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PREHOSPITAL CARE AND TREATMENT OF INJURED IN TRAFFIC ACCIDENTS

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PREHOSPITALNO ZBRINJAVANJE I NEGA POVREĐENIH U SAOBRAĆAJNOM NEZGODAMA

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ABSTRACT

Effective care for all types of trauma resulting from traffic accidents is a priority in all healthcare systems. Every year, many of the 1.35 million lives lost globally could be saved, and a significant portion of disability among the injured could be prevented if prompt and competent prehospital services were available at the scene of the accident. In 2016, the World Health Organization (WHO) reported that traffic accidents are among the top 10 leading causes of death, particularly among younger traffic participants, predominantly males. Triage and trauma protocols aim to utilize existing resources from the healthcare system and the civil sector to benefit as many injured individuals as possible. The time interval between the occurrence of a traffic accident and the initiation of first medical aid and healthcare at a trauma center is considered an important predictor of the victim's survival. The goal of this work is to emphasize the importance of using protocols in the care of the injured and to highlight the significance of prehospital care and treatment in reducing mortality following traffic injuries. This paper will present information from relevant data sources: PubMed, MEDLINE, SCOPUS, and the Serbian Citation Index, among other relevant databases. Implementing and applying effective triage protocols, as well as establishing an easily accessible network of trauma centers, are key to improving prehospital care and reducing mortality. These measures enable a quicker response to accidents, optimal resource allocation, and improved outcomes for the injured, which is essential for enhancing the public health system of a country.

Key words: *emergency medicine; multiple trauma; public health.*

SAŽETAK

Efikasna nega svih vrsta trauma kao posledica povređivanja u saobraćaju prioritet je u svim zdravstvenim sistemima. Svake godine mnogi od 1,35 miliona izgubljenih života na globalnom nivou mogli bi da budu spaseni i veliki deo invaliditeta povređenih mogao bi da se spreči ako bi brze i kompetentne prebolničke usluge bile dostupne na mestu gde se nesreća dogodila. Godine 2016. Svetska zdravstvena organizacija (SZO) izvestila je da su saobraćajne nesreće među 10 vodećih uzroka smrtnosti, posebno kod mlađe kategorije učesnika u saobraćaju gde dominiraju osobe muškog pola. Trijaža i protokol traume imaju za cilj da postojeće resurse sistema zdravstvene zaštite i civilnog sektora, upotrebe u korist što većeg broja povređenih. Smatra se da je vremenski interval između pojave saobraćajne nezgode i početka prve medicinske pomoći i zdravstvene neg, u određenom centru za traumu važan prediktor preživljavanja žrtve. Cilj ovog rada bio je da se naglasi važnost korišćenja protokola prilikom zbrinjavanja povređenih i istaknuti značaj prehospitalnog zbrinjavanja i nege za smanjenje mortaliteta nakon povređivanja u saobraćaju. U ovom radu biće predstavljene informacije iz relevantnih izvora podataka: PubMed, MEDLAJN, SCOPUS, Srpskog citatnog indeksa i drugih relevantnih baza. Uvođenje i primena efikasnih trijažnih protokola, kao i formiranje lako dostupne mreže trauma centara ključni su za poboljšanje prehospitalne nege i smanjenje smrtnosti. Ove mere omogućavaju brži odgovor na nesreće, optimalnu raspodelu resursa i poboljšanje ishoda za povređene, što ima suštinski značaj za unapređenje sistema javnog zdravlja jedne države.

Ključne reči: *urgentna medicina; politrauma; javno zdravlje.*

INTRODUCTION

Traffic trauma represents a significant socio-medical and public health issue in every society, at local, regional, and global levels, regardless of whether it is in low, middle, or high-income countries (1), with more than 5 million deaths and 100 million people temporarily or permanently disabled (2, 3). An adequate and accessible healthcare and a prompt and timely response from the entire healthcare system and emergency medical services are essential for reducing morbidity and mortality from traffic trauma. Triage and trauma protocols aim to utilize the existing resources of the healthcare and civil sectors to benefit the largest number of injured individuals. Using

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triage protocols is essential in managing the injured and can significantly impact the outcome of their treatment (1, 4). In 2016, the World Health Organization (WHO) reported that traffic accidents are among the top 10 causes of death (5). This paper aims to emphasize the importance of using protocols when treating the injured and the significance of prehospital care and treatment in reducing mortality after traffic injuries.

TRAUMA MANAGEMENT PROTOCOL

Trauma management protocols are designed to assist medical teams treating trauma patients in making decisions to improve patient outcomes. Primary care follows the ABCDE system, which includes assessing and managing airways, breathing, circulation, disability, and exposure (6). The ABCDE procedure refers to a rapid clinical assessment and evaluation of the injured person's condition and the need for immediate care.

This term represents the first letters of the English abbreviations for the words:

- A (airway) – clear and secure the airway;
- B (breathing) – assessment of breathing;
- C (circulation) – assessment of circulation;
- D (disability) – assessment of consciousness and cause of unconsciousness;
- E (exposure) – examination of the whole patient.

This concept of patient condition assessment involves rapid response from the medical team, diagnosis, application of emergency therapy, and prioritizing the injured based on urgency (7-11). The severity and type of injury are determined based on scoring systems, and the obtained value influences the treatment choice for the injured, as well as whether the patient will be transported to a secondary or tertiary healthcare facility. There are numerous trauma scoring systems, but most of those related to prehospital care have many shortcomings, so new scoring systems that would be the most reliable for assessing the injured's condition and survival are still being sought (12, 13). The first injury assessment scale, the Abbreviated Injury Scale (AIS), was published in 1971, aiming to categorize types and severity of injuries. The AIS injury scale has been revised several times under the guidance of the Association for the Advancement of Automotive Medicine (AAAM) (14). Besides the initial use of the AIS scale, injury severity assessment can also be done using an additional scale, the Injury Severity Score (ISS), created in 2005 (15). Care for the injured begins immediately at the site of the injury, followed by transporting the injured to the nearest trauma center. The stages of care must occur continuously, systematically, and within the shortest possible time frame (16). It is essential to treat the injured according to a well-established system of managing severely injured individuals. Care for the injured should be divided into several subsystems, but all activities must function as a single, indivisible unit (17, 18).

Subsystems include:

1. Prehospital care of the injured at the accident site
2. Transport of the injured to the nearest trauma center from the accident site
3. Initial hospital care of the injured in the trauma center if conditions allow
4. Definitive hospital care of the injured in the trauma center if conditions allow
5. Post-surgical hospitalization and special care of the injured in the trauma center
6. Physical therapy and rehabilitation of the injured in specialized physical medicine and rehabilitation institutes (18, 19).

Prehospital treatment of the injured is crucial for the final outcome of care and patient prognosis, encompassing:

1. Prehospital stabilization of the injured
2. Transport of the injured to the nearest trauma center from the accident site (20).

Further medical treatment of the injured is decided at the accident site by the medical team members, ideally including a specialist with an emergency team or an emergency medicine specialist with an emergency medical team. Consultation within a multidisciplinary team for urgent patient care, including specialists in surgery, orthopedics, general surgery, anesthesiology, urology, neurosurgery, and other relevant specialties, is necessary (21, 22).

PREHOSPITAL CARE AND TREATMENT OF INJURED IN TRAFFIC ACCIDENTS

Prehospital care for victims of traffic trauma includes basic first aid and a range of medical procedures. Prehospital care is provided by specially trained healthcare workers, and the time interval between the occurrence of a traffic accident and the beginning of healthcare in a trauma center is considered an important predictor of the victim's survival (23, 24).

Timely and effective prehospital services can often minimize the consequences of an accident (25, 26). Each year, many of the 1.35 million lost lives globally could be saved, and a large portion of disabilities in injured individuals could be prevented if prompt and competent prehospital services were available at the accident scene (27). Effective prehospital care after traffic accidents should include rapid communication and activation of the emergency medical system, if available; quick response of

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the activated system; assessment and treatment of the injured at the scene, followed by expedited transport to an appropriate healthcare facility. Prehospital emergency care involves examination and care of the patient by medical professionals, unlike first aid provided by laypeople (28). Prehospital emergency care varies worldwide in terms of the knowledge and skills level of service providers. Regardless of the level, studies show that prehospital emergency medical care is a vital service that can save lives and reduce disability (29). In countries with well-organized emergency medical systems, the death rate from traffic accidents is 25% lower than in countries without these systems (30). This is because providing healthcare after traffic accidents via emergency services is organized, timely, and safe, with services provided by trained staff using well-equipped ambulances to transport the injured (31, 32).

Prehospital care is inadequate in many countries, especially in underdeveloped and developing countries, where most trauma deaths occur in the prehospital phase. Quick arrival of emergency services at the accident scene and proper transport of victims by trained personnel can reduce the severity of injuries and decrease the number of preventable deaths. It is important to note that many trauma experts consider the first 60 minutes after an injury – known as the "golden hour" – to be the most optimal for saving lives. After this period, the risk of death or severity of injury significantly increases (33, 34). The care that traffic accident participants receive from prehospital service providers ranges from incomplete to high-quality care, depending on the knowledge and skills of the providers. Whether an ambulance is available for evacuation or not, police officers have been shown to be the first to arrive at the accident scene and the first to contact the injured (35).

Although the course of the patient's condition often depends on their assessment, i.e. their ability to provide first aid, their competencies in providing first aid are limited. In most cases, the police are directly or indirectly involved in post-accident care by giving instructions to other responders and coordinating transportation for traffic accident victims. Despite the significant role of the police as key first responders in post-accident care, evidence from studies indicates worse outcomes for victims who receive direct physical assistance from the police before arriving at the hospital (36). Recent study findings show that these worse outcomes are due to a lack of adequate knowledge and skills for providing care to victims (37).

In a qualitative study conducted in Tanzania, traffic police officers reported that one of their duties upon arriving at the scene was to provide initial care for injuries and other assistance to victims and facilitate their transport to the hospital. The study showed that the traffic police did not understand the concept of first aid, and for them, providing first aid essentially involved interventions such as extracting victims from the accident scene and transporting them to the hospital for further care. However, the study did not clarify how the traffic police provided initial forms of care for the injured, such as controlling bleeding, immobilizing the neck and fractures, measures that optimize the outcome. Providing initial assistance without applying such safety principles could expose victims to further injuries or lead to permanent disability or even reduce their chances of survival. This could be why victims who are cared for at the scene and/or transported to the hospital by the police are more likely to have fatal outcomes than those cared for by emergency personnel (38, 39).

Prehospital care for the injured must be adequate, timely, and safe. To better prepare the police for this role, life-saving skills and basic principles of post-accident care should be an inclusive topic in the police training curriculum and one of the competencies to be acquired during the initial training (39, 40). In most low- and middle-income countries, transport for traffic victims is usually provided by relatives, taxi drivers, truck drivers, police officers, and other drivers, who are typically untrained (41, 42). A significant number of neurological injuries are thought to result from the extraction or transportation process of the injured without adequate immobilization, mainly by untrained individuals (43). Studies have shown that inadequate healthcare system infrastructure and poor access to healthcare services are important reasons for the high burden of traffic accidents (44).

Studies in high-income European countries show that about 50% of deaths from traffic accidents occur within minutes, either at the scene or during the transport to the hospital. Among patients transported to the hospital, about 15% of deaths occur within 1-4 hours after the accident, while 35% of deaths occur more than 4 hours after hospital admission. It is estimated that severely injured passengers in an accident who receive care at a level one trauma center within an hour have a 25% reduction in the risk of death (45). Poor access to healthcare resources has tragic consequences and increases the risk of mortality from traffic accidents (46). A study by Genowska and authors highlighted significant territorial differences in mortality from traffic accidents in Poland depending on available healthcare resources. The availability of healthcare was assessed in 66 sub-regions using the HCR (health care resources) index, created based on human and infrastructural resources that potentially affect access to healthcare. The results showed that mortality in sub-regions with a low HCR index was 25% higher compared to those with a high HCR index.

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Similar connections were found for traffic accidents involving pedestrians, motorcyclists, and motor vehicle drivers (47). It is likely that in the case of cyclist mortality, other characteristics may play a greater role in increasing mortality. However, it should be noted that areas with low HCR levels are also less populated with inadequate cycling infrastructure, including poor marking and maintenance. A low HCR index was associated with increased mortality from traffic accidents, especially in terms of out-of-hospital mortality, while on the other hand, the percentage of deaths in hospitalized conditions was higher in areas with a high HCR index. Out-of-hospital deaths from traffic accidents were 68% higher compared to the number of deaths in hospital settings (48). In general, traffic accident victims from rural areas have poorer survival rates due to extended emergency response times and/or excessive waiting times (49, 50). Available studies show that a distance of more than 30 km from a trauma care center increases the risk of death from traffic accidents. Severely injured patients are more likely to die on the spot before being resuscitated (51).

Air transport, which almost triples the survival rate compared to ambulance transport, is of great importance in caring for accident victims from rural areas (46, 52). In sub-regions with a high HCR index (large urban agglomerations), out-of-hospital mortality was lower compared to sub-regions with low HCR. This was due not only to better access to care but also to the possibility of implementing preventive measures, more frequent traffic safety checks, and better road infrastructure, including traffic separators, better street lighting, and step-down curves (52-54) However, in urbanized areas, so-called late death is more common than in rural areas. Study results show that the location of the traffic accident affects mortality more than the HCR index, except for accident categories involving cyclists.

Recent studies from Germany and the USA (55) have highlighted the connection between accident locations in rural areas and the risk of death. Due to their geographical location, less urbanized areas may be characterized by longer waiting times for medical assistance or limited access to adequate prehospital care or transport to the hospital, affecting survival (56). Also, most high-risk patients injured in rural regions were cared for outside major trauma centers (55). The importance of prehospital helicopter transport in traumas has been analyzed in several retrospective studies. Some research has shown that helicopter transport reduced mortality in trauma patients, but the costs for this type of transport are high, which applies to low- and middle-income countries (57-59). In low- and middle-income countries, the mortality rate is higher, especially for head injuries and for the younger population, where males predominate (60), as well as in countries that were recently at war and under bombardment, and in countries where the current situation does not allow for resources such as available specialized hospitals, educated staff, helicopter transport, and modern equipped surgical centers are not feasible in low-income societies and in countries with social inequality and war-torn countries with outdated traffic infrastructure. Therefore, there is an urgent need to develop trauma system models to identify measures that would improve a country's healthcare system (31). The formation of an easily accessible network of trauma centers is the best solution for the state, as well as the formation of a trauma registry. In order to reduce mortality from the consequences of traffic trauma (61, 62).

RECOMMENDATIONS FOR ESTABLISHING A TRAUMA REGISTER

Literary data supports the fact that in high-income countries where trauma registers are in force, a lower mortality rate was recorded than in middle- and low-income countries where there is no trauma register (63, 64). As for the recommendations for the trauma registry, it would refer to the design and implementation of procedures and algorithms for trauma registries, and in order to achieve these goals, it is necessary to determine the current status and to document well the existing studies, plans and synthesized knowledge about trauma registries, the collection of data from the scene of traffic accidents , from the health institutions where the patient was hospitalized, the report of the emergency service which carries out triage and pre-hospital treatment of the injured, in order to prevent the number of traffic fatalities and reduce the rate of mortality and disability (64-66). Creating a traffic trauma register would enable the collection and analysis of data, with the aim of obtaining useful information for the management of organizations in the public health system. The trauma register, in addition to data related to the epidemiology of traffic trauma, gives us guidelines for the implementation of professional and educational programs to prevent the occurrence of trauma in traffic (63, 67-70).

CONCLUSION

Prehospital triage, patient examination, and adequate professional assessment of the type of injury are important factors in deciding whether the patient is transported to the nearest or a specialized hospital for a specific segment of the injury. Transporting the patient from the accident scene to an appropriate healthcare facility is a critical element of prehospital care, as the lack of adequate transportation often represents the main barrier preventing patients from accessing emergency assistance. Delay in the arrival of emergency services is the most common reason cited for delays in accessing emergency care after a traffic accident.

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This professional paper can provide recommendations for future research related to the development of protocols for trauma management in traffic trauma and their effectiveness to reduce mortality from the co. Implementing and applying effective triage protocols, as well as establishing an easily accessible network of trauma centers, are key to improving prehospital care and reducing mortality. These measures enable a quicker response to accidents, optimal resource allocation, and improved outcomes for the injured, which is essential for enhancing the public health system the healthcare system of a country.

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