Knowledge on cardiopulmonary resuscitation in the Internal Medicine Department: Scenario of the crash carts

Yusmani I. Martínez Llópiz✉, MD; and Carlos Fernández Mesa, BS

Intensive Care Unit. Hospital Docente Clínico-Quirúrgico Celia Sánchez Manduley. Manzanillo, Granma, Cuba.

Este artículo también está disponible en español

ABSTRACT

Introduction: The coronary artery disease is the most common cause of sudden cardiac death. In up to 50% of cases it can occur suddenly, with cardiorespiratory arrest, sometimes as the first and last symptom.
Objective: To evaluate the knowledge about cardiopulmonary resuscitation and the conditions of the crash carts.
Method: A descriptive and transversal study was carried out, with 63 health professionals, in the Internal Medicine Department of the «Hospital Celia Sánchez Manduley», in Manzanillo, Cuba, in April 2016; they were given a knowledge questionnaire and a form to evaluate the crash carts.
Results: The 75% of participants demonstrated low knowledge. The 69.9% of doctors have 1 to 5 years of experience and of them, 50% showed a low level of knowledge and the rest, average. In the three groups of the analyzed graduated nurses, more than 85% achieved a low rating. The 80% of doctors and 83.3% of graduates who received a course on resuscitation showed low knowledge. Of the five rooms that the Internal Medicine Department has, only one has a crash cart and its condition is not tolerable.
Conclusions: There is a lack of knowledge concerning cardiopulmonary resuscitation in the Internal Medicine Department. Years of experience and training in the subject are not associated with the level of knowledge. There is a crash cart and its condition is not tolerable.
Key words: Cardiac arrest, Cardiopulmonary resuscitation, Sudden cardiac death

On-Line Versions:
Spanish - English

Conocimientos de reanimación cardiopulmonar en el Servicio de Medicina Interna: Escenario de los carros de paro

RESUMEN

Introducción: La enfermedad arterial coronaria es la causa más común de muerte súbita cardíaca, hasta en un 50% de los casos se puede presentar de manera súbita, con un paro cardiorrespiratorio, a veces como primero y último síntoma.
Objetivo: Evaluar el conocimiento sobre reanimación cardiopulmonar y las condiciones de los carros de paro.
Método: Se realizó un estudio descriptivo y transversal, con 63 profesionales de la salud, en el servicio de Medicina Interna del Hospital Celia Sánchez Manduley, de Manzanillo, Cuba, en abril de 2016; a los que se les aplicó un cuestionario de conocimientos y un formulario para evaluar los carros de paro.
Resultados: El 75% de los participantes demostraron conocimientos bajos. El 69,9%

✉ YI Martínez Llópiz
Calle 18 Nº 58, e/ 4ª Avenida y
Avenida Camilo Cienfuegos.
Manzanillo, Granma, Cuba. E-mail
address: yusmani@infomed.sld.cu

de los médicos tienen de 1 a 5 años de experiencia; de ellos, el 50% demostró un nivel de conocimiento bajo y el resto medio. En los tres grupos de licenciados en enfermería analizados, más del 85% alcanzó una calificación baja. El 80% de los médicos y el 83,3% de los licenciados que recibieron curso en reanimación demostraron un conocimiento bajo. De las cinco salas con las que cuenta el Servicio de Medicina Interna, solo una tiene carro de paro y su estado es no tolerable.

Conclusiones: En el Servicio de Medicina Interna existen deficientes conocimientos en reanimación cardiopulmonar. Los años de experiencia y la capacitación en el tema no están asociados con el nivel de conocimientos. Existe un carro de paro y se encuentra en estado no tolerable.

Palabras clave: Paro cardíaco, Reanimación cardiopulmonar, Muerte súbita cardíaca

INTRODUCTION

Coronary artery disease is the most common cause of sudden cardiac death[1]. It starts on childhood, progresses during youth and reaches adulthood with no symptoms at all. Hence, up to 50% of cases have significant coronary artery occlusion and may suddenly present with cardiac arrest (CA), sometimes being the first, only and last symptom[2].

Cardiac arrest (an abrupt, sudden and potentially reversible interruption of breathing and circulation)[3] is the ultimate vital emergency that anyone may suffer.

It is responsible for nearly one million deaths in the world every year; in Europe and the U.S., one person dies every 30 seconds due to CA, while sudden cardiac death is thought to account for 50-70% of all these deaths[4]. In Cuba, in 2014, death from cardiac causes was the second cause of death and the first in the Granma province[5].

It is currently known that between 0.4-2.0% of in-hospital patients and up to 30% of deceased patients require cardiopulmonary resuscitation (CPR)[4], (also known as cardiorespiratory resuscitation) a technique used to reverse CA comprising a set of provisional and intentionally normalized maneuvers in order to maintain the oxygen supply to every vital organ when spontaneous blood circulation suddenly stops, regardless of the cause[6].

Quick and effective response to CA increases the chances of survival in cardiac arrest victims. A favorable prognosis for a patient in cardiac arrest is directly proportional to the training of staff caring for him and inversely proportional to the time between cardiac arrest and initiation of CPR. For every minute delay in CPR, survival chances decrease by 7-10%[7]; and sometimes, non-availability or lack of op-timal conditions of crash carts is another negative aspect. That is why health-care professionals, mostly medical and nursing staff, are recommended to constantly train and update on CPR since the beginnings of this technique[7].

One of the first written references on CPR is found in the Old Testament, later in the Middle Ages (Vesalius [1514-1564] and Paracelsus [1493-1541]), and from 1700 on, in the humanistic societies of Amsterdam, Copenhagen, London and Massachusetts; some of which recommended mouth-to-mouth resuscitation in suffocation victims[8].

The modern history of CPR begins in the late 50's when Peter Safar and James Elan described the airway opening maneuver and mouth-to-mouth ventilation[8].

In 1973 The American Heart Association published the first guidelines on this subject, subsequently spread and applied worldwide and then in 1992 the International Liaison Committee on Resuscitation (ILCOR) was founded, which includes the five continents[8,9].

Several studies worldwide have assessed health personnel's knowledge in CPR; showing low levels of knowledge to provide high-quality CPR to CA patients[4,7]. Relatively few studies on CPR knowledge have been attempted in Cuba and most of the results have been unsatisfactory[10].

Driven by this reality, (crash carts conditions, increased number of seriously ill patients in the Internal Medicine Rooms and high morbidity in the seriously ill patient care service, we set out to lead this investigation to evaluate doctors and graduate nurses' levels of CPR knowledge, crash carts conditions in the Department of Internal Medicine and to know our weaknesses so as to make suggestions for further decision making.

METHOD

A descriptive, cross-sectional study was carried out in the Internal Medicine Department at Celia Sánchez Manduley Hospital, in Manzanillo, Cuba, during the month of April 2016. The sample obtained through probabilistic sampling consisted of 63 health professionals, 23 physicians and 40 graduate nurses, who met the inclusion and exclusion criteria. Their CPR knowledge and crash carts conditions were assessed using a questionnaire and a form respectively.

Inclusion and exclusion criteria
Medical and nursing staff of any shift, assigned to the Internal Medicine Department in the aforementioned hospital, which agreed to participate anonymously and confidentially in the study. The exclusion was conditioned by non-compliance with the inclusion criteria. All questionnaires and forms were properly answered, and none were incomplete or illegible.

Variables
Level of knowledge: Ordinal qualitative variable, expressed in all the information that health personnel have concerning CPR. It was measured through the respondents' answers to the 8 questions in the questionnaire (**Appendix 1, supplementary material** [in Spanish]) each with point value of 12.5. The following categories were considered: high (100 - 85 points), medium (84 - 60 points), low (59 - 0 points).

Experience: Qualitative ordinal variable expressed in the years of service after their medicine and nursing degree. The following categories were considered: poor (1 - 5 years), average (6 - 10 years), high (more than 10 years).

Training in CPR: Dichotomous nominal qualitative variable, depending on former CPR studies and training, which main objective is to increase and update knowledge. It was classified in the Yes and No categories.

Crash carts conditions: their evaluation, based on the data obtained through the form (**Appendix 2, supplementary material** [in Spanish]), is shown in the **box**.

Method of obtaining information
The questionnaire (**Appendix 1, supplementary material** [in Spanish]), based on the international standards established by the ILCOR in 20159, was applied to the participants under supervision, to gather information on their knowledge about diagnosis and management of patients in CA and CPR maneuvers. Doubts were clarified to the participants at the end.

Box. Guide to quantify crash carts deficiencies.

Condition	Deficiencies		
	Slight	**Serious**	**Very serious**
Optimal	0	0	0
Improvable	1-5	1-3	0
Unsuitable	6-8	4-5	1
Non tolerable	Más de 8	6 ó más	2 o más

The form was also applied (**Appendix 2, supplementary material** [in Spanish]) to evaluate the quality of the crash carts (characteristics and equipment), consistent with the order of importance according to the Cuban regulations and the research developed by Regalado *et al.*[11]. We visited every room where deficiencies were found.

Processing and analysis of information
The information was stored and analyzed using Microsoft Office Excel 2007 for Windows XP. Results are presented in frequency tables; proportion was used as an Information Summary Measure. A hypothesis test was conducted to assert the independence of the variables: level of knowledge, years of experience and training in CPR.

RESULTS

When knowledge among the staff was assessed (**Table 1**) an overall 75% scored below 60 points (poor knowledge) and, in particular, 52.2% of doctors and 10% of graduates showed average knowledge. No respondent reached high knowledge scores (100-85 points).

The results (**Table 2A**) showed that 69.6% of the physicians participating in the study had little experience (1 to 5 years), 50% reached an average level of knowledge while the rest had a poor knowledge. 75% of the group of 6 to 10 years (average experience) and 33.3% of those with more experience,

demonstrated average knowledge. Concerning the nursing staff (**Table 2B**), the average experience group comprised more participants (37.5%). Poor level of knowledge predominated and in all the study groups: 90.9%; 93.3% and 85.7%, respectively, according to their experience.

A 21.7% of doctors reported having taken CPR courses (**Table 3A**); from them, only 20% reached average knowledge scores. On the other hand, out of 18 who did not receive this subject, 61.1% showed the same level of knowledge. Something similar happens with nursing graduates (**Table 3B**), where only 15.6% reported having been trained, but only 16.7% showed an average level of knowledge; as well as 8.8% of those who did not study the subject.

Finally, in data that is not tabulated since it is scarce, it was observed that in the Internal Medicine Department −where there are five wards− there is only one and almost useless crash cart, as it has 2 or more serious deficiencies.

DISCUSSION

When analyzing the relationship between profession and level of knowledge (physician or graduate) the first ones showed greater knowledge on CPR; however, the maximum score was only 77.5 points, which shows outdated and inadequate level of knowledge on CPR. This may lead to misguided behavior in a CA emergency affecting survival.

In studies carried out in Spain[7] and Sweden[12], an important lack of knowledge on CPR was evidenced, which coincides with the results found in this research.

In this study, no relationship was found between the years of experience and the level of knowledge. Calculation for physicians (χ^2=1.43) and for nursing graduates (χ^2=0.5), with a significance level of 0.05, allows to accept the null hypothesis in both cases that the level of knowledge is independent of the years of experience.

The analysis between the level of knowledge and

Table 1. Level of knowledge according to profession.

Profession	Level of knowledge				Total	
	Average		Poor			
	Nº	%	Nº	%	Nº	%
Physician	12	52.2	11	47.8	23	100
Nursing Graduates	4	10.0	36	90.0	40	100
Total	16	25.0	47	75.0	63	100

Table 2. Level of knowledge according to years of experience.
2A. Physicians.

Experience (years)	Level of knowledge				Total	
	Average		Poor			
	Nº	%	Nº	%	Nº	%
1 − 5	8	50.0	8	50.0	16	69.6
6 − 10	3	75.0	1	25.0	4	17.4
More than 10	1	33.3	2	66.7	3	13.0
Total	12	52.2	11	47.8	23	100

2B. Nursing Graduates.

Experience (years)	Level of knowledge				Total	
	Average		Poor			
	Nº	%	Nº	%	Nº	%
1 − 5	1	9.1	10	90.9	11	27.5
6 − 10	1	6.7	14	93.3	15	37.5
More than 10	2	14.3	12	85.7	14	35.0
Total	4	10	36	90	40	100

training paradoxically showed similar results for physicians (χ^2=2.6) and graduates (χ^2=0.4), with the same significance level; supporting the independence between these variables.

In our opinion, this result turns out ambiguous as the level of knowledge should correlate with training. However, such result may reflect the elapsed time (more than five years) from the training to the moment this research was conducted.

CPR is a dynamic process so guidelines are updated every five years. There is evidence that renewing basic and advanced life support certification every two years is inadequate; but the optimal time for retraining has not been determined[1].

On the other hand, Chamberlain *et al.*[13] as-

sessed CPR skills retention time and demonstrated that it deteriorated between six months and a year after the last course was taken which upholds our results since all the participants had received their course more than 5 years ago; so we can state that part of the knowledge was lost or outdated. However, Woollard *et al*.[14] consider that training in CPR is related to adequate levels of knowledge in the subject.

Crash carts are critical for successful CPR; that is why we were struck by the fact that there was only one available in the five rooms at the Internal Medicine Department and unfortunately it did not meet the criteria required by the Ministry of Cuban Public Health, thus affecting quick CPR response. In the remaining rooms they have sort of "emergency carts", with a few drugs; but they lack other material required by Cuban and international standards.

CONCLUSIONS

The Internal Medicine Department showed deficiencies in CPR skills retention. Their knowledge on the subject did not match the years of experience or training. Crash carts were almost unfit for emergency use.

REFERENCES

1. Monsieurs KG, Nolan JP, Bossaert LL, Greif R, Maconochie IK, Nikolaou NI, *et al*. European Resuscitation Council Guidelines for Resuscitation 2015: Section 1. Executive summary. Resuscitation. 2015;95:1-80.
2. Dávila Radilla F, Casas Juárez J. Principales trastornos cardiacos relacionados con la muerte súbita. Rev e-sholarum. [Internet]. 2009 [citado 08 Ago 2016];11:42-53. Disponible en: http://genesis.uag.mx/escholarum/vol11/muerte.html
3. García Herrero MÁ, González Cortés R, López González J, Aracil Santos FJ. La reanimación cardiopulmonar y la atención inicial a las urgencias y emergencias pediátricas. Rev Pediatr Aten Primaria Supl. 2011;13(20):197-210.
4. Instituto Mexicano del Seguro Social. Manejo inicial del paro cardiorrespiratorio en pacientes mayores de 18 años [Internet]. México: Guía de Práctica Clínica, 2013 [citado 08 Ago 2016]. Disponible en: http://www.imss.gob.mx/sites/all/statics/guiasclinicas/633GRR.pdf
5. Ministerio de Salud Pública. Anuario Estadístico de Salud 2013. La Habana: Dirección Nacional de Registros Médicos y Estadísticas de Salud; 2014.
6. Truong HT, Low LS, Kern KB. Current approaches to cardiopulmonary resuscitation. Curr Probl Cardiol. 2015;40:275-313.
7. Balcázar-Rincón LE, Mendoza-Solís LA, Ramírez Alcántara YL. Reanimación cardiopulmonar: nivel de conocimientos entre el personal de un servicio de urgencias. Rev Esp Méd Quir. 2015;20: 248-55.
8. Cueto Pérez M. Conocimiento del personal de enfermería de un hospital materno-infantil sobre técnicas de reanimación cardiopulmonar [tesis de maestría en Internet]. España: Universidad de Oviedo; 2013 [citado 12 Ago 2016]. Disponible en: http://digibuo.uniovi.es/dspace/bitstream/10651/17303/1/TFM_Monica%20Cueto%20Perez.pdf
9. Travers AH, Perkins GD, Berg RA, Castren M, Considine J, Escalante R, *et al*. Part 3: Adult Basic Life Support and Automated External Defibrillation: 2015 International Consensus on Cardiopulmonary Resuscitation and Emergency Cardiovas-

Table 3. Level of knowledge according to training in resuscitation.
3A. Physicians.

Training in CPR	Nivel de conocimiento				Total	
	Medio		Bajo			
	Nº	%	Nº	%	Nº	%
Yes	1	20.0	4	80.0	5	21.7
No	11	61.1	7	38.9	18	78.3
Total	12	52.2	11	47.8	23	100

3B. Nursing Graduates.

Training in CPR	Nivel de conocimiento				Total	
	Medio		Bajo			
	Nº	%	Nº	%	Nº	%
Yes	1	16.7	5	83.3	6	15.6
No	3	8.8	31	91.2	34	84.4
Total	4	10	36	90	40	100

cular Care Science With Treatment Recommendations. Circulation. 2015;132(16 Supl 1):S51-83.

10. Machado Álvarez MC, Roque González R, Barrios Osuna I, Nodal Ortega J, Olive González JB, Quintana Pajón I. Nivel de conocimientos en reanimación cardiopulmonar cerebral en el Centro Nacional de Cirugía de mínimo acceso. Rev Cuba Anestesiol Reanim [Internet]. 2010 [citado 08 Ago 2016];9:83-94. Disponible en:
http://scielo.sld.cu/pdf/scar/v9n2/ane04210.pdf

11. Regalado Becerra CA, Segura Veja J, Órnelas Aguirre JM. Evaluación de conocimientos y equipamiento en los carros rojos para la reanimación cardiopulmonar en una unidad de tercer nivel de atención. Medicrit. 2008;5:63-73.

12. Israelsson J, Källén P, Carlsson J. Test cases: in-hospital, scenario-based cardiopulmonary resuscitation training. Med Educ. 2009;43:1099-100.

13. Chamberlain D, Smith A, Woollard M, Colquhoun M, Handley AJ, Leaves S, *et al*. Trials of teaching methods in basic life support (3): Comparison of simulated CPR performance after first training and at 6 months, with a note on the value of re-training. Resuscitation. 2002;53:179-87.

14. Woollard M, Whitfeild R, Smith A, Colquhoun M, Newcombe RG, Vetteer N, *et al*. Skill acquisition and retention in automated external defibrillator (AED) use and CPR by lay responders: a prospective study. Resuscitation. 2004;60:17-28