

REVIEW

Herding cats: ethics in prehospital triage

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Abstract

Objective: Triage can create an ethical slippery slope when providing prehospital emergency health care. In triage decisions, emergency management is like the idiom of “herding cats”, which refers to managing or controlling the chaos and organizing people toward common goals. The purpose of this literature review is to explore the ethical framework of prehospital triage and to provide a critical view of the subject.

Methods: Published materials related to “triage”, “ethics”, and “prehospital emergency medicine” were extracted from online databases and books from 1985 until February 2021. The papers were handled in seven themes including the historical basis, the importance of the triage, ethical considerations in prehospital triage, justice, assessment and decision-making, the variability of triage assessment criteria, and the reliability of triage decisions. Except for the historical basis and the importance of triage, the other five groups were discussed with an ethical critique of the content. The methodology in this article is based on a critical interpretation of discussions on triage through ethical approaches.

Results: There are three basic ethical approaches to triage: utilitarianism, beneficence, and justice. Due to the historical military basis of triage, results-focused approaches have become more prominent. Ethical values in prehospital triage include the issues of human rights, moral rights, social justice, and beneficence. Ethical difficulties in triage decision-making involve vulnerability, limited resources, the concern of safety, the urgency of the situation, and instability. Triage decisions may be affected by subjective approaches such as the personal values and beliefs of the decision-makers.

Conclusions: Three predominant ethical concepts in triage are utilitarianism, beneficence, and justice. The unique dynamics of the field influence triage decision-making in a variety of ways. The way triage is structured makes it more amenable to subjective influences. Considering the differences in prehospital triage models and approaches, there is an important need for an ethical framework that expresses clear values and principles that will guide prehospital emergency caregivers. In this paper, it is suggested that an ethical framework should include the following six headings: basic bioethical principles, distributing scarce resources, decision-making process, community support, assessment criteria, and promote the common good.

Keywords

Prehospital emergency medicine; Triage; Management; Decision-making; Justice; Ethical theories

1. Introduction

In prehospital emergency medicine, health care providers and patients face unique medical issues and ethical conflicts. While certain ethical conflicts are present in other medical specialties, the conflicts pertaining to prehospital emergency medicine are particularly interesting because of the novel implications for health care provider practice, and patient and family experiences of care [1–6]. An *ethical conflict* may arise when the demand for health care overwhelms the supply of medical care resources, such as ambulances; an ethical conflict can arise quickly during a disaster or mass casualty incident. Triage is

the process of prioritizing patients on the basis of their clinical acuity. This process is essential for the effective management of emergency patients when there is an insufficient supply of resources to match the demand for health care [7, 8]. Even if prehospital emergency caregivers (PECs) are not constantly aware of the tension between supply of resources and demand for health care, they will employ triage when deciding who to treat between two patients who arrive at the same time and under similar conditions.

The type of triage relevant for this paper is *trauma triage*, which is the infield selection and evaluation process to deter-

mine the priority for treatment and transport in situations where the number of patients who need medical attention is high and resources and space are limited. The findings of this paper have been informed by discussions with PECs who have had physical contact with the injured people in field. This paper discusses the structure of prehospital field related to triage, evaluating basic approaches for using triage in emergency management, and performing an ethical critique of triage and triage systems.

2. Methods

This literature review discusses the ethical conflicts that arise during triage in prehospital emergency medicine. Using a number of keywords (triage, ethics, and prehospital emergency medicine), this literature review conducted a search for relevant articles and books published between 1985 and February 2021 in the following databases: Web of Science (Thomson Reuters, New York, New York USA), PubMed (National Center for Biotechnology Information, National Institutes of Health, Bethesda, Maryland USA), Cochrane Library (The Cochrane Collaboration, London, United Kingdom), Scopus (Elsevier, Amsterdam, Netherlands), and Google Scholar (Google Inc., Mountain View, California USA).

Accordingly, the papers were handled in seven different themes of information: including the historical basis of triage, the importance of triage for prehospital emergencies, ethical considerations, distributive justice and the principles of utilitarianism and egalitarianism, decision-making in triage, the variability of triage assessment criteria, and triage systems and the reliability of triage decisions. However, this paper also mentions overlaps between the themes of information as some articles contained arguments that related to multiple themes. All seven themes are critiqued ethically in this paper.

The methodology of this article is based on a critical interpretation of discussions on the issue, through ethical approaches with PECs. Thus, the four basic principles of medical ethics are not mentioned separately, but the principle of justice is specifically mentioned in the relevant context.

2.1 The historical basis of triage: differences between military and civilian triage

While this paper deals with the issue of civilian triage, discussing the philosophical premises of triage can offer clarity for its application. Triage originated from the French word “trier” that was primarily used in the context of military systems [9–14]. Treating patients equally in all areas of medical practice is a fundamental ethical principle. The application of this basic principle to wounded soldiers on the battlefield is almost necessary and expected. Providing equal treatment is also more practical in a military setting because there are few overt differences between soldiers; they are mostly in the same uniform and approximately the same age. Notwithstanding, providing equal treatment is more challenging in civilian triage because of major demographic and cultural differences.

Another difference between military and civilian triage comes from the focus of triage criteria. Military triage focuses

on maintaining the ability of the wounded to return to battle and duty [15]. In this way, the military perspective towards medical triage prioritizes the number of soldiers and their functionality. The one exception to where functionality does not apply is the advanced medical treatment needed for soldiers who are seriously injured on the battlefield. The logic of military triage is to “leave to die in dignity”, which is contradictory to the principles and logics that guide civilian triage [15]. Especially, it is a standard of practice for trauma surgeons to avoid spending time and resources on complex operations with low success rates [16].

From the standpoint of the facade discipline, soldiers who are more likely to return to combat are prioritized over soldiers who require greater resources and time for recovery. To this end, the triage of soldiers who are seriously injured or who require advanced medical intervention are evaluated to maximize the efficient use of limited resources.

The principle of “treating minor injuries first” is simple and easy to apply in the military perspective as well. This approach can also be referred to as “reverse triage”; however, this approach may lead to extreme consequences on humanitarianism. For example, in the 1982 Lebanon war, surgeons started operating on a soldier with a complex injury, only to have them executed by the commander because of the time and resources they would have taken for completing the treatment [17]. It should not be overlooked that the military triage system is basically “number focused” and this is in stark contrast with the principles that guide civilian triage.

2.2 The importance of triage

The military origins of triage have served as the foundation for civilian triage during mass casualty incidents. In situations where trauma threatens the lives of victims, triage can be a crucial way to provide efficient delivery of health care. Furthermore, triage can aid in providing timely and adequate prehospital emergency medical interventions, which may ultimately reduce the mortality rates of trauma patients [18].

The majority of trauma deaths occur in prehospital settings [19]. Some studies have reported that 15-21% of all trauma deaths are considered potentially preventable [20, 21]. In trauma-related injuries, death usually develops rapidly within six to 12 hours [22, 23]. In terms of the time of death, 50% of deaths due to trauma occur within the first few minutes [24, 25]. For this reason, prehospital triage is very important in trauma situations.

If triage is not applied adequately, undertriage puts patients at risk, whereas overtriage results in system strain. There is clear ethical conflict between two principles, beneficence and non-maleficence, that may affect the ethical distribution of health care services. Careful triage of trauma patients is pivotal in achieving optimum outcomes in patients. Mortality and morbidity can be reduced through effective management including identification, in field triage, and transport of injured patients to appropriate hospitals. However, in mass casualty triage, it is a reasonably difficult case due to two issues: minimizing the group’s overall morbidity and mortality and distributing patients to prevent overwhelming hospitals.

2.3 Ethical considerations in prehospital triage

While some ethical principles such as equality are particularly pertinent for the context of prehospital triage, a broader ethical discussion about mass casualties is highly relevant and needed [26]. In a mass casualty incident, there are two relevant ethical concepts. The first one is the individual virtues of the people who apply triage such as prudence, courage, justice, stewardship, vigilance, resilience, self-effacing charity, and communication [27]. The second concepts are the principles that the health service organization or emergency system advance, such as the organizational vision, mission, and values. The second one is a relatively slow but objective approach to disseminating corporate philosophy, such as preparing for disasters, eliminating technical and logistical deficiencies, and providing triage training to staff. The guiding principles of individual values are nourished as professional values, maintained by individual attitudes of staff, and can be partially changed by professional education [17, 28]. The key principle of both two concepts is beneficence.

Ethical inquiries in prehospital triage include issues of human rights, vulnerability, limited resources and options, justice, insecurity, urgency, instability, and decision-making in limited time. Due to these complexities, ethical approaches to decision-making during triage have generally been speculative, tentative and lacking, and remain an ongoing area of research [29]. However, triage is difficult to justify in terms of ethics on a daily basis in medicine. Triage must be replaced by other approaches in the allocation of health services for upholding human rights in routine medical practice [17, 30, 31]. Triage is only used in routine medical practice in situations where there are no other alternative courses of action.

There is a persistent ethical tension between two approaches or principles when discussing triage arguments [32]. One of these approaches is to maximize the “lives/benefits” of the greatest number of people; “do the greatest good for the greatest number of patients”. The other approach is to equip each patient with equal opportunity for receiving medical intervention. It can be said that the first approach is “results-oriented”, and the second approach is “intention-focused”. The philosophers of J. Bentham and J. S. Mill advocated for the biblical approaches, John Taurek (Should the Numbers Count?) and J. Harris (The Value of Life) promoted the intention-focused approach (equal chances) [13, 33, 34].

The first approach can be summarized as seeking to treat the greatest number of injured people with the quickest treatment methods. The first approach promotes the rapid assessment of patients who are easier to treat, and priority-setting and allocation in health service delivery and transport. So, in the military context, the measure of success in the first triage approach is the number of soldiers/people saved at the end of the battle. The majority of triage models applied in civilian settings are grounded in this basic philosophy since it emphasizes the treatment of the greatest number of people in a limited time frame.

The function the two basic approaches to triage discussed in this section is to guide practitioners and offer an ethical assess-

ment of their values and principles. Each approach has critical aspects that practitioners must reflect on. These approaches broadly reflect Aristotelian virtues, Kantian duty-based (deontological) ethics, utilitarianism, communitarianism, or liberal approach [35]. Health care providers must be aware of the ethical discussions surrounding distinct approaches to triage, which may aid them in acting in an ethical manner.

Finally, according to some studies, there are three basic ethical values that are pertinent for the field of prehospital emergency medicine: social justice, utilitarianism, and moral rights [36, 37]. However, there is an important divergence between the values of health care professionals and the values prioritized by the ambulance system [36, 38]. When making decisions about health care, PECs emphasize social justice and moral rights, while ambulatory organizations advocate for utilitarianism. Notwithstanding, the examination of triage through ethical principles remains incomplete [39]; there is an opportunity to examine triage from the standpoint of other ethical approaches and theories such as humanitarianism.

2.4 Justice, equity, and equality

The way in which limited healthcare resources are managed and allocated is an ongoing discussion that involves invoking the ethical concept of distributive justice [40, 41]. In situations where there are limited health care resources, the principle of distributive justice is assessed on the issue of allocation/distribution of resources within ambulance services. In prehospital settings, distributive justice may be examined in light of the following three principles: equal chances, utilitarianism, and egalitarianism.

The principle of equal chances is similar to the phrase “first-come, first-served” in routine medical practice. However, the application of this approach is impractical in prehospital emergency medicine. Patients with minor injuries will likely arrive first to receive care because they are likely more physically capable of travelling to a health service organization. In this way, patients are not clinically equally and prioritizing patients who arrive first will rapidly consume health care resources before the arrival of patients with complex injuries that may require urgent medical interventions [42].

The utilitarian approach is an outcomes-focused approach that emphasizes “the greatest good for the greatest number of people”. This approach optimizes emergency care for the maximum number of patients. Disaster triage decisions are inherently utilitarian in nature [32], and despite the potential for injustice at the individual level, society may consider utilitarian theory as more appropriate for mass casualty incidents [41]. Yet, the main discussion is not exactly based on the concept of utilitarianism but egalitarianism. According to egalitarianism, emergency care resources would be directed to patients with the most severe injuries that require complex medical care. However, the challenge with egalitarianism is that it may use scarce resources on patients with complex injuries who may have a low survival rate; resources that could have been used to save patients with minor injuries have therefore been wasted (futility).

Furthermore, according to the principle of equality, PECs are required to adopt an attitude that opposes discrimination

and injustice, and provide equal and accessible health care to all those in need, especially to vulnerable groups [43, 44]. This principle is also reflected in the emergency medicine code of ethics [44, 45]. Equality is the basic principle to guide medical practice; in triage, health care should not be distributed according to age, gender, nationality, political and religious beliefs as an election criterion [46]. The point at which ethics and medicine intersect is deciding the criterion for who receives emergency medical intervention.

2.5 Assessment and decision-making process

In the case of a large number of injured patients, PECs' value system is the main facilitator of ethical decision-making, with many internal and external determinants affecting the situation [47]. Ethical decision-making is influenced by the subjective values of decision-makers which address ethical relativism; however, there is also a need to consider how decision-making affects other patients. In most situations, triage is an informal process where decisions are made *ad hoc* and implemented in a variety of ways [48]. Moreover, differences in ethical decision-making may arise not only among emergency health care professionals, but also between each professional group such as emergency technicians, nurses, and physicians [49, 50]. Therefore, the decision-making process emerges in the context of the individual as the result of eclectic thinking or preparedness rather than being the product of a totally single approach.

The general approach of medical ethics is to reference basic ethical principles and values in situations that require triage. Rather than tendering practical prescriptions applicable to each case, the basic ethically justifiable approaches to the topic were discussed in this paper, and the one to be preferred depends on the PEC. The main issue, however, in these situations occurs when there is a need for separate evaluation for each case to determine the most approach ethical approaches, values and principles. In medical education, triage is conceptualized as the process of coding and resource management. However, there is a need to develop appropriate selection and evaluation criteria for the ethical provision of health care.

2.6 Assessment criteria and slippery slopes

There is a compendium of prehospital emergency care systems used by countries around the world today [51]. Accordingly, there is no global acceptance of a particular triage system and no perfect triage algorithm exists. For these reasons, the issues related to triage in prehospital settings discussed previously vary across countries, cultures, health-education curricula, and community perceptions of the ambulance service. Since triage in prehospital settings is so dependent on a variety of perspectives, triage should be considered as more than a medical issue.

According to some authors, a sensitive and safe triage system should consider three parameters: physiological variables, anatomical structure, and the mechanism of injury [52]. Triage systems measure these variables using algorithms that assess circulation, respiration, the presence of abdominal trauma, motor response and speech skills, trauma urgency scores [5, 53]. There are also instruments that represent a combination

of these algorithms in one measurement.

Furthermore, a significant amount of triage scales, indexes, scores, protocols, and systems have been developed for emergency services and departments. However, some research suggests that such systems impose unnecessarily rigid rules on triage decision-making; furthermore, these systems are essentially invalid because they are a product of "subjective" expert opinion [54]. Some authors suggest that the majority of these systems have a weak scientific base [55–57], lack studies with high-quality evidence supporting triage and treatment [58, 59].

Numerous triage models have been established for the purpose of rapidly sorting and categorizing of victims for pre-hospital settings [8, 60–64]. Though, there is insufficient evidence showing which prehospital triage systems/models are effective in achieving better health outcomes and quality of care [5, 57, 65–69]. Clearly, the quality of prehospital trauma triage depends on health care provider accuracy of and compliance with triage protocols and procedures [70]. Research shows that compliance rates to triage protocols vary from 21% to 94% for different procedures and process [71]. A recent review showed that different triage protocols were not capable in accurately discriminating between patients with simple and complex injuries [72]. Notwithstanding, the lack of evidence regarding the effectiveness of prehospital triage systems do not preclude their effectiveness. The uncertainty is a prime reason why triage and related issues serve as a slippery slope in prehospital emergency medicine and management.

2.7 The reliability of triage decisions/herding cats

Since the prehospital area is a more public and less controlled environment than the hospital environment [6], PECs must constantly keep their safety in mind [73]. Especially in cases of mass injuries and disasters, PECs rushing to help may inadvertently expose themselves to unexpected trauma. In triage decisions, emergency management is like the idiom of "herding cats", which refers to managing or controlling the chaos and organizing people toward common goals. Triage is also related to a number of socio-cultural concepts like chaos management, communication skills, and a resilient organization. Unpredictable social reactions and the on-scene dynamics of the crisis make this field more complicated. PECs often deal with hostile patients and significant others alongside the intensity of the crisis. Thus, all PECs must first ensure that they are in a safe environment before beginning the assessment and treatment of patients.

Some research indicates that seniors are undertriaged while children are overtriaged [74–76]. However, a recent study found that neither of the four most popular triage systems for children worked with high accuracy, and each demonstrated an unacceptable amount of undertriage [77]. The challenge of reducing undertriage is also essential for maximizing the accuracy of mass casualty triage systems in the adult population in emergency services [78]. Ultimately, undertriage may cause a potential conflict in the accuracy of triage decisions when applied to different populations. On the other hand, some research has found that the individual characteristics

of health care workers affect triage decision-making when physiological data of patients are used [79]. There are also a number of differences between how health care providers make triage decisions depending on their demographic and personal characteristics [47].

Other studies have achieved that similar result in this regard [80–85]. For instance, one study found that more than half decisions were correct in emergency triage situations [81]. Moreover, in the same study, agreement between triage decisions made by different health professionals was very low. These observations raise the following question: do individuals characteristics and personal differences of health care providers have a greater influence on triage decisions than expected? The same questions pertaining to the adequacy and reliability of triage apply in the context of prehospital emergency medicine. For example, one study found that compliance of paramedics with triage guidelines to be below acceptable levels [82]. Another study reported that paramedics were not enough to make accurate decisions to reflect patient needs for emergency services [83]. Similarly, lower acuity patients who could have been treated in the community were not accurately identified by paramedics who lacked extended care training [84]. In another study, the overlap between the triage decisions within the same occupational groups is 47% for the 3-point scale and 45% for the 5-point scale [85]. Finally, significant differences with regards to insufficient or overtriage decisions between paramedics and emergency nurses were found for the 5-point triage scale [65].

Another challenge in the reliability of triage decisions is to use multiple triage systems. It is necessary to use the same triage system in hospital units and departments because using multiple systems - that might have distinct protocols and language - can worsen the patient's prognosis [23]. However, using multiple triage systems is a challenge when health care providers use the "human factor", or alternative methods guided by their professional norms to make triage decisions. Otherwise, it would be unrealistic to expect a professional contribution to the development of the profession from those who acted mechanically within a set of rules and obligations. Moreover, it may be considered ethical absolutism for a prehospital emergency system to insist on using a specific triage system.

Clinical findings in prehospital medicine and disaster management within the emergency department in terms of vital signs and emergency trauma scoring in patients may be different in some cases [86]. That is, the urgency index of the trauma patient may not always be accurately determined in the prehospital area. This observation shows that there is uncertainty in the triage process that requires clarification.

Patient vital signs are not always the key factor in triage decisions. One study found patient vital signs did not affect the triage decisions of the majority (92%) of the health professionals [87]. According to another study, PECs placed a significant emphasis on the speed of decisions, relying on initial impressions and immediately observable information, rather than the precise measurement of vital signs or systematic application of field triage criteria [88]. However, deciding on the most appropriate field triage criteria raises many questions as mentioned previously in this paper.

When deciding the medical condition of trauma patients, the main issue is to determine the severity of the trauma. One of the parameters used to assess trauma severity in prehospital settings is the respiratory rate. In any trauma case, it is relatively convenient to determine the patient's respiratory rate on the scene; the respiratory rate can also help to make triage decisions that maximize providing medical attention to patients who need it immediately. However, some studies indicate that the respiratory rate of trauma patients does not provide reliable information about the patient's oxygen saturation [89]. Therefore, using a less than ideal method to make triage systems will make the triage system invalid.

In many models, casualties are divided into four or more groups. Each patient is encoded with color-coded triage tags reflecting their casualty group. However, there are no international standards for triage tags. Since triage evaluation represents a continuum, there is always a possibility that an injury with a specific tag may receive a different tag at a future evaluation [7]. This possibility reduces the functional applicability of the encoding process. Furthermore, there is the question of the number of available triage tags in ambulances and how they can be used practically for each disaster situation.

Another criticism is that, in the case of a large number of injured patients during disasters, directing emergency health care professionals to the coding process will reduce attention to providing immediate medical attention in the ambulance. At the same time, who will use the triage coding? Is it for the other ambulance crews or emergency departments? It seems that the first thing in the evaluation of the patient is triage coding and not the treatment. Further, trauma triage is not a linear process, and assessments are not performed in a sequential fashion [88]. So, what will a PEC do when s/he comes to a patient with hemorrhage? Will she start immediately to hemorrhage control of current injured, or continue the triage assessment?

Finally, several decision support systems have been developed for prehospital settings in recent years which have great potential to augment triage decision-making. These support systems, such as artificial intelligence, raise significant ethical issues concerning triage, as well as humanity and compassion, and impact on society's perceptions of medicine.

3. Conclusions

Triage decisions are among the most difficult to make in the delivery of health care because these decisions raise a number of ethical conflicts in the decision-making process. Although there are many triage systems, some of which are quite popular, there are doubts about the accuracy of these systems, and how to adequately manage overtriage and undertriage. Considering the differences between prehospital triage models and approaches, there is a need for approaches that will guide prehospital emergency caregivers more clearly and in an ethically sensitive manner. Unlike formal training and education, the circumstances of the real situation can introduce novel challenges in making ethical triage decisions. The way triage is structured also means that decision-making is affected by the personal values and beliefs of decision-makers. The influence of subjectivity on triage decision-making in prehospital caregivers is at the forefront of the discussion on

TABLE 1. The ethics framework for developing triage systems in prehospital emergency medicine.

BASIC BIOETHICAL PRINCIPLES	DISTRIBUTING SCARCE RESOURCES	DECISION-MAKING PROCESS	COMMUNITY SUPPORT	ASSESSMENT CRITERIA	PROMOTE COMMON GOOD
Nonmaleficence	Equity	Less affectability by the individual decision-making process	Considering the values of society in the triage developing procedure	Easy to apply for prehospital settings	Transparency
Beneficence	Awareness of vulnerable groups	Objectivity	Ready for chaos as possible	Reliability and objectivity	Accountability
Justice	Justifiability	Personnel educated by a standard training curriculum	Good communication skills	Classification based on clear medical data	Trustworthiness
	Accountability	Admitting mistakes and relearn in every case	(Trust) a society that relies on the fairness of the prehospital triage system	Competent prehospital emergency healthcare personnel	Respecting human rights

ethics in prehospital emergency medicine. A clear, concise, and comprehensible triage model for prehospital settings will aid emergency caregivers in making accurate and rationalized triage decisions in the field.

However, it is necessary to avoid insisting on a triage model that provides a uniform approach to triage education. Considering triage as the ethical framework for decision-making and adopting methods that are aligned with the socio-cultural characteristics of the society would ensure that the most appropriate triage models are used. It is therefore important for governments and institutions to establish reasonable, basic, and optional triage models that allow health care professionals to align their model with local socio-cultural features. Of course, developing consensus on which triage models and criteria to use will take time and discussion. These discussions should bring in issues in not only medicine, but also ethics, culture, and humanity.

The ethics framework offers ethical guidance for developing triage systems in prehospital emergency medicine. The following ethics framework specifies an approach to ethical prehospital triage (Table 1).

4. Limitations

The literature reviewed for this paper included peer-reviewed scholarly writings and books. Ethics is an important issue to consider in prehospital emergency medicine. It is contrary to the nature of ethics and philosophy to claim that there is only one truth on any subject. Ethical discussions consider a variety of disciplinary perspectives such as culture and medicine. This article discusses the contribution of ethics to the field of triage systems in prehospital emergency medicine.

AUTHOR CONTRIBUTIONS

HE designed the study, collected and analyzed the data. He analyzed the results and drafted the manuscript.

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CONFLICT OF INTEREST

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REFERENCES

- [1] Adams JG, Arnold R, Siminoff L, Wolfson AB. Ethical conflicts in the prehospital setting. *Annals of Emergency Medicine*. 1992; 21: 1259-1265.
- [2] Heilicser B, Stocking C, Siegler M. Ethical dilemmas in emergency medical services: the perspective of the emergency medical technician. *Annals of Emergency Medicine*. 1996; 27: 239-243.
- [3] Erbay H. Some ethical issues in prehospital emergency medicine. *Turkish Journal of Emergency Medicine*. 2014; 14: 193-198.
- [4] Chung JYM. An exploration of accident and emergency nurse experiences of triage decision making in Hong Kong. *Accident and Emergency Nursing*. 2006; 13: 206-213.
- [5] Cameron PA, Gabbe BJ, Smith K, Mitra B. Triage the right patient to the right place in the shortest time. *British Journal of Anaesthesia*. 2014; 113: 226-233.
- [6] Iserson KV. Ethical considerations in emergency care. *Israeli Journal of Emergency Medicine*. 2004; 4: 10-17.
- [7] Aacharya RP, Gastmans C, Denier Y. Emergency department triage: an ethical analysis. *BMC Emergency Medicine*. 2011; 11: 16.
- [8] Vassallo J, Smith J. Major incident triage and the evaluation of the Triage Sort as a secondary triage method. *Emergency Medicine Journal*. 2019; 36: 281-286.
- [9] Robertson-Steel I. Evolution of triage systems. *Emergency Medicine Journal*. 2006; 23: 154-155.

- [10] Lounsbury DE. Military Medical Ethics. In Pellegrino ED, Hartle AE, Howe EG (eds.) *Textbook of maritime medicine* (pp. 1-127). Washington: TMM Publications. 2003.
- [11] Goniewicz M. Effect of military conflicts on the formation of emergency medical services systems worldwide. *Academic Emergency Medicine*. 2013; 20: 507-513.
- [12] Blagg CR. Triage: Napoleon to the present day. *Journal of Nephrology*. 2004; 17: 629-632.
- [13] Iserson KV, Moskop JC. Triage in medicine, part I: concept, history, and types. *Annals of Emergency Medicine*. 2007; 49: 275-281.
- [14] Repine TB, Lisagor P, Cohen DJ. The dynamics and ethics of triage: rationing care in hard times. *Military Medicine*. 2005; 170: 505-509.
- [15] Giannou C, Baldan M. *War Surgery vol-I*. Geneva: International Committee of the Red Cross. 2010.
- [16] Giannou C, Baldan M, Molde A. *War Surgery vol-II*. Geneva: International Committee of the Red Cross. 2013.
- [17] Domres B, Koch M, Manger A, Becker HD. Ethics and triage. *Prehospital and Disaster Medicine*. 2001; 16: 53-58.
- [18] Yeguayan J, Garrigue D, Binquet C, Jacquot C, Duranteau J, Martin C, *et al*. Medical pre-hospital management reduces mortality in severe blunt trauma: a prospective epidemiological study. *Critical Care*. 2011; 15: R34.
- [19] Beck B, Smith K, Mercier E, Bernard S, Jones C, Meadley B, *et al*. Potentially preventable trauma deaths: a retrospective review. *Injury*. 2019; 50: 1009-1016.
- [20] Girard E, Jegouso Q, Boussat B, François P, Ageron F, Letoublon C, *et al*. Preventable deaths in a French regional trauma system: a six-year analysis of severe trauma mortality. *Journal of Visceral Surgery*. 2019; 156: 10-16.
- [21] Kleber C, Giesecke MT, Tsokos M, Haas NP, Buschmann CT. Trauma-related preventable deaths in Berlin 2010: need to change prehospital management strategies and trauma management education. *World Journal of Surgery*. 2013; 37: 1154-1161.
- [22] Rabinovici R, Frankel HL, Kirton OC. *Trauma, critical care, and surgical emergencies: a case and evidence-based textbook*. Florida: CRC Press. 2010.
- [23] Romero Pareja R, Castro Delgado R, Turégano Fuentes F, Jhon Thissard-Vasallo I, Sanz Rosa D, Arcos González P. Prehospital triage for mass casualty incidents using the META method for early surgical assessment: retrospective validation of a hospital trauma registry. *European Journal of Trauma and Emergency Surgery*. 2020; 46: 425-433.
- [24] Anand LK, Singh M, Kapoor D. Prehospital trauma care services in developing countries. *Anaesthesia, Pain Intensive Care*. 2013; 17: 65-70.
- [25] Sobrino J, Shafi S. Timing and causes of death after injuries. *Proceedings*. 2013; 26: 120-123.
- [26] Leider JP, DeBruin D, Reynolds N, Koch A, Seaberg J. Ethical guidance for disaster response, specifically around crisis standards of care: a systematic review. *American Journal of Public Health*. 2017; 107: e1-e9.
- [27] Geale SK. The ethics of disaster management. *Disaster Prevention and Management*. 2012; 21: 445-462.
- [28] Cairo SB, Fisher M, Clemency B, Cipparone C, Quist E, Bass KD. Prehospital education in triage for pediatric and pregnant patients in a regional trauma system without collocated pediatric and adult trauma centers. *Journal of Pediatric Surgery*. 2018; 53: 1037-1041.
- [29] Afolabi MO. Public health disasters. *Advancing Global Bioethics*. 2018; 12: 1-24.
- [30] Whitehall G. The aesthetics of triage. In Lawrence JL, Wiebe SM (eds.) *Biopolitical Disaster* (pp. 242-256). New York: Routledge. 2018.
- [31] Domres B, Kees T, Gromer S, Braitmaier P, Tanja G. Ethical aspects of triage. *ROČNÍK*. 2010; 2: 76-82.
- [32] Sztajnkrzyce MD, Madsen BE, Alejandro Báez A. Unstable ethical plateaus and disaster triage. *Emergency Medicine Clinics of North America*. 2006; 24: 749-768.
- [33] Taurek JM. Should the numbers count? *Philosophy & Public Affairs*. 1979; 6: 293-316.
- [34] Harris J. *The value of life: an introduction to medical ethics*. United Kingdom: Psychology Press. 1985.
- [35] Veatch RM. *The basics of bioethics*. 3rd edn. New York: Routledge. 2003.
- [36] Bremer A, Herrera MJ, Axelsson C, Martí DB, Sandman L, Casali GL. Ethical values in emergency medical services: a pilot study. *Nursing Ethics*. 2015; 22: 928-942.
- [37] Weis D, Schank MJ. Professional values: key to professional development. *Journal of Professional Nursing*. 2002; 18: 271-275.
- [38] French E, Casali GL. Ethics in emergency medical services - who cares? An exploratory analysis from Australia. *Electronic Journal of Business Ethics and Organization Studies*. 2008; 13: 44-53.
- [39] Braithwaite SS. Ethics in paramedic practice: a qualitative case study of paramedic perceptions of ethical decision-making in practice. Raleigh, North Carolina: North Carolina State University. 2014.
- [40] Bauzon S. Classical distributive justice and the European healthcare system: rethinking the foundations of European health care in an age of crises. *The Journal of Medicine and Philosophy*. 2015; 40: 190-200.
- [41] Dunlop M, Savulescu J. Distributive justice and cognitive enhancement in lower, normal intelligence. *Monash Bioethics Review*. 2014; 32: 189-204.
- [42] Christian MD, Farmer JC, Young BP. Disaster triage and allocation of scarce critical care resources. In Rubinson L, Amundson D, Geiling J (eds.) *Fundam. Disaster Manag* (pp. 1-17). 3rd edn. Society of Critical Care Medicine. 2008.
- [43] World Medical Association. *WMA Declaration of Geneva*. 2006.
- [44] World Medical Association. *WMA International Code of Medical Ethics*. 2006.
- [45] American College of Emergency Physicians. *Code of ethics for emergency physicians*. 2014th ed. 2014.
- [46] UNESCO. *Universal declaration on bioethics and human rights*. 2005.
- [47] Gertz MF, Bucknall TK. Influence of task properties and subjectivity on consistency of triage: a simulation study. *Journal of Advanced Nursing*. 2007; 58: 180-190.
- [48] Ghanbari V, Ardalan A, Zareiyan A, Nejati A, Hanfling D, Bagheri A. Ethical prioritization of patients during disaster triage: a systematic review of current evidence. *International Emergency Nursing*. 2019; 43: 126-132.
- [49] Ellensen EN, Hunskaar S, Wisborg T, Zakariassen E. Variations in contact patterns and dispatch guideline adherence between Norwegian emergency medical communication centres-a cross-sectional study. *Scandinavian Journal of Trauma, Resuscitation and Emergency Medicine*. 2014; 22: 2.
- [50] Gunnarsson B, Warrén Stomberg M. Factors influencing decision making among ambulance nurses in emergency care situations. *International Emergency Nursing*. 2009; 17: 83-89.
- [51] Roudsari BS, Nathens AB, Cameron P, Civil I, Gruen RL, Koepsell TD, *et al*. International comparison of prehospital trauma care systems. *Injury*. 2007; 38: 993-1000.
- [52] Engum SA, Mitchell MK, Scherer LR, Gomez G, Jacobson L, Solotkin K, *et al*. Prehospital triage in the injured pediatric patient. *Journal of Pediatric Surgery*. 2000; 35: 82-87.
- [53] Jehan F, Con J, McIntyre M, Khan M, Azim A, Prabhakaran K, *et al*. Prehospital shock index correlates with transfusion, resource utilization and mortality; the role of patient first vitals. *The American Journal of Surgery*. 2019; 218: 1169-1174.
- [54] Moll HA. Challenges in the validation of triage systems at emergency departments. *Journal of Clinical Epidemiology*. 2010; 63: 384-388.
- [55] Rørtveit S, Meland E, Hunskaar S. Changes of triage by GPs during the course of prehospital emergency situations in a Norwegian rural community. *Scandinavian Journal of Trauma, Resuscitation and Emergency Medicine*. 2013; 21: 89.
- [56] Huibers L, Smits M, Renaud V, Giesen P, Wensing M. Safety of telephone triage in out-of-hours care: a systematic review. *Scandinavian Journal of Primary Health Care*. 2011; 29: 198-209.
- [57] Lidal IB, Holte HH, Vist GE. Triage systems for pre-hospital emergency medical services - a systematic review. *Scandinavian Journal of Trauma, Resuscitation and Emergency Medicine*. 2013; 21: 28.
- [58] Weinstein E, Gosney JE, Ragazzoni L, Franc J, Herbert T, Weinstein B, *et al*. The ethical triage and management guidelines of the entrapped and mangled extremity in resource scarce environments: a systematic literature review. *Disaster Medicine and Public Health Preparedness*. 2020; 1-9.
- [59] Parikh PP, Parikh P, Guthrie B, Mamer L, Whitmill M, Erskine T, *et al*. Impact of triage guidelines on prehospital triage: comparison of guidelines with a statistical model. *The Journal of Surgical Research*.

- 2017; 220: 255-260.
- [60] Sartorius D, Le Manach Y, David J, Rancurel E, Smail N, Thicoipé M, *et al.* Mechanism, glasgow coma scale, age, and arterial pressure (MGAP): a new simple prehospital triage score to predict mortality in trauma patients. *Critical Care Medicine.* 2010; 38: 831-837.
- [61] Domingues C de A, Nogueira L de S, Serttervall CHC, Sousa RMC de. Performance of Trauma and Injury Severity Score (TRISS) adjustments: an integrative review. *Revista da Escola de Enfermagem da USP.* 2015; 49: 138-146.
- [62] Cassignol A, Marmin J, Cotte J, Cardinale M, Bordes J, Pauly V, *et al.* Correlation between field triage criteria and the injury severity score of trauma patients in a French inclusive regional trauma system. *Scandinavian Journal of Trauma, Resuscitation and Emergency Medicine.* 2019; 27: 71.
- [63] Galvagno SM Jr, Massey M, Bouzat P, Vesselinov R, Levy MJ, Millin MG, *et al.* Correlation between the revised trauma score and injury severity score: implications for prehospital trauma triage. *Prehospital Emergency Care.* 2019; 23: 263-270.
- [64] Groscurin O, Gayet-Ageron A, Suppan L, Simon J, Villar A, Trombert V, *et al.* Reliability and performance of the Swiss Emergency Triage Scale used by paramedics. *European Journal of Emergency Medicine.* 2019; 26: 188-193.
- [65] Smith DT, Snyder A, Hollen PJ, Anderson JG, Caterino JM. Analyzing the usability of the 5-level Canadian triage and acuity scale by paramedics in the prehospital environment. *Journal of Emergency Nursing.* 2015; 41: 489-495.
- [66] Matsushima K, Chouliaras K, Koenig W, Preston C, Gorospe D, Demetriades D. Should we still use motor vehicle intrusion as a sole triage criterion for the use of trauma center resources? *Injury.* 2016; 47: 235-238.
- [67] van Rein EAJ, van der Sluijs R, Houwert RM, Gunning AC, Lichtveld RA, Leenen LPH, *et al.* Effectiveness of prehospital trauma triage systems in selecting severely injured patients: is comparative analysis possible? *The American Journal of Emergency Medicine.* 2018; 36: 1060-1069.
- [68] Lin C, Lin C, Tai C, Lin Y, Shih FF. Challenges of Burn Mass Casualty Incidents in the Prehospital Setting: lessons from the Formosa Fun Coast Park Color Party. *Prehospital Emergency Care.* 2019; 23: 44-48.
- [69] Haukoos JS, Campion EM, Pons PT. Optimizing prehospital trauma triage—a step closer? *JAMA Surgery.* 2019; 154: 429-430.
- [70] van Rein EAJ, Sadiqi S, Lansink KWW, Lichtveld RA, van Vliet R, Oner FC, *et al.* The role of emergency medical service providers in the decision-making process of prehospital trauma triage. *European Journal of Trauma and Emergency Surgery.* 2020; 46: 131-146.
- [71] van Rein EAJ, van der Sluijs R, Raaijmakers AMR, Leenen LPH, van Heijl M. Compliance to prehospital trauma triage protocols worldwide: a systematic review. *Injury.* 2018; 49: 1373-1380.
- [72] van Rein EAJ, Houwert RM, Gunning AC, Lichtveld RA, Leenen LPH, van Heijl M. Accuracy of prehospital triage protocols in selecting severely injured patients: a systematic review. *The Journal of Trauma and Acute Care Surgery.* 2017; 83: 328-339.
- [73] Brown J, Sajankila N, Claridge JA. Prehospital assessment of trauma. *Surgical Clinics of North America.* 2017; 97: 961-983.
- [74] Erbay H, Can R, Turkan AH. For whom the sirens toll: a study on an ethical challenge in prehospital emergency medicine. *Eurasian Journal of Emergency Medicine.* 2018; 17: 122-128.
- [75] LaMantia MA, Stewart PW, Platts-Mills TF, Biese KJ, Forbach C, Zamora E, *et al.* Predictive value of initial triage vital signs for critically ill older adults. *Western Journal of Emergency Medicine.* 2013; 14: 453-460.
- [76] Carron P, Taffé P, Ribordy V, Schoettker P, Fishman D, Yersin B. Accuracy of prehospital triage of trauma patients by emergency physicians: a retrospective study in western Switzerland. *European Journal of Emergency Medicine.* 2011; 18: 86-93.
- [77] Heffernan RW, Lerner EB, McKee CH, Browne LR, Colella MR, Liu JM, *et al.* Comparing the accuracy of mass casualty triage systems in a pediatric population. *Prehospital Emergency Care.* 2019; 23: 304-308.
- [78] McKee CH, Heffernan RW, Willenbring BD, Schwartz RB, Liu JM, Colella MR, *et al.* Comparing the accuracy of mass casualty triage systems when used in an adult population. *Prehospital Emergency Care.* 2020; 24: 515-524.
- [79] Gerdtz MF, Bucknall TK. Triage nurses' clinical decision making, an observational study of urgency assessment. *Journal of Advanced Nursing.* 2001; 35: 550-561.
- [80] Dojmi Di Delupis F, Mancini N, Ruggeri M, Pisanelli P. Perceptions of emergency department triage nurses about prehospital emergency rescuers in Italy: a latent threat to clinical handover. *Journal of Patient Safety.* 2020; 16: e34-e38.
- [81] Göransson K, Ehrenberg A, Marklund B, Ehnfors M. Accuracy and concordance of nurses in emergency department triage. *Scandinavian Journal of Caring Sciences.* 2005; 19: 432-438.
- [82] Pointer JE, Levitt MA, Young JC, Promes SB, Messana BJ, Adèr ME. Can paramedics using guidelines accurately triage patients? *Annals of Emergency Medicine.* 2001; 38: 268-277.
- [83] Silvestri S, Rothrock SG, Kennedy D, Ladde J, Bryant M, Pagane J. Can paramedics accurately identify patients who do not require emergency department care? *Prehospital Emergency Care.* 2002; 6: 387-390.
- [84] Tohira H, Fatovich D, Williams TA, Bremner A, Arendts G, Rogers IR, *et al.* Which patients should be transported to the emergency department? A perpetual prehospital dilemma. *Emergency Medicine Australasia.* 2016; 28: 647-653.
- [85] Kahveci FO, Demircan A, Keles A, Bildik F, Aygencel SG. Efficacy of triage by paramedics: a real-time comparison study. *Journal of Emergency Nursing.* 2012; 38: 344-349.
- [86] Dinh MM, Oliver M, Bein K, Muecke S, Carroll T, Veillard A, *et al.* Level of agreement between prehospital and emergency department vital signs in trauma patients. *Emergency Medicine Australasia.* 2013; 25: 457-463.
- [87] Cooper RJ, Schriger DL, Flaherty HL, Lin EJ, Hubbell KA. Effect of vital signs on triage decisions. *Annals of Emergency Medicine.* 2002; 39: 223-232.
- [88] Jones CMC, Cushman JT, Lerner EB, Fisher SG, Seplaki CL, Veazie PJ, *et al.* Prehospital trauma triage decision-making: a model of what happens between the 9-1-1 call and the hospital. *Prehospital Emergency Care.* 2016; 20: 6-14.
- [89] Raux M, Thicoipe M, Wiel E, Rancurel E, Savary D, David JS, *et al.* Comparison of respiratory rate and peripheral oxygen saturation to assess severity in trauma patients. *Intensive Care Medicine.* 2006; 32: 405-412.

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