teaching tests, observations of trainees or a combination of these. This can be best carried out using a control group if feasible or to use the same group as their own controls. It is important to ensure a 100% participation or alternatively to use a representative sample of the group.

Evaluating at level III attempts to establish if the newly acquired skills, knowledge, or attitude are being used in the everyday environment of the learner. For many trainers this level represents the truest assessment of a program's effectiveness. However, measuring at this level is difficult as it is often impossible to predict when the change in behaviour will occur, and thus requires important decisions in terms of when to evaluate, how often to evaluate, and how to evaluate.

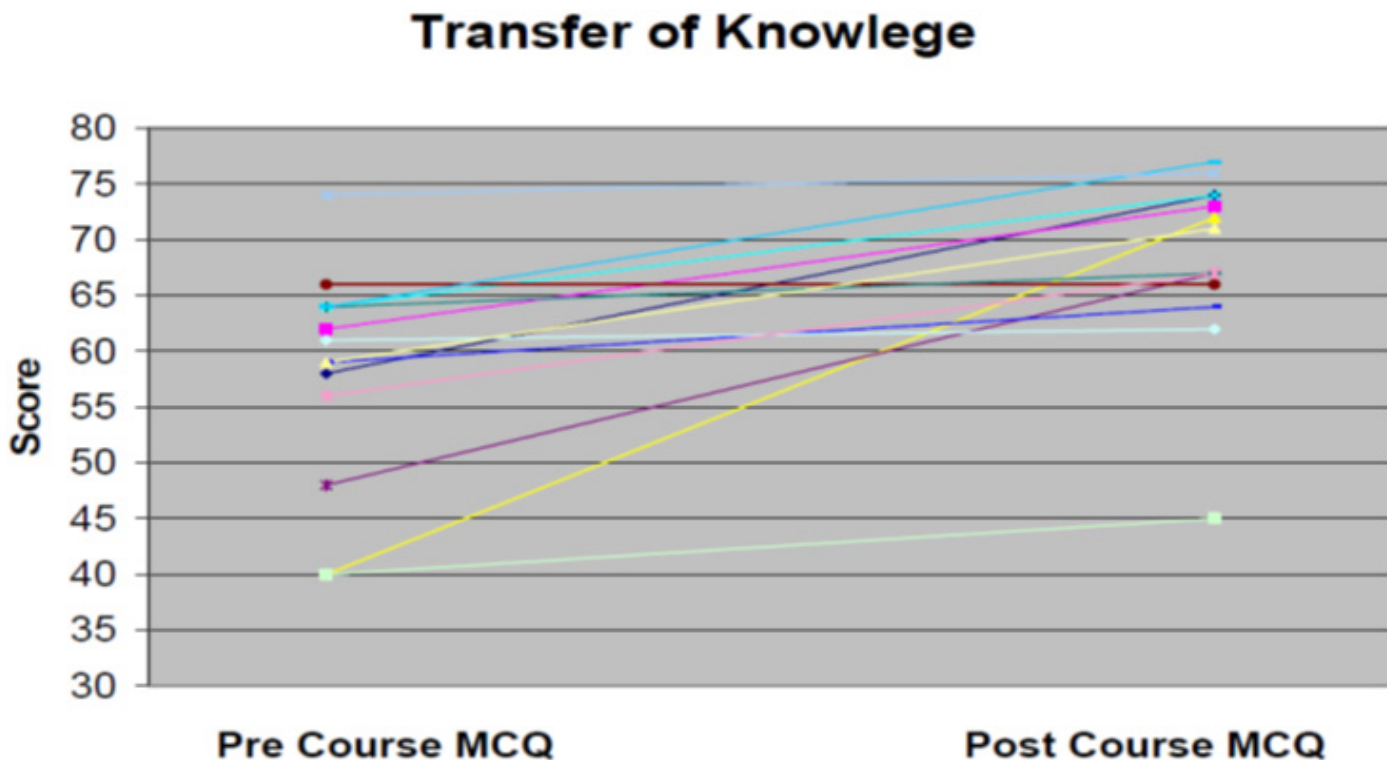
The results from the questionnaire sent to the participants' 1 year later shows that they all felt that their skills had improved as a result of partaking in the course in contrast to the supervisors' survey

Table 1: Evaluation of the Open and Endovascular Therapy Course, Windsor. 21st to 23rd March 2012

1: Poor, 2: Satisfactory, 3: Good, 4: Excellent, 5: Outstanding			
Title	Contents	Presentation	
<b>Session I - Aortic disease natural courses and diagnostics</b>			
Natural course of aneurysms and dissections	3.88	3.59	
PAU and IMH - Old diseases in a new light	4.06	4.12	
Biomarkers and their usefulness in acute and chronic aortic pathology	4.06	4.12	
Imaging-Part I (CT, MRI, PET, functional imaging)	3.88	3.82	
Imaging – Part II (TTE, TEE, IVUS, Aortoscopy)	3.76	3.53	
<b>Session II - Tips and tools for starting an endovascular program</b>			
Technical skills for endovascular procedures	4.35	4.29	
Choosing access for TEVAR- Decision algorithms what to do and what not to do	3.94	3.94	
Which stent-graft fits best to my needs?	4.29	4.18	
<b>Session III – Bring your cases</b>			
Participants Cases	4.06	3.88	
<b>Session IV - Cardiopulmonary bypass, cannulation and perfusion</b>			
CPB– the arterial access issue	3.83	3.72	
CPB- the organ protection issue	4.39	4.39	
CPB- the perfusion and temperature debate	4.28	4.28	
<b>Session V - Aortic root and ascending aorta</b>			
Root I - Mechanical solutions	3.50	3.56	
Root II - Biological solutions	3.94	4.00	
Root III- Ross operation	4.06	4.06	
Root IV - Valve sparing modalities	4.29	4.12	
Root V - What to do with bicuspid	3.06	2.75	
<b>Session VI - Aortic arch</b>			
Conventional aortic arch surgery	4.56	4.56	
Extending arch surgery to distal segments	3.78	3.28	
Combined vascular and endovascular approaches	4.06	4.00	
Why we do need a European Registry for Aortic Disease and how you can participate	4.12	4.00	
<b>Session VII - Aortic dissection</b>			
Evidence and lack of evidence in the treatment of acute type A aortic dissection	3.94	3.88	
What you always wanted to know about type A aortic dissection but did not dare to ask	4.12	4.00	
What you always wanted to know about type B aortic dissection but did not dare to ask	3.94	3.94	
What you always wanted to know about graft infections and their treatment but did not dare to ask	4.44	4.39	
<b>Session VIII - Descending and thoracoabdominal aorta</b>			
Why and how TEVAR has changed the way of thinking in descending aortic pathologies	3.94	3.89	
The collateral network concept and its clinical implications	4.50	4.44	
Organ protection for thoracoabdominal replacement	4.67	4.61	
Surgical techniques in thoracoabdominal disease	4.61	4.61	
<b>Session IX - Abdominal aorta</b>			
Why abdominal aneurysms are a distinct pathophysiological entity	4.14	4.14	
Why today EVAR is better for abdominal aortic aneurysms than 10 years ago	3.93	3.93	
Why surgery will remain the more durable treatment modality	4.33	4.27	
Side branches, chimneys, fenestrations and scallops	4.00	3.92	
Simulator Training	3.94	3.88	
<b>Course Facilities</b>			
	EACTS	Mean	4.27
<b>Course Organisation</b>			
	EACTS	Mean	4.27
<b>Would you recommend this course to a colleague</b>			
	Yes: 13	No: 0	No Answer: 5

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Figure 1



Graphic representation of the improvement in scores of Participants who completed both Pre and Post Course MCQ

Table 2. Level III Evaluation: Questionnaire responses of attendees and Level IV Evaluation: attendees’ supervisors - 1 year post course.

Attendees	Responses (n=15)		
	Yes	No	Not answered
“Did attending the EACTS Open & Endovascular Aortic Therapy change your practice?”	10 (71.4%)	4 (28.6%)	1
“Did attending this course allow you to introduce a new procedure in your common practice?”	8 (53.3%)	7 (46.7%)	0
“Did attending this course allow you to better deal with a more complex case?”	14 (93.3%)	1 (6.7%)	0
Supervisors	Responses (n=2)		
“Did attending the Open & Endovascular Aortic therapy course change the trainee’s practice?”	0	2 (100%)	0
“Did attending this course allow the trainee to introduce a more complex procedure into common practice?”	0	2 (100%)	0
“Did attending the course allow the trainee to better deal with a more complex case?”	0	2 (100%)	0

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results which suggest that they didn't notice any change in their trainees' skills. However, the supervisor's survey result could be negatively skewed as only 22% completed the questionnaire. Another possibility is that the participants did not have the appropriate work environment for their newly obtained knowledge and skills to be transferred. Kirkpatrick has four conditions that must be met in order for change to occur <sup>(4)</sup>: the person must have a desire to change, the person must know what to do and how to do it, the person must work in the right climate and the person must be rewarded for changing. These conditions were not examined in this study and would be quiet challenging to assess in any setting. Lack of opportunity would be a significant barrier for learners to use their knowledge and skill on the job <sup>(5)</sup>, which in turn would explain why the supervisor didn't notice any changes in the participants' skill level. For future evaluations, the details of supervisor of the participant and their agreement to be contacted for further follow up should be a mandatory at course registration to allow their use as a resource in longitudinal follow up which requires a lot more resources and more advanced methodology<sup>(6)</sup> using live surgical procedure or Objective Structured Evaluation of Technical Skills<sup>(7)</sup>. This was not possible to conduct in our study due the fact that the learners where from international background.

The final stage is the evaluation of results which is best achieved by using a control group and assessed after allowing a sufficient period of time for the results to be realised. Cost becomes even more relevant and prohibitive and this has to be considered versus the expected benefit. It is not always possible to achieve inconvertible proof and evidence of results has to be accepted. This measurement of the final results attempts to measure the impact or transfer of learning to the work place or society. The results in this stage of evaluation would be certainly dependent on the goal of the training program. The use of clinical outcomes of patients as surrogate for adequate training may also be considered. Again this was not possible in our study due to the diverse nature of the learners.

Effective evaluation of an educational experience has been suggested to revolve in a cycle<sup>(8)</sup>. The process can start at any point in

the cycle. The teaching or learning activity is planned with evaluation in mind. On completion of the evaluation, the data is collected, analysed and assessed. Reflection on the results and the required changes to the educational activity will follow. This is followed by planning and preparation to implement these changes into the next educational session or activity with a repeat of the evaluation process. This in essence for the clinicians is akin to the well-established and practiced clinical audit cycle.

This study attempted to employ the Kirkpatrick method of evaluation of a surgical course. It has demonstrated some ways of applying the different levels with varying degrees of success highlighting the difficulties and challenges in educational evaluation. Further studies are required of other courses and examining other options to particularly evaluate courses at level IV.

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