

# Active teaching strategies improve nursing knowledge and skills to assist burn victims

*Estratégias ativas de ensino melhoram conhecimentos e habilidades de enfermeiros, para atendimento à pessoa com queimaduras*

*Las estrategias de aprendizaje activas mejoran los conocimientos y las habilidades de enfermeros para la atención de persona con quemaduras*

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## How to cite this article:

Meschial WC, Ciccheto JRM, Lima MF, Menegaz JC, Echevarría-Guanilo ME, Oliveira MLF. Active teaching strategies improve nursing knowledge and skills to assist burn victims. Rev Bras Enferm. 2021;74(Suppl 5):e20200235. doi: <http://dx.doi.org/10.1590/0034-7167-2020-0235>

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EDITOR IN CHIEF: Dulce Barbosa  
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**Submission:** 04-02-2020    **Approval:** 09-07-2020

## ABSTRACT

**Objective:** to evaluate the impact of an educational intervention, on nurses' self-perception, about knowledge and skills for initial care for burn victims. **Methods:** a quasi-experimental study of the type before and after, with 18 nurses who assist burn victims. The intervention was carried out for 11 days in face-to-face meetings and online activities, and comprised active case-based learning strategies, simulation training, concept maps and digital portfolio. A structured instrument was used to collect sociodemographic data, and another one related to the knowledge and essential skills to the initial care for burn victims. **Results:** The average scores found before the intervention ranged from 2.78 to 3.33 and, after the intervention, they ranged from 3.89 to 4.72. Relevant statistical differences ( $p < 0.005$ ) were found in all questions addressed. **Conclusion:** this educational intervention, based on innovative teaching methods, showed a positive impact on nurses' knowledge and skills on initial care for people with burns.

**Descriptors:** Education, Nursing; Learning; Knowledge; Simulation Training; Burns.

## RESUMO

**Objetivo:** avaliar o efeito de intervenção educativa, na autopercepção de enfermeiros, sobre conhecimentos e habilidades para atendimento inicial a pessoa que sofreu queimaduras. **Métodos:** estudo quase experimental do tipo antes e depois, com 18 enfermeiros que assistem pacientes que sofreram queimaduras. A intervenção, realizada durante 11 dias em encontros presenciais e atividades on-line, compreendeu as estratégias ativas *case-based learning*, simulação realística, mapas conceituais e portfólio digital. Utilizou-se um instrumento estruturado para coleta de dados sociodemográficos, e outro referente ao conhecimento e habilidades essenciais ao atendimento inicial a pessoa com queimaduras. **Resultados:** As pontuações médias obtidas antes da intervenção variaram de 2,78 a 3,33 e, após a intervenção variam de 3,89 a 4,72. Observou-se diferenças estatisticamente significantes ( $p < 0,005$ ) em todas as questões abordadas. **Conclusão:** esta intervenção educativa, baseada em métodos de ensino inovadores, mostrou efeito positivo nos conhecimentos e habilidades dos enfermeiros sobre o atendimento inicial a pessoa com queimaduras.

**Descritores:** Educação em Enfermagem; Aprendizagem; Conhecimento; Simulação; Queimaduras.

## RESUMEN

**Objetivo:** evaluar el efecto de la intervención educativa sobre la autopercepción de los enfermeros sobre los conocimientos y las habilidades para la atención inicial de las personas que sufrieron quemaduras. **Métodos:** estudio cuasi experimental antes-después, con 18 enfermeros que atienden a pacientes que sufrieron quemaduras. La intervención se llevó a cabo durante once días en reuniones presenciales y actividades online e incluyó estrategias de aprendizaje activas basadas en casos, simulación realista, mapas conceptuales y portafolio digital. Se utilizó un instrumento estructurado para la recolección de datos sociodemográficos y otro relacionado con los conocimientos y habilidades esenciales para la atención inicial de las personas con quemaduras. **Resultados:** Las puntuaciones medias obtenidas antes de la intervención oscilaron entre 2,78 y 3,33 y después de la intervención, entre 3,89 y 4,72. Hubo diferencias estadísticamente significativas ( $p < 0,005$ ) en todas las preguntas abordadas. **Conclusión:** esta intervención educativa basada en métodos de enseñanza innovadores mostró un efecto positivo en los conocimientos y las habilidades de los enfermeros en la atención inicial de las personas con quemaduras.

**Descriptorios:** Educación en Enfermería; Aprendizaje; Conocimiento; Simulación; Quemaduras.

## INTRODUCTION

Globally, burns correspond to the most serious form of traumatic injury, with important challenges in terms of patients' functional and psychological recovery<sup>(1)</sup>. People who have suffered burns have a chain of complex changes, with the potential to quickly overwhelm unprepared health teams and cause unsatisfactory outcomes. In many cases, burns are accompanied by other traumas, such as fractures, traumatic brain injury and injuries by inhaling smoke and toxic gases, and the care performed in the first 24 hours after the injury can impact the patient's long-term prognosis<sup>(2)</sup>.

Despite considerable advances in intensive treatment in burn treatment units (BTU), severe burns remain associated with high rates of long-term morbidity and mortality. It is noteworthy that, depending on the local reality, most patients receive initial care in non-specialized burn services before being transferred to a BTU or even receive all treatment in non-specialized services<sup>(3)</sup>. A study carried out in the Southeast region of Brazil, with health professionals from the urgency and emergency services, found that the participants, despite having professional experience in caring for people who suffered burns, did not have adequate knowledge in the area for decision making, demonstrating the need of educational actions to improve their skills<sup>(4)</sup>.

Nurses play an important role in the initial care of burn victims. Therefore, a factor that contributes to unfavorable patient prognosis, by the nursing team, is the lack of clinical skills based on scientific evidence<sup>(5)</sup>. The national and international scientific literature has shown that nursing care for burned patients is not discussed in depth in nursing undergraduate school and continuing education, consequently most nurses receive poor training in this subject<sup>(6-7)</sup>.

Clinical expertise is one of the conditions that nurses must have in clinical environments, is considered a fundamental component of nursing care, capable of directly influencing the quality of services provided by nurses. In this sense, competence in nursing can be defined as the ability to use knowledge, skills, attitudes, judgments and values, which increase efficiency and effectiveness in professional work environments<sup>(8)</sup>.

Considering the need for professional improvement, continuing education actions are considered, which are vital tools for establishing standards of care, allowing professionals who work in the care of burn victims to develop the necessary clinical skills to achieve desirable levels and offer good quality service. To be effective, educational actions need to be directed to meet the challenges and specific needs of services and health professionals<sup>(9)</sup>. They should also be based on methods that promote active learning<sup>(10)</sup> and that allow students to participate.

Active methodologies (AM) consist of a new teaching approach, whose objective is to train critical and reflective professionals, with the ability to solve problems. Knowledge is built from the students' experience, placing them in a protagonist's position during this process. Thereby, it results in greater motivation, involvement with the subject, as well as the development of critical thinking and skills, resulting in deep learning<sup>(10)</sup>.

Meanwhile, studies carried out in Italy<sup>(11)</sup>, England<sup>(6)</sup> and Brazil<sup>(7)</sup> suggest that efforts are needed to advance concerning the qualification of health professionals to care burn patients, improving their clinical skills. Considering the relevance of this theme, the scarce scientific

production and the proposal that permanent education actions are connected to the needs of health services and carried out based on active methods, it is questioned: can an educational intervention based on AM teaching and learning impact on the knowledge and skills of nurses about the acute management of burn patients?

## OBJECTIVE

To evaluate the impact of educational intervention, on nurses' self-perception, on knowledge and skills for initial care for burn victims.

## METHODS

### Ethical aspects

The study followed the recommendations of Resolution 466/12 of the National Health Council, being authorized by the institutions to which the participants belonged and, subsequently, approved by the Permanent Ethics Committee on Research with Human Beings (COPEP), of the Universidade Estadual de Maringá, Brazil. The participants were informed about the details of the study and signed the Informed Consent Form in two copies.

### Study design, setting and period

Study with a quasi-experimental design, of a before and after type, with a non-random allocation method and involving two groups. The instruction TREND<sup>(12)</sup> (Transparent Reporting of Nonrandomized Designs) through a checklist for reporting studies evaluating interventions with non-randomized designs, made available by the EQUATOR network (<https://www.equator-network.org/>), was used as a reference in the planning and description of the present study.

The educational intervention was carried out in a teaching room and practical nursing teaching laboratory at a public state university, in the city of Maringá, State of Paraná, Brazil. Data collection took place in November 2017 and October 2018, in Intervention Group I (GI) and Intervention Group II (GII), respectively. The period of performance of these interventions followed the requests of the permanent education service of the institutions to which the participants belonged, thus justifying the execution on different dates, following the same guidelines and structure for both groups.

### Population or sample: inclusion and exclusion criteria

Before the educational intervention, which was disclosed to the target population as "Theoretical-practical course of initial care for burn victims", it was presented to and authorized by the *Núcleo de Educação Permanente* (NEP) (Permanent Education Nucleus) of the respective services and by the coordination of the multi-professional residency and, later, disseminated to nurses through posters and social networks, 15 days in advance. The selection of the subjects took place based on their own intention to participate in the research, respecting the number of vacancies available for educational intervention.

A total of 18 nurses participated in this investigation, who composed the intentional sample of this study, since they attended to the following inclusion criteria: working for longer than one year as an interventionist nurse in Prehospital Care Emergency Medical Services (EMS) or as an assistant nurse in the Emergency Room (ER), or be regularly enrolled in the multi-professional residence

in urgency and emergency. It was considered exclusion criteria discontinued participation in the educational intervention and the non-acceptance to participate in the research, even during filling the online registration form. All enrolled professionals participated in the intervention from beginning to end and agreed to participate in the study, therefore, there were no refusals.

Thus, groups GI and GII were organized, with a maximum of ten participants each, considering the theoretical reference and the teaching methods employed, enabling dialogue and reflection. The GI was composed of six residents and two nurses working in a prehospital care EMS. The GII consisted of ten nurses, two residents, four working in the ER of a teaching hospital and four in prehospital care EMS.

### Study protocol

The educational intervention lasted eleven days and consisted of four classroom pedagogical workshops and online activities, whose planning and conduction were guided by the theoretical reference of Paulo Freire<sup>(13)</sup>, totaling 30 hours, 20 hours in person and 10 hours online.

Paulo Freire's socio-cultural pedagogical conception, anchored in historical-dialectical materialism, proposes a pedagogical action that promotes the articulation between theory and practice (praxis). It allows students to go beyond the immediate view of phenomena and understand that this is a project whose commitment is social transformation, as from a critical, problematizing and emancipatory educational practice<sup>(13)</sup>.

It was focused on MA teaching-learning, with a participatory and problematizing type. Variation and innovation in teaching methods were sought, resulting in the combination of four: Case-based Learning (CBL), simulation training, concept maps and digital portfolio.

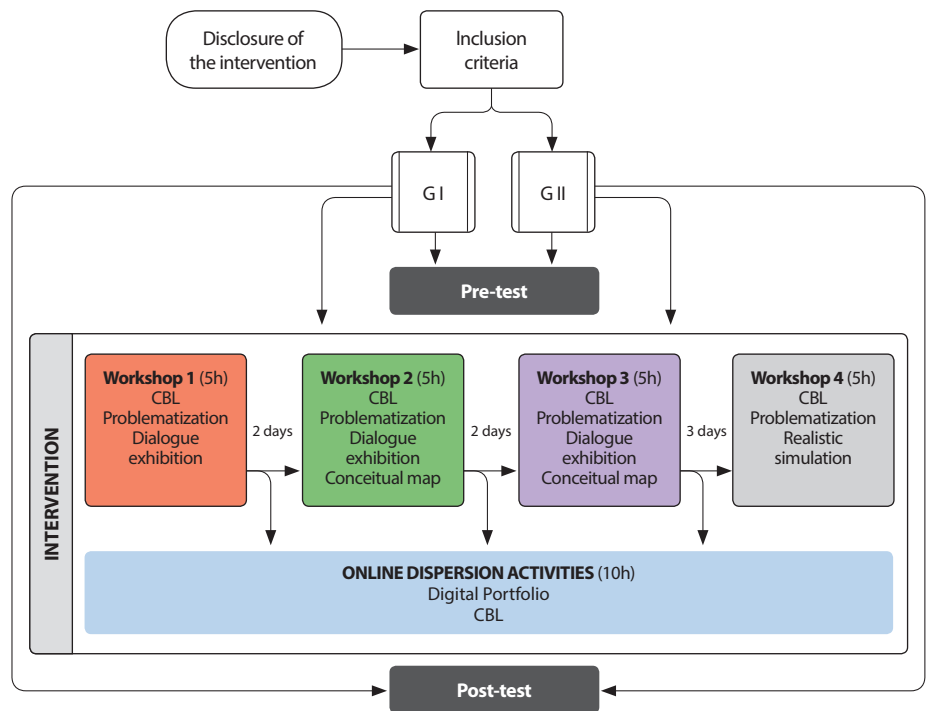
The digital portfolio consisted of a virtual space, using the Google Drive® tool, aimed at sharing bibliographies, collaborative construction of knowledge and individual reflections on the teaching-learning process. For the CBL strategy, which permeated the course from beginning to the end, a clinical case reported in the local media was used; the participants elaborated learning questions during the workshops and answered them critically in the online activities, alternating with the presentational ones. The construction of the MC was carried out in the second and third workshops, with the assistance of a notebook, using the software CMap Tools®. The simulation training featured a scenario, with 15 minutes of duration, and a debriefing, of 30 minutes. We opted for the simulation with *mouled* actors - a technique that uses makeup and other materials to simulate injuries.

The meetings lasted five class/hours and had the presence of the

students, the teacher-tutor, with previous training in the Acute Management Burn (AMB) and in AM, and with a team of monitors, formed by two doctoral students in nursing and four undergraduate nursing students. In each pedagogical workshop, specific themes were worked on, to build knowledge and develop skills for the care of people with burns, with an emphasis on action, considering, however, the theoretical basis. The themes, knowledge and abilities developed are presented in Chart 1.

**Chart 1** - Titles of pedagogical workshops and knowledge and abilities developed during the educational intervention, Maringá, Paraná, Brazil, 2017-2018

Workshop	Developed knowledge and abilities
"A look beyond injuries"	Evaluation and initial care in the prehospital approach. Classification of the clinical severity of the burn in adult patients. Airway assessment and treatment of toxic gas inhalation injuries. Evaluation of shock and fluid infusion in the burned patient.
"Dealing with special situations"	Evaluation and treatment of injuries by chemical products. Evaluation and treatment of injuries by electricity. Initial nursing care for children with burns.
"Challenges in the face of the pain and the suffering of others"	Assessment, monitoring and pain control in burn patients. Injury care and infection prevention. Dealing with the emotional aspects of the burned patient and his family.
"The science and the art of care for burned patients"	Nursing care for the burned patient in the emergency room. Clinical evaluation of the burn patient and the ability to make immediate decisions. Stabilization, referral and transport.



Note: GI: Intervention Group I; GII: Intervention Group II; CBL: Case-based Learning

**Figure 1** - Study design, Maringá, Paraná, Brazil, 2017-2018

The online activities were carried out virtually, in the interval between one workshop and another, using the digital portfolio, used for sharing files and collaboratively solving activities, in which they answered learning questions about a clinical case, and students were allowed to make edits and added information to the text. The virtual tool used for this purpose was Google Drive®. The tutor followed the collaborations of the participants in the activity, as well as making pertinent notes in their productions.

In Figure 1, the study design is presented, with the description of each executed part of the method and its respective details.

For data collection, two instruments were used: an *ad-hoc* form, with sociodemographic and professional characteristics, and a structured instrument for assessing the self-perception of professionals about the initial care for the burned person. The first aimed to characterize the participants. It included 11 questions and was structured in an online format, on *Google Forms*.

Throughout enrollment in the course, the participants completed this and the self-perception instrument about their knowledge and abilities about the initial care for the burned person, as a pre-test. In a second moment, they answered again, as a post-test assessment instrument, right after the last pedagogical workshop.

The participants' knowledge and skills evaluated the followed the recommendations of the International Network for Training, Education and Research in Burns – Interburns<sup>(9)</sup>, focused on the needs of services classified as basic and intermediate, excluding those at an advanced level, since they are related to actions performed in specialized burn services. An Italian study instrument was also considered, which evaluated the performance of participants in an advanced life support course in burns.

So, an instrument composed of 13 questions was elaborated by the research team (Q1, Q2...Q13), which assessed the professionals' self-perception of their knowledge and skills about the AMB. The questions were divided into two blocks, the first relating to basic knowledge and skills and the second to intermediate level. To evaluate each proposition, a Likert-type scale with five response intervals was used, ranging from one (strongly disagree) to five (strongly agree). The score for each question could vary from one to five points, the higher the score, the better the participants' perception of their knowledge and skills to perform a certain role. Thus, the instrument was submitted to a panel of specialists in urgency and emergency, for apparent and content validation, being assessed for objectivity, simplicity, clarity, relevance, precision, credibility and adequacy of the language to the target population. After evaluation by the judges, which took place over three months, minor adjustments were made, maintaining the number of questions.

The knowledge and abilities classified as basic relate to: the initial assessment and stabilization of the burn victims, considering first aid measures; the assessment of clinical severity, including aspects such as depth, location and extent of the lesions and associated factors; adequate pain management (evaluation, control and monitoring measures); management of injuries aimed at healing and infection prevention; identification of criteria for transfer to a BTU; land transport of the burn victim; and effective communication, with the correct exchange of information about the patient and the injury.

The knowledge and abilities classified as intermediate, were related: the evaluation and treatment of pediatric patients; to

special burns (chemical and electrical); the assessment of the need for advanced airways; ideal fluid replacement, considering the Parkland formula and urinary output assessment; and emotional support for patients and their families. Knowledge and skills for advanced level services were not worked, as they are related to actions performed in specialized services in burns.

### Analysis of results and statistics

For data analysis, it was used the SPSS program, version 15.0, and a descriptive analysis of the sociodemographic variables were performed using the average, standard deviation, absolute and relative frequencies. To verify the distribution of continuous quantitative variables, the *Shapiro-Wilk* normality test was used. All 13 items tested, from the self-perception instrument on knowledge and skills, showed normal distribution, with a paired *t*-test being performed to assess differences in intragroup average. The results were considered statistically relevant if  $p < 0.05$ , with a 95% confidence interval.

## RESULTS

The characterization of the participants showed a female prevalence (88.89%). Age ranged from 22 to 40 years, the majority being single. Concerning continuing education, half had a post-graduate course, of these, only one was *stricto sensu* (doctorate). Among those who had an institutional link (66.67%), six work in prehospital care EMS and four in the PS of a teaching hospital. The time in the current activity (residence or health service) ranged from one to 12 full years.

In the results presented in Tables 2 and 3, the average and standard deviation values were verified for all questions of the instrument, with a p-value, relating to the two moments before and after the intervention.

**Table 1** - Sociodemographic and professional characterizations of nurses participating in the intervention, Maringá, Paraná, Brazil, 2017-2018

Variables	n (%)	Average (standard deviation)
Sex		
Female	16 (88.89)	
Male	2 (11.11)	
Age range		
20-30	12 (66.67)	29 (6.77)
30-40	6 (33.33)	
Higher level of education		
University undergraduate*	9 (50.00)	
<i>Lato sensu</i> specialization	8 (44.44)	
Doctorate degree	1 (5.56)	
Current activity		
Mobile prehospital	6 (33.33)	
Emergency Room	4 (22.22)	
Urgent and emergency residence	8 (44.44)	
Graduation time		
1-10	13 (72.22)	6.63 (6.53)
>10	5 (27.78)	
Current activity time		
1-5	15 (83.33)	3 (3.69)
>5	3 (16.67)	

Note: \*Eight participants were in their second year of multi-professional residency in urgency and emergency.

Table 2 shows the values of the questions related to basic level knowledge and skills. When comparing the scores before and after the intervention, in the seven questions evaluated, it was verified that there was a statistically significant increase in the average ( $p < 0.05$ ) after the intervention. Among the issues that had lower averages in the pre-intervention moment, stood out those related to the evaluation of transfer criteria to specialized centers and the land transport of patients to these units, both with an average of less than 3. The scores before the intervention ranged from an average score of 2.67 to 3.11 and after the intervention, all questions had an average of more than 4, ranging from 4.22 to 4.61.

**Table 2** - Questions on nurses' knowledge and abilities on initial care for burn victim - basic level, Maringá, Paraná, Brazil, 2017-2018

Knowledge and abilities – basic level	Pre-intervention Average (sd)	Post-intervention Average(sd)	P
Q1. Initial stabilization at the place where the burn occurred.	3.00 (0.97)	4.33 (0.49)	<0.001
Q2. Perform the severity classification in adult patients.	3.00 (1.14)	4.39 (0.61)	<0.001
Q3. Perform pain management in a burned patient.	3.11 (0.76)	4.61 (0.61)	<0.001
Q4. Perform correct injury management to prevent infection.	3.06 (0.87)	4.56 (0.62)	<0.001
Q5. Assess the need for referral to a specialized center.	2.67 (1.09)	4.61 (0.50)	0.002
Q6. Perform ground transportation to a specialized center.	2.89 (1.41)	4.39 (0.61)	<0.001
Q7. Coordinate the transfer with clear and accurate information.	3.06 (1.16)	4.22 (0.64)	<0.001

Note: sd: standard deviation.  $p < 0.05$ .

Table 3 shows the values of the questions regarding knowledge and skills at an intermediate level. In this group, it was also found that all items showed statistically significant differences ( $p < 0.05$ ). The average scores, before the intervention, ranged from 2.78 to 3.33. At this time, only questions 11 and 13, related to the assessment of the need for advanced airway and volume replacement, respectively, presented an average  $> 3$ . After the intervention, the averages ranged from 3.89 to 4.72.

**Table 3** - Questions on nurses' knowledge and abilities about initial care for burn patients - intermediate level, Maringá, Paraná, Brazil, 2017-2018

Knowledge and abilities – intermediate level	Pre-intervention Average (sd)	Post-intervention Average(sd)	P
Q8. Perform the classification of severity in children.	2.78 (1.11)	4.06 (0.53)	<0.001
Q9. Perform initial care in a patient with an electrical burn.	2.83 (1.20)	3.94 (0.73)	<0.001
Q10. Perform initial care in a patient with a chemical burn.	2.89 (0.96)	4.67 (0.49)	<0.001
Q11. Assess the need for advanced airway.	3.33 (1.33)	4.56 (0.66)	0.001
Q12. Provide emotional support to the patient and family.	2.83 (0.86)	3.89 (0.68)	0.001
Q13. Perform volume replacement in an appropriate manner.	3.22 (1.01)	4.72 (0.58)	<0.001

Note: sd: standard deviation.  $p < 0,05$ .

Globally, the descriptive and dispersion statistical values referring to the participants' scores in the pre-intervention and post-intervention moments, considering the 13 questions of the instrument, presented an average self-perception of knowledge and skills initially of 2.97, reaching 4, 38, after the intervention.

## DISCUSSION

Investigations indicate that this is the first Brazilian study focused on the conception, implementation, and assessment of the impact of an educational intervention with innovative teaching methods, focused on AMB, for nurses working in pre- and intra-hospital emergency services. The present educational intervention, based on Paulo Freire's theoretical framework and operationalized through active teaching-learning methodologies, proved to be effective, since there was a significant increase in the nurses' self-perception about their knowledge and abilities to care for the burned person.

A study, carried out at a BTU in southern Germany, compared the prognosis of patients who came directly to the referral service in burns, with those who received initial care in non-specialized services, with subsequent transfer to BTU. There were statistically significant differences concerning severity, time on mechanical ventilation and time to perform the first surgical excision, with lower values being observed in the group of patients who were admitted directly to the BTU. Still, it showed shorter hospital stay in patients admitted primarily to BTU<sup>(3)</sup>. These results contribute to reflections about the first assistance provided in the emergency services, pointing to possible deficits in human and material resources in these places, which probably contributes to a worse prognosis for the victims and reinforces the need for effective Permanent Education in Health (EPS) actions, capable of increasing the skills of the frontline professionals.

Considering the Brazilian reality, and that of most countries in the world, in which there is an insufficient quantity and inequitable distribution of BTUs, burn victims receive initial care in emergency care services, by non-specialized professionals, before specialized and specialized treatment<sup>(14)</sup>. However, even though it is a common type of injury in emergency units, professionals have difficulties in treating victims<sup>(4)</sup>. Since the morbidity and mortality from burns are lessened in patients who have been properly managed in the acute phase, frontline health professionals need to develop the necessary skills for initial care for burn patients<sup>(7)</sup>.

Therefore, the promotion of nurses' knowledge and skills in urgency and emergency services, through permanent education actions that problematize the reality of professionals and allow them to (re)construct knowledge actively, as performed in this intervention, is important. Considering that competence can be conceived by the set of knowledge, skills and attitudes, and that it is accepted that its development is staggered, the attitude observed in performance, a determining element in the assessment of presence or absence of competence, tends to occur when the professional evaluates that he/she has own resources to respond<sup>(15)</sup>.

For directing actions to the EPS in the AMB, well-defined operational standards must be established. In this educational intervention, the guidelines of the Interburns<sup>(9)</sup> and from the

International Society for Burn Injuries (ISBI) were followed, since they are essential for professionals working in the Emergency Care Network. The Interburns® developed, in 2012, a set of operational standards for services that provide care to burn patients. Moreover, essential knowledge and abilities were listed for health professionals to ensure satisfactory clinical outcomes<sup>(9)</sup>. In 2016, the ISBI launched the ISBI Practice Guidelines for Burn Care, containing recommendations for the diagnosis and treatment of burns. The singularity of this material consists of an approach that considers the local characteristics of developing countries and with limited resources, such as Brazil<sup>(1)</sup>.

It should be noted that in Brazil, in 2012, the *Cartilha para tratamento de emergência das queimaduras* (Guiding for emergency treatment of burns) was launched by the Ministry of Health, a brief and easy-to-handle material, with the purpose to be a guiding tool for health professionals in the AMB, considering varying degrees of complexity of injuries<sup>(16)</sup>. This material, although in a very synthetic way, addresses several of the contents discussed in the present intervention, being presented to the participants, and indicated to them as relevant material to check.

A major aspect of the therapeutic success in burns is the ideal volume replacement. In this sense, the estimate of the percentage of total body surface area (%TBSA) is crucial, as it is considered according to the formulas that calculate the volume of liquids to be infused in the patient. A study, conducted by doctors and nurses during two international scientific events on burns, revealed high differences in the evaluation of % TBSA and the indication of the initial volume of fluids administered. Accurate evaluation of % TBSA is crucial in AMB. Estimation errors can lead to inappropriate transfers to BTUs; fluid overload, which can result in compartment syndrome and cerebral edema; and/or volume input lower than the patient's needs<sup>(17)</sup>.

Considering the several weaknesses related to this theme, the permanent education actions directed to the reality of each health service and guided by political-ideological references, aligned with the guidelines of the health care networks, constitute a promising strategy to expand the educational practices and can improve the motivation and active participation of professionals<sup>(18)</sup>. Studies carried out in the United States of America<sup>(2)</sup>, in England<sup>(6)</sup> and in Italy<sup>(19)</sup>, proved that educational interventions on the care of burn patients, which go beyond traditional teaching methods and promote the effective participation of professionals, can contribute more significantly to the upgrading of these professionals and, consequently, to improve assistance to these patients.

This educational intervention had as one of its differentials the fact of combining the learning of new information with the practice of skills based on real situations, through innovative teaching methods (CBL, CM, digital portfolio and simulation training). These methods present active, dialogical and critical character. Thus, an emancipatory and transformative education was sought, guided by the dialogue between the educator and the students, in a horizontal relationship<sup>(13)</sup>. This strategy possibly helped to motivate students to learn, corroborating for the improvement in the self-perception of knowledge and skills of the intervention's participants.

In the study scenario, as in other institutions with limited resources, the use of teaching methods such as simulation training

can be a limitation due to the high cost of high-accuracy dummies and their limitations of access by most educational institutions. Many courses involving simulation training have chosen to use low-accuracy dummies. However, this fact can compromise the quality of teaching, since students have difficulties in suspending disbelief and are unable to practice many skills, which are critical in real-life situations. For example, participants cannot continuously engage in evaluating, providing nursing interventions and re-evaluating a patient in a rapidly evolving scenario<sup>(2)</sup>. Simulation with actors, to overcome these difficulties, has already been used in international studies<sup>(20)</sup>, and this type of simulation is also adopted in this intervention.

Thus, efforts were focused on the development of an innovative strategy, based on simulation training with actors and the use of the *Moulage* technique, which consists in the use of authentic makeup and other materials to simulate a variety of burn injuries. This technique has been used in international studies and has shown promising results in the development of necessary skills in urgencies and emergencies, as in the case of burns<sup>(20)</sup>.

The simulation of urgencies and emergencies, added to enabling the joint action of health professionals, can strengthen the articulation between theory and practice of the topics covered, and the development of skills necessary for assistance in the developed scenarios. It is also capable of enabling the active participation of all members of the group, the sharing of knowledge and experiences, as well as reflection on areas for improvement<sup>(14)</sup>.

### Study limitations

As limitations of the study, it is highlighted that the sample was not randomized, which means that the results cannot be generalized to populations with different characteristics. Moreover, although it can be stated that the educational intervention contributed to the improvement of the participants' knowledge and skills, it was not possible to assess the assimilation of expertise by professionals and their ability to transfer it to clinical practice. Therefore, it cannot be guaranteed that the educational gains of the participants, after the educational intervention, will be kept over time.

### Contributions to the field of nursing, health, or public policy

The present study contributes to the qualification of nursing care provided to patients with burns in non-specialized urgency and emergency services, since it enhanced the knowledge and skills of nurses working in these scenarios. This fact, possibly, will reflect in a better prognosis and quality of life of these patients. Also, it contributes to health services, when guiding the development of effective permanent education actions.

### CONCLUSION

The educational intervention, with active teaching methods (Case-based Learning, simulation training, concept maps and digital portfolio), proved to be effective, since it positively impacted the nurses' knowledge and skills, aimed at the initial care of burned people. Thus, EPS actions, with active teaching methods, of a

participatory and problematic character, have shown to have positive implications for nursing education.

Finally, it should be remarked that the nurses' knowledge and skills were self-reported, that is, they started from the perception

of each professional about the progress they achieved during the intervention. Thus, it is suggested that further studies be carried out with the perspective of assessing the clinical skills of nurses in the AMB, as well as the effectiveness of specific teaching methods.

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