## NURSES' PERFORMANCE
## IN BASIC LIFE SUPPORT[1]

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# ABSTRACT

Sudden cardiac arrest is one of the leading causes of death in developed countries. Nurses are the ones who most often encounter these situations, and the safety and survival of of critically ill patients depends on the effectiveness of their intervention. It was intended to evaluate the performance of the emergency nurses in basic life support, before and after a theoretical and practical training session on this topic, and to identify some of the determinants of their performance. An exploratory-descriptive study was developed during five weeks, in which 10 training sessions were performed using simulation, involving 30 nurses. The performance verified in the first simulation was 77.5% and in the second 94.3%. In the group of nurses that performed best in the first simulation, 93% had previous training in basic life support, and 31% of them had completed training after 2015. In the group with the worst performance, only 63% had training in this area and none of the nurses had trained after 2015.

**Keywords**: Nurses; psychomotor performance; cardiopulmonary resuscitation; patient safety; simulation.

# INTRODUCTION

Sudden cardiopulmonary arrest (CPA) is currently one of the leading causes of death in developed countries[1]. Mortality attributed to ischemic heart disease was around 15.98% worldwide in 2015, maintaining the growing trend[2]. In the hospital setting, only 40% to 60% of patients with CPA recover spontaneous circulation and, in the end, only 15% to 20% survive and are eventually discharged[3]. In Portugal, the prevalence of people with ischemic heart disease has increased in the last 5 years, standing at 2.63% in 2015, ranking second among the pathologies that killed the most and caused the earliest deaths between 2005 and 2015[2].

Nurses are most often faced with CPA situations, namely emergency room nurses, and patient survival depends to a large extent on the effectiveness of their intervention[4-6]. Only by performing appropriate, high-quality maneuvers can patients be more likely to survive, as several authors have documented by stating that performance of this level makes it possible to double and even quadruple survival of CPA victims[1,4,7]. For this reason, an investment in the training of professionals is necessary to ensure that they institute adequate basic life support (BLS) maneuvers[8].

The objectives of this research work are to evaluate the performance of nurses in the BLS before and after a theoretical-practical training session in this area, and identify some of its determinants.

*The importance of simulation in BLS*

Since 1993, the International Liaison Committee on Resuscitation (ILCOR) has been responsible, through its working groups, for developing studies on various areas of resuscitation, including the BLS, to issue periodic evidence-based recommendations to amend the guidelines until then in force and thus contribute to the achievement of higher survival rates in patients with CPA[9]. From the year 2000 onwards these recommendations have been published every 5 years and the 2015 ones are currently in force, which in itself already compromises the professionals with the need to recertify competences in this area.

BLS can be defined as a set of procedures with its own methodology, whose objective is to recognize early life-threatening situations, to know how and when to ask for help, and to start immediately and without the use of any device, maneuvers to preserve ventilation and circulation, keeping the victim viable until the application of the most appropriate medical treatment, which may provide a greater probability of return to spontaneous circulation[10]. Since the correct execution of BLS implies the possession of psychomotor skills and specific knowledge, the Portuguese Resuscitation Council (PRC) argues that a periodic recertification of competences is necessary[11].

Adequate and safe care for patients and professionals cannot be neglected, which requires regular training and prior preparation of PRC maneuvers[12]. In this sense, several authors refer to simulation, defining it as the training of competences in a controlled environment, which mimics real clinical situations and allows an objective assessment in order to improve the performance of professionals[4].

Simulation began to be used a few decades ago in aviation and with the advancement of technologies related to pedagogy was adopted in the health area[13]. Simulation is an excellent teaching method, particularly for nurses caring for critically ill patients. Its application in nursing is advocated by the National Council of State Boards of Nursing and the National League of Nursing, who add that there is scientific evidence that the use of simulation can in many cases completely replace theoretical lectures[14,15]. Nursing is a profession with a very practical component and the increasing complexity of patients and clinical contexts does not always favor safe clinical practice. The lack of training opportunities in the clinical context and the concern with the quality of care and patient safety has led to a progressive bet on clinical simulation[16].

# MATERIAL AND METHODS

An exploratory-descriptive study was conducted involving nurses from a medical--surgical HU in southern Portugal. The data collection period lasted five weeks and took place in November and December 2016, after a favorable opinion was obtained from the Ethics Committee of the Local Health Unit where the study took place, ensuring compliance with the principles of Declaration of Helsinki, and of the Ethics Committee of the University of Évora GD/43625/2016. Invitations were made to the 46 HU nurses to participate in a theoretical-practical BLS training session, and 30 nurses participated in it, according to their availability and motivation. Ten training sessions were held, each involving 3 nurses. Each session began with the signing of the participants' free and informed consent and the completion of questionnaires, which enabled the obtaining of socio-demographic data: age, gender, years of service and years in the HU and data related to training in BLS: completion of certified prior training in this area and date of last training. After completion, the trainers evaluated the nurses' performance in solving a PRC scenario, using a simulation exercise using a medium fidelity dummy, using a clinical examination observation checklist, structured objective, consisting of 23 items, prepared in accordance with the recommendations of the European Resuscitation Council regarding the 2015 BLS guidelines[8]. After the resolution of the scenario by the nurses, a debriefing was performed in which the strengths and points to improve in the intervention of each one of them were identified, followed by a short talk about BLS and a demonstration of the resolution of a PRC case by the trainers. In the end, the training sessions ended with a new simulation, where the individual performance of each nurse was again evaluated, making use of the above-mentioned checklist again.

Finally, the collected data were entered and processed in Excel, using descriptive statistics.

# RESULTS

The sample consists of 15 male and 15 female nurses from a medical-surgical HU in southern Portugal, corresponding to 65% of the service's nurses. About the nurses in the sample: 90% are under 40 years old and 86.8% under 15 years of service; 76.7% had previously received certified BLS training, of which 30.4% attended the training before 2010, 52.2% between 2010 and 2015, and 17.4% after 2015.

In order to evaluate the performance of HU nurses in BLS, before and after the training session in this area, table 1 and graphs 1, 2 and 3 show the performance results for both moments.

Table 1 – Performance of nurses in BLS before and after the training session.
(*Percentage of nurses who performed the intervention properly).

| Items | Pre-forming simulation* | Post-forming simulation* |
|---|---|---|
| 1 - Verification of safety conditions | 13.3 | 66.7 |
| 2 - Assessment of state of consciousness | 83.3 | 100 |
| 3 - Airway permeability (neck extension and chin lift) | 53.3 | 100 |
| 4 - VOSP during 10'' (check for effective breathing and carotid pulse) | 56.7 | 100 |
| 5 – To perform request for help | 86.7 | 100 |
| 6 – To start chest compressions | 66.7 | 100 |
| 7 – To put the base of one hand in the center of the chest/lower half of the sternum | 100 | 100 |
| 8 – To put the second hand over the first one | 100 | 100 |
| 9 – To interlace the fingers | 100 | 100 |
| 10 - To ensure that the pressure is not held in the ribs | 50 | 83.3 |
| 11 – To adopt upright position with patient | 90 | 100 |
| 12 – To keep arms straight | 83.3 | 96.7 |
| 13 – To compress the chest 5 to 6 cm (to confirm feedback from dummy compressions) | 66.7 | 80 |
| 14 – To relieve chest pressure completely between each compression without losing contact with the chest wall | 93.3 | 96.7 |
| 15 – To perform compressions at a rate of 100 to 120 b / min | 73.3 | 86.7 |
| 16 – To permeate the airway after 30 compressions | 100 | 100 |
| 17 – To perform 2 ventilations with face mask and hand blower | 93.3 | 100 |
| 18 – To perform correctly the technique of adapting the face mask to the face of the dummy using one hand | 46.7 | 96.7 |
| 19 –To provide effective ventilations in which chest elevation can be observed (give feedback from the medium fidelity dummy through a visual analog scale) | 40 | 63.3 |
| 20 - Each ventilation should not last more than 1'' | 93.3 | 100 |
| 21 - Interruption of compressions to perform the two ventilations should not exceed 10 " | 96.7 | 100 |
| 22 – To return to chest compressions immediately | 100 | 100 |
| 23 – To maintain BLS maneuvers until conditions to assess heart rate or until trainer instructs to suspend maneuvers | 96.7 | 100\ |
| **Compliance with the BLS algorithm as a whole (average of multiple items)** | **77.5** | **94.3** |
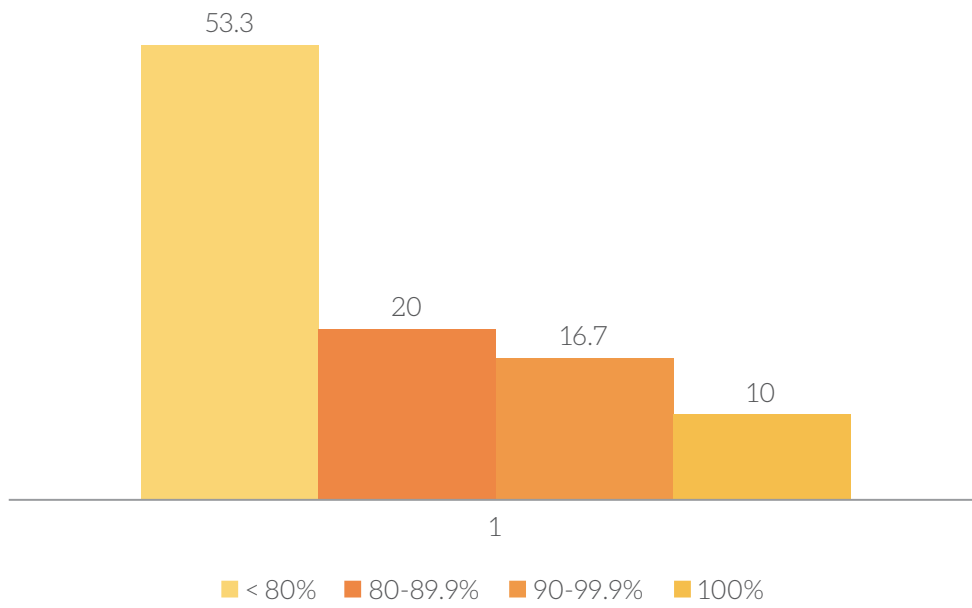
Graph 1 – Analysis of the first simulation by performance intervals.
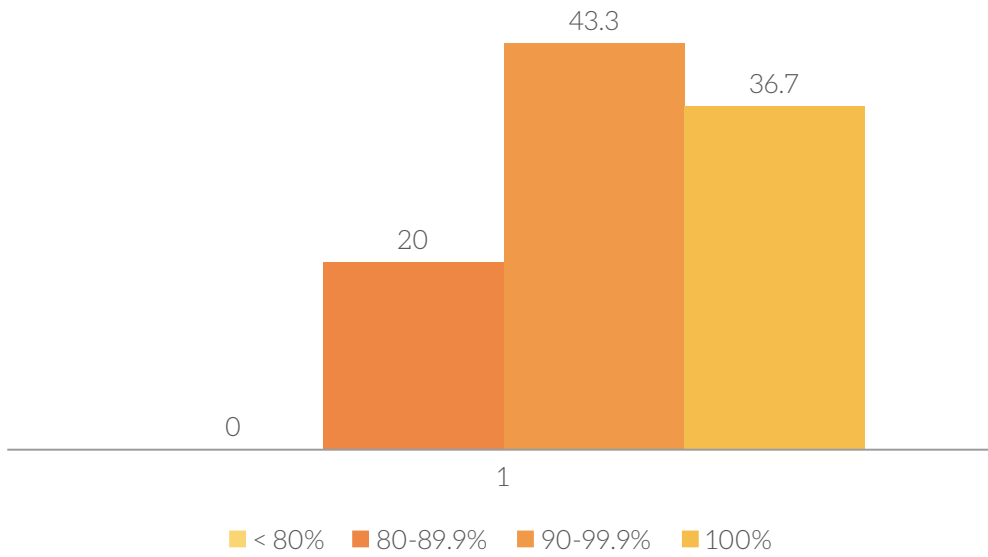


Graph 2 – Analysis of the second simulation by performance intervals.
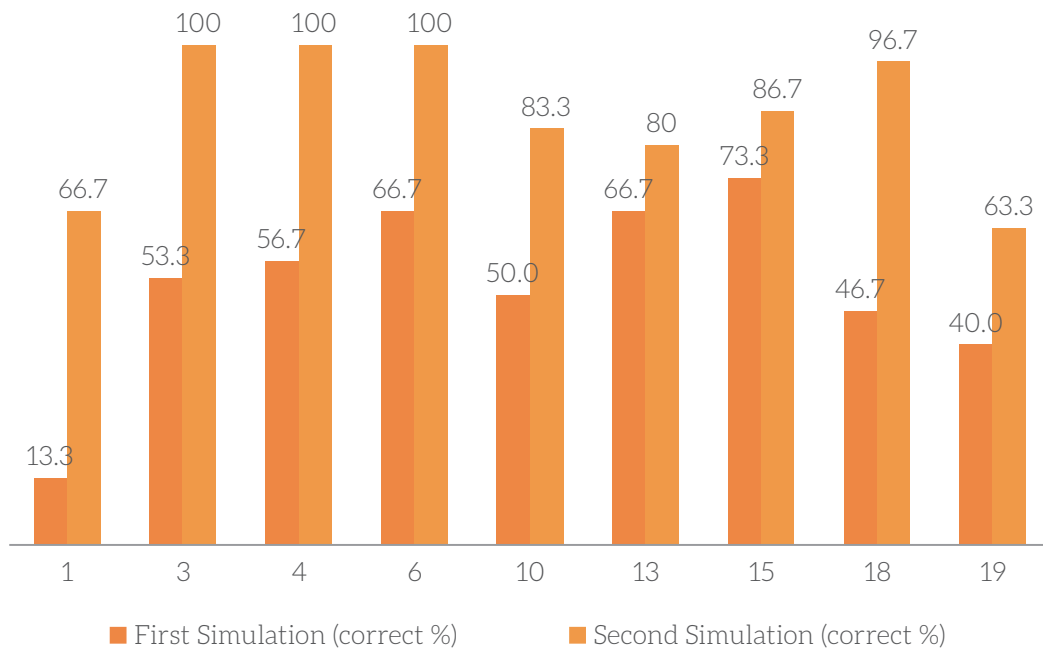
Graph 3 – Items with the worst performance in the 1st simulation and compared with the 2nd simulation.

In order to identify some of the determinants of SU nurses' performance in SBV, table 2 presents the crossover between some of the data collected in the questionnaires and the performance of the first simulation.

Table 2 – Comparing the characteristics of nurses who had the best and the worst performance in the 1st simulation.

| | | The worst performance n = 16 | The best performance n = 14 |
|---|---|---|---|
| No certified training in BLS | | 38% | 7% |
| With certified training in BLS | | 62% | 93% |
| Date of last certified training | Before 2010 | 50% | 15% |
| | Between 2010-2015 | 50% | 54% |
| | After 2015 | 0% | 31% |

# DISCUSSION

The vast majority of nurses are under 40 years-old and under 15 years of service, indicating that they are a young team. About the gender, the sample is balanced, since it is composed of an equal number of men and women. More than 75% of the nurses had already received certified training in BLS at least once, and of these 83% had training with guidelines prior to 2015 (outdated). More specifically, 52% of nurses have been trained for at least 2 years and 31% for at least 7 years. Only 17% of nurses have updated training (2015 guidelines), meaning that training has taken place in the last 2 years.

The performance demonstrated by nurses in solving a CRP scenario (1st simulation) was median, since the average relative to the correct execution of the evaluation target items was 77.5%. However, as they are health professionals performing their duties in a US, the results should have been more satisfactory, as this would have a negative impact on the survival of critically ill patients with CRP[12,17].

Looking at graph 1, it is clear that most nurses in the sample had a performance below 80% and only 26.7% a performance above 90%. Similar or inferior performances have been documented by various authors, demonstrating their studies that nurses and other health professionals struggle with retaining psychomotor resuscitation skills[1,4,6,18-20]. One of the authors states that only 19% of nurses were classified as approved in a simulation exercise[6].

Analyzing the 9 items in which nurses showed worse performance, it is understood that the assessment of safety conditions was the one that registered the lowest performance (13.3%). The assessment of safety conditions was also neglected by a significant percentage of nurses (36% did not), evidence from another study[1]. The remaining items in this group refer to airway permeabilization, carotid pulse evaluation and adequate chest compressions and ventilations, with an average performance of 51.9%. In the aforementioned study, only 69% of nurses who did not perform BLS simulation often permeated the airway correctly, only 45% evaluated the carotid pulse and only 36% performed ventilations with adequate volumes. Two other authors have also documented insufficient and decreasing ventilatory volumes as time has passed since the last simulation[18,19]. The best performance obtained in this resuscitation competency (adequate ventilation) was 42.7% and 39.3%, respectively. In another study, it was found that the adaptation of the mask to the patients' faces was not satisfactory, allowing significant leaks and conditioning low ventilation volumes[16]. Regarding chest compressions, their performance according to their quality did not exceed 55.7% and 48.1% in two identical investigations[18-19].

The performance shown by the nurses in the second simulation was much higher, as can be seen in table 1. It was found that the average relative to the correct execution of the evaluation target items was 94.3%, which corresponds to an average improvement of 16.8% in sample performance. Comparing graphs 1 and 2, it is also clear that in the second simulation none of the nurses presented a performance below 80% and that 80% of the sample had their performance rated above 90%, which means an increase of 53.3% of nurses with this performance compared to the first simulation. Analyzing the 9 items in which nurses showed a lower performance in the first simulation, it can be seen that the average percentage improvement for the second simulation was 34.4%, and the item related to the assessment of safety conditions was the one that saw performance will be more increased (53.4%), see Graph 3. Overall, in the second simulation, these 9 items had an average performance of 86.3%.

Several authors present justification for this performance improvement. On the one hand, they concluded in their studies that simulation is an important part of resuscitation training, which is highly effective in the acquisition, development and maintenance of competences[9,12,17,21]. One researcher aimed for a 67.8% increase in nurses' performance in BLS after performing a simulation[5]. On the other hand, the real-time feedback provided by the medium fidelity dummy in relation to the quality of compressions and ventilations and the debriefing performed by the trainers, proved to be critical components in the learning process and acquisition of psychomotor skills of BLS[15,18,21].

Comparing the characteristics of nurses who had the worst and the best performance in the first simulation (Table 2), it is important to highlight the disparity of both groups with regard to previous training in BLS. In the group with the best performance, 93% of nurses had ever received certified training in BLS, unlike the other group, whose percentage of previous training was no more than 62%. In addition, the group with the best performance was also the one in which the previous training was more recent, that is, 54% of these nurses were trained between 2010 and 2015 and 31% less than 2 years ago, already with the guidelines issued by ILCOR. In 2015. Only a small percentage (15%) had been trained before 2010. In contrast, in the worst performing group no nurse had certified BLS training after 2015 and 50% of these nurses had been trained for over 7 years, i.e. , with BLS guidelines prior to those issued by ILCOR in 2010.

Several researchers have concluded that a period of 1-2 years between BLS skill re--certifications is too long, as a few weeks or months after training there is skill deterioration. In some studies, even after 3 to 12 months, nurses had significantly decreased their performance[4,5,8,17,18]. In another article, only 63% of nurses were approved in the simulation 3 months after initial training and 58% at the end of the first year[22]. In this

regard, the CPA argues that the time intervals for repeating training will differ according to participants' characteristics, an opinion also shared by other authors, alerting one of them that the interval must inevitably be less than one year[6-8,17,23]. It is therefore indispensable to perform short and frequent simulations after the initial training in BLS, allowing to profit the professionals' time and to train only the resuscitation skills[5,6,8,23].

# CONCLUSION

The performance of HU nurses in BSL before the training session (referring to the 1st simulation) was below the desirable level, however, meeting the other results found in other studies. Nevertheless, it is important not to relativize this issue, since the performance documented in this study refers to health professionals, who in their work context have a legal, moral, ethical and deontological obligation to intervene proficiently in CPA situations, in order to provide greater safety and probability of survival for the critically ill patient.

It was also found that when performing simulation exercises with medium fidelity dummies, which provide feedback on the interventions performed, and when the debriefing with the trainer is performed, the performance of nurses increases significantly, as was verified in the 2nd simulation, including in the items initially identified with the worst performance.

The nurses with the best performance were those who had received prior certified training less recently. This is due to the difficulty of nurses to retain psychomotor skills of BSL for long periods without their training. For all these reasons, this study reinforces the recommendations on the importance of repeating short-term simulations, with intervals of less than one year, to develop and maintain BLS skills, as other studies argue.

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