
Evaluation and Care of a Polytraumatized Patient

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Abstract

Polytrauma is a simultaneous severe injury to at least two body regions where at least one injury, or a combination of multiple injuries, endangers life. The spectrum of injuries and posttraumatic disorders is extremely wide. Most commonly they include shock, hypotension due to bleeding or vital organs injury. Injuries are the leading cause of death in developed countries today, and proportion of people who experience polytrauma in the total number of the injured is 3%, with a high mortality rate of 22%. Reanimation procedures and understanding of pathophysiology have progressed remarkably, and in the last twenty years, mortality has decreased by twenty percent. Time is a very valuable factor in the treatment of a polytraumatized patient and requires initiation of injury treatment within 60 minutes of its occurrence. In the clinical approach to treatment, algorithms for the treatment of polytrauma are used to achieve the best results of treatment and to reduce posttraumatic complications. Triage is a formal process through which the condition of all the patients is evaluated right after their arrival at the Emergency Department. Triage determines the urgency of the problem and assesses the allowed and expected waiting time for the beginning of the physician's examination and treatment of the patient. The approach to a polytraumatized patient is multidisciplinary, includes many specialties and requires continuous education and highly educated staff. High-quality skills, good communication and readiness to respond quickly and efficiently are just some of the key determinants of working with patients with life-threatening conditions.

Introduction

Taking care of a polytraumatized patient is a great challenge even for a highly experienced multidisciplinary team because of the definition of polytrauma that indicates that you are dealing with a patient whose condition is life-threatening. Over time, the definition of polytrauma, given by H. Tscherne in 1984, has been shaped and it is still widely accepted. Instead of the organ system it mentions the body region (head, chest, belly, locomotor system) and it states: "Polytrauma is a simultaneous severe injury of at least two body regions where at least one injury, or a combination of them, endangers life" (1).

Polytrauma is considered to be the most complicated condition of a human organism. During polytrauma, the organism undergoes a series of pathophysiological processes that require extraordinary knowledge and skills from the people involved in the treatment and care. One of the key people in the treatment of a polytraumatized patient is also a nurse whose interventions include recognition, care and treatment of an emergency. The nurse must know how to act right at any time in order to save the patient's life and shorten the recovery. The basic things expected of a nurse in the treatment of a polytraumatized patient are: drug administration, taking samples for analysis, treating shock, stopping bleeding and the use of immobilisation agents (2).

The share of polytraumatized patients in the total number of injured people is 3%, and the mortality rate is high and ranges from 16% to 22%. In developed countries, the main cause of mortality from the age of 1 to 44 is an injury. Continuous investment and improvement of diagnostic and therapeutic procedures, improvement of early care and treatment quality, establishment of trauma centers resulted in a decline in mortality after polytrauma from 40% to 20% (2).

What is of utmost importance is the continuous education of healthcare workers involved in care, through trauma and advanced life support courses, and what is necessary is the understanding and proper use of algorithms for the treatment of polytraumatized patients. Adhering to these care procedures, investing in yourself and your knowledge, research, and training of a multidisciplinary team will reduce the chance of complications, speed up the recovery of a traumatized patient, and thus reduce the cost of treatment (1).

Polytrauma

The term polytrauma depends on the language source of the literature that is used: polytrauma (poly + trauma, root of the Greek word, many injuries) multiple injury, multiple injuries.

The term was first defined in Croatia by M. Grujić in 1962, but it did not specify the meaning of the "two systems", which later proved to be inadequate (2). Over time, the definition of polytrauma, given by H. Tscherne in 1984, has been shaped and it is still widely accepted. Instead of the organ system it mentions the body region (head, chest, belly, locomotor system) and it states: "Polytrauma is a simultaneous severe injury of at least two body regions where at least one injury, or a combination of them, endangers life" (1). Because of the differences in the definition of polytrauma, by comparing lethality through literature, we found a range of 9% to 48%, which points to differences in the definition of polytrauma rather than the quality of surgical treatment of a polytraumatized patient (2). According to the data of the Croatian Institute of Public Health, approximately 49,000 traumatized patients are treated annually in the Republic of Croatia. In 2016 there were 2,834 deaths (a rate of 67.9 per 100,000), out of which 2,087 were accidents (50 per 100,000). Among accidents, the most frequent deaths were due to falls (1,096 a rate of 26.3 per 100,000) and traffic accidents (390 a rate of 9.4 per 100,000). From the data we can conclude that traffic accidents and falls from height are the most common causes of polytrauma and the average age of the traumatized patient is 40 years (3).

We need to distinguish between three groups of injuries, depending on the need for an emergency treatment and a life-threatening condition. Firstly, there are critical injuries (airway obstruction, hypovolaemic or cardiogenic shock, heart and blood vessels injury, cardiac tamponade, flail chest). Then there are serious injuries and lastly, minor injuries, in which we include lacerations and less extensive injuries to the soft tissue, ligaments and joints, or cases requiring surgical treatment where patients are often not obliged to stay in hospital (4).

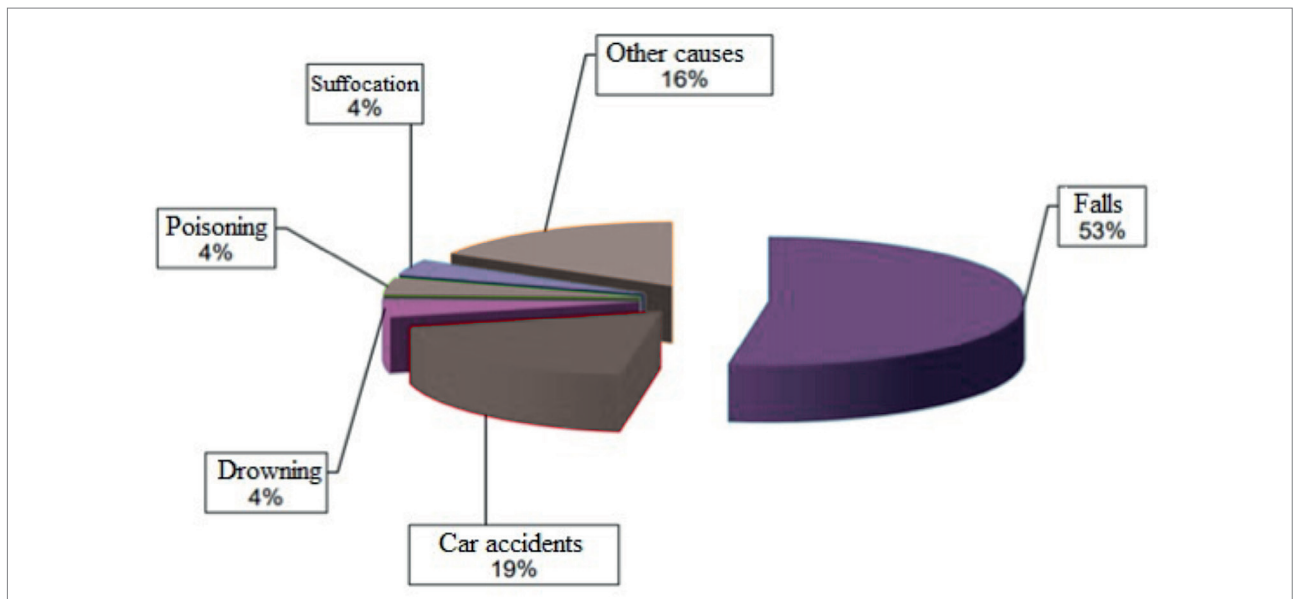


Figure 1. Accident cases in Croatia in 2016

Data source: Croatian Bureau of Statistics, 2017 (DEM-2/16) Data processing: Croatian Institute of Public Health, 2017.

(Suffocation 4%, other causes 16%, falls 53%, car accidents 19%, drowning 4%, poisoning 4%)

Rating scale

Trauma score scales are essential for treating trauma patients and for clinical investigations associated with trauma in order to estimate the severity of injury. There are several scales to assess the severity of an injury, mortality and morbidity, most notably the Glasgow Coma Scale (GCS), Revised Trauma Score (RTS), Abbreviated Injury Scale (AIS), Injury Severity Score (ISS) and Trauma and injury severity score (TRISS) (5). The quantification of the severity of the injury first began to appear in the Anglo-American scientific literature. Classification of the severity of the injury by various triage tag systems and clinical evaluation systems at the admission facilitates a decision on triage, identifies the patients with an unexpected outcome and provides data on the quality of follow-up of the treatment of the injured (5).

Injury Severity Score (ISS) and Abbreviated Injury Scale (AIS)

Today, the most commonly used scale in the world is the Injury Severity Score (ISS) and it is used for anatomical definition of multiple injuries. It is based on the Abbreviated Injury Scale (AIS) system, which marks the severity of each part of body and organ injury (5).

Table 1. AIS-grade description (4)

AIS grade	Injury
1	Minor
2	Moderate
3	Serious
4	Severe
5	Critical
6	Unsurvivable

The AIS table was first introduced in 1969 and has changed many times since then. The latest revision and the one in current use is the scale from 1998 (5).

In the ISS scale, each injury is assigned an appropriate number for the severity of the most serious injury in a particular region of the body. The top three scores are squared and summed up. The obtained number indicates the ISS. The score can range from zero to seventy-five. It is important to note that limbs and pelvis are regarded as one region during the assessment, and the fracture of two bones and a pelvis, or fracture of multiple limbs are not regarded as polytrauma if there is no injury to another region (5). Most authors regard the ISS greater than 16 indicative of polytrauma.

Revised Trauma Score (RTS)

The Revised Trauma Score is considered one of the most commonly used physiological scale. It is based on the measurements of vital indicators of the pathophysiological disorder.

Management of polytrauma

According to older statistical models, the goal of taking care of patients was to prevent death. However, today's goal is to prevent death and prevent consequences that will significantly affect the quality of life after polytrauma. It is rare that the clinical condition is so different in procedures, type and time of treatment such as polytrauma. The reason for this are very complex injuries and damage and insufficiently explained body responses to stress and therapeutic procedures. Management of a polytraumatized patient starts at the site where the injury took place and risk assessment is of decisive importance (6). In assessing the condition of a polytraumatized patient, several factors that are indicators of the total severity of the injury should be taken into account and they are: state of consciousness, duration of hypotension, respiration, severity of individual injuries. By observing these indicators further diagnostic and therapeutic procedures are determined. The state of consciousness can be altered irrespectively of whether the patients have experienced a head trauma. If there is no indication of a head injury, consciousness disorder is most commonly caused by

Table 2. Calculation of ISS-a while applying AIS-grades (6)

Body region	Injury description	AIS	Square top three
Head and neck	Cerebral Contusion	3	9
Face	No Injury	0	
Chest	Flail Chest	4	16
Abdomen	Minor Contusion Of Liver	2	
	Complex Rupture Spleen	5	25
Extremities	Fractured Femur	3	
External	No Injury	0	
		ISS	50

Table 3. RTS measurements and scores

Glasgow Coma Scale	Systolic Blood Pressure	Respiratory Rate	RTS value
13-15	>89	10-29	4
9-12	76-89	>29	3
6-8	50-75	6-9	2
4-5	1-49	1-5	1
3	0	0	0

a reduced blood pressure and blood circulation. If we notice an injury then we use the Glasgow Coma Scale (GCS) (5).

The duration of hypotension is estimated according to the time of injury, the onset of emergency care and the measured pressure on arrival. If the patient has a blood pressure lower than 90 mmHg for a longer period, more serious condition of the injured patient is expected (5).

Chest injuries often cause disorder in breathing rhythm and quality, but there are also frequent changes in breathing, superficial breathing or full inhalations in patients with no chest injury (6).

The severity of the injury is assessed by clinical examination and the surgeon's experience. The main injury is the one that directly threatens the life of the patient, and more such injuries can be present. The main injury does not determine the patient's condition because all injuries affect the general condition of the patient. In Croatia blunt traumas more frequent than open wound injuries (1).

Assessment of the condition of patients using the ABCDE approach

When approaching the patient, it is necessary to assess whether the location is safe, to determine the nature of the injury, to determine the number of patients and whether additional medical staff, police or firefighters are needed. If additional help is required, it should be requested (8). Since time is precious in treating polytraumatized patients, it is essential to have a systematic, easy-to-understand and practical approach. Depending on the results of the assessment, a quick trauma or targeted examination is performed. If the mechanism of the injury is dangerous or the patient is unconscious a fast trauma examination is performed (from head to toe). If the mechanism of the injury suggests an isolated injury (stab wound or gunshot wound), an examination of the injury area is performed. Then follows the ABCDE assessment to determine the urgency and the presence of directly life-threatening conditions of the injured (8).

- A (airway) - examination and assessment of the respiratory tract
- B (breathing) - assessment of breathing
- C (circulation) - circulatory assessment
- D (disability) - a fast neurological assessment
- E (exposure) - exposing the patient

Hospital care of polytraumatized patient

After pre-hospital assessment and care, the patient is transported to the nearest facility for further treatment. The polytraumatized patient and his or her arrival at the Unified Emergency Admission Department must be announced by the outpatient emergency team to timely gather the hospital team. A multidisciplinary team in the care of a polytraumatized patient is made up of a surgeon as a team leader, a younger physician, an anesthesiologist, Emergency Department head nurse, two nurses as members of the resuscitation team, a neurosurgeon for head traumas, an otorhinolaryngologist due to possible emergency tracheotomy (7).

Depending on the type of an injury specialists should be informed. The polytraumatized patient is placed in the resuscitation room and a primary examination to identify life-threatening conditions and injuries begins.

Triage

Triage is a formal process by which all patients are assessed immediately after their arrival at the Emergency Department. Triage estimates the urgency of the problem and assesses the expected waiting time for the initiation of the examination and treatment of the patient (6). We distinguish between three levels of triage. The first is pre-hospital and involves a decision on the need for intervention of the emergency medical team. The second level is performed

on the spot when the emergency team comes into contact with the patient, and the third is performed in hospitals and emergency services, where triage is performed by experienced nurses (2).

The most widely used model is the Australasian Triage Scale (ATS), which consists of five categories of urgency. The first category includes an immediately life-threatening conditions, the second is a life-threatening condition and the maximum waiting time for a doctor's examination is 10 minutes. The third category includes potentially life-threatening condition or critical time, critical treatment and therapy, and a severe pain, and the maximum waiting time for doctor's examination is up to 30 minutes. The fourth category involves potentially life-threatening situations or situations of urgency, significant complexity, and maximum waiting time for the start of the examination is 60 minutes. In the last category there are less urgent states with waiting time for up to 120 minutes (7).

The purpose of the triage system is to ensure that the level and quality of health care provided to the community is proportionate to objective clinical criteria rather than administrative or organizational needs. Due to the complex nature of triage, nurses must have the knowledge of and experience with many diseases and injuries. The use of standard triage systems facilitates quality improvement at the Emergency Department. Re-triage is mandatory if the clinical status changes in such a way that this change affects the triage category itself, if we get information that can affect the triage category, and if the maximum allowed time for triage is exceeded. It is performed by a nurse and a physician, and the assessment itself should not last longer than five minutes (7).

The most common injuries in a polytraumatized patient

During a primary examination of life-threatening injuries, they should be identified immediately. Injuries can easily be remembered as "the deadly dozen": airway obstruction, flail chest, open pneumothorax, massive hemothorax, tension pneumothorax, car-

diac tamponade, myocardial contusion, traumatic aortic disruption, tracheobronchial disruption, traumatic diaphragmatic rupture, pulmonary contusion and explosion injuries (8).

Immediate causes of death are the loss of too much blood, tissue hypoxia, intracranial hemorrhage, while the most common complication is sepsis with multiple organ failure and thromboembolism (8).

Despite progress and ongoing investment in the treatment of polytraumatized patients, mortality is still extremely high. There is a characteristic trimodal distribution of mortality. Immediate mortality, about 45%, refers to death at the accident site. Early mortality refers to death within three hours after the accident and amounts to 35%, and late mortality refers to days and weeks after the accident and it amounts to 20% (9).

1. Severe thoracic injuries

A simple rib fracture is the most common thoracic injury, and if there are no other fracture complications, the main problem is the pain that prevents normal breathing (10). Serious injuries can include a flail chest, open pneumothorax and a massive hemothorax. Pulmonary contusion is one of the more frequent injuries and is caused by bleeding into pulmonary parenchyma.

The nurse controls oxygen saturation in the blood with a pulse oximeter, if there is a need he or she gives oxygen, constantly monitors the heart rhythm and prepares the IV line for the required therapy. After each bolus of liquids, it is necessary to check the vital signs again.

2. Severe abdominal injury

The abdomen is the third most commonly injured region in a polytraumatized patient. Of the total number of injuries ending in the operating room, 20% refers to abdominal injuries. Complications occurring as a result of abdominal injury are bleeding and infection, and often hemorrhagic shock and postoperative complications occur as well (9).

Nurses' interventions are preparing multiple IV lines according to standard procedures, permanent monitoring of patients and observation of their condition and change in condition, pulse oximetry and the use of analgesics and therapies.

3. Head trauma

Head trauma is the leading cause of death or disability in polytraumatized patients. Often head trauma is accompanied by spinal injuries, therefore, immobilization immediately follows (6). In patients with head trauma nurse checks the pupils' reaction to light, symmetry and accommodation reflex, vital signs, GCS and anamnesis. Brain injuries usually occur as a result of head trauma (9).

The nurse must ensure the passage of airway, monitor the patient, monitor vital functions, and prepare multiple IV lines according to standard procedures. If it is necessary, he or she initiates cardiopulmonary resuscitation, monitors the patient, and if the patient vomits, turns him to a lateral position and if necessary, applies oropharynx suction. The main goal is to provide adequate brain oxygenation.

4. Spine trauma

In people who are conscious specific signs of spinal cord injury are neck and back pain, loss of sensation in the extremities and a feeling of burning. If a person is not conscious, it is necessary to monitor the vital functions, check the extremity temperature, breathing, and the presence of muscle reflexes (7).

Nurses' interventions are restraining the spinal mobility, checking and if necessary, opening the airway, checking vital functions, monitoring patients, preparing IV lines, and administering analgesics (7).

5. Pelvic and extremity trauma

Pelvic injury is most commonly associated with intraabdominal or intrathoracic injuries. Fractures of the extremities can be open and closed, they are very painful and can cause a loss of a large amount of blood. In addition to the fractures, joint dislocations are frequent and they are considered as an emergency condition because they can lead to disability or extremity amputation (9).

The nurses' interventions are, in addition to all the things mentioned in previous traumas and injuries - wound treatment, and immobilization of the extremities.

Nursing interventions in the care of a polytraumatized patient

The nursing care of patients with polytrauma encompasses a wide range of nurse's interventions. A nurse is an important link in a multidisciplinary team that takes care of a polytraumatized patient. To prevent complications and possible deaths, the ability and power of observation of each team member is essential. Skill, speed, education and the ability to make good assessment in critical situations are the qualities of highly educated and professional nurses in the care of a polytraumatized patient.

In addition to the above-mentioned interventions, such as making decisions about a triage category, helping and participating in a team, the nurse must provide timely help and provide a comfortable environment for the patient at the Emergency Department. Interventions of nurses must be in agreement with the patient, privacy must be ensured and the patient's dignity must be preserved. All interventions must be explained to the patient in an understandable manner, nursing interventions should not delay medical examinations and finally everything has to be documented in the nursing documentation (10).

In most cases nurses are not there only to stabilize the condition of a patient, but they need to provide psychological support to the patient and the family, talk to them and provide information within the code of ethics, encourage patients to be positive. Although it often seems as irrelevant, conversation and support help a lot later in recovery and rehabilitation. Guidelines and procedures involving nursing interventions must always be documented in the nursing documentation, especially in life-threatening situations (1).

Some of the basic nursing interventions are administering analgesics, antiemetics, antipyretics, oral rehydration and oxygen therapy, patient monitoring, immobilization, preparing IV lines, use of basic life support procedures, taking blood samples for analysis, wound treatment and stopping bleeding and many others (2).

Monitoring of patients in the intensive care unit

The purpose of monitoring is to identify and interpret the disorders in the physiological parameters of the patient and to take measures and interventions to eliminate and treat the already existing disorders. We divide monitoring it into non-invasive and invasive - in which skin is penetrated.

Basic patient monitoring includes the use of a pulse oximeter, capnometer, blood pressure measurement, ECG, body temperature measurement. Extended monitoring includes evoked potentials, electroencephalography, intracranial pressure, pulmonary artery pressure (7).

Neurological monitoring includes assessment of consciousness using the Glasgow Coma Scale, pupil evaluation, reflex presence, limb sensitivity, and cardiorespiratory evaluation. After the initial evaluation we use neurological monitoring to monitor the intracranial pressure that can be measured by an intraventricular catheter, subarachnoid screw, subdural or epidural catheter and fiber optic sensor (7). Regardless of the type of monitoring used, when introducing and using the system intracranially the use of asepsis must be strictly observed. With respiratory monitoring we monitor and evaluate adequate lung function. The nurse must regularly evaluate breathing parameters, function of respiratory muscles, skin color. Non-invasive monitoring involves pulse oximetry, capnography and capnometry for the analysis of carbon dioxide concentrations.

Cardiovascular monitoring, closely related to respiratory monitoring, allows for the cardiovascular function and heart function monitoring. Invasive monitoring by arterial cannulation allows for continuous monitoring of blood pressure and taking blood samples for analysis. Keeping in mind the complications that can arise from arterial cannulation, the nurse must regularly check the puncture site and monitor the symptoms and signs of complications such as thrombosis, infection, bleeding and side effects of therapy.

Conclusion

Treatment of a polytraumatized patient is one of the most demanding and greatest challenges in medicine due to the complexity of the injury and still insufficiently researched stress response caused by multiple trauma and injury. It is necessary to introduce guidelines for the treatment of polytraumatized patients and to comply with standard procedures for each procedure that is being performed on patients.

The approach to polytraumatized patient is very complicated due to the severity of his or her condition. Firstly, the patient's life must be preserved and his condition stabilized while being transported to the nearest institution, in which diagnostics and advanced treatment of such condition are being carried out. Saving the patient's life is primary and treatment is more important than the final diagnosis. Due to the complexity of injuries and disorders in the care of a polytraumatized patient, a multidisciplinary team should be involved which can take care of and provide all the interventions that the patient's condition requires.

Interventions of a nurse as a member of a multidisciplinary team are of great importance from the admission until the discharge of the patient. Continuous education and skill improvement is required to develop the necessary competences that work in such circumstances requires because no state of polytrauma is the same, and the nurses daily encounter new types of polytrauma. As members of the team, nurses make a decision on a triage category, carry out interventions that are specific to certain conditions, monitor changes in vital functions, apply therapy, communicate with the patient, and ensure a safe and comfortable environment for the patient, and ultimately, document everything in the nursing documentation.

The success of the treatment of a polytraumatized patient depends on good co-operation and organization of the team, gaining experience through work and continuous education, investing in equipment and continually comparing results and quality of care with the previous results as well as the results of other trauma centers in order to reduce mortality, discover new and more effective ways of taking care of certain life-threatening conditions and shorten the time of rehabilitation.

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PROCJENA I ZBRINJAVANJE POLITRAUMATIZIRANOG BOLESNIKA

Sažetak

Politrauma je istodobna teška ozljeda najmanje dviju tjelesnih regija gdje najmanje jedna ozljeda ili kombinacija više njih ugrožavaju život. Spekter ozljeda i posttraumatskih poremećaja izrazito je širok. Najčešće uključuju šok, hipotenziju zbog krvarenja ili ozljeda vitalnih organa. Ozljede su danas vodeći uzrok smrti u razvijenim zemljama, a zastupljenost politraumatiziranih u ukupnom broju ozlijeđenih iznosi 3 % uz visoku stopu smrtnosti, koja doseže 22 %. Reanimacijski postupci i razumijevanje patofiziologije iznimno su napredovali te se u posljednjih dvadeset godina smrtnost smanjila za dvadeset posto. Vrijeme je vrlo dragocjen čimbenik u zbrinjavanju politraumatiziranog bolesnika te se zahtijeva početak zbrinjavanja ozljede unutar 60 minuta od njezina nastanka. U kliničkom pristupu liječenju primjenjuju se algoritmi za zbrinjavanje politraume s pomoću kojih se žele postići što bolji rezultati zbrinjavanja i smanjiti pojava posttraumatskih komplikacija. Trijaža je formalan proces kojim se svi bolesnici procjenjuju odmah nakon dolaska u odjel hitne medicine. Trijažom se određuje hitnost problema i procjenjuje dozvoljeno i očekivano vrijeme čekanja na početak pregleda liječnika i liječenja bolesnika. Pristup je politraumatiziranom bolesniku multidisciplinarnan, uključuje brojne specijalnosti te zahtijeva kontinuiranu edukaciju i visokoobrazovano osoblje. Kvalitetne vještine, dobra komunikacija i spremnost da se reagira brzo i kvalitetno samo su neke od ključnih odrednica za rad s vitalno ugroženim bolesnicima.

Ključne riječi: politrauma, algoritam zbrinjavanja, trijaža, multidisciplinarni tim
