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REVIEW

Advanced mobile prehospital nursing care for elderly people post-trauma: integrative review

Atendimento pré-hospitalar móvel avançado de enfermagem para idosos pós-trauma: revisão integrativa

Atención prehospitalaria móvil avanzada de enfermería a ancianos postrauma: una revisión integrativa

Gláucia Costa Degani[I,II]
ORCID: 0000-0002-5848-0495

Karina Dal Sasso Mendes[II]
ORCID: 0000-0003-3349-2075

Luana Baldin Storti[II]
ORCID: 0000-0002-5428-2520

Sueli Marques[II]
ORCID: 0000-0002-4301-087X

[I] *Centro Universitário Claretiano. Batatais, São Paulo, Brazil.*
[II] *Universidade de São Paulo. Ribeirão Preto, São Paulo, Brazil.*

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Corresponding Author:
Gláucia Costa Degani
E-mail: glau_degani@yahoo.com.br

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ABSTRACT

Objective: to identify scientific evidences available on the literature on nursing interventions on advanced mobile prehospital care for elderly people post-trauma. **Method:** an integrative review of literature on the databases PubMed, CINAHL, and LILACS, from 2012 to 2017. **Results:** a sample composed by 26 studies, grouped into six thematic categories: circulation with hemorrhage control (n=11); dysfunction, neurological state (n=7); airway with protection of the cervical spine (n=3); secondary evaluation (n=3); ventilation and breathing (n=1), and environment exposition/control (n=1). **Conclusion**: Despite having identified nursing interventions, there was no description of specific nursing interventions related to advanced mobile prehospital care for elderly people post-trauma.
Descriptors: Emergency Medical Services; Aged; Ageing; Wounds and Injuries; Nursing.

RESUMO

Objetivo: identificar as evidências científicas disponíveis na literatura acerca das intervenções de enfermagem no atendimento pré-hospitalar móvel avançado para idosos pós-trauma. **Método:** revisão integrativa da literatura nas bases de dados PubMed, CINAHL e LILACS, no período de 2012 a 2017. **Resultados:** amostra composta por 26 estudos, agrupados em seis categorias temáticas: circulação com controle da hemorragia (n=11); disfunção, estado neurológico (n=7); via aérea com proteção da coluna cervical (n=3); avaliação secundária (n=3); ventilação e respiração (n=1) e exposição/controle do ambiente (n=1). **Conclusão:** apesar de terem sido identificadas intervenções de enfermagem, não houve descrição de intervenções específicas de enfermagem relacionadas ao atendimento pré-hospitalar móvel avançado de idosos pós-trauma.
Descritores: Serviços Médicos de Emergência; Idoso; Envelhecimento; Ferimentos e Lesões; Enfermagem.

RESUMEN

Objetivo: identificar las evidencias científicas disponibles en la literatura acerca de las intervenciones de enfermería durante la atención prehospitalaria móvil avanzada a ancianos postrauma. **Método:** revisión integrativa de la literatura en las bases de datos PubMed, CINAHL y LILACS, realizada en el período entre 2012 y 2017. **Resultados:** la muestra constó de 26 estudios, que fueron agrupados en seis ejes temáticos: Circulación con control de la hemorragia (n=11); Disfunción, estado neurológico (n=7); Vía aérea con protección de la columna cervical (n=3); Evaluación secundaria (n = 3); Ventilación y respiración (n=1); y Exposición/control del ambiente (n=1). **Conclusión:** en las intervenciones de enfermería identificadas, no se describían intervenciones específicas de enfermería relacionadas a la atención prehospitalaria móvil avanzada a ancianos postrauma.
Descriptores: Servicios Médicos de Urgencia; Anciano; Envejecimiento; Heridas y Lesiones; Enfermería.

INTRODUCTION

Demographic data[1] show an increase of Brazilian elderly people in the population, from 9% in 2001 to 13.8% in 2014, with the prediction of growth rates of more than 4% per year in the period from 2012 to 2022. In 2000, the population older than 60 years old was of 14.2 million, increasing to 19.6 million in 2010, with the prediction of reaching 41.5 million in 2030 and 73.5 million in 2060.

With the population ageing, the number of people with locomotion difficulty in the cities will grow expressively. Elderly people have chronical problems in the spine, vision, balance, and difficulty to walk, which can make them more vulnerable to accidents, specially due to the existence of physical barriers found in urban areas, such as the low quality of sidewalks, loose rocks, potholes, unprotected manholes, steps, obstacles, unevenness, insufficient width in the walking area[2], among others. Thus, during daily life activities, such as walking outside, going to the bank, shopping, using public transportation, or crossing wide avenues with traffic lights with inadequate time, elderly people can have accidents[3].

Accidents and violence define the intentionally of traumas, respectively, in non-intentional or accidental causes or intentional or violent causes. The trauma or traumatism means an injury[4]. AN non-intentional trauma can occur due to accidents caused by involuntary and occasional physical contact, while intentional trauma is represented by acts of violence, interpersonal or self-directed one; for example, in cases of homicide, aggression, suicide, marital violence, and war[5].

In a literature integrative review (IR) that aimed to identify the origin of trauma for elderly people, based on the databases MEDLINE, LILACS and SciELO, the authors included 25 primary studies that presented falls as the main reasons for trauma in elderly people, followed by traffic accidents. The factors leading elderly people to fall were: the use of inadequate shoes, furniture disposition, use of rugs inside their own homes, the presence of many illnesses, difficulties related to the perception of balance and the frailty of the musculoskeletal system, sedentarism, self-perception of health as bad, and the consumption of numerous medicines, specially benzodiazepine ones[6].

In another study, which analyzed 131 records of the assistance to elderly with higher severity admitted into a trauma room of a tertiary care hospital in Ribeirão Preto, São Paulo, Brazil, the prevalent trauma mechanisms were falling (31.3%), followed by trampling (28.2%) and the most affected body areas were head and limbs, caused by traumatic brain injury (TBI) and femur and hip fracture[7].

In Brazil, in 2016, regarding injuries due to external causes among elderly people, falls were in the first place in the number of hospitalizations, with 386.966 cases, that is, 34.38% of the total, followed by accidents with land transportation (206.262, 18%) and aggressions (51.526, 4.50%). Regarding deaths related to injuries due to external causes, for the same population and in the same year, falls were responsible for 8.364 of 27.533 deaths, representing 30.38% of it, transportation accidents were responsible for 5.486 (19.73%) and aggressions for 2.540 (9.10%), thus representing the three main death causes[8].

Traumas due to external causes determine the need for care starting in the place of the accident, but also in the hospital and after medical discharge, involving a series of integrated health services. The Mobile Prehospital Care (MPHC) is responsible for performing the first procedures in the place of the accident by a specialized team with the intent of stabilizing victims until their arrival at a fixed or definitive health service[9].

MPHC in Brazil was organized based on the North-American and French models of emergency care, with adaptations regarding the professional categories involved and the care and/or treatments that may be simple or complex depending on the victim's situation[10]. The advanced life care is performed at least by one doctor and a nurse, professional who have the autonomy to make decisions for the evaluation and treatment of emergencies, with technical and scientific skills to perform invasive life support measures, both at the place of the accident and during transportation. For that, they have resources/equipment to perform intensive care[11].

The nursing team acting on the MPHC and their main initial interventions are actions for circulatory control, opening airways, cervical spine control, and the immobilization of limbs with the hard stretcher, as well as measuring vital signs and capillary glucose[12].

It is necessary to stablish specific interventions for elderly care, contributing to the reduction of sequelae, since the first care may determine the trauma victim's prognosis[9].

Applying standardized actions may guarantee the quality of the service with the aim of reducing mortality rates and sequelae. Thus, the care team must be prepared and capacitated to make decisions during urgent/emergency situations.

Give that, the following research question is asked: "which are the evidences available in literature on nursing interventions related to advanced MPHC for post-trauma elderly people?"

It is believed that is essential to understand MPHC nursing interventions for post-trauma elderly people, once the Brazilian population is growing, that the lack of security in elderly mobility may result in external causes, that trauma I elderly people has specific characteristics and effects and the MPHC demands readiness in decision-making.

OBJECTIVE

To identify scientific evidences available in literature on advanced MPHC nursing interventions for elderly people post-trauma.

METHOD

This is a integrative literature review, once it performs an important role on the applicability of clinical practice[13]. The development of this review happened according to the following phases: designing the review question, stablishing criteria for literature search and for the selection of the sample, identification of the characteristics of primary research, analysis of findings, result interpretation, and the report of the review[14].

The following controlled descriptors were used (Medical Subject Headings, and Health Science Descriptors): Aged, 80 and Over, Wounds and Injuries, Nursing Care, Evidence-Based Nursing, Emergency Care, Quality of Nursing Care, Ambulances, Advanced Trauma Life Support Care, and the non-controlled descriptors

(keywords): Elderly, Trauma, Nursing Activities, Trauma Geriatric, Prehospital Mobile Emergency.

The descriptors were searched in July 2017, in the databases National Library of Medicine National Institutes of Health (PubMed), Cumulative Index to Nursing and Allied Health Literature (CINAHL) and Latin-American Health Sciences Literature (LILACS). The descriptors were combined in different ways to guarantee a wide search.

The criteria for including primary studies were: studies with elderly people (≥ 60 years old) in their sample, which approached nursing interventions related to MPHC post-trauma, published between January 2012 and June 2017, in Portuguese, English, and Spanish. The exclusion criteria were: secondary studies, which had publication duplicity in the selected databases (in this case, one study was excluded); which approached simultaneously psychiatric, gynecological, clinical or dental emergencies; exclusively pediatric emergencies; not having abstracts and/or the full text, and that were not in the human health area.

The flowchart (Figure 1) describes the path of identifying, selecting, and including the selected primary studies, according to the electronic base consulted.

The identification of the characteristics of primary research was performed by a tool[15]. Therefore, after extracting interest data, a synthetical chart was designed to summarize and document the data from primary studies, which comprised the articles' title, authors, periodical and publication year, objectives, sample details, and level of evidence.

For data analysis, a classification of evidence quality was used[16]. The data were analyzed in a descriptive way, by a text summary of the characteristics and relevant information of scientific evidences. Later on, the primary studies were grouped according to similarities and organized into thematic categories: a) nursing interventions: airways if cervical spine protection; b) nursing interventions: ventilation and breathing; c) nursing interventions: circulation with hemorrhage control; d) nursing interventions: dysfunction, neurological state; e) nursing interventions: environment exposition/control; and f) nursing interventions: secondary evaluation.

RESULTS

Regarding the year of publication, more publications were found between 2014 and 2015 (6, 23.1%), and as for the language, it was observed the prevalence of studies published in English (25, 96.2%), followed by Portuguese (1, 3.9%), and none in Spanish.

Included studies were published in 17 different journals. Regarding the journals' thematic area, there was prevalence of nursing (11, 42.3%), with the highest number of articles published in the journals Prehospital Emergency Care Journal (5, 19.2%) and Journal of Trauma Nursing (4, 15.38%), according to Chart 1.

Regarding the clinical question and level of evidence, there was prevalence of Prognosis/Prediction or Etiology clinical questions (16, 61.5%), with level of evidence IV. Based on the 26 studies included in this review, Chart 2 presents a summary of the primary studies according to title, objective, outline and sample, publication year, and level of scientific evidence.

The 26 primary studies included in the review were grouped into six thematic categories, with 11 (42.3%) in the category of nursing interventions: circulation with hemorrhage control[18-22,25,30,32-33,37,40]; 7 (26.9%) in the category of nursing interventions: dysfunction, neurological state[27-29,31,34-35,41]; 3 (11.5%) in the category of nursing interventions: airways with cervical spine protection[24,26,36]; 1 (3.9%) in the category of nursing interventions: ventilation and breathing[23]; and 1 (3.9%) in the category of nursing interventions: environment exposition/control[17].

In Chart 3, it is possible to verify the summary of nursing interventions identified in the primary studies according to their thematic categories.

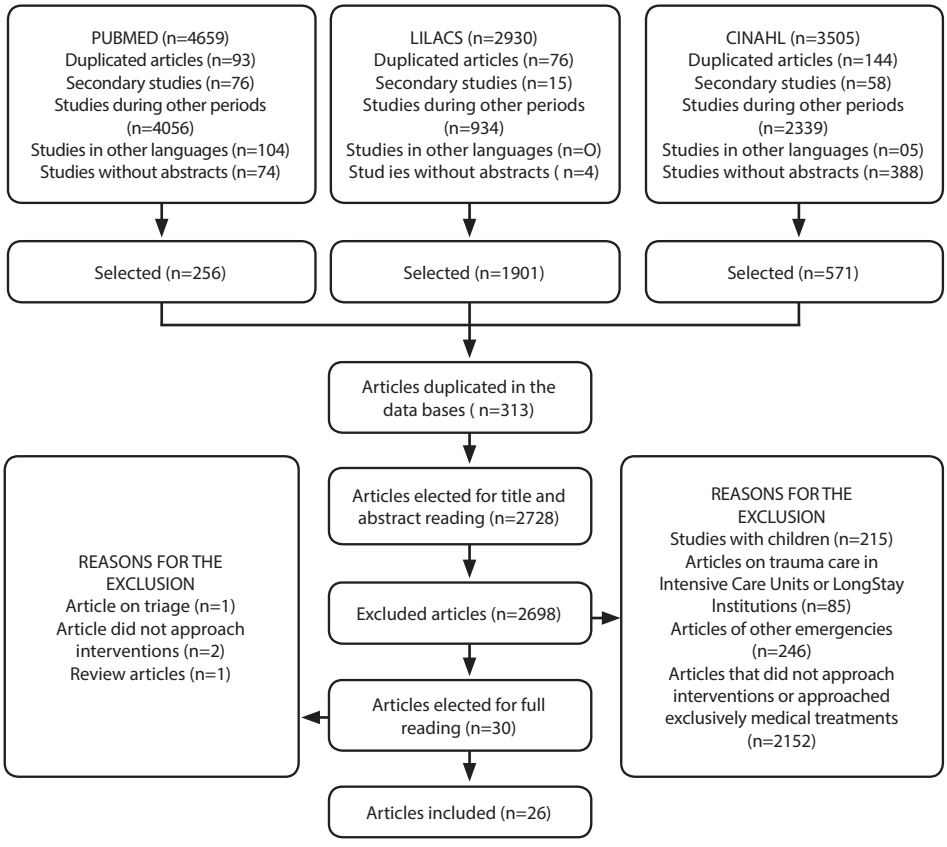

Figure 1 - Flowchart of identification and selection of primary studies, in the search performed in the selected databases, for the inclusion in the integrative review, Brazil, 2017

Chart 1 - Distribution of primary studies included in the integrative review according to thematic area, name of the journal, and number of articles, Brazil, 2017

Thematic area	Name of the journal	n	%
Nursing	Journal of Trauma Nursing	4	15.4
	Critical Care Nursing Quarterly – Journals	1	3.9
	Iranian Journal of Nursing and Midwifery Research	1	3.9
	Nursing Midwifery Studies Journal	1	3.9
	Revista de Enfermagem UFPE On Line	1	3.9
	International Journal of Orthopaedic and Trauma Nursing	1	3.9
	Australasian Emergency Nursing Journal	1	3.9
	Journal of Clinical Nursing	1	3.9
Trauma/ surgery	Journal of Trauma and Acute Care Surgery	3	11.5
	The American Surgeon	1	3.9
	Trauma Monthly (An International Journal in the Field of Trauma and Emergency Medicine)	1	3.9
	Injury – International Journal of the Care of the Injured	1	3.9
Prehospital	Prehospital Emergency Care Journal	5	19.2
	Prehospital and Disaster Medicine Journal	1	3.9
Geriatrics	Journal of the American Geriatrics Society	1	3.9
Other	South African Medical Journal	1	3.9
	Iranian Red Crescent Medical Journal	1	3.9

Chart 2 - Summary of primary studies according to title, objective, outline and sample, publication year, and level of scientific evidence (2012-2017), Brazil, 2017

Title	Objective	Outline/ Sample	Publication year / Level of evidence
Evidence-based thermoregulation for adult trauma patients[17]	To develop a protocol for implementing the evaluating care with thermoregulation, based on evidence, for adult patients with trauma during the treatment in the emergency department.	Cohort -	2012/V
Development of a geriatric resuscitation protocol, utilization compliance, and outcomes[18]	To develop a protocol for geriatric resuscitation based on lactate measures, to consult geriatric trauma surgeons to assess the compliance to the protocol and analyze the outcomes before and after implementing the protocol	Cohort Pre-implementation n=1157 Post-implementation n=585	2012/IV
High-risk geriatric protocol: improving mortality in the elderly[19]	To asses the efficiency of a protocol for high-risk geriatric patients used during the last five years	Transversal n=4.534	2012/IV
Assessing guidelines for the discontinuation of prehospital peripheral intravenous catheters[20]	To identify the period in which peripheral intravenous catheters (PVC) punctured during Prehospital Care (PHC) of trauma patients were removed and to determine the complication rate at the moment of discontinuing the PVC.	Transversal n=365	2012/IV
A comparison between the effects of simple and traction splints on pain intensity in patients with femur fractures[21]	To determine and compare the effects of using traction and simple splints over pain intensity immediately after, and one, six, and twelve hours after, for patients with femur fractures care for in medical centers of an Iranian university.	Quasi-experimental n=32	2012/IV
Association between a Geriatric Trauma Resuscitation Protocol using venous lactate measurements and early trauma surgeon involvement and mortality risk[22]	To investigate if the implementation of a geriatric resuscitation protocol using lactate-guided therapy with the involvement of trauma surgeons is connected to lower mortality during the precocious recognition of occult hypoperfusion.	Prospective Cohort n=1.998	2013/IV

To be continued

Chart 2

Title	Objective	Outline/ Sample	Publication year / Level of evidence
The quality of pre-hospital oxygen therapy in patients with multiple trauma: a cross-sectional study[23]	To investigate the quality of prehospital oxygen therapy for multiple trauma patients.	Transversal n=350	2014/IV
Efficacy of prehospital spine and limb immobilization in multiple trauma patients[24]	To investigate the epidemiology of trauma and the quality of cervical spine and limb immobilization in multiple trauma patients in Iran	Transversal n=400	2014/IV
Utilization of prehospital intravenous access[25]	To describe the use of intravenous therapy (IV) in the South-African prehospital scenario and to determine the proportion of intravenous access considered unnecessary when classified into the South-African triage classification chart.	Transversal n=242	2014/IV
Cervical Spine Fractures in elderly patients with hip fracture after low-level fall: an opportunity to refine prehospital spinal immobilization guidelines?[26]	To explore the prevalence of cervical spine fracture in elderly population with fracture of long bones due to low-level falls, in the state of Minnesota, United States	Transversal n=1.394	2014/IV
The implementation and evaluation of an evidence-based statewide prehospital pain management protocol developed using the National Prehospital Evidence-based Guideline Model Process for Emergency Medical Services[27]	To access the impact of adopting a handling protocol in PHC, Maryland Institute for Medical Emergency, United States.	Transversal n=19.910	2017/IV
Initial emergency nursing management of patients with severe traumatic brain injury: development of an evidence-based care bundle for the Thai emergency department context[28]	To describe the development of an evidence-based care bundle for initial nursing evaluation of patients with severe traumatic brain injury (TBI) for a Thai emergency context	Transversal -	2014/ IV
Infrequent assessment of pain in elderly trauma patients[29]	The study's main objective was to identify and describe patterns for pain evaluation for a geriatric trauma population (≥ 65 years). Specific objectives: to describe the frequency of pain evaluation and to determine if the evaluations are being performed in the intervals demanded by hospital protocols. To describe pain evaluation methods to verify if self-reporting and behavioral tools were fit.	Transversal n=587	2014/IV
Systolic blood pressure criteria in the National Trauma Triage Protocol for geriatric trauma: 110 is the new 90[30]	To assess the impact on mortality by substituting for systolic blood pressure SBP < 110 mmHg in the triage of adult and elderly patients of *The National Trauma Triage Protocol*.	Retrospective cohort n=1.555.944	2015/IV
Using an evidence-based care bundle to improve initial emergency nursing management of patients with severe traumatic brain injury[31]	General objective: to test the feasibility of an evidence-based care bundle in a Thai emergency service. Specific objective: to examine the impact of implementing the care bundle on initial nursing care for patients with severe traumatic brain injury (TBI).	Cohort Pre-test n=20 Post-test n=25	2015/II
Activation of massive transfusion for elderly trauma patients[32]	To revise the use of massive transfusion protocol (MTP) for elderly patients. To compare results after activating MTP in elderly trauma patients for their younger counterparts to determine whether older age predicts higher mortality after activating the MTP.	Transversal n=66	2015/IV
Intravenous access in the prehospital settings: what can be learned from point-of-injury experience[33]	To analyze prehospital data on peripheral venous access and to validate the clinical practice guidelines by the Israel Defense Forces Medical Corps.	Cohort n=1082	2015/IV
Pain management in trauma patients in (pre) hospital based emergency care: current practice versus new guideline[34]	To evaluate id the current pain handling practice is in compliance to the *Pain managements for trauma patients in the chain of emergency care* of the Association for Emergency Nurses, in Dutch, Netherlands. And to assess the precocious pain treatment for traumatized adults in emergency care.	Transversal n=1.066	2015/IV
Identification of a neurologic scale that optimizes EMS detection of older adult traumatic brain injury patients who require transport to a trauma center[35]	To identify a scale or its components that may enhance the detection of elderly patients with EMS, who need to be transported to a trauma center, regardless of the trauma mechanism.	Transversal n=15	2015/V

To be continued

Chart 2 (concluded)

Title	Objective	Outline/ Sample	Publication year / Level of evidence
Patients immobilized with a long spine board rarely have unstable thoracolumbar injuries[36]	To determine the prevalence of unstable thoracolumbar injuries among patients who underwent spine immobilization during PHC.	Transversal n=5.593	2016/IV
The quality of pre-hospital circulatory management in patients with multiple trauma referred to the trauma center of Shahid Beheshti Hospital in Kashan, Iran, in the First Six Months of 2013[37]	To investigate the quality of treatment for circulation priority in PHC of multiple trauma patients.	Transversal n=400	2015/IV
The use of broad geriatric evaluation by nurses from an emergency hospital[38]	To identify whether the Broad Geriatric Evaluation (BGE) is used as a tool by nurses in geriatric triage.	Transversal n=15	2016/IV
Delta Alerts: changing outcomes in geriatric trauma[39]	To stablish a third level trauma alert for geriatric trauma.	Transversal -	2016/VI
Prehospital fluid administration in trauma patients: a survey of state protocols[40]	To characterize emergency medical services protocols for intravenous fluid administration during the initial treatment of hypotensive trauma patients.	Transversal n=27	2017/IV
Initial testing of a behavioral pain assessment tool within trauma units[41]	To assess the results of initial test of the Bolton Pain Assessment Tool (BPAT).	Transversal n=46	2017/IV
Do EMS providers accurately ascertain anticoagulant and antiplatelet use in older adults with head trauma?[42]	To identify if health professionals have evaluated the use of anticoagulant and antiplatelet for severe brain injury elderly patients.	Transversal n=2.110	2016/IV

Chart 3 - Summary of nursing interventions identified in the included primary studies according to their thematic categories, Brazil, 2017

Thematic category	Nursing interventions identified in the studies of the integrative review
Nursing interventions: circulation with hemorrhage control	Measuring blood pressure (BP) and heart rate (HR)[18-19,22,28,30]; controlling active bleeding through an adequate bandage on the injury[40]; Guaranteeing antisepsis for inserting the intravascular device. Inserting a thick intravascular device away from the wounded area. Limiting attempts to insert the intravascular device [20,25,33]; Initiating volume replacement therapy [32] and controlling infusion volume[28,37,40]; Examining the injured limb (feeling, movement, distal pulse and color) [37]; Immobilizing fractured limbs [21], one articulation above and the other below the injured area and selecting the right splint size to fixate fractures[24]; Removing clothing from injured limbs, without handling fractures in the trauma scene [37].
Nursing interventions: disfunction, neurological state	Evaluating pain in elderly people through evaluation scales[29,41] and treating pain[28] in patients with fractures, contusions, soft tissue injuries with rest, ice, compression, and elevation[27,34]; Evaluating the level of consciousness with the Glasgow Comma Scale (GCS), emphasizing the alertness level and whether the patient responds to commands[28,35]; Evaluating pupil response [28,31].
Nursing interventions: airways with cervical spine protection	Selecting the appropriate cervical collar [36]; Keep the patient's head in a neutral position (without rotation, flexion or extension); aligning head, body and limbs in a neutral position [24,28]; Being attentive to cervical being reports by elderly people [26].
Nursing interventions: secondary evaluation	Collecting data on the mechanism of trauma [39], use of medicines[42] and age[38].
Nursing interventions: ventilation and breathing	Performing pulmonary auscultation. Assessing breathing rhythm. Evaluating oxygen saturation. Administrating oxygen [23,28].
Nursing interventions: environment exposition/control	Document environmental temperature. Providing blankets and warming fluids [17].

DISCUSSION

The analysis of selected studies allowed for the identification of thematic categories of advanced MPHC interventions for post-trauma elderly patients, namely, nursing interventions: circulation with hemorrhage control; dysfunction, neurological state; airways with cervical spine protection; secondary evaluation; ventilation and breathing; and environment exposition/control.

In the category of nursing interventions: circulation with hemorrhage control, the measures for precocious identification and control of hemorrhagic shock composed the evaluation of vital signs, which constituted one of the parameters for initiating

precocious treatment measures, such as systolic blood pressure (SBP) < 90 mmHg[30] and/or HR > 120 bpm[18], besides considering the trauma mechanism (such as head trauma, more than two rib fractures, pulmonary contusion, among others), one or more items of health history (such as the use of anticoagulants, history of heart diseases, chronical hepatic failure), and GCS < 14 points[19], and lab blood data (venous lactate measure) and the evaluation by a trauma surgeon in the emergency service[22].

Regarding measures to control hemorrhagic shock, even with physiological differences related to age, the activation of massive transfusion must be considered for elderly patients, since this population may respond positively to precocious aggressive blood transfusion[32]. The quality of treatment for patients older than 90 years old during the transportation by the prehospital service was related to the following interventions[35]: lack of active bleeding when admitted to the trauma center for patients with penetrating trauma; adequate bandages for each injury; inserting ´peripheral thick intravenous access (18 g or more) and selecting the limb for puncture away from the injured area; proper fixation of intravenous accesses; when SBP < 90 mmHg, inserting at least two intravenous accesses and beginning volume replacement therapy. Regarding the volume replacement, despite the lack of a standardized approach for the initial treatment of hypotension post-trauma patients (SBP > 90 mmHg), the strategies for estimating the volume vary, but they include strategies for the administration of standard *bolus* of 200mL, 250 mL, 500 mL, and 1 L, as well as strategies based on the patient's weight, such as 20mL/kg, and a maximum dose of 2L, without medical control. Regarding the type of fluids, there were recommendation for using normal saline solution, ringer lactate, and normal saline solution or ringer lactate[40].

Another theme in this category was the insertion of intravenous devices, and the results indicate that the practice of preventive intravenous access during PHC does seems not to have additional advantages for the patient's well-being[25], that substituting peripheral intravenous catheters during PHC should be less focused on time since the insertion and more on improving the aseptic technique[20] and there are recommendations for limiting the number of intravenous catheter insertions during PHC to two attempts, followed by a reevaluation of the need for another more invasive access[33].

Regarding the effects of using traction and simple splinters on pain intensity for patients with femur fractures, there is evidence supporting the superiority of using traction[21]. Limb injuries should be immobilized before the patient is transported and traction splinters are indicated temporarily for femur fractures, since its proper application helps to control blood loss, reduces pain and avoids the aggravation of soft tissue injuries[45].

The programs for polytrauma care[5,43] recommend precocious monitoring of elderly cardiovascular system, with attention to vital signs, since they are not good shock indicators, and to urine debt, which is not a good indicator of perfusion in elderly patients[5], besides carefully monitoring the administration of crystalloid solutions to prevent electrolytic disorders. The indication of blood transfusion does not differ from what is determined for younger victims; however, it should not be indiscriminate, due to the risk of infections caused by the blood, of compromising the host's immune response and alterations in blood viscosity[43]. Performing a complete evaluation of all blood loss sources and, if necessary, performing direct compression on open wounds, stabilizing or immobilizing fractures and transporting quickly elderly people to the trauma center[5].

In the category dysfunction and evaluation of neurological state, an appropriate tool for pain evaluation for post-trauma elderly patients (≥ 65 years old) was appointed, with its suggested use at frequent intervals during the hospitalization, since it is possible that flaws in pain evaluation or treatment in traumatized elderly patients may delay their return home or increase the probability of them needing specialized care after being discharged[29]. A tool for pain evaluation in trauma, for example, for patients with cognitive deficiency in trauma centers includes aspects involving the family or care giver and is in study phase[41].

Regarding pain treatment, it is possible to perform it during the prehospital care, during transportation of patients with traumatic injuries or burns. Morphine was the chosen drug, and, with the implementation of the protocol for prehospital pain treatments, there was an increase in the dose of narcotic analgesic administrated for treating traumatic pain, however, it was consistent to what is recommended by international literature[27]. Non-pharmacological treatment of patients with fractures, contusions and soft tissue injuries involved resting, ice, compression, and elevation[34].

Concerning the evaluation of the neurological state, all three primary studies included in this category referred to the evaluation of TBI patients[28,31,35]. The authors of the study[28] developed a nursing care plan for severe TBI patients to be used in a Thai emergency context, and it comprised the following nursing activities: stablishing safe airways along with spine protection (precocious intubation, open and clear airways, using mandible traction, manual stabilization during intubation; insertion of an appropriate cervical collar and proper fit; keeping oxygen adequation and ventilation (monitoring oxygen saturation – SaO_2 – continuously, keeping SaO_2> 90%); monitoring ventilation using capnography; observing the ventilatory frequency (VF) regularly; keeping circulation of fluid volume balance (administrating intravenous solution with isotonic fluids, monitoring blood pressure and keeping SBP> 90 mmHg, monitoring electrocardiograms and HR); applying GCS and notifying the doctor/neurosurgeon in case of GCS reduction or dilated, asymmetric pupils, slow response or non-responsive; keeping brain venous flow through the maintenance of head and neck in neutral alignment; keeping bed head at 30º (unless contraindicated); certifying that the cervical collar is positioned correctly; treating pain, agitation, and irritability; administrating sedation before intubating; administrating analgesic; immobilizing limb fractures; perform urine characterization; observing agitation/cough signs and referring to urgent CT scan, it vital signs are stable. After testing the feasibility of the nursing care plan, there were significant improvements in the clinical care for severe TBI patients, specially when referring to the use of final monitoring of carbon dioxide through capnography, the systematic evaluation (at each 15 minutes) of VF, HR, BP, neurological state, and the patient's pupil response; besides its positioning (bed head elevation at 30º)[31].

The study, in its turn, aimed to identify a scale or elements that could help identifying TBI in patients (≥ 55 year old) during PHC transportation, aiming to ease the triage to a trauma center. A panel of specialist evaluated many scales and concluded that the domains, alert level (alert versus non-alert), and motor function

(responding to commands versus not responding) were fit to be used in the identification of TBI in elderly patients during their transportation to a trauma center. However, the authors suggest that new studies should be carried out.

It is recommended to distinguish the chronical state of neurological alterations of acute ones in elderly people[5]. A quick evaluation on the use of anticoagulant and the consequent correction with blood compounds may improve the results of severe brain contusions and the computerized tomography (CT) of the brain provides important information[43].

Nursing interventions related to the category airways with cervical sine protection have mentioned that the quality of spine and limb immobilization of post-trauma adult and elderly patients had considered the following items: examining the injured limb (sensation, movement, distal pulse, and color); immobilizing the articulations above and below the affected area; selecting the adequate splint size for fracture fixation; removing clothing from injured limbs, without manipulating the fracture at the trauma scene; selecting the appropriate cervical collar (from shoulders to neck); keeping the victims head in a neutral position (with no rotation, flexion or extension); and aligning head, body, and limbs at a neutral position[24]. While other studies[26,36] have presented epidemiological aspects of spine fractures and injuries among patients that had their spines immobilized during PHC. There were evidences that elderly patients who presented hip fractures during the fall had less risks of cervical trauma[26].

Programs for polytraumatized care[5,43] recommend stablishing and keeping permeable airways and, for that, it is possible to perform precocious intubation for elderly patients in shock, who present injuries in the chest wall or alterations in the levels of consciousness. Due to the possibility of obstruction of airways, nurses should inspect teething, tongue increasement, and broken tooth prothesis. It may be necessary to increase the force applied in the bag-valve-mask, in order to overcome the increase in chest wall resistance. The protection of spine with a collar must be carefully performed, specially for elderly patients with severe kyphosis, and care should be taken to prevent pressured injuries when positioning them in rigid stretchers.

In the secondary evaluation category, the authors of the studies[38-39] have approached issues on the components of neurological evaluation or tools for data collection for elderly post-trauma care (≥ 60 years old). In a study[58], the authors aimed to identify if the BGE was used by the nurses as a data collection tool for the triage of elderly patients in an emergency service, since, according to the author, it allows for the identification of problems non-diagnosed by other evaluation tools, besides presenting predicting criteria for elderly morbidity and mortality. The results have showed that the BGE was not used by the nurses as a guiding tool for elderly triage.

While in another study[39], the authors have stablished components that allowed for the precocious identification of elderly patients (≥ 65 years old) with more severity in trauma, represented by: those who used anticoagulants; victims of bicycle or less severe traffic accidents; who presented TBI or spine trauma or any trauma that could lead to injuries.

In relation to another study[42], the authors have identified the use of anticoagulant and antiplatelet by patients older than 55 year old with TBI admitted to emergency services in the United States. The anticoagulants and antiplatelets identified in the research were warfarin, direct oral anticoagulants, aspirin and other antiplatelet agents (for example, clopidogrel). The collection of medicine use during PHC can be improved with the education and capacitation of professionals acting of this care service.

There are indications that the precocious use of invasive monitoring, the identification of pre-existing clinical diseases, and the use of medicines have increased survival rates for elderly patients, besides, after the victim's stabilization during initial evaluation, it is recommended for the treatment of musculoskeletal injuries in elderly people to be the less invasive possible, however, it should be definite. The focus on precocious mobilization and on the proper nutritional support allows for better post-trauma recovery[43]. In this sense, it is suggested that post-trauma elderly patients should be transported to specialized trauma centers[44] and that they should receive multi-professional evaluation, including a geriatric doctor, for a specific approach to the polytraumatized elderly patient[45].

Regarding the ventilation and breathing category, in a certain study[23], it was investigated the quality of oxygen therapy for patients with multiple trauma (aged from two to 90 years old, an average of 34 year old) during the transportation by the prehospital service to a trauma center, based on a four-item tool: i) performing pulmonary auscultation; ii) evaluating ventilatory rhythm; iii) evaluating oxygen saturation; and iv) administrating oxygen. The results suggest monitoring oxygen saturation during prehospital transportation to assess the need for oxygen therapy and recommend the implementation of protocols based on evidences on this treatment.

For the priority of ventilation and breathing care in post-trauma elderly patients, it is necessary to monitor the respiratory system carefully and to administrate supplementary oxygen as soon as possible, keeping saturation above 95%, even when there is a pulmonary disease[5], as well as to balance pain and the use of narcotic drugs in cases of chest injuries, preserving the efficiency of ventilatory function[43].

In the environment exposition/control category, researchers[17] have developed a protocol to assess thermoregulation care for adult patients, aged from 30 to 50 years old, with trauma assisted by an emergency area. Among the body temperature heating interventions, it is highlighted: to document environment temperature; provide cotton or forced-air blankets; heated oxygen therapy; heating blood products and other fluids; and aggressive re-heating (extracorporeal heating, heart bypass).

It is recommended to protect against hypothermia and hyperthermia, considering that, for elderly people, hypothermia that is not related to shock can indicate hidden diseases such as sepsis, endocrinal diseases, or pharmacological causes; the need for tetanus immunization should be investigated[43].

Study limitations

There was no description of specific nursing interventions related to advanced MPHC in post-trauma elderly patients. Most evidence described the quality of interventions of local trauma care protocols, being nursing interventions developed in trauma centers or PHC interventions involving adult and elderly patients.

Contributions to the Nursing and Public Health areas

Since it was impossible to identify nursing interventions associated to the specificities of elderly patients related to advanced post-trauma MPHC, this study aims to contribute to the development of researches filling this gap.

CONCLUSION

Based on the studies analyzed, some interventions for advances MPHC for post-trauma elderly patients are considered, such as continuously monitoring vital signs, specially blood pressure and heart rate; controlling the injury's active bleeding; performing antisepsis during the insertion of intravascular devices; controlling replacement volume; examining and approaching the injured limb; evaluating pain in elderly patients with proper scales and treating it; evaluating the level of consciousness and pupil response; selecting the proper-sized cervical collar, with head alignment and attention to cervical pain; collecting data on the trauma mechanism; using medicines and age; performing physical chest examination; measuring oxygen saturation and administrating oxygen; and documenting environment temperature and heating the patient.

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