

# USE OF A METRONOME IN CARDIOPULMONARY RESUSCITATION IN AN INTENSIVE CARE UNIT

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## USO DO METRÔNOMO NA RESSUSCITAÇÃO CARDIOPULMONAR EM UMA UNIDADE DE TERAPIA INTENSIVA

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## USO DEL METRÓNOMO EN LA RESUCITACIÓN CARDIOPULMONAR EN UNIDAD DE TERAPIA INTENSIVA

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**Objective:** to report the experience of three nurses with the use of a metronome during cardiopulmonary resuscitation maneuvers in an intensive care unit. **Method:** this is an experience report which reflects the exchange of information in the work routine of three nurses who work in the intensive care unit of a large hospital in Salvador, Bahia, Brazil. **Results:** continued use of the device in cardiopulmonary resuscitation is indicated to help in chest compressions. The sound emitted by the device does not indicate the end of each cycle in reanimation and does not ensure an adequate depth of compressions. It makes the environment noisier, hampers communication within the multiprofessional staff and is an additional device to be set up at the moment of cardiopulmonary resuscitation, all of which are negative effects. **Conclusion:** in this experiment, the metronome did not ensure quality in cardiopulmonary resuscitation.

**Descriptors:** Heart Arrest. Cardiopulmonary Resuscitation. Intensive Care Units. Critical Care. Critical Care Nursing. Noise.

*Objetivo:* relatar a vivência de três enfermeiras assistenciais na utilização do metrônomo durante manobras de ressuscitação cardiopulmonar em unidade de terapia intensiva. *Método:* trata-se de um relato de experiência que reflete a troca de informações, no cotidiano de trabalho, de três enfermeiras que atuam na unidade de terapia intensiva de um hospital de grande porte em Salvador, Bahia, Brasil. *Resultados:* o uso continuado do equipamento na ressuscitação cardiopulmonar tem sido indicado para auxiliar na realização das compressões torácicas. O som emitido pelo dispositivo não indica o término de cada ciclo na reanimação e/ou assegura a adequação da profundidade das compressões. *Acrescenta ruídos ao ambiente, dificulta a comunicação da equipe multiprofissional*

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*e é mais um aparelho a ser configurado no momento da ressuscitação cardiopulmonar, impactando de forma negativa. Conclusão: o metrônomo, nessa experiência, não assegurou a qualidade na ressuscitação cardiopulmonar.*

*Descritores: Parada Cardíaca. Reanimação Cardiopulmonar. Unidade de Terapia Intensiva. Cuidados Críticos. Enfermagem de Cuidados Críticos. Ruído.*

*Objetivo: relatar la vivencia de tres enfermeras asistenciales en la utilización del metrónomo durante maniobras de resucitación cardiopulmonar en unidad de terapia intensiva. Método: relato de experiencia que refleja el intercambio de informaciones, en el cotidiano de trabajo, de tres enfermeras que actúan en unidad de terapia intensiva de hospital de gran porte en Salvador, Bahía, Brasil. Resultados: el uso continuado del equipo en la resucitación cardiopulmonar ha sido indicado para auxiliar en la realización de las compresiones torácicas. El sonido emitido por el dispositivo no indica el final de cada ciclo en la reanimación y/o asegura la adecuación de la profundidad de las compresiones. Añade ruidos al ambiente, dificulta la comunicación del equipo multiprofesional y es más un aparato a ser configurado en el momento de la resucitación cardiopulmonar, impactando negativamente. Conclusión: el metrónomo, en esa experiencia, no aseguró calidad en la resucitación cardiopulmonar.*

*Descriptorios: Paro Cardíaco. Reanimación Cardiopulmonar. Unidades de Cuidados Intensivos. Cuidados Críticos. Enfermería de Cuidados Críticos. Ruido.*

## Introduction

Heart arrest (HA) is a syndrome with a multifactorial etiology related to hemodynamic instability and it can lead to severe consequences such as brain damage and permanent damage to other organs, or even death. It is considered a public health issue and it is estimated that 200,000 cases take place every year in Brazil, despite the progress in resuscitation and post-heart arrest maneuvers<sup>(1)</sup>.

Global guidelines of heart arrest care highlight the importance of maintaining blood flow by means of effective and high-quality external chest compressions, with a minimum of 100 and maximum of 120 compressions per minute, and a minimum depth of 5 and maximum of 6 centimeters, allowing for a full recovery of the chest<sup>(2)</sup>. With the purpose of making it easier to comply with these recommendations, a sound command resource has been used in order to help to obtain a proper frequency of chest compressions. Thus, the metronome is a device that is capable of reproducing clear heartbeats at a pace set by the user, which improves its technical performance<sup>(3)</sup>.

This device is considered to be low-cost and easily available, and it can even be found in smartphones. It is an alternative for services that do not have defibrillators with CPR feedback<sup>(2)</sup>.

Authors support that sound stimuli increase the quality of compressions since it enables the performance of the recommended frequency and rescuers can be more careful with regard to the force applied to the chest and to its proper recovery<sup>(4)</sup>.

The benefits of the metronome as an instrument that helps CPR have been the object of research. After analyzing the use of this resource in CPR in pre- and intra-hospital care, there was better adequacy of chest compression frequency, but there was no significant difference in the return of spontaneous circulation and hospital discharge<sup>(2)</sup>. Another study showed that the use of metronomes resulted in an effective improvement of compression frequency; however, it did not have a positive effect on its depth<sup>(5)</sup>. The reasons for this are still unknown, but the possibility of several factors contributing to compressions with inadequate depth has been considered, including multitasking, fatigue, and distraction<sup>(6)</sup>.

Despite these results, studies on the use of this device are still at an incipient stage. In the search carried out in electronic databases of the Virtual Health Library (VHL), without delimitation of period, no articles were found with the following descriptors: Heart Arrest,

Cardiopulmonary Resuscitation, Intensive Care Unit, Critical Care, Critical Care Nursing, and Noise, with Boolean operator AND, using the combinations: Heart Arrest AND Intensive Care Unit AND Noise; Heart Arrest AND Critical Care AND Noise; Heart Arrest AND Critical Care Nursing AND Noise; Cardiopulmonary Resuscitation AND Intensive Care Unit AND Noise; Cardiopulmonary Resuscitation AND Critical Care AND Noise; Cardiopulmonary Resuscitation AND Critical Care Nursing AND Noise. Therefore, a search for keywords in Portuguese was carried out: Metronome AND Heart Arrest, with three articles found; Metronome AND Cardiopulmonary resuscitation, with two articles found; and Metronome, with 16 articles, one of which was duplicated and only three addressed the topic. Using the keywords in English, Cardiopulmonary Resuscitation AND Metronome, no articles were found; using the word Metronome, 981 articles were found, 14 of which were selected after reading of their title/abstract, since they were related to the topic, without delimitation of period. No articles were found using the descriptors Heart Arrest, Cardiopulmonary Resuscitation, Intensive Care Unit, Critical Care, Critical Care Nursing and Noise with the Boolean operator AND, with different combinations. Thereby, a search for keywords was carried out in Portuguese and English: Metronome AND Heart Arrest; Metronome AND Cardiopulmonary Resuscitation; and Metronome. A total of 981 articles were found, 14 of which referred to the topic, after a reading of their titles and abstracts.

In view of the above, studies that report the experience of health professionals with the use of metronomes are relevant, since they can contribute to broaden knowledge on the benefits of this technology and reflect about its use in different settings of CPR care. Therefore, the objective of our study was to report the experiences of three nurses regarding their use of a metronome during CPR maneuvers.

## Method

This is an experience report about the use of a metronome in CPR maneuvers in an ICU with 17 beds in a large-sized philanthropic hospital in Salvador, Bahia, Brazil. The use of a metronome was recommended in this unit since its implementation in 2015, for all CPR maneuvers, after the publication of the American Heart Association, Guidelines 2015 CPR & ECC, which suggests hearing guidance to better comply with recommendations regarding the frequency of chest compressions. All members of this ICU health staff are trained to perform CPR maneuvers. This device was introduced with the purpose of improving compliance with CPR recommendations, which suggest 100 to 120 compressions per minute at each cycle, with a depth of 5 to 6 cm. After the staff was trained to handle the metronome, the device was used in a CPR. The device has 30 options of sound and rhythm, which can vary between 35 to 250 beats per minute, adjusted by means of scroll buttons. It is set up before it is used and placed on the upper part of the emergency car, near the nursing station, next to the defibrillator and orotracheal intubation devices, that is, in an easily reachable place. There is one metronome available per 8.5 beds in this unit. The reported experience reflects the experience of three nurses who work in the aforementioned ICU, and it has been shared in daily work and in CPR training sessions, when reflections about its use were made.

## Results

During a CPR, the understanding of the setting where professionals are found, the identification and availability of resources and agility in the performance of CPR are crucial to ensure its quality. Exposing patients to a longer period without blood flow and to weak compressions prevent resuscitation from being successful.

Providing CPR care in an ICU means the need for an optimization of time and technical and scientific skills<sup>(7)</sup>. In addition, the team's ability to

control stress is essential for excellence in CPR within hospitals<sup>(8)</sup>.

In the experience of CPR care services, it was observed that, before situations of imminent death risk, even when the multiprofessional team is in tune, it has to deal with high levels of stress. Reanimation maneuvers must be undertaken promptly and by this time the emergency vehicle must be close, material to perform definitive airways must be provided for, drugs must be prepared and administered, the defibrillator must be handled, and peripheral venous access must be punctured, in the absence of a central venous access. Besides the agility to perform these procedures, communication among health staff members must be effective, so as the duties of each professional are performed in a correct, quick and organized way, thus ensuring a spontaneous return of circulation and improving the patient's prognosis. In this context, the authors' experience with the metronome considers the stress experienced by them and by the care staff, in addition to countless demands for action and readiness to ensure an effective CPR.

With the purpose of improving the effectiveness of chest compressions, the metronome was adopted in the studied unit as a device with sound command. For each CPR, the device must be switched on and set up by the unit nurse who will use it, since there are different pace and sound settings that can be changed from one use to another. The device does not have a safety lock that keeps the previous setting, so it can be easily reset. To make access easier during CPR, the device remains in the emergency car and can be used by any person, including the cleaning staff, who can accidentally reset it. Therefore, once a CPR is needed, nurses must be aware of settings, which takes time and makes it another task to be taken into account. In addition, it is important to highlight that every device must be handled properly so as to ensure patient safety<sup>(9)</sup>.

It is also noteworthy that the noise produced at the same pace and intensity by the metronome used in the ICU indicates the time when every compression must be repeated, but it does not

indicate the end of each CPR cycle. For that reason, it is the professionals' duty to count the number of compressions performed and to be performed, and this is seen as a negative aspect. It is recommended that, for adults without a definitive airway, professionals indicate when 30 compressions have been performed, so that two ventilations can be performed until 100 to 120 compressions per minute are done, with a permanent pace monitoring. Once this compression frequency is completed, a new sign must be given for a pulse check. In adults with definitive airway, ventilation must be done every six seconds, and 100 to 120 compressions must be made per minute, with a sign given for a pulse check, as described above<sup>(2)</sup>.

With regard to the use of the metronome in professional practice, it was possible to observe professionals' concern with keeping the defined pace to ensure the frequency of chest compressions, but not the proper depth, which can hamper the effectiveness of the outcomes and have a negative effect. Some authors state that this fact can be the result of multitasking required by the simultaneous CPR perception and technique when using the metronome, with a consequent decrease in chest compression average depth<sup>(10)</sup>.

High-quality chest compressions are essential for a successful CPR and it is very important to ensure patients' survival and recovery<sup>(11)</sup>. However, the recommendation regarding the use of the metronome is associated with a lower depth of chest compression in the first five cycles<sup>(12)</sup>. Results of another study confirmed the authors' experience, in which the use of a metronome in CPR resulted only in adequate frequency of compressions, but not in improved depth and chest recovery<sup>(5)</sup>. Another study which assessed the effects of a regular metronome and a telephone-assisted metronome on frequency and depth of compressions detected that both were insufficient to ensure CPR quality<sup>(13)</sup>. It was also observed that there was no improvement in survival rates and in spontaneous return of circulation in a study carried out with nurses

during a CPR, with or without the use of a metronome<sup>(3)</sup>.

During the use of the sound command device, it was observed that the noise emitted is a disturbing factor, hampering staff concentration and communication, resulting in more stress. The noise produced by the metronome can affect communication. Since this device makes a sound emitted by a loudspeaker, it contributes to a noisier environment in real situations<sup>(14)</sup>.

It should be emphasized that during CPR, verbal orders made by professionals to lead the team must be repeated by the executor before and after the requested action<sup>(1)</sup>, which requires full concentration and attention to commands. Since the device emits repetitive and intermittent sounds, complaints have been made by ICU professionals about the increased noise in CPR settings, since it produces noise nuisance, distraction, and difficulties to communicate. This observation was made by another study, which concluded that additional information, whether it is through voice or sound command, results in increased distraction and a consequent decrease in CPR quality<sup>(13)</sup>.

Thus, in the experience of our researchers, the use of a metronome as a support to CPR, on its own, was not considered as a resource capable of contributing effectively to CPR. In addition, all materials and equipment used in CPR must be at hand, and another device that emits a repetitive sound command must be turned on and set up, without a feedback on CPR maneuver efficiency with regard to compression depth. The device has been considered by nurses as a stressful factor for the team, often making communication difficult between members. For this reason, it is essential that any means used to provide instructions works not only in controlled simulations but also in an actual context<sup>(15)</sup>.

Therefore, it is necessary to think about a device with a visual feedback, in real time, which helps in both frequency and depth of compressions, since audio guidance alone does not always result in better CPR<sup>(10)</sup>. Feedback devices can help to improve the quality of CPR maneuvers and can include simple devices such

as visual or hearing metronomes, or monitors/defibrillators which provide frequency, depth, and pause settings in real time<sup>(1)</sup>.

## Conclusion

The experience of a group of nurses in an intensive care unit showed that the use of a hearing metronome was not considered as a device that ensures quality CPR, since it did not ensure an adequate depth of compressions, reduced the attention and concentration of health professionals and made it difficult for them to communicate effectively due to the noise produced. In addition, it must be previously set up, making it an additional device to be turned on and set up, at a critical moment of stress that requires quick and effective actions. It was suggested that more modern devices should be implemented in professional practice, so as to ensure an effective compression, since the metronome only complies with recommendations regarding compression frequency. It is also believed that experience reports of other services will also be useful to contrast or confirm the findings of this experiment.

## Collaboration:

1. conception, design, analysis and interpretation of data: Flávia Silva Ferreira, Laíne Maria Monteiro Garrido and Raquel Chagas Oliveira;

2. writing of the article and relevant critical review of the intellectual content: Flávia Silva Ferreira, Laíne Maria Monteiro Garrido, Raquel Chagas Oliveira, Mariana de Almeida Moraes, Cláudia Geovana da Silva Pires and Fernanda Carneiro Mussi;

3. final approval of the version to be published: Mariana de Almeida Moraes, Cláudia Geovana da Silva Pires and Fernanda Carneiro Mussi.

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