



# Comparison of American guidelines for field triage and Polish criteria as qualification to a trauma center

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## Abstract

**Introduction.** Trauma is the third cause of death among the general population in Poland, and the first in people aged 1–44 years. Trauma centers are hospitals dedicated to treating patients with multiple organ injuries, in a complex way that endeavours to ensure a lower mortality rate, shorter hospital stay and better outcomes if the patients are transferred to such a center. Worldwide, there are many models on how to treat a trauma patient, but them to be qualified for the procedure, the selection of potential patients is crucial.

**Objective.** The aim of the study was to compare the Polish model for qualification to a trauma center and American Guidelines for Field Triage.

**Materials and method.** Retrospective analysis of medical documentation recorded between 1 January 2014 – 31 December 2014 was undertaken. The study concerned trauma patients admitted to the Emergency Department of the Regional Trauma Center at the Copernicus Memorial Hospital in Łódź, Poland. Inclusion criterion was initial diagnosis 'multiple-organ injury' among patients transported by the Emergency Medical Service (EMS).

**Results.** In the period indicated, 3,173 patients were admitted to the Emergency Department at the Copernicus Memorial Hospital. From among them, 159 patients were included in the study. Only 13.2% of the patients fulfilled the Polish Qualification Criteria to Trauma Center in comparison to 87.4% who fulfilled the American Guidelines for Field Triage.

**Conclusions.** Polish qualification criteria do not consider the large group of patients with severe injuries (ISS>15), but indicate patients with minimal chance of survival. Polish criteria do not consider the mechanism of injury, which is a relevant predictive indicator of severe or extremely severe injuries (ISS>15). Further studies should be undertaken to improve the qualification and treatment of trauma patients in Poland.

## Key words

trauma, guidelines, decision making, emergency medical services, EMS, injury, triage, ISS, multiple organ injuries, trauma center

## Abbreviations

**MOI** – multiple organ injuries, **CDC** – Centers for Disease Control and Prevention, **EMS** – Emergency Medical Service, **HEMS** – Helicopter Emergency Medical Service, **ISS** – Injury Severity Score, **AIS** – abbreviates Injury Score

## INTRODUCTION

Trauma is the third cause of death among the general population in Poland (6% in 2013), and the first in people aged 1–44 years [1, 2]. Multiple-organ injuries (MOI) are particularly difficult because they demand rapid diagnostics and rapid treatment performed by a well-prepared team of specialists and emergency physicians. Trauma centers are hospitals dedicated to treating patients with multiple organ injuries in a complex way. Studies showed that trauma patients have a lower mortality rate, shorter hospital stay and better outcomes if they were transferred to a trauma center [3, 4]. Worldwide, there are many models on how

to treat trauma patients, but for all the systems one of the most crucial aspects is to establish a good identification and qualification procedure for selecting potential patients to a trauma center [5, 6].

## OBJECTIVES

The aim of the study was to compare the Polish model of qualification to a trauma center, determined by the Ministry of Health Regulation about Trauma Centers (entered into force on 18 June 2010) and American system Guidelines For Field Triage (CDC 2012).

**General background.** Between 2009 – 2010, the system of Trauma Centers was introduced in Poland which consisted

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of 14 such centers located around the whole country. There is no division of levels (stage of reference) of trauma centers, all are equipped and organized at Level I or Level II, as in the trauma centers in US. According to the Ministry of Health regulation, for patients to be qualified to a trauma center they have to fulfill at once two anatomical and two physiological criteria. Mechanism of injury is not considered (Tab. 1a) [7].

In the USA, according to Guidelines For Field Triage, to qualify a patient to a Level I or Level II trauma center, it is enough to fulfil only one criterion among anatomical, physiological, mechanism of injury criteria (Tab. 1b) [8].

## MATERIALS AND METHOD

A retrospective analysis of medical documentation recorded between 1 January 2014 – 31 December 2014 was undertaken which involved trauma patients admitted to the Emergency Department of the Regional Trauma Center at the Copernicus Memorial Hospital in Lodz, Poland. Inclusion criteria were initial diagnosis 'multiple-organ injury' among patients transported by the EMS service (including HEMS, local EMS and interhospital transfers). Because no trauma registry exists in Poland, the subject of analysis was medical documentation of all patients with ICD-10 diagnosis T01-T08. Isolated injuries and ambulatory cases were excluded from the analysis. Which Polish criteria for each patient was assessed and was compared to the model from Guidelines For Field Triage. To assess severity of injury, the ISS score as an independent

**Table 1a.** Polish Qualification Criteria to Trauma Centre.

Anatomical criteria	Physiological criteria
a) Penetrating wounds of head or trunk, blast injuries with signs of involvement of internal organs, injuries around head, chest and abdomen.	a) Systolic blood pressure below 80 mm Hg.
b) Traumatic limb amputation above the level of knee or elbow.	b) Heart rate equal to or over 120/min.
c) Massive crush injury of limbs.	c) Respiratory rate below 10 or over 29 per minute.
d) spinal cord injury	d) Glasgow Coma Scale equal or less than 8.
e) Fractures with vessels or nerves injuries.	e) SpO2 equal or less than 90%.
f) Fractures of at least two proximal long bones or pelvis.	

**Table 1b.** Guidelines for field triage of injured patients – CDC, US, 2011 [8]

1. Vital signs and level of consciousness (physiological criteria).	
a) systolic blood pressure below 90 mm Hg; b) respiratory rate below 10 or over 29 per minute, or need for ventilator support; c) Glasgow Coma Scale equal or less than 13.	
2. Anatomy of injury (anatomical criteria).	
a) penetrating injuries to head neck, torso, and extremities proximal to elbow or knee; b) chest wall instability or deformity; c) two or more proximal long-bone fractures; d) crushed, degloved, mangled or pulseless extremity; e) amputation proximal to wrist or ankle; f) pelvic fractures; g) open or depressed skull fracture; h) paralysis.	If any present, patient should be transported to the highest level trauma center.
3. Mechanism of injury.	
a) falls: • adults: >20 feet/>6 meters; • children: > 10 feet/>3 meters, or three times the height of the child, b) high-risk auto Crash: • intrusion, including roof >12 inches/>30 cm; occupant site or >18 inches/>45 cm, any site, • ejection (partial or complete) from vehicle; • death in the same passenger compartment; • vehicle telemetry data consistent with high risk of injury. c) auto vs pedestrian/bicyclist thrown, run over, or with significant impact >20 mph/>32 kmph; d) motorcycle crash >20 mph/>32 kmph.	If any present (after excluding point 1 and 2.) patient should be transported to trauma center but not necessarily to the highest level
4. Special patient or system considerations.	
a) Older adults: • risk of injury/death increases after age 55 years • SBP <110 might represent shock after age 65 years • low-impact mechanisms might result in severe injury. b) Children: • should be triaged preferentially to pediatric trauma centers. c) Anticoagulants and bleeding disorders: • patients with head injury are at high risk of deterioration. d) Burns: • without other trauma mechanisms transport to burn facility; • with trauma mechanisms transport to trauma center. e) Pregnancy >20 weeks. f) EMS provider judgement.	If any present, (excluding points 1 – 3) consider transport to trauma center but not necessarily to the highest level.

**Table 2.** Comparison between Polish model and American CDC Guidelines For Field Triage

	Polish Ministry of Health Regulation n (%)	American CDC Guidelines for Field triage n (%)	p
Total number of patients	159 (100%)		
Number of patients fulfilling Qualification Criteria to Trauma Center	21 (13.2%)	139/159 (87.4%)	<0.05
Undertriage index	96(60.4%)	10/159 (6.3%)	<0.05
Overtriage index	0 (0%)	32/159 (20.1%)	<0.05
Patients with ISS>15	117 (73.6%)		
Patients with ISS>15 fulfilling criteria	21 (18%)	107/117 (91.5%)	<0.05
Patients with ISS>=25	69 (43.4%)		
Patients with ISS>=25 fulfilling criteria	20 (29%)	67 (97.1%)	<0.05
24-hour survival	8 (38.1%)	16 (11.5%)	<0.05
7-day survival	10 (47.6%)	39 (28%)	<0.05
Up-to-discharge survival	2 (9.5%)	93 (66.9%)	<0.05
Mean ISS score	48 (IQR 24–75)	28.17 (IQR 3–75)	<0.05

indicator was calculated in each case. To calculate the ISS score, Abbreviated Injury Scale Tables (AIS) 2005, updated 2008, were used [9]. Depending on the ISS score, trauma patients were divided into three groups:

- a) mild and moderate injuries (ISS<16);
- b) severe injuries (ISS 16–24);
- c) extremely severe injuries (ISS>24) [10, 11, 12].

All qualification criteria were correlated with actual ISS score. 24-hour-, 7-day-, up-to-discharge survival was also evaluated. Statistical analysis was performed in the program Statistica 10. Significant relevance –  $p < 0.05$ . Approval to conduct the study was obtained from the local Ethics Committee.

## RESULTS

Between 1 January 2014 – 31 December 2014, 3,173 patients were admitted to the Emergency Department at the Copernicus Memorial Hospital and from among them 159 were included to the study.

## DISCUSSION

The Polish qualification criteria to trauma center do not consider the large group of patients with severe injuries (ISS>15), potentially suggesting transport to non-trauma center hospitals. The Polish criteria are too sophisticated, therefore, if the patient fulfills them, the injuries sustained are so critical that the chances of survival are minimal, independent of efforts and intensive treatment. According to ACS-COT recommendations, the over-triage rate of between 25–50% and under-triage rate of <5% are considered as approvable [6]. The Polish criteria do not take into consideration the mechanism of injury, which is a relevant predictive indicator of severe or extremely severe injuries (ISS>15) [8, 13]. Furthermore, Polish criteria demand the simultaneous fulfilment of four different criteria (2 anatomical and 2 physiological), whereas each of them individually correlates with sustaining severe injuries. In the Polish model, the probability of sustaining severe injuries is amplified, therefore, patients definitely qualified to trauma centers are very likely to die.

This study shows that to achieve an optimal over-triage rate of 25–50% and an under-triage rate of <5%. The American system based on CDC Guidelines For Field Triage should be implemented.

Additionally, other difficulties were revealed: 1) lack of a National Trauma Registry makes studies on Trauma Centers and their effectiveness extremely difficult; 2) there is no medical data standardization, and no trauma sheet exists; 3) documentation performed by EMS are usually incomplete for the purpose of investigating correlations between mechanism of injuries and circumstances of accidents.

**Limitations.** The retrospective data analysis presented in this study refers to previous years, but legislation and work organization have not been changed and remain in force to the present day. The Ministry of Health Ordinance about Qualification criteria to Trauma Center is in force and constitutes the standard of procedure in Poland.

## CONCLUSIONS

It seems that the American Centers for Disease Control and Prevention (CDC) Guidelines For Field Triage should replace the Polish qualification criteria to a trauma center. Further studies should be undertaken to improve the qualification and treatment of trauma patients in Poland.

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