



Analgesia in trauma patients administered by Emergency Medical Services

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ABSTRACT

INTRODUCTION: A pain response is an inevitable symptom in trauma patients and requires to undertake a medical intervention in pre-hospital conditions. In the Polish system of medical rescue, there are teams including a doctor or without one where a paramedic is the main person to make decisions. Due to lack of standard procedures and a pain rating scale attached to the documents of medical rescue teams, the authors of the research attempted to analyse the administration of analgesics in trauma patients.

MATERIAL AND METHODS: The research was conducted on 266 trauma patients selected from 2307 interventions of Emergency Medical Service in Łęczyca in 2016. ANOVA, one-way analysis of variance, and T-tests for unpaired samples were applied. All the results were found significant at $p < 0,05$.

RESULTS: The study was carried out on 150 males and 100 females. The average age of the the trauma patients was 77 (SD \pm 38). Rescue teams were sent to trauma patients at 71-80 and 51-60 age groups. In 64,7 % (n=172) of the cases, help was provided in rural areas, whereas in 35,3 % (n=94) cases - urban areas. Most frequently, the patients were injured as a result of traffic accidents, activities while carrying out farm work as well as cut wounds and self-mutilation. Anaesthesia was applied in 120 cases (45,11%), mostly in patients between the age of 81 and 90 and most rarely in children. A total number of painkiller administration was higher in basic Emergency Medical Services (B-EMS) than in specialized ones (S-EMS) (84 vs. 55). No statistically significant relation between the choice of the medicine and the injury type was discovered (Kruskal-Wallis; $p=0,82$). The drug used most often was Ketoprofenum (n=87) and Fentanylum (n=35). There was significant difference in the administration of analgesic drugs between B-EMS and S-EMS teams (χ^2 ; $p=0,042$).

CONCLUSIONS: Over half of the trauma patients was not secured by administering analgesic drugs in pre-hospital conditions. The number of analgesic drugs used in B-EMS and S-EMS teams was diverse. Patients were given nonsteroidal anti-inflammatory drugs (NSAIDs) more often than opioids.

KEY WORDS: Emergency medical service, analgesia, trauma, pain,

INTRODUCTION

Emergency Medical Rescue System in Poland

The beginning of Emergency Medical Services in Poland dates back to 1891 when the first Emergency Medical Service was set up in Cracow. In the following years, the next emergency medical units were established in other cities in Poland [1]. Nowadays the system consists of hospital medical services: ER – emergency rooms and EMS – emergency medical service, including HEMS – helicopter emergency medical service. In 2018, 1554 medical rescue teams existed in Poland, most of which included teams without any doctor (Figure 1).

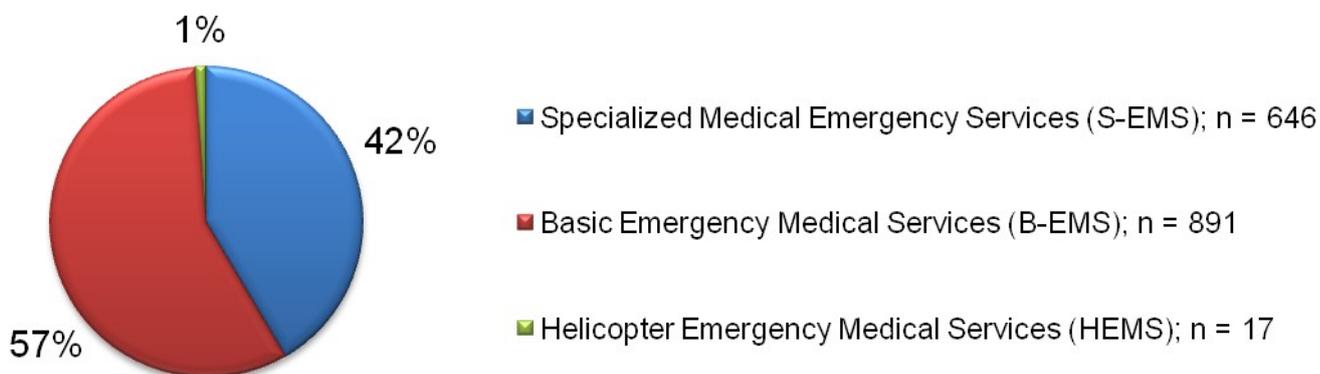


Figure 1. Type of EMS

In teams with no doctors, a paramedic or a specialised nurse is the manager who makes decisions. On the basis of the Regulation by the Minister of Health dated on the 20th April 2016 on medical rescue services and other health care services that can be provided by medical rescuers (Dz. U. 2016 poz. 587), a paramedic can administer 47 drugs including 6 analgesic drugs [2]. A doctor in S-EMS team is allowed to administer 2 additional drugs presented in Table 1.

Table 1. Analgesics in the B-EMS and S-EMS

| | The name of the analgetics | Type of EMS |
|----|-----------------------------------|--------------------|
| 1. | Acidum acetylsalicylum | B-EMS, S-EMS |
| 2. | Fentanylum | B-EMS, S-EMS |
| 3. | Ketoprofenum | B-EMS, S-EMS |
| 4. | Lidocaini hydrochloridum | B-EMS, S-EMS |
| 5. | Morphini Sulfas | B-EMS, S-EMS |
| 6. | Paracetamololum | B-EMS, S-EMS |
| 7. | Ketaminum | S-EMS |
| 8. | Tramadoli hydrochloride | S-EMS |

Pain assessment

Due to an ability to feel pain, a person can react to alarming changes taking place in the body. However, pain is a subjective sensation and it is hard to determine its scale. It is made even more complicated by the fact that everyone has a different threshold of acceptable pain and different degree of pain resistance [3]. The main function of pain is to warn against dangers, which allows people to use mechanisms aiming at minimising negative consequences of an illness or injury for the body. In medicine, numerous scales of rating pain are applied. The most significant element intended to determine pain is an interview with a patient. It may be noticed that the examination of the level of pain is conducted in order to make an appropriate diagnosis as well as introduce proper therapeutic procedures and indicate the most effective ways of relieving pain [4]. To determine pain properly, the following must be taken into account: the patient's description of pain, pain location, patient's reaction, the influence of pain on fitness and time characteristics.

VRS – Verbal Rating Scale

Verbal Rating Scale is the easiest and faulty way of pain assessment - mainly because patients find it difficult to describe their painful sensations. The five-level psychometric Likert scale is usually used in which numbers correspond to the level of the experienced pain (Figure 2) [5].

Wong-Baker Scale

The Wong-Baker Faces Pain Rating Scale is also used and it is based on the interpretation of faces presented on pictures ranging from a happy face at 0 (no pain) to a crying face at 10 (unbearable pain). The method is often applied in pediatric patients who have difficulty determining their level of pain. In their case, the illustrations may come very useful.

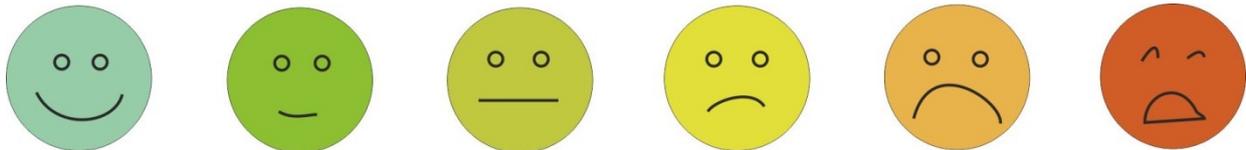


Figure 5. Wong-Baker Scale

The authors of the article undertook an attempt to analyse the administration of analgesic drugs in trauma patients, indications and frequency of use depending on the type of medical rescue teams.

MATERIAL AND METHODS

The analysis was conducted using medical records of rescue activities completed by managers of basic and specialized teams of medical rescue services. The research comprised 2307 interventions of medical rescue services in Łęczycza between 1st January 2016 and 31st December 2016, from which 266 cases concerning trauma patients were selected. The Shapiro–Wilk test was applied to test normality of distribution of a random variable. Statistical analysis was conducted using one-way analysis of variance ANOVA as a non-parametric method of the Kruskal–Wallis test as well as T-tests for unpaired variables with the use of Past 3 program. All the results were significant at $p < 0,05$.

RESULTS

Patient's profile

The analysis of data from 266 intervention records of Emergency Medical Rescue Services allowed the authors to determine the profile of a trauma patient. 58,6 % (n=156) of the cases were males, whereas 41,4% (n= 110) - females. It was discovered that the teams were most frequently sent to trauma patients aged 71-80 and 51-60. As a result of the medical analysis, it was found that 31 cases concerned patients under 18.

While analyzing the specifics of the place where the events occurred, it was determined that 64,7 % (n=172) of the cases happened in rural areas and 35,3 % (n=94) - urban areas. Some patients' condition was assessed as good and stable - 41 % (n=109), whereas other people's state was considered to be unstable (average, severe or critical). Every tenth patient suffered from injuries to an upper or lower limb, head or ribs. Unconscious patients amounted to 9,7% (n=26). People under the influence of alcohol were identified among trauma patients (n=14). As a next step, the analysis of the mechanisms of trauma occurrences was conducted. It was observed that traffic accidents, activities while carrying out farm work as well as cut wounds and self-mutilation were the most frequent cause of traumas. The cases of slipping, falls from a height, battery and epilepsy episodes were also observed. Injuries occurring as a result of a fall from a bike, fainting and animal attacks were the most rare. A detailed summary is presented in Table 2.

Table 2. Mechanism of injury

| Mechanism of injury | Number of events (%) |
|---|-----------------------------|
| Car accident | 37 (13,9%) |
| Fall on the same plane (stumble) | 36 (13,5%) |
| Agricultural works | 34 (12,8%) |
| Cut wound or self-mutilation | 30 (11,3%) |
| Crime / battery | 15 (5,6%) |
| Fall from a height | 7 (2,6%) |
| Epilepsy | 5 (1,9%) |
| Fireworks | 5 (1,9%) |
| Classes in the school | 4 (1,5%) |
| Attack of an animal | 4 (1,5%) |
| Fainting (disturbance of consciousness) | 3 (1,1%) |
| Fall from the bike | 2 (0,8%) |

Frequency of applying pharmacological analgesia

The number of calls to trauma patients for a specialized ambulance amounts to 28,94% (n=77), whereas 71,05% (n=189) of the cases involved patients of the basic ambulance. Analgesic drugs were administered in 45,11% (n= 120) of the cases of trauma patients. It was determined that the biggest group of patients who had anaesthesia were at the age group of 81-90, which constituted 15,41% (n= 18) of all the analysed patients. The most rarely, only in 4,88% (n= 6) of the cases, analgesic drugs were applied in pediatric patients aged between 0 and 10. Trauma patients under 18, were secured by using analgesic drug in 17 cases, which constituted 54,84% of the pediatric group. Taking into account the type of medical service, the number of analgesics given is presented in Table 3.

Table 3. The amount of analgesics given

| The name of the analgetics | B- EMS | S-EMS |
|-----------------------------|-----------|-----------|
| 1. Acidum acetylsalicylum | 59 | 28 |
| 2. Fentanylum | 5 | 7 |
| 3. Ketoprofenum | 20 | 5 |
| 4. Lidocaini hydrochloridum | 0 | 2 |
| 5. Morphini Sulfas | 0 | 1 |
| 6. Paracetamololum | 0 | 2 |
| 7. Ketaminum | 0 | 0 |
| 8. Tramadolii hydrochloride | 0 | 0 |
| SUM | 84 | 55 |

The total number of analgesics administration in Emergency Medical Rescue Services in B-EMS and S-EMS types amounted to n=139 in 120 patients. B-EMS ambulances gave analgesics in 84 cases, which constituted 60,4% of the total number of applications in trauma patients, whereas in S-EMS ambulances, analgesics were administered in 55 cases - 39,6% of all uses. General classification showed that the most frequently used drug was Ketoprofenum (n=87) and Fentanylum (n=35). Opioids were administered 49 times, whereas nonsteroidal anti-inflammatory drugs (NSAIDs) - 88 times. Statistically significant difference in the total number of analgesics administration was found between B-EMS and S-EMS (χ^2 ; p=0,042). A statistically significant influence of the type of trauma on the applied analgesic drug was not discovered, either (the Kruskal-Wallis test; p=0,82).

The most frequent injuries in which analgesics were not administered were head damages. The group included mostly people under the influence of alcohol. On the other hand, patients experiencing traumas to upper limbs refused to be given analgesia (Table 4).

Table 4. Cases of non-use of anesthesia

| Type of injury | There is no use of analgesia and the number of patient refusals |
|---------------------------|--|
| Head damage | n = 53 (Refusal = 0) |
| Trauma to upper limbs | n = 19 (Refusal = 6) |
| Injury of the lower limbs | n = 28 (Refusal = 3) |
| Chest injury | n = 25 (Refusal = 4) |
| Spine injury | n = 6 (Refusal = 0) |
| Abdominal injury | n = 2 (Refusal = 0) |
| SUM | n = 133 (Refusal = 13) |

DISCUSSION

As a result of the conducted research, statistically significant difference in the amount of administered analgesics was found in trauma patients between B-EMS and S-EMS teams (χ^2 ; $p=0,042$). However, it should be pointed out that the total number of applications of analgesics was higher in basic teams than in the specialized ones (84 vs. 55). It can be explained by the fact that there were twice as many calls for B-EMS ambulances than S-EMS ones concerning trauma patients, and as a consequence, the need to use pharmacological analgesia was more frequent [6]. It was observed that opioids were administered as often as in the basic ambulance as in the specialized one (B-EMS = 25 vs. S-EMS = 24), although medical rescuers had not received the right to use Fentanyl until the middle of 2018.

Generally, the most frequently used drugs were Ketoprofenum and Fentanyl. The results confirmed that in pre-hospital conditions trauma patients were given nonsteroidal anti-inflammatory drugs (NSAIDs) more often than opioids (88 vs. 49). It was also acknowledged that pediatric trauma patients had analgesics administered more rarely than adult patients. Documentation of medical records of Emergency Medical Service did not contain a section required to assess pain, which might influence more rare use of analgesics in pre-hospital conditions [7]. According to J. Kiszka, D. Ozga, S. Szela, J. Wordliczek, each injured person should be given painkillers, also a small patient such as a child [8]. Pain was one of the reasons for calling for an ambulance. However, on the basis of numerous studies, not only in Poland, but also in the USA, it was stated that the analgesic treatment was not often applied [9]. According to the research conducted at Hadassah University Hospital-Mt. Scopus, as many as 70% of the patients did not receive analgesic drugs [10]. After conducting the research, the authors confirmed the fact that painkillers were not administered in 45,17% of the pediatric cases. It may be noticed that pain was rarely alleviated and it was the main source of suffering, not only a warning and defensive mechanism of the body [11]. Such a belief resulted in a significant increase in patient's discomfort and inducing unnecessary stress. It was particularly important in the case of children, who could not cope with the feeling of danger and fear caused by experienced pain.

Lack of applying adequate analgesia in pre-hospital conditions may be the result of insufficient training, lack of procedures as well as the medical staff's fear of complications. In the case of complex

injuries co-existing with other illnesses, it is necessary to assess the patient in the appropriate way. Otherwise, it could pose significant risk to the patient. In literature, there is sound evidence that opioids were administered by medical rescuers only in 0,74% calls in Poland, mainly in cases of post-trauma pain, without the assessment of pain intensification [12]. In order to improve the quality of health services concerning trauma patients, it is reasonable to attempt to assess the intensity of trauma pain at an appropriate scale as well as take into account age of the patients, body weight, trauma mechanism and conditions in which they are to be transported [13].

CONCLUSIONS

The number of opioids applications in the basic and specialized medical rescue teams was diverse. Pediatric trauma patients were given analgesics more frequently than adult patients. Fentanylum was an opioid which was administered most often, whereas Ketaprofenum was most frequently used from the group of nonsteroidal anti-inflammatory drugs (NSAIDs). There was no significant difference in the administration of particular analgesics between B-EMS and S-EMS ambulances. More than half of the trauma patients was not secured by administering analgesic drugs in pre-hospital conditions.

Disclosure statement

No potential conflict of interest was reported by the authors.

REFERENCES

- [1] Klepacka M, Sholokhova D, Bakalarski P, Kupiński K, Leszczyński PK. The profession of a paramedic as a new specialty in the health care system - a prospective assessment of social awareness. *Critic Care Innov.* 2018; 1(2):11-19.
- [2] Wejnarski A, Gajek Villebæk PA, Leszczyński PK. Prospective evaluation of interactive project of Emergency Medicine Exam with the use of multimedia computer devices. *Critic Care Innov.* 2018; 1(1):1-15.
- [3] Neumann-Podczaska A, Nowak T, Wieczorowska-Tobis A. Miejsce paracetamolu wśród leków przeciwbólowych. *Gerontol Pol.* 2013; 4: 133-137.
- [4] Campbell, J.E: ITLS International Trauma Life Support. *Ratownictwo przedszpitalne w urazach*, Kraków 2015, *Medycyna Praktyczna*, wyd. VII.
- [5] Korbut R. *Farmakologia*. PZWL, Warszawa 2012.
- [6] Szyller A, Koral A, Zyśko S. Analiza zastosowania opioidowych leków przeciwbólowych przez ratowników medycznych w zespołach podstawowych ratownictwa medycznego. *Anestez Ratow.* 2013; 7: 165-172.
- [7] Rozporządzenie Ministra Zdrowia z 9 listopada 2015 r., w sprawie rodzajów, zakresu i wzorów dokumentacji medycznej oraz sposobu jej przetwarzania (Dz. U. 2015, poz. 2069).
- [8] Kiszka J, Ozga D, Szela S, Wordliczek J. Stosowanie leków przeciwbólowych w Zespołach Ratownictwa Medycznego - doniesienie wstępne. *Anestez Ratow.* 2017; 11: 282-290.
- [9] Ellershaw J, Wilkinson S. *Care of the dying: a pathway to excellence*. Oxford University Press 2005.
doi: <http://dx.doi.org/10.1093/acprof:oso/9780198509332.001.0001>
- [10] Kosiński S, Bryja M, Wojtaszowicz R, Górka A. Występowanie, charakterystyka i leczenie bólu w jednym rejonie operacyjnym zespołów ratownictwa medycznego. *Anest Intens Tera.* 2014; 46(2): 90-95.
- [11] Dobrogowski J, Zajączkowska R, Dutka J, Wordliczek J. Patofizjologia i klasyfikacja bólu. *Pol Przeg Neurol.* 2011; 7: 20-30.
- [12] Stalnikowicz R, Mahamid R, Kaspi S. Undertreatment of acute pain in the emergency department. *Internat J Qual Health Care.* 2005; 17(2): 173-176.
doi: <https://dx.doi.org/10.1093/intqhc/mzi022>
- [13] Jarosławska-Kolman K. System Państwowego Ratownictwa Medycznego w Polsce. *Zeszyty Naukowe SGSP* 2016; 4: 168-181.