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Cardiorespiratory arrest diagnosis and treatment: theoretical knowledge evaluation in a general hospital's physicians

Diagnóstico e tratamento de parada cardiorrespiratória: avaliação do conhecimento teórico de médicos em hospital geral

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ABSTRACT

Background: The main causes of cardiopulmonary arrest are endemic, and require constant medical improvement on cardiopulmonary resuscitation techniques. Training and continued education are essential to skilled management of cardiopulmonary resuscitation.

Objective: This study aimed to evaluate the physicians' theoretical knowledge on diagnosis and treatment of cardiopulmonary arrest.

Methods: This was a cross-sectional descriptive research conducted in a general hospital in Roraima, Brazil. The study population consisted of physicians who worked in the emergency department and intensive care units. The data were collected using a questionnaire addressing the subject.

Results: Forty four physicians answered the questionnaire. The mean score was 50% right answers. Most (88.5%) respondents committed "fatal errors". Half of the sample was never trained in advanced life support skills. No correlation was found between the number of right answers and attendance to advanced life support training courses. An inverse correlation was found between performance and age, but no statistically significant correlation was seen regarding performance and time from medical graduation.

Conclusion: The physicians' theoretical knowledge on this field is worrisome. The results point to the importance of professional advanced life support training in order to assure quality standards for cardiac arrest management in this general hospital.

Keywords: Heart arrest/diagnosis; Heart arrest/therapy; Cardiopulmonary resuscitation; Health knowledge, attitudes, practice; Basic life support; Advanced life support

INTRODUCTION

Cardiovascular diseases (CVD) are worldwide main cause of death, with an incidence rate similar to all cancer, chronic respiratory diseases, accidents and diabetes combined deaths.[1-3]

Brazilian cardiovascular mortality rate is even worse. Data from the World Health Organization point to 341 cardiovascular deaths per 100,000 Brazilians in 2004, corresponding in the same period to more than twice the number of deaths for cancer in Brazil, and almost three times the CVD death rate in the United States.[4]

About one half of all CVD deaths are sudden deaths.[5,6] The incidence of sudden cardiac death in the United States is about 55 per 100,000 inhabitants, representing 5.6% of the yearly deaths, and is a serious public health issue.[7] Less than 15% of the extra-hospital cardiorespiratory arrest

(CRA) are related to trauma, and most of them are caused by cardiovascular disease.[8]

The approach to CRA victims while still in the community and the prompt arrival of medical or paramedical rescue are decisive before arrival to the emergency department. It is essential to have skilled professionals in these medical units, appropriately trained and up-to-date in cardiopulmonary reanimation procedures, with focus on the physician's role for quick recognition of the CRA cause and heart rhythm, and the use of the external defibrillator.[9,10]

This study aimed to evaluate the theoretical knowledge on CRA diagnosis and treatment among physicians working on duty shifts in the either emergency room or intensive care units in a tertiary general hospital in Boa Vista – Roraima (Brazil).

METHODS

This was a cross-sectional descriptive study evaluating the knowledge of physicians working on duty shifts in either in the emergency or intensive care units of a general hospital in Boa Vista, Roraima, Brazil (HGR), which is part of the governmental health network. This is the only tertiary reference hospital in Roraima state.

From June 1-14, 2008, medical professionals were actively searched at their site of work for completing a questionnaire, after approved by the hospital management. The physicians were allowed 30 minutes to complete the questionnaire at their workplace, in a quiet room, individually, with no consultation allowed, after signing a verbal informed consent that explained the study objectives and relevance.

Study tools

The semi-structured questionnaire was prepared based on the American Heart Association (AHA, 2005) guidelines, and on the modified Price et al. template, divided into 3 parts:[11]

- Personal profile – age, gender, medical specialty;

- Training and professional experience – courses, time from graduation

- Theoretical knowledge – 14 questions based on the cardiorespiratory reanimation guidelines.

Fatal errors were considered those related to critical issues, to the point of seriously jeopardizing the expected outcome during life support activities. Three questions, adapted from the questionnaire, evaluated these issues: 1) ability to identify the techniques to manually open the airways; 2) ability to know the shockable rhythms; 3) ability to recognize and mention the revertible causes of pulseless electrical activity.

Statistical analysis

The t Student test was used to evaluate the average samples' differences for parametrical variables. The Smirnov test was used to analyze the samples' distribution. The Chi square test was used to analyze the two samples proportions. The Pearson's test was used to determine the correlation coefficient for the numerical variables. A 95% significance level was adopted.

RESULTS

The questionnaires completed by 44 physicians working on duty shifts in the HGR's either emergency or intensive care units were analyzed. The sample included 83% of the total population. Four physicians were on vacations, 3 on medical license and 1 refused to participate.

The male gender was predominant (84.1%). The age ranged between 25 and 59 years, averaging 37.8 years. Regarding the specialty, 37 (84.1%) were general practitioners, 3 (6.8%) general surgeons, 2 (4.5%) infectologists, 1 (2.2%) gynecologist and 1 (2.2%) pulmonologist. Thirty physicians coursed a residency or were board certificated. All other doctors coursed medical residency.

Twenty one physicians (47.7%) were graduated for less than five years, followed by 18.2% graduated for 6 to 10 years, 18.2% for 15 to 20 years, and 15.9% graduated for more than 20 years.

Regarding the frequency of courses, 24 (54.6%) had no training. Twenty (45.4%) reported having specific advanced life support skills training. From these, 17 (85%) participated in advanced life support training skills in trauma, and only 3 (15%) were trained in advanced life support skills in cardiology. The year of the training ranged from 2000 to 2005. Eighteen doctors (94.7%) completed the training at least 4 years before the study.

Performance evaluation

The participant doctors completed 14 CRA diagnosis and treatment questions. The right answers ranged from 3 to 14, averaging 7 right answers.

A higher right answers average was identified for the physicians working in the intensive care unit ver-

sus those working in the emergency unit (11.4 vs 6.5 right answers, respectively, p=0.0008). When the average right answers for previously advanced life support skills trained professionals is compared to those who were never trained, no statistically significant difference was found (7.1 right answers versus 6.5, respectively; p=0.62).

A weak, however statistically significant inverse correlation was identified for the physicians' age and number of right answers (r = - 0.459; p=0.021). No statistically significant correlation was found for average right answers and time from graduation.

The first two questions evaluated CRA recognition and diagnosis. The first evaluated a conceptual CRA definition, while the second regarded a clinical situation. We found a similar number of right answers for both questions (84% and 81.8%, respectively). Regarding the first measure to be adopted following a CRA diagnosis, only 41% of the participants answered correctly, mentioning request support.

Vasopressin was correctly considered an alternative to epinephrine for treating refractory ventricular fibrillation by only 13.6% of the participants. However, 79.5% correctly chose administration via endotracheal tube, if needed.

Questioned on the indication of defibrillation for asystolia, 43.2% wrongly indicated this method. And another 59% failed to search the CRA cause when caused by pulseless electrical activity. Bicarbonate use in CRA was overestimated by 41% of the completers.

In a scenario with no advanced airways patients, only 47.8% of the professionals would perform 30 chest compressions for 2 ventilations. In a setting with advanced airways patient, only 29.5% correctly opted for the number of ventilations restriction to 8 to 10 per minute, with no chest compressions pauses.

The "strong, fast, ceaseless" compression technique, with an approximately 100 compressions per minute frequency was correctly chosen by 52.2% of the completers.

The three questions regarding critical and decisive situations, and considered fatal errors were:
- Airways opening techniques (22.8% mistakes);
- Recognition of revertible causes of pulseless electrical activity (79.5% mistakes).

Most of the participants (88.5%) made at least one fatal error. One, two and three fatal errors were seen in 18%, 52.3% and 18.2% of the respondents, respectively. The most common identified errors are shown on table 1.

Table 1 – Most common professionals errors

Most common errors	Frequency (%)
Not knowing PEA causes (blank)	79.5
Orotracheal intubation as first measure following diagnosis	47.7
Defibrillation as PEA therapy	47.7
Not considering "strong, fast, ceaseless" compression as right	36.3
Use of adenosine as alternative to epinephrine in VF	34.1
Performing 12 to 16 ventilations per minute in AA patient	34.1
Not using atropine for asystolia	25.0
No AA compression/ventilation rate 5:1	25.0
Not using atropine for PEA	13.6

VF – ventricular fibrillation; AA – advanced airway; PEA – pulseless electrical activity.

Sample evaluation by performance groups

Figure 1 shows the number of right answers distribution among the respondents. In order to sort the sample according to performance groups, we used the statistical difference of fatal errors prevalence between the groups, in different cutoff points (number of right answers) as the performance divider. The number of right answers which statistically most differentiated the groups, considering the number of fatal errors, was of 10 questions (p<0.0001). We named Group A the one with best performance (more than 10 right answers, 11 doctors), and Group B the poorer performer (up to 10 right answers, 33 doctors).
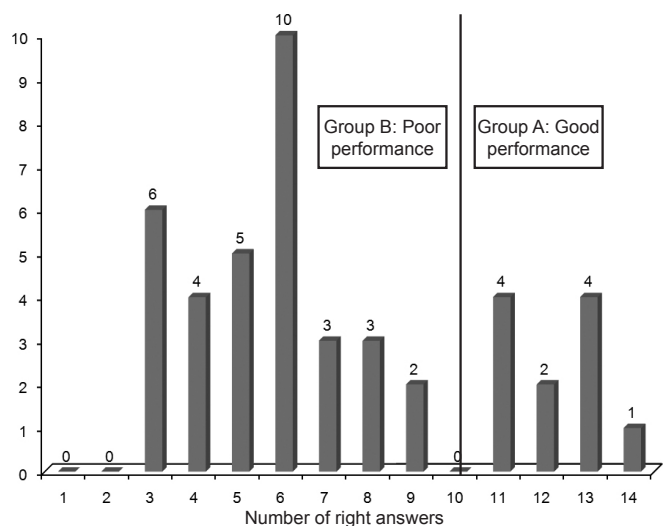

Figure 1 – Distribution of the number of right answers by participant doctors

The professionals' characteristics for both performance groups and their differences are shown on table 2.

Table 2 – Characteristics of the physicians by performance group

Characteristics	Group A N=11	Group B N=33	P value
Female gender	1 (9)	6 (18)	< 0.0001
Age (years)	30.7±4.2	40±3.9	0.007
Graduated for less than 5 years	7 (63)	14 (42)	0.13
Training course participation	4 (36)	16 (48)	0.15
Number of right answers	12.2±1.2	5.5±2.8	0.002
At least one fatal error	3 (27)	33 (100)	<0.0001

Results expressed as number (%) or mean ± standard deviation.

Self-rating

In our questionnaire the participants were requested to self-rate their abilities on the specific and general cardiorespiratory reanimation issues, in five questions. Most of the evaluated professionals acknowledge a deficiency in:
- performing effective compressions (28 physicians);
- correctly ventilating a patient during a cardiorespiratory reanimation (30 physicians);
- ability to defibrillate CRA patients (30 physicians);
- correct intubation techniques (29 physicians);
- performing an overall standard cardiorespiratory reanimation (30 physicians).

DISCUSSION

In this study, the right answers average was 7 (50%), and most (88.5%) of the participants made errors which were considered fatal. In the Price et al.'s study, the average right answers in a similar questionnaire was 56.6%, and fatal errors were made by 45% of the participant doctors, and the authors considered these rates dangerous.[11] Thus, our study data suggest that a considerable number of inappropriate knowledge on reanimation protocols physicians work in sites directly involved in treating CRA.

The cardiorespiratory arrest diagnosis is of paramount importance for well succeeded reanimation steps. Delay to identify and request support is related to the reluctance to acknowledge the existence of an emergency or ignorance of the emergency.[12] Among the participant doctors, 84% had no difficulty to identify a CRA. However, less than one half of them

(41%) would request support after recognizing this emergency; instead, their first decision would involve establishing an advanced airway (47%). The American Heart Association's guidelines clearly state the sequence of actions for CRA.[10] The delay on requesting support in turn delays the arrival of the defibrillator, and additionally it is currently known that the intubation may be postponed if effective non-invasive ventilation can be established.[13]

Only 47.8% of the participants chose the 30 compressions for 2 ventilations rate as correct. Although a 15:2 option was available, most of the doctors choosing wrong answers marked the 5 compressions to 1 ventilation alternative, showing not only a lack of knowledge of the most recent guidelines, but also ignoring the previously recommended one. In our study, 70.5% of the doctors ignore the requirement of ceaseless compressions with 8 to 10 ventilations in CRA patients with established advanced airway. Most of the participants answered that the ideal frequency would be 12 to 16 times/minute. Samson et al.[12] report that during the first moments of a CRA, oxygen and carbonic gas pressures are maintained by chest compression without ventilation, emphasizing the relevance of preventing hyperventilation.

Only 41% of the respondents stated to be concerned with the identification of revertible causes of pulseless electrical activity, and 20.5% know at least six of these. In a similar study conducted in Hospital Alagoano,[14] the authors found that 41% of the responding physicians relied on defibrillation as a treatment for asystolia, and considered this an alarming rate. In our study we found that 43.2% would use the external defibrillator in these patients.

Only 13.6% of the participants knew that vasopressin may be used instead of epinephrine in ventricular fibrillation (VF) cases with unsuccessful first shock. These data are similar to those of Barbosa et al., where only 15.4% of the respondents had this knowledge; this fact restricts the therapeutic options for CRA patients in our hospital.[14]

The American Heart Association recommends reanimation courses revalidations every two years.[10] Evidences point to a low retention a of knowledge and abilities after 6 months or one year, trending to the levels before the training.[15] And, although Smith et al. found stable health care professionals levels of reanimation knowledge one year after the training, their reanimation abilities relevantly declined.[15-17] These evidences may explain why participation in advanced

life support skills training had no correlation with better performance, as most were trained at least 4 years before the study.

CONCLUSION

This study results evidenced knowledge deficiencies of physicians working in emergency units of a general hospital in Boa Vista, Roraima. These were acknowledged by the doctors in self-rating questions. Qualification of professionals working in emergency departments is indispensable for high quality cardiopulmonar rehabilitation care. It is the employer duty assure that the professionals are trained, providing resources, facilities and encouragement for the continued education process.

RESUMO

Introdução: As principais causas de parada cardiorrespiratória são endêmicas e exigem do médico constante aperfeiçoamento no que se refere à reanimação cardiorrespiratória, tornando o treinamento e a educação continuada essenciais ao atendimento qualificado de parada cardiorrespiratória.

Objetivo: O objetivo deste estudo foi avaliar o conhecimento teórico de médicos sobre diagnóstico e tratamento da parada cardiorrespiratória.

Métodos: Trata-se de pesquisa de corte transversal e descritiva em hospital geral terciário de Roraima. A população foi composta por médicos que atuam em unidades de pronto atendimento. Para coleta de dados foi utilizado questionário com perguntas sobre o tema e busca ativa dos profissionais em seus locais de trabalho.

Resultados: Responderam ao questionário 44 profissionais. A média de acertos foi de 50%. Cometeram "erros fatais" 88,5% dos profissionais. Cursos de treinamento nunca foram realizados por 54,5% dos médicos. Não houve correlação entre número de acertos e realização de cursos de treinamento. Houve correlação inversamente proporcional entre desempenho e idade, mas não houve diferença estatisticamente significativa entre desempenho e tempo de graduação.

Conclusão: o conhecimento teórico dos médicos mostrou-se preocupante. Os dados apontam para a importância do treinamento de profissionais em suporte avançado de vida para garantir um padrão de qualidade no atendimento à parada cardiorrespiratória neste hospital geral.

Descritores: Parada cardíaca/diagnostico; Parada cardíaca/terapia; Ressuscitação cardiopulmonar; Conhecimento, atitudes e praticas em saúde; Suporte básico de vida; Suporte avançado de vida

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