







## Nursing in pre-hospital care for burn victims: a scoping review

*Assistência de enfermagem no atendimento pré-hospitalar a vítimas de queimaduras: scoping review*

*Asistencia de enfermería en la atención prehospitalaria para víctimas de quemaduras: scoping review*

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### ABSTRACT

**Objective:** to identify the scientific evidence on nursing in pre-hospital care for burn victims. **Method:** this scoping Review was conducted following the Joanna Briggs Institute guidelines and the PRISMA-ScR protocol. Six data sources were searched in the time frame from 2016 to 2020. Twelve articles met the inclusion criteria and were selected for sampling of the results. **Results:** prominent within the scope of nursing care were fluid volume replacement by infusion; local cooling with clean, running water at room temperature; monitoring / control of vital signs, use of oxygen therapy; analgesia and wound care, using occlusive dressings, identification of the causative agent, assessment of the Burned Body Surface Area, extent and depth of the injury. **Conclusion:** nursing in pre-hospital care for burn victims mainly involves controlling the progression of the injury caused by the incident between the moment of arrival and tertiary care.

**Descriptors:** Nursing; Delivery of Health Care; Delivery of Health Care; Burns.

### RESUMO

**Objetivo:** identificar as evidências científicas sobre a assistência de enfermagem no atendimento pré-hospitalar a vítima de queimadura. **Método:** revisão de escopo realizada conforme orientações do Instituto Joanna Briggs e protocolo PRISMA-ScR. A busca foi executada em seis fontes de dados, no recorte temporal de 2016 a 2020. Doze artigos atenderam aos critérios de inclusão, sendo selecionados para a amostra dos resultados. **Resultados:** no âmbito da assistência de enfermagem, destacaram-se reposição volêmica com infusão de fluidos; resfriamento local com água limpa, corrente e em temperatura ambiente; monitoramento/control dos sinais vitais, uso de oxigenoterapia; analgesia e cuidados com a ferida, utilizando coberturas oclusivas, identificação do agente causador, avaliação da Superfície Corporal Queimada, extensão e profundidade da lesão. **Conclusão:** a assistência de enfermagem frente ao atendimento pré-hospitalar às vítimas de queimaduras se dá principalmente pelo controle da evolução dos danos causados pelo incidente desde o momento da chegada até o atendimento terciário.

**Descritores:** Enfermagem; Assistência à Saúde; Serviços Médicos de Emergência; Queimaduras.

### RESUMEN

**Objetivo:** identificar la evidencia científica sobre la asistencia de enfermería en la atención prehospitalaria a víctimas de quemaduras. **Método:** Revisión del alcance realizada según las orientaciones del Instituto Joanna Briggs y el protocolo PRISMA-ScR. La investigación se realizó sobre seis fuentes de datos, en el período de 2016 a 2020. Doce artículos cumplieron los criterios de inclusión y fueron seleccionados para la muestra de los resultados. **Resultados:** en el ámbito de la atención de enfermería se destacó la reposición volêmica a través infusión de fluidos; enfriamiento local con agua corriente limpia en temperatura ambiente; seguimiento / control de signos vitales, uso de oxigenoterapia; analgesia y cuidado de heridas, utilizando curas oclusivas, identificación del agente causante, evaluación de la superficie corporal quemada, extensión y profundidad de la lesión. **Conclusión:** la asistencia de la enfermería ante la atención prehospitalaria a las víctimas de quemaduras ocurre principalmente mediante el control de la evolución de los daños ocasionados por el incidente desde el momento de la llegada hasta la atención terciaria.

**Descriptores:** Enfermería; Prestación de Atención de Salud; Servicios Médicos de Urgencia Quemaduras.

## INTRODUCTION

Burns are traumatic damages resulting from exposure to an external agent, whether of thermal, chemical, biological, electrical or radioactive origin. They are classified according to the degree of tissue damage and the extension of the affected area<sup>1</sup>.

As for tissue impairment, burns are classified into four degrees. First-degree burns affect only the superficial layer of the skin, characterized by hyperemia and local pain. Second-degree burns are more profound, also destroying part of the dermis, and are characterized by phictemas, maintaining pain in the affected area. The third-degree burn is distinguished from the others by damage to the hypodermis, in addition to the epidermis and dermis; and it is commonly seen with the presence of blackened lesions and pain in varying intensities. Finally, fourth-degree burns are more

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debilitating and physically deforming, since they reach the maximum tissue depth possible, and can even reach internal organs and other systems<sup>2</sup>.

It is important to recognize the extent of the burn to guide decisions during treatment. For that, in adults, the Rule of nine can be used, in which the head, upper limbs, chest and abdomen are worth (9%) each, the lower limbs (18%) and the genital region (1%). In pediatrics, the classification is adapted: head (18%), upper limbs (9%), chest (9%), abdomen (9%), lower limbs (13.5%) and genital region (1%). Another issue is that the burn can change its characteristics in the first hours, with constant observation and not taking hasty measures being important<sup>2</sup>.

The World Health Organization (WHO) claims that burns are a global public health problem. It is estimated that, worldwide, there are nearly 265,000 deaths/year due to fires, in addition to other types of burns, whether electric or of any other nature<sup>3</sup>. In Brazil, there is a mean of 1,000,000 burn incidents/year. Of these, only 100,000 seek hospital care and, of that portion, it is estimated that 2,500 victims die directly or indirectly as a result of their injuries<sup>4</sup>.

Burns occur mainly at home or in the workplace. Women and children are more likely to suffer burns at home, usually in the kitchen, due to hot liquids or direct flames, as well as to stove explosions. On the other hand, men are more likely to suffer burns in the workplace due to fires, and to chemical and electrical burns. Of the survivors, millions are left with disabilities and disfigurements throughout life, often linked to stigma and social prejudice<sup>5</sup>.

In order to act in the care of burn victims, the mobile or fixed Pre-Hospital Care (PHC) has the purpose of care agility and refined clinical reasoning, in order to minimize the maximum of significant consequences resulting from the occurrence<sup>6</sup>. In Brazil, there is still not enough investment in PHC professionals. Many do not have the necessary permanent training or the minimum structure to operate, not to mention the stress and tension these professionals are subjected to<sup>7</sup>.

Most of the time, Nursing is the burn victim's first contact with the health sector, being the support point and of fundamental relevance for the therapeutic prognosis. PHC measures by Nursing can mitigate the evolution of the condition, reducing not only the need for more intensive care, but also reducing health costs<sup>7-10</sup>.

In view of this problem, this study is justified by the need to update and train Nursing in the PHC for burn victims, as the therapeutic prognosis tends to improve as sooner and more appropriate the assistance provided is. Consequently, the population that lacks such care will benefit from more accurate assistance.

In addition, it is expected that this study will contribute to the scientific community, *a posteriori* coming to serve as basis for new research studies, as a focus guide for pre-hospital Nursing care, thus enriching the available literature. Therefore, this study aims to identify the scientific evidence on Nursing assistance in pre-hospital care for burn victims.

## METHOD

The study in question is a scoping review, carried out in September 2020, following the Joanna Briggs Institute method<sup>11</sup>. This research design seeks to recognize and map the main evidence about a given area, exploring investigative gaps and offering an overview of the main concepts about the field of knowledge<sup>11</sup>. The research went through the stages of identifying the research question; search for pertinent studies; selection of articles; extraction of research data and grouping of results. This scoping review was registered in the *Open Science Framework* (<https://osf.io/pm7ng>)<sup>12</sup> platform for registering scientific papers.

In order to perform a tracking, as well as the identification of other scoping reviews or similar protocols, a search was performed on the following platforms: *Open Science Framework* (OSF); *The Cochrane Library*; *JBI Clinical Online Network of Evidence for Care and Therapeutics* (ConNECT+); *Database of Abstracts of Reviews of Effects* (DARE); and *Prospective Register of Systematic Reviews* (PROSPERO). After the searches, it was possible to reveal the absence of similar materials.

The research question was constructed using the PCC strategy, which points out the following as fundamental mnemonics: P - Population; C - Concept; and C - Context. Thus, the following elements were established: P = Burn victims; C = Nursing assistance for burn victims; and C = Pre-hospital care. Given the above,

the following research question was elaborated: "How does Nursing assistance in pre-hospital care for burn victims occur?"

After defining the research question, the search for relevant studies was carried out through the Journals portal of the Coordination for the Improvement of Higher Level Personnel (*Coordenação de Aperfeiçoamento de Pessoal de Nível Superior*, CAPES), which consulted the collection of Latin American Literature databases and Caribbean in Health Sciences (*Literatura Latino-Americana e do Caribe em Ciências da Saúde*, LILACS), Cochrane Library, Cumulative Index of Nursing and Allied Health (CINAHL), The Scientific Electronic Library Online (SciELO), Web of Science and National Library of Medicine (PubMed) databases. The crossing in the databases was performed with the descriptors "Enfermagem", "Queimaduras" and "Serviços médicos de emergência" indexed in the Descriptors in Health Sciences (*Descritores em Ciência da Saúde*, DeCS); and "Nursing", "Burns" and "Emergency medical services", in line with the Medical Subject Headings (MeSH), using the Boolean operators AND and OR.

In order to expand the searches, for the sample of results, the crossings were performed with the descriptors in English, as shown in Figure 1. The groupings and selection of articles were carried out in the aforementioned databases.

DATA SOURCES	SYNTAX
CINAHL	<i>(burns AND nursing) AND (burns AND emergency medical services) AND (burns AND emergency medical services AND nursing) AND (emergency medical services AND burns AND Nursing) OR (burns AND nursing)</i>
COCHRANE	<i>"burns" in All Text AND "nursing" in All Text "burns" in All Text AND "emergency medical services" in All Text "burns" in All Text AND "emergency medical services" in All Text AND "nursing" in All Text "burns" in All Text OR "nursing" in All Text "burns" in All Text OR "emergency medical services" in All Text "burns" in All Text OR "emergency medical services" in All Text OR "nursing" in All Text</i>
LILACS	<i>tw:((tw:("burns"))) AND (tw:("nursing"))) tw:((tw:("burns"))) AND (tw:("emergency medical services")) tw:((tw:("burns"))) AND (tw:("emergency medical services")) AND (tw:("nursing"))) tw:((tw:("burns"))) OR (tw:("emergency medical services")) (tw:("burns")) OR (tw:("emergency medical services")) OR (tw:("nursing"))</i>
PUBMED	<i>(((((Burns AND Emergency medical services AND nursing)) AND (Nursing AND Burns OR Emergency medical services))) AND ((((((burns AND nursing)) AND (burns AND emergency medical services)) AND (burns AND emergency medical services AND nursing)) AND (emergency medical services AND burns AND Nursing)) OR (burns AND nursing))</i>
SCIELO	<i>("burns") AND ((nursing OR nursing care)) ("burns") AND ((emergency medical services OR emergency)) ("burns") AND ((emergency medical services OR emergency)) AND ((nursing OR nursing care)) ("burns") OR ((nursing OR nursing care)) ("burns") OR ((emergency medical services OR emergency)) ("burn") OR ((emergency medical services OR emergency)) OR ((nursing OR nursing care))</i>
Web Of Science	<i>TS=(Burns) AND TS=(Emergency medical services) OR TS=(Burns) AND TS=(Emergency medical services) AND TS=(Nursing) OR TS=(Burns) AND TS=(Emergency medical services) AND TS=(Nursing)</i>

**FIGURE 1:** Chart of the research syntax in the scientific data sources. Natal, RN, Brazil, 2020  
Source: Research data.

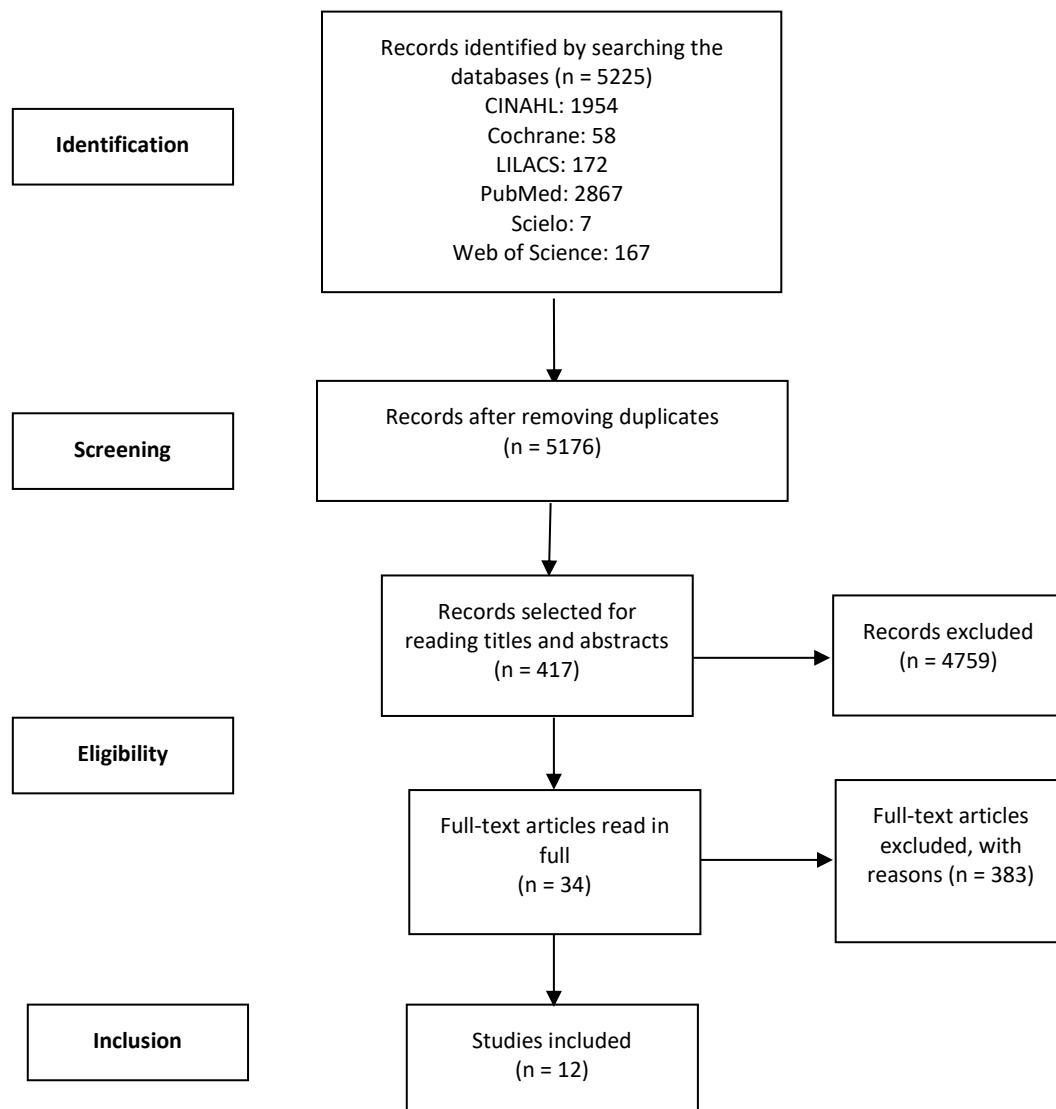
For the selection of studies, the inclusion criteria were articles available online for free in full, published in Portuguese, English and Spanish and in the time frame from 2016 to 2020. Scientific papers that deviate from the theme proposed by the study were excluded, and the duplicates were kept only once.

The articles were previously chosen after reading their titles and abstracts. *A posteriori*, reading and textual analysis were performed in full in accordance with the inclusion criteria, to compose the final sample of 12 articles for information extraction.

The search was carried out jointly by two independent collaborators during the collection period using different computers, in order to ensure that no important studies were eliminated. To avoid incompatibilities, the studies were chosen after peer discussion. After selection, the studies were categorized into: authors, year, place of publication, type of study, level of evidence, and degree of recommendation in line with the Oxford Center for Evidence-based Medicine<sup>13</sup>, population, age group, objective and Nursing assistance.

## RESULTS

A total of 5,225 articles were identified through the crossings performed in the data sources. After applying the inclusion and exclusion criteria, 49 duplicates were discarded and 417 titles and abstracts were read, where it was found that 383 articles did not meet the established criteria. After this process, shown in Figure 2, a total of 12 articles were included for elaboration of the results.



**FIGURE 2:** PRISMA-ScR flowchart (adapted). Natal, RN, Brazil, 2020  
Source: Research data.

The 12 studies included, summarized in Figure 3, were published between 2016 and 2019. Among them, the countries with the largest number of publications were as follows: Brazil with six studies (50.0%)<sup>14,18,20-21,23-24</sup>, United States of America with 3 publications (25.0%)<sup>15,19,25</sup>, and Argentina, Ecuador and Tanzania with one publication each (25%)<sup>16-17,22</sup>. Namely: a guide to the clinical practice<sup>22</sup>, three integrative reviews<sup>20-21,24</sup>, a literature review<sup>23</sup>, a case study<sup>18</sup>, three descriptive studies<sup>14,16,19</sup>, a retrospective review<sup>15</sup> and a descriptive qualitative study<sup>17</sup>.

Regarding the level of evidence and degree of recommendation, the guidelines established by Oxford Centre for Evidence-based Medicine were used. It is noteworthy that the highest level of evidence corresponds to the lowest number indicated and, as for the degree of recommendation, "A" is indicated as more recommended and "D" as less recommended<sup>13</sup>.

The place of publication of the studies includes countries from several continents. The population involves children, youth, adults and mainly nurses; however, two articles did not specify their target population. The level of evidence varied between 2B and 4, whereas the degree of recommendation was between B and C. As for the objectives found in the sample, they predominantly assess nurses' knowledge about the care, description and implementation of Nursing assistance for burn victims. Among the Nursing assistance measures most found, volume replacement with fluid infusion stands out, as well as local cooling with clean, running water and at room temperature, monitoring and control of the Vital Signs (VVSS), mainly breathing control with the use of oxygen therapy, analgesia and wound care, such as the use of occlusive dressings, identification of the causative agent, assessment of the Burned Body Surface (BBS), extension and depth of the injury.

*ID/ Year/ Place of publication	Type of study / Level of evidence / Degree of recommendation/ Population	Nursing assistance
E1 <sup>14</sup> /2016/Brazil	Descriptive study/ 2B/B/Children and youth	Remove the victim from the causative agent, cool with clean, running water for 10-20 minutes, warm the victim.
E2 <sup>15</sup> /2017/USA	Retrospective review/ 2B/B/Ns*	Volume replacement, monitor vital signs (VVSS), assess signs of inhalation injury.
E3 <sup>16</sup> /2019/ Ecuador	Descriptive study/2B/B/Nurses	Keep affected skin moist, volume replacement.
E4 <sup>17</sup> /2019/ Tanzania	Descriptive and qualitative study/2B/B/Nurses	Application of cold water, make occlusive dressing.
E5 <sup>18</sup> /2018/Brazil	Case study/4/C/Adults	Assess the extent of the injury. Monitor VVSS, O2 saturation, risk of infection and enable Peripheral Venous Access (PVA).
E6 <sup>19</sup> /2016/USA	Descriptive study/2B/B/Nurses	Perform volume replacement and analgesia. Observe signs of infection and poor peripheral arterial perfusion.
E7 <sup>20</sup> /2017/Brazil	Integrative review/4/C/Adults	Wash affected area, analgesia with pharmacological and non-pharmacological measures, assess cases of inhalation burns.
E8 <sup>21</sup> /2016/Brazil	Integrative Review/4/C/Nurses	Monitor O2 saturation and VVSS. Maintain patent airways, use chlorhexidine for cleaning, dress, identify edema, apply compresses and perform analgesia and PVA.
E9 <sup>22</sup> /2016/ Argentina	Clinical practice guide/4/C/Children	Wash the affected area, check VVSS, administer O2 and analgesics. Restore blood volume, clean lesion with 4% chlorhexidine, use 0.22% nitrofurazone or silver sulfadiazine.
E10 <sup>23</sup> /2017/Brazil	Literature review/2C/B/Ns*	Replace fluids, enable PVA, clean lesion with 0.9% PS or water. Apply sterile dressings, observe VVSS and signs of hypoxemia, hypothermia, sweating, cyanosis and hypovolemia.
E11 <sup>24</sup> /2018/Brazil	Integrative review/4/C/Adults	Remove chemical agent powder with brushes/cloths, cool with running water, remove adornments/clothes, replace blood volume.
E12 <sup>25</sup> /2018/USA	Descriptive study/2B/B/Nurses	Wound care, infection control, preserve patient safety.

**FIGURE 3:** Summary chart of the results found in the final sample. Natal, RN, Brazil, 2020.

Ns\*: Not specified USA: United States of America. \*ID: Identification of the studies.

## DISCUSSION

Burns are high-cost traumas with treatment and recovery, in addition to often being debilitating and disabling, making it difficult for the victim to accept and define a prognosis. Professionals working in this area need to be trained enough to work on the specifics of each injury. This preparation combined with agility is fundamental in the early care of the target audience<sup>26</sup>.

A simple, low-cost method that is widely used by nurses in PHC in burns is cooling at the injury site. In this review, the importance of using clean, running water, at room temperature and for a pre-established time (not less than 10 minutes), was directly highlighted in 58.3% of the studies as one of the first behaviors of the PHC in burns. Delay in local

cooling can lead to worsening of the burn and require longer periods of hospital care, in addition to promoting an intuitive reduction in temperature, reducing the chances of local infection, promoting analgesia and faster healing in deep burns<sup>7</sup>.

Another assistance measure is volume replacement, one of the bases of PHC in burns that has a positive impact when performed properly and as early as possible. The Parkland formula, frequently used to calculate volume replacement in burned patients, shows that, in adults, replacement of (4 ml x body weight in kg x percentage of BBS) must be considered, with 50% of the result to be administered in the first 8 hours after the injury and the other half to be administered in the remaining 16 hours. In other words, this calculation is made taking as a notion the liquids that the victim lost during the trauma and still considering what the victim may lose in the first 24 hours after the burn. Nearly 66.6% of the articles point to volume replacement as fundamental Nursing assistance, carried out through puncture of PVA or CVA and administration of fluids according to medical prescription<sup>2,26</sup>.

For several benefits, the occlusive dressing is considered a measure widely used in burns. It must contain specific coverage according to the aspect of the lesion and the objective to be achieved, in addition to having sufficient thickness to absorb the fluids released by the wound, protection against external infections and ensuring local temperature control. 33.3% of the sample corroborates with such data, which bring in their results the use of occlusive dressing as Nursing assistance used in burns<sup>27</sup>.

Silver-based dressings, mainly 1% silver sulfadiazine, are first-choice methods in dressings for burns. Their advantages are the aid in reepithelization, antimicrobial control and analgesia. In addition to that, hydrocolloid dressings, hydrogels, Essential Fatty Acids (EFAs), non-adherent gauze, synthetic and biological membranes, dermal regeneration matrix and paraffined cotton mesh, among others, are available on the market. Dressings have the potential to transform an open and partially contaminated lesion into a clean lesion. Remembering that occlusion must be avoided only in burns in genital and facial regions<sup>28</sup>.

Therefore, in PHC in burns, it is essential to assess the extension, causative agent and depth of the injury. Approaching a burn victim, it is necessary to investigate the source of the injury and its exposure time. Then, the victim is distanced from the aggressor factor and their clothes and ornaments are removed, paying attention to the particularities of each causative agent. Only 33.3% of the sample stopped to explain this nursing assistance measure in their results<sup>29</sup>. It is worth mentioning that the interventions performed can vary according to the type of thermal agent involved in the injury, thus influencing the assistance provided.

The usual cause of death in fatal victims of fires is inhaling hot and highly toxic smoke. This smoke ends up causing internal burns, mainly in the respiratory tract. This can quickly lower the level of consciousness due to hypoxia and death from asphyxiation. 58.3% of the results show the need for monitoring the VVSS with a focus on breathing<sup>29</sup>.

Whenever possible, the Nursing team must make the immediate primary evaluation, which should not last more than 5 minutes and a secondary evaluation, focusing on maintaining airway permeability and control of the VVSS. Oxygen must be supplied 100% via a humidified mask and, in the event of carbon monoxide (CO) intoxication, the therapy continues for 3 hours with the same dosage. The airways must be aspirated and investigated for the presence of foreign bodies. The headboard will be raised to 30° and the cervical region will be kept in hyperextension. Assess and report the presence of dyspnea, cyanosis and cough<sup>30</sup>.

The more severe the burn, the greater the chances of instability in the vital parameters. Hence the importance of constant monitoring the VVSS. The injured skin, without the epidermis, tends not to control the retention of body heat. The patient must be kept warm with thermal blankets or bedspreads. The use of a pulse oximeter is not recommended, as it can mask CO poisoning. Changes in breathing such as noises, dyspnea, ineffective respiratory incursions observed by the non-full expansion of the chest, reflecting an increase in respiratory and heart rate, are also indications of inhalation burns. In extremity burns, edema is formed by local leakage of liquids, which makes it difficult to accurately measure peripheral blood pressure during PHC. Pain should be analyzed rigorously, as well as other VVSS, as it is closely linked to the stability of other parameters<sup>2,31</sup>.

As it has many nerve endings, when burned, the skin ends up injuring these endings, which generates a lot of pain. Each individual has a pain threshold and this is reflected in Nursing assistance for the reason that pain has repercussions in the physical, biological and emotional aspects. Of the studies reviewed, 41.6% identified the importance of analgesic control in PHC by nurses in caring for burn victims. Thus, there is lack of more studies that aim to assist not only the wound, but the pain it carries along<sup>32</sup>.



Analyzing the level of evidence and the degree of recommendation of the selected studies, it is possible to conclude a higher frequency of the B2 level of evidence, with a total of six studies (50%) from the sample. One study is level 2C (8.3%) and five are level 4 (41.6%). Regarding the degree of recommendation, seven studies are grade B (58.3%) and five are classified as grade C (41.6%). According to the Oxford Center for Evidence-based Medicine<sup>13</sup>, these results reveal low strength in the level of evidence and degree of recommendation of the sample, extracting from this information the need to develop more expressive research studies.

In view of what was exposed in the results and discussion, considering the relevance of the issue and the high number of traumas caused by burns worldwide, this scoping review provides subsidies for enriching the available scientific literature, describing how Nursing assistance is being developed in PHC for burn victims. The findings showed greater emphasis, in percentage, for volume replacement (66.6%), local cooling (58.3%), control of the VVS, especially respiratory control (58.3%), analgesia (41.6%) and wound care (33.3%).

However, this review is limited to studies published recently, in the period from 2016 to 2020. This time limit may have restricted some articles of greater relevance; however, all the efforts were made to search papers that met the best selection criteria and in the more accessible databases. As a result, the sample includes studies from several countries and with different populations.

## CONCLUSION

The population involved were mainly nurses who work in the burn care sector. The objectives of the publications under analysis listed and described the assistance provided by nurses in practice. As they had a level of evidence from 2B to 4 and a degree of recommendation between B and C, the sample showed shallow academic expressiveness. Finally, the results were able to evidence the care measures mainly based on local cooling of the lesion, volume replacement, use of occlusive dressings, evaluation of the wound characteristics, monitoring of the VVSS with greater observance in respiratory assessment and pain control.

With this, from the analysis of the studies, it was possible to observe that the nurse's assistance in the pre-hospital care for first- to fourth-degree burn victims is mainly performed by controlling the evolution of the damage caused by the incident until arrival at tertiary care.

Therefore, it is hoped that the present study will serve to elucidate scientific knowledge about the main Nursing assistance measures provided to burn victims seen by the emergency services, in order to contribute to the quality of the care provided, and that it will awaken the increasing interest in the production of new scientific research studies in the area and with a greater degree of academic expressiveness.

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