

# Evaluation of the Level of knowledge in Basic Areas in Postgraduate Cardiology Education

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## SUMMARY

### Background

In our country, training in cardiology is achieved by participating in residency programs, attending a hospital cardiology unit or taking university courses. On the basis of comments from teachers giving classes in the SAC Biennial Course about certain kind of deficit in basic areas of the specialty among cardiology residents attending the course, we decided to investigate their knowledge in cardiovascular anatomy, physiology, physical diagnosis, pharmacology and clinical cardiology after 1 or 2 years of training in Internal Medicine or Cardiology residency programs, respectively.

### Objective

To evaluate the knowledge in basic areas in cardiology among residents attending the UBA Biennial Cardiology Course given by the Argentine Society of Cardiology.

### Material and Methods

We conducted an observational, cross-sectional study. A questionnaire was designed with 50 multiple choice questions, divided in three subjects: Subject A, 17 questions about cardiovascular anatomy, physiology, pathophysiology and pharmacology; Subject B, 15 questions about clinical cardiology, physical diagnosis and electrocardiography; and Subject C, 18 questions regarding medical practice and cardiological clinical syndromes.

The questionnaire was answered by residents either initiating the course (Group 1) or who were attending the second year (Group 2).

### Results

In the general exam, Group 1 (n=63) had a median of 29/50 right answers (58%) and Group 2 (n=57) 30/50 (60%). There were no significant differences between both groups (p=0.21). The performance in Subject A was significantly lower compared to Subjects B and C in both groups.

### Conclusions

This study demonstrates the presence of anomalies in diastolic and systolic function and structural changes in the left ventricle, represented by increased interstitial collagen volume fraction and myocyte cross-sectional area.

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**Key words >** Knowledge Assessment - Basic Cardiovascular Sciences - Medical Education - Graduate Education Quality

## Abbreviations >

<b>SAC</b>	Argentine Society of Cardiology (Sociedad Argentina de Cardiología)	<b>UBA</b>	University of Buenos Aires (Universidad de Buenos Aires)
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## BACKGROUND

The advances and developments in the scientific and technological field, the strong changes in the social and economic reality and its correlation with the

system of values produces transformations in the productive systems and creates new conditions and social requirements. (1)

Medical practice is characterized by the rapid

growth of medical knowledge, the development of technologies and the requirements of the population in terms of medical care. During the last decades, medical practice has changed dramatically due to changes in the management of health care services. (2-4) The development of human resources is also affected by these changes; training specialists and the need of permanent education to ensure keeping up-to-date with current practices, demand effort and resources. (5)

Undergraduate and postgraduate changes in the curricula depend on several factors, such as structural changes in the educational institutions or personal issues as motivation and interests of the faculty members. (6, 7)

In our country, training in cardiology is achieved by participating in residency programs, attending a hospital cardiology unit or taking university courses.

The University of Buenos Aires (UBA) has organized these modalities in the postgraduate Specialist Degree Course in Cardiology. (8) The curriculum includes one-year residency program in Internal Medicine, a three-year residency program in Cardiology and a theory course during the last two years of the residency program. To be certified as a Specialist in Cardiology, the physician should attend the Biennial Course given at the Argentine Society of Cardiology (SAC), pass eight assessment examinations and a centralized final examination taken at the end of the residency program and of the course. This written test is implemented at the School of Medicine and has 100 questions.

The cardiology residency program of the UBA is developed in five locations: Hospital de Clínicas, Hospital Argerich, Hospital Ramos Mejía, Hospital Posadas and the Instituto Cardiovascular de Buenos Aires. Other hospitals with associated residency programs are subsidiary locations of the university course. The main and subsidiary locations are medical residency programs developed at medical centers providing secondary or tertiary health care. Each year, about 75 residents enter the UBA Specialist Degree Course in Cardiology. All trainees from the different main and subsidiary locations enrolled should attend and pass this postgraduate biennial course. When this study was performed, a total of 140 trainees who were in their second or third year of a cardiology residency program were attending the Biennial Cardiology Course at the same time.

The topics of the Biennial Course focus on diagnostic methods and making decisions about treatment of the different clinical syndromes, assuming that as first-year residents in Internal Medicine and second or third-year residents in Cardiology they have already learnt cardiovascular anatomy, physiology, pathophysiology and pharmacology.

During the last years, the teachers invited to give classes in the course have made comments about certain kind of deficit in basic areas of the specialty

among cardiology residents.

On the basis of these comments, we decided to investigate their knowledge in cardiovascular anatomy, physiology, physical diagnosis, pharmacology and clinical cardiology after one year and one or two years of training in Internal Medicine or Cardiology residency programs, respectively.

The goal of the present study is to evaluate the knowledge in basic areas in cardiology among residents starting the UBA Biennial Cardiology Course and establish the presence of differences with those who have already passed the first year of the course and are attending the second year.

## MATERIAL AND METHODS

We conducted an observational, cross-sectional study among residents in Cardiology attending the UBA Biennial Course given at the SAC facilities.

Faculties from the Department of Physiology of the School of Medicine, UBA, elaborated a multiple-choice questionnaire of 50 questions. The questions were constructed following the recommendations of the 2005 National Board of Medical Examiners. (9) The level of complexity of the questions was revised by the director of the Biennial Course.

The 50 questions were divided in three subjects:

- Subject A: 17 questions about cardiovascular anatomy, physiology, pathophysiology and pharmacology.
- Subject B: 15 questions about clinical cardiology, physical diagnosis and electrocardiography.
- Subject C: 18 questions about medical practice and cardiological clinical syndromes.

One point was awarded for each right answer, with a maximum score of 50 points. The test required 60% of correct answers to consider the trainee had an acceptable or sufficient level of knowledge (passing grade).

The questionnaire was answered by two groups of students:

- Group 1: those initiating the Biennial Course after completing one year of residency in Internal Medicine and one or two years of residency in Cardiology.
- Group 2: those starting the second year of the course.

The questionnaire was completed anonymously.

The results are expressed as median (25-75) and percents with 95% confidence intervals. Quantitative variables were analyzed using the t test, and chi square test was used for qualitative variables. All the statistical calculations were performed using Statistix 7.1 software package.

## RESULTS

Group 1 (n = 63) had a median of 29 (25-34) right answers. The passing score was not achieved by 57% of the examinees.

Group 2 (n = 63) had a median of 30 (26.5-34.5) right answers. In this group, 47.4% did not reach the passing score.

There were no statistically significant differences between first-year versus second-year students: p = 0.21 (Figure 1).

Table 1 and Table 2 show the results obtained by group by each of the three subjects (A, B and C).

The percentage of right answers in subject A was significantly lower in Group 1 and Group 2 compared

to subjects B and C ( $p < 0.0001$  in both groups).

**DISCUSSION**

This study demonstrated that residents initiating a postgraduate course at the UBA had a low level of knowledge in the basic areas of the specialty despite having completed two or three years of a residency program.

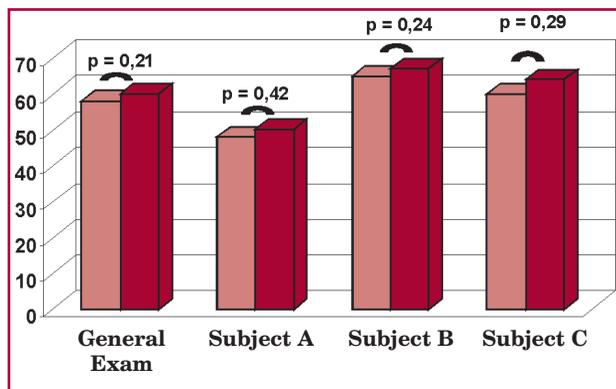
This deficit is more evident in cardiovascular anatomy, physiology, pathophysiology and pharmacology. This may be probably due to the fact that residents' activities are mainly focused on providing medical care at the expense of their educational scaffolding. Residents focus their hours of study on finding the information needed to solve their medical care activity, as diagnostic methods and therapeutic advances. As an example, the trainees are more familiar with the clinical indications than with the mechanisms of pharmacological action of the different antiplatelet agents.

In addition, the residency programs in our country have experienced increasing deficiencies affecting the performance of the educational role of the system. A survey implemented by the CONAREC showed that only 14% of the residents were satisfied with the education provided by the system and 38% thought that the communication with the staff physician should improve. (10)

In 1997, Carballido et al. reported that 52 hospitals had cardiology residency programs training about 550 cardiologists. Probably, this number may be similar nowadays. Based on this information, the residents attending the SAC Biennial Course represent 20% of in-training cardiologists.

During 2004 and 2005, the SAC evaluated 19 residency programs participating in the project UBA-SAC (Specialist Degree Course in Cardiology) and reported that "the quality of bedside training is strongly influenced by the working conditions and the attitude of staff physicians (schedules and compromise)". (11)

We did not find significant differences in the level of basic knowledge among residents initiating the



**Fig. 1.** Comparison between first and second-year trainees. Legend: Group 1 (light red), Group 2 (dark red)

**Table 1.** Results of the exam. Group 1: residents initiating the Biennial Course

	Right answers	
	Median (25-75)	Percent (95% CI)
General questionnaire		
50 questions	29 (25-34)	58 (45-71)
Subject A - 17 questions	8 (6-10)	48 (32-64)
Subject B - 15 questions	10 (8-12)	65 (49-81)
Subject C - 18 questions	11 (9-13)	60 (45-75)

Subject A: Questions about cardiovascular anatomy, physiology, pathophysiology and pharmacology.

Subject B: Questions about clinical cardiology, physical diagnosis and electrocardiography.

Subject C: Questions about medical practice and cardiological clinical syndromes.

**Table 2.** Results of the exam. Group 2: residents in the second year of the Biennial Course

	Right answers	
	Median (25-75)	Percent (95% CI)
General questionnaire		
50 questions	30 (26.5-34.5)	60 (49-71)
Subject A - 17 questions	8 (7-11)	50 (34-66)
Subject B - 15 questions	10 (9-11.5)	67 (54-80)
Subject C - 18 questions	12 (10-13)	64 (51-77)

Subject A: Questions about cardiovascular anatomy, physiology, pathophysiology and pharmacology.

Subject B: Questions about clinical cardiology, physical diagnosis and electrocardiography.

Subject C: Questions about medical practice and cardiological clinical syndromes.

course or those attending the second year. This might be due to the fact that the course curriculum does not include specific contents of basic sciences and is more focused on diagnostic and treatment strategies based on controlled clinical trials and evidence-based medicine.

Becoming familiar with the basic cornerstones of knowledge and reasoning the pathophysiological mechanisms are the necessary tools for making critical interpretation of the different information received. The National Consensus Statement on Medical Education in Cardiology (2) states that the main goal is to educate to "think" and that only pathophysiological reasoning allows physicians to make a diagnosis and treat a disease. Competent "teachers" are necessary to stimulate and educational needs of young physicians.

The instrument of evaluation did not include enough questions to draw definite conclusions, and this is a limitation of the study. Case and Swanson (9) have stated that a test should have at least 100 multiple-choice questions to reach a reliable score.

However, according to these results, it might be necessary to debate in order to find strategies

to improve the education of the young specialists. There will not be significant changes if the residency programs do not modify the current scenario based mainly on medical care. The Ministry of Health has implemented a National System for the Evaluation and Certification of the Health Care Residency Programs (12) in order to improve the quality of training programs for specialists. The SAC has an active participation in this National System as Evaluator of the Cardiology Residency Programs nationwide. (13)

### CONCLUSIONS

The level of knowledge in basic areas of cardiology among residents either initiating or attending the second year of the postgraduate university cardiology course at the School Medicine is insufficient, with greatest deficits in cardiovascular anatomy, physiology, pathophysiology and pharmacology. These findings suggest the need of revising and, eventually, modifying the curriculum of the Biennial Cardiology Course. In addition, it might also be convenient to analyze the opportunities of learning and studying provided by the cardiology residency programs.

### RESUMEN

#### Evaluación del nivel de conocimientos en áreas básicas en un posgrado de Cardiología

#### Introducción

La formación de especialistas en Cardiología en nuestro país se realiza fundamentalmente a través del sistema de Residencias Médicas o de Concurrencia a un servicio de la especialidad y a través de los Cursos Universitarios. Tomando en cuenta la apreciación de docentes invitados para el dictado de las clases del Curso Bienal de la SAC sobre cierto déficit en la formación en áreas básicas de la especialidad que tendrían los residentes, se decidió realizar un estudio para evaluar los conocimientos en anatomía, fisiología, semiología, clínica y farmacología cardiovascular de los residentes que inician su formación teórica sistemática en la Sociedad Argentina de Cardiología después de un año de residencia en Clínica Médica y uno o dos años de residencia en Cardiología.

#### Objetivo

Evaluar el nivel de conocimientos en áreas básicas de Cardiología de los residentes que iniciaban la carrera de Especialista en Cardiología de la UBA y que concurrían al Curso Bienal dictado en la Sociedad Argentina de Cardiología.

#### Material y métodos

Estudio observacional de corte transversal. Se elaboró un cuestionario con 50 preguntas de selección múltiple: 17 de anatomía, fisiología, fisiopatología y farmacología cardiovascular (Tema A), 15 sobre clínica, semiología y electrocardiografía (Tema B) y 18 sobre práctica médica y síndromes clínicos cardiológicos (Tema C).

El cuestionario fue respondido por los residentes que iniciaban el primer año del Curso Bienal (Grupo 1) y también

por los residentes que estaban asistiendo al segundo año de ese curso (Grupo 2).

### Resultados

En el examen general, con 50 preguntas, el Grupo 1 (n = 63) obtuvo una mediana de 29 respuestas correctas (58%) y el Grupo 2 (n = 57) llegó a una mediana de 30 respuestas correctas (60%). No hay diferencia estadísticamente significativa entre ambos grupos (p = 0,21). El rendimiento en el Tema A resultó significativamente más bajo en los Temes B y C tanto en el Grupo 1 como en el Grupo 2.

### Conclusión

El nivel de conocimientos en áreas básicas de Cardiología que mostraron los residentes se considera insuficiente. Los mayores déficits se registraron en anatomía, fisiología, fisiopatología y farmacología cardiovascular. Se plantea la necesidad de revisar la programación del Curso Bienal y también la conveniencia de analizar las oportunidades de aprendizaje y reflexión que ofrece el sistema de residencias médicas.

**Palabras clave >** Evaluación de conocimientos - Ciencias básicas cardiológicas - Educación médica  
Calidad de educación médica en posgrado

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