

# A qualitative study of the impact on learning of the mini clinical evaluation exercise in postgraduate training

ALBERTO ALVES DE LIMA, RUTH HENQUIN, JORGE THIERER, JORGE PAULIN, SEBASTIÁN LAMARI, FERNANDO BELCASTRO & C.P.M VAN DER VLEUTEN  
*Instituto cardiovascular de Buenos Aires, Buenos Aires, Argentina*

**SUMMARY** *The study was designed to illustrate how residents perceive the Mini Clinical Examination Exercise as an assessment tool and its influence on their approach to learning and studying. A phenomenographic approach was applied. All 16 residents from a cardiology training program in Buenos Aires were included. Results show that in all cases residents demonstrate an intrinsic interest in the subject matter. They show self-regulating strategies when required to select, relate and make critical appraisals of their own. They consistently demonstrate an aim to build a relationship between individual experience and their chosen topic. The residents feel comfortable because it melds with their routine. Residents find the Mini Clinical Examination Exercise to be a useful assessment tool with a favorable influence towards a constructive approach to study and learning.*

## Introduction

The Mini Clinical Evaluation Exercise (Mini-CEX) aims to assess students at the top of Miller's pyramid (Norcini *et al.*, 1995, 1997, 2003). Assessment literature in general has shown positive results at almost every level in the 'climbing' of Miller's pyramid. The only exception to this ascent is at the top, which is particularly relevant for senior-year medical trainees in postgraduate situations.

The Mini-CEX has been designed to incorporate both the skills that residents require in actual patient encounters and with the educational interactions that attending physicians routinely encounter with residents during teaching rounds. It is an evaluation method that promotes the assessment of clinical skills along with attitudes and behaviors that are essential in high-quality patient care. It is a performance-based evaluation method that is used to assess selected clinical competences (e.g. patient charts and physical examination, also communication and interpersonal skills) in the medical training context. A single faculty member observes and evaluates a resident while he/she conducts a thorough history and physical examination on an in- or outpatient or a patient in the emergency department. After asking the resident for a diagnosis and treatment plan, the faculty member completes a short evaluation form and gives direct feedback. As the interaction is relatively brief and occurs as a natural part of the process in the training environment, each individual can be evaluated on several occasions and by various faculty members. Ten or more encounters are required in order to reach a reproducibility of 0.80. According to Norcini *et al.* (1995) data collected on confidence intervals is important since it makes it clear that,

even with relatively few encounters, useful information can be gathered. Confidence intervals provide additional information that permits the test length to be shortened and tailored to specific situations (Norcini *et al.*, 1995). Performance-based evaluations allow for the medical trainee to perform in a real-life situation and according to Miller's pyramid it is at the 'shows-how' level in which trainees reflect their ability to act appropriately in a practical situation (Miller, 1990).

Undoubtedly, the assessment system constitutes the most vital factor influencing student learning behavior (Newble, 1983, 1990). When students see that the recall of factual information is a predominant requirement in the examination system, they tend to adopt a rote-learning or surface approach; however, if examiners wish to assess students at the highest level of Miller's pyramid, they must evaluate the student's habitual performance in daily practice (Van der Vleuten *et al.*, 2000).

We wanted to study whether a measure from the highest level of the pyramid can influence the way that residents approach their studies. We chose the Mini-CEX because as a performance-based tool it encourages the resident to resolve ill-structured problems, driving learning to a deeper level. We expect the Mini-CEX format assessment to have a more favorable influence on those with a tendency toward a deeper approach to learning.

## Methods

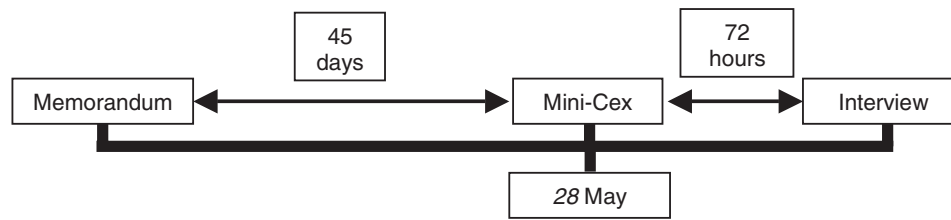
The study took place at the Cardiovascular Institute of Buenos Aires (ICBA), a 55-bed cardiovascular training hospital located in the federal district of Buenos Aires province, Argentina. The institution itself, together with the cardiology residency program, is affiliated with the University of Buenos Aires (UBA).

## Subjects

Research subjects were cardiology residents from the training program. The program consists of a four-year training period with 16 residents evenly stationed (four per year). All 16 were invited to participate. Participation was voluntary and every resident accepted.

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*Correspondence:* A.A. de Lima, Educational Department, Instituto cardiovascular de Buenos Aires, Blanco Encalada 1525, C1428DCO, Ciudad de Buenos Aires, Buenos Aires, Argentina. Email: aealvesdelima@icba-cardiovascular.com.ar



**Figure 1.** Study design.

### *The phenomenographic approach*

As the aim of the study was to focus on how residents perceive an assessment tool and its influence on their approach to learning, an inductive method was used. With this in mind, the analysis was carried out in accordance with the phenomenographic approach, which involves repeated readings of the transcribed interviews in order to gain a thorough understanding of each interview. The analysis was conducted through the relation and comparison of each sector of each interview with the relevant and corresponding sectors of other interviews (Marton, 1979a, 1979b), Similarities and dissimilarities of the components of the interview that emerged during the analysis were categorized according to description (Marton, 1986; Elder, 1995; Stacy, 2000).

### *Implementation procedure*

So as not to interfere with daily activities, the following procedure was developed: the exam (Mini-CEX format) was scheduled for 28 May. Each participant received a memorandum with the instructions 45 days before the exam. Each resident participated in only one encounter. The interview plan consisted of one interview per participant during the 72 hours following the exam (Figure 1). The Mini-CEX provides a 15 to 20 minute snapshot of a resident/patient interaction which focuses on the core skills that residents demonstrate in patient encounters (Norcini *et al.*, 1995, 1997). Four examiners participated in the study. Each examiner was randomly assigned to four residents. All four examiners were attending physicians from the institution. All of them had received training on the application of this format. Only one examiner was aware of the aims of the study. The assessment used was a maximum-performance but formative evaluation.

### *Descriptors of competences demonstrated during the Mini-CEX*

In relation to the skills demonstrated during Mini-CEX we would mention (Figure 2):

- *Medical Interviewing Skills:* Facilitates patient rapport through effective use of questions to obtain accurate and adequate information necessary; responds appropriately to non-verbal cues.
- *Physical Examination Skills:* Follows logical sequence, efficiently; balances screening/diagnostic steps relevant to problem; thoroughly informs patient and is sensitive to patient's comfort and modesty.

- *Humanistic Qualities/Professionalism:* Shows respect, compassion, empathy, establishes trust; attends to patient's necessities: comfort, modesty, confidentiality, information.
- *Clinical Judgment:* Selectively orders/performs appropriate diagnostic studies, considers risks and benefits.
- *Counseling Skills:* Explains rationale for test/treatment, obtains patient consent, educates/counsels on management.
- *Organization/Efficiency Skills:* Prioritizes; is timely; is succinct.
- *Overall Clinical Competence Skills:* Demonstrates judgment, synthesis, care, effectiveness, efficiency.

Open and semi-structured interviews constitute the basis for gathering data within the interview plan. The reason for choosing the interview as a data-collection method is that it was deemed valuable to give the residents the opportunity to describe how the concept of their preparation and approach to learning prior to an examination was perceived.

An interview outline introduced a number of phenomena by considering the following fields or domains (Figure 3):

- preparation strategies;
- regulation strategies;
- affective strategies;
- appraisal of the exam method.

### *Data analysis*

In the study, interviews were initially recorded and transcribed literally by an independent typewriter leading up to analysis. The researcher then read each interview a number of times, gaining an overall impression. Subsequently, interviews were processed according to the concepts taken from residents' statements. The core of analysis entailed the comparison of different statements, revealing both similarities and differences. To obtain an overview of how these similarities and differences could be connected, they were grouped into patterns. The final pattern to emerge resulted in categories that were obtained through the interaction between the segments as a whole and their parts. The researcher was involved as interviewer and in some cases as examiner. Practical circumstances avoided stronger methodological strategies.

### **Results**

The results are presented in four categories within the interview:

- preparation strategies;
- regulation strategies;

Evaluator: \_\_\_\_\_ Date: \_\_\_\_\_  
 Fellow: \_\_\_\_\_  F-1  F-2  F-3  
 Patient Problem/Dx: \_\_\_\_\_  
 Setting:  Ambulatory  Inpatient  ED  Other  
 Patient: Age: \_\_\_\_\_ Sex: \_\_\_\_\_ New: \_\_\_\_\_ Follow-up: \_\_\_\_\_  
 Complexity:  Low  Moderate  High  
 Focus:  Data gathering  Diagnosis  Therapy  Counselling

1. Medical interviewing skills: (  not observed )

1 2 3	4 5 6	7 8 9
Unsatisfactory	Satisfactory	Superior

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2. Physical examination skills: (  not observed )

1 2 3	4 5 6	7 8 9
Unsatisfactory	Satisfactory	Superior

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3. Humanistic qualities / professionalism: (  not observed )

1 2 3	4 5 6	7 8 9
Unsatisfactory	Satisfactory	Superior

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4. Clinical judgment: (  not observed )

1 2 3	4 5 6	7 8 9
Unsatisfactory	Satisfactory	Superior

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5. Counseling skills: (  not observed )

1 2 3	4 5 6	7 8 9
Unsatisfactory	Satisfactory	Superior

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6. Organization / efficiency: (  not observed )

1 2 3	4 5 6	7 8 9
Unsatisfactory	Satisfactory	Superior

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7. Overall clinical competence: (  not observed )

1 2 3	4 5 6	7 8 9
Unsatisfactory	Satisfactory	Superior

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Mini-CEX time: \_\_\_\_\_ Observing: Min \_\_\_\_\_ Providing feedback: \_\_\_\_\_ Min

Evaluator satisfaction with mini-CEX:

Low	1 2 3	4 5 6	7 8 9	High
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Fellow's satisfaction with mini-CEX:

Low	1 2 3	4 5 6	7 8 9	High
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Comments: \_\_\_\_\_

Fellow signature

Evaluator signature

Dx = diagnosis; ED = emergency department; min = minutes; F1 = first year fellow; F2 = second year fellow; F3 = third year fellow;

Figure 2. The Mini-CEX form.

<b>1</b>	<b>Cognitive learning (preparation) strategies</b>
1.1	How did you prepare for this exam?
1.2	How did you begin your preparation?
1.3	Can you describe for me, in as much detail as possible
1.4	How did you organise your activities?
1.5	What kind of activities did you organise?
1.6	Did you feel that some tasks were too difficult to tackle?
1.7	If, yes, what was your strategy?
1.8	Did you read the instructions given before the exam?
1.9	Did you take into account the assessment format at the moment that you were preparing for the exam. In what way, how?
<b>2</b>	<b>Regulation of preparation (metacognitive regulation strategies)</b>
2.1	How did you know if you had achieved an adequate level of knowledge in order to succeed in the exam?
2.2	What was your strategy?
2.3	How did you organise your priorities? Did you have a basis for this?
2.4	Did you take into account things that were taught during the meetings?
2.5	Did you prioritise what the teacher considered a priority?
2.6	For this format, did you consider it important to have previous experience in this format in order to succeed?
<b>3</b>	<b>Affective strategies (like motivating, regulating own emotions, etc.)</b>
3.1	How did you feel prior to the exam?
3.2	Do you think that the assessment format could interfere with your anxiety level?
3.3	Do you think that anxiety could interfere with your results?
3.4	What is the relationship between the themes and your practice?
3.5	How can you explain this?
<b>4</b>	<b>Appraisals of the exam format</b>
4.1	How do you feel about this format, did you like it?
4.2	Do you feel that this is an adequate assessment technique?
4.3	Did you feel comfortable?
4.4	Can you name some favorable characteristics of this format, please?
4.5	Can you name some unfavorable characteristics of this format?

**Figure 3.** Interview format.

- affective strategies;
- appraisal of the exam methods.

The analysis of the transcripts led to the identification of different categories in each section. As mentioned earlier in the methods section, emphasis is placed on the qualitative description of the categories (Dahlgren *et al.*, 1992).

Feedback on preparation, regulation, affective strategies and the concept of the format itself originates from the context of each individual's experience but is not attributable to one single resident. The results are holistic, describe common experiences and are a collective understanding of

the qualitative and varying ways that residents experience assessment formats. Several times during the interviews residents expressed more than one concept, but not all of them shared the same experience or understanding of the phenomenon.

#### *Reflections on preparation strategies*

The first question was related to preparation strategies for the Mini-CEX format as a general phenomenon. Participants were asked for a spontaneous reflection and their answers

were grouped into two categories: (a) preparation in terms of understanding and construction of their knowledge and (b) preparation in terms of training skills with everyday practice.

(a) *Preparation in terms of understanding and constructing their own knowledge.* This category describes the residents' conception of their ability to relate elements of the subject matter to each other and to incorporate these elements as a whole when aiming to link the topics to their practice:

I tried to construct an overall picture of the topics, based on the most frequent patients that are admitted in my sector. . .

I tried to compare the different points of view in relation to the topics of the exam. Although I took into account the information given in meetings and rounds, I tried to develop my own overall view. . .

(b) *Preparation in terms of training skills with everyday practice.* In this category residents describe that the format is related to their everyday practice:

I read the instructions but I didn't organise anything special. The performance fashion of the format is my daily practice. . .

#### *Reflections on regulation strategies*

This category describes residents' concepts relating to their realization of whether they have achieved adequate knowledge to succeed in the Mini-CEX format. The participants' answers could be grouped into one category: regulation as the ability to explain and perform the skills learned.

(a) *Regulation in terms of the ability to explain and perform the skills learned.* This category describes the residents' conception of regulation as a personal understanding process:

In this case I have to think, to explain orally and also to show my skills, and I think that I have achieved an adequate level when I am able to perform all of the tasks. . .

No, I don't need to train on the format itself, because I am working on 'the format' throughout my entire journey.

#### *Reflection on affective strategies*

All residents agree that anxiety is the main problem that this format can produce. Anxiety can either result in a hindering feeling or become a motivational effect. The answers given fall into the category of affective strategies, represented as a feeling of anxiety.

(a) *Affective strategies as feeling of anxiety.* This category describes the concept of external influence on the format. It indicates a potential interference in the participants' performance during the exam. In this format the need to interact with the examiner can promote a negative effect. All residents agree that the interaction with the examiner enhances anxiety.

During oral exams you have to discuss your ideas with another person. There are factors that can interfere such as: personality or *halo* effects. . .

It is my environment. It is the way that I have always worked.

#### *Reflections on the format itself*

The answers provided by the residents fall into two categories: (a) a gaining in understanding of one's level of expertise and (b) an educational experience.

(a) *A gaining in understanding of the residents' level of expertise.* This category describes the conception that the format assesses residents in a 'real world' environment. Residents experience what the format takes into account from their environment.

It evaluates our everyday activity. . . .

I think that is the best evaluation method. . . .

(b) *An educational experience.* This category describes the moment at which the residents experience just how useful this assessment tool is in helping to enhance their knowledge. This happens when residents are able to share and interpret information during the assessment process. The feedback also gives them a clear performance update:

It's an educational or learning experience. . .

When I say something wrong, I have the possibility to explain the reasons for my arguments in relation to the topic. . .

In summary, most of the conceptions that residents seem to have regarding preparation for the Mini-CEX are associated with deeper learning characteristics.

## **Discussion**

The purpose of the present study was to evaluate cardiology residents' approaches to learning and studying when exposed to a performance-assessment instrument during their training program in a teaching hospital. Here follows a summary of major conclusions we have reached regarding the four categories mentioned above:

- (a) In relation to *preparation strategies*, which refer to the thinking process needed in order to assimilate learning prior to the exam, students have said that they always try to understand the meaning of the subject matter. They look for central concepts and try to prove or reject them in relation to their opinions and experiences. 'Preparation', therefore, is seen as an understanding and construction-based process of their knowledge in order to succeed. This, precisely, is a characteristic of a deep learning approach.
- (b) In relation to *regulation strategies*, residents adapt their approach to study according to their personal interest, prior knowledge and requirements, which are,

in their view, needed for the fulfillment of the task. This type of regulation is internally oriented or self-regulated and is also characteristic of a deep-learning approach.

- (c) In relation to *effective learning activities*, residents consistently demonstrate an intrinsic interest in the topics studied for the exam. They attempt to construct a relationship between personal experience and the topics they study to achieve set objectives. This is another characteristic of a deep-learning approach
- (d) The fourth category relates to the reflection of the *format* itself. Each individual feels quite comfortable with the Mini-CEX as it allows for the evaluation of hands-on practice. Students agree that it constitutes a valuable assessment strategy and is a motivating educational experience.

Results show that the residents, in response to preparation strategies, regulation strategies and effective learning activities, consistently demonstrate intrinsic interest in the subject matter regardless of the assessment method. They aim to understand the meaning of the subjects. They often describe their goal as being the interrelation of all parts of the subject matter to construct a broader picture of the problem. In every case, residents reveal self-regulating strategies at the moment of selecting, relating and making critical appraisals of their own. The reflection on the format itself shows that they feel very comfortable with the performance-based format because it is intertwined in their routine.

## Conclusion

The assessment's objectives should clearly match educational objectives. When they do not, the assessment objectives will prevail. The implication for practice is to be constantly aware of the educational effects of assessment and to try to use the driving forces of assessment in order to achieve desirable educational effects. Examination motivates students' learning. This law illustrates one of the strongest relationships in education. If examiners wish to assess students at the highest level of Miller's pyramid they must not give them tests of memory reproduction. They should give tests to evaluate the students' habitual performance in everyday practice. In this vein, the Mini Clinical Examination Exercise is a performance-based format, designed to introduce direct observation of the trainee's clinical competence and to assess the integration of clinical skills. It is a valuable teaching and feedback tool that orients residents to a more fully integrated approach to learning.

It is only through research into residents' learning styles and approach to learning that the evidential basis for educational change can be provided. Before this, any justification lies on intuitive grounds. Moreover, it is essential to consider how one conceives their learning and studying since this characterizes, to a great extent, the teaching provided. Continued research would therefore be of interest in respect of this topic. The implication from a practical point of view is to be constantly aware of the educational effects of assessment and to try to use the driving forces of assessment to achieve desirable educational effects (Van der Vleuten, 1996).

## Limitations of the study

Although our outcomes are in accordance with our expectation, it is also possible to find other factors that may have had an influence:

- The assessment used was a maximum-performance but formative evaluation. Maximum performance assessments have been labeled as those procedures used to determine a person's ability. They are concerned with how well individuals perform when they are motivated to obtain the highest possible score. Assessment results indicate what individuals can do when they make their best effort and formative assessments are used to monitor learning progress during instruction. Their final purpose is to provide continuous feedback to both students and teachers concerning successful learning and to identify the specific learning errors that would need correction. However, if we take into account that this assessment does not assign grades or certifications, this could seriously have affected the perception of the residents and influenced their approach to learning and studying.
- All of the participants were cardiology residents. To join our program was their own decision. Furthermore, keeping up to date as well as maintaining competence constitutes dependent voluntary self-motivated activities, which are likely to be undertaken most effectively by those practicing a deep learning approach. The training programs themselves may constitute an effective educational technique in encouraging residents to shift from a superficial learning approach to a deep learning approach (Newble, 1990). In unpublished data, we have recorded the learning style assessment of 107 cardiology residents of the Argentine Society of Cardiology through the application of the inventory learning style developed by Vermunt (1996) and found that they showed a significantly higher score on a deep approach to learning in all of the four categories evaluated.
- Physicians in this study were recruited from the upper academic quarters of medical schools graduates. These successful students might be those with more desirable approaches to learning (Newble, 1990).

## Notes on contributors

ALBERTO ALVES DE LIMA, MD, is a cardiologist and Head of the Education Department at the Instituto Cardiovascular de Buenos Aires, Buenos Aires, Argentina.

RUTH HENQUIN, MD, is a cardiologist in the Education Department at the Instituto Cardiovascular de Buenos Aires, Buenos Aires, Argentina.

JORGE THIERER, MD, is a cardiologist in the Education Department of the Instituto Cardiovascular de Buenos Aires, Buenos Aires, Argentina.

JORGE PAULIN, MD is an intern in the Education Department of the Instituto Cardiovascular de Buenos Aires, Buenos Aires, Argentina.

SEBASTIÁN LAMAR, MD, is an intern in the Education Department of the Instituto Cardiovascular de Buenos Aires, Buenos Aires, Argentina.

FERNANDO BELCASTRO, MD, is a cardiologist in the Department of Education, Instituto Cardiovascular de Buenos Aires, Buenos Aires, Argentina.

CEES VAN DER VLEUTEN, Professor, is Psychologist and Chairperson of the Department of Educational Development and Research, Maastricht University, The Netherlands.

## Note

Professor C. van der Vleuten supervised the research project and critically commented on earlier versions of the article.

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