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ȘCOALA DOCTORALĂ DE MEDICINĂ  
DOMENIUL DE DOCTORAT: MEDICINĂ

# PhD THESIS

## summary

### *"Contributions to emergency management of ofta-oro-maxillofacial trauma"*

*Goldberger 1990, "When you prepare for an emergency,  
the emergency ceases to exist."*

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## 1. Introduction

Trauma, and especially head trauma, is the number one cause of death for adults younger than 45 in Europe. The trimodal distribution described by Tunkey also highlights a significant proportion of deaths in the early hours of trauma, which could have been reduced by faster medical interventions in the early stages. This has led some services across Europe to propose to have at least one trauma specialist on all types of ambulances in crews.

Regarding the chain of vital support in trauma of the cephalic extremity within the emergency services, it is considered that the most sensitive link is the initial management in the pre-hospital initiated both by the non-medical staff who intervene with first aid maneuvers and by the specially trained technical staff, paramedics, nurses and doctors.

For **ATLS** (Advanced trauma life support), very important is what happens in the prehospital, such as the time factor (not hours but minutes and seconds), brain preservation and early resuscitation. Rigid protocols should be replaced by flexible life support elements. Current research aims to clarify fluid management strategies, differences between accidental hypothermia and the benefits of therapeutic hypothermia, hibernation strategies for long-term transportation from rural or military areas, fantastic potential for diminishing secondary manifestations in patients with severe brain damage. Research for an ideal blood substitute requires openness to the new, not closure on patent and copyright grounds.

Multidisciplinary emergency management of the cephalic extremity should be carried out longer and better. Also, the introduction as soon as possible of protocols for the preservation of the human body through profound hypothermia in massive blood loss, brain damage, cardiac arrests is no longer the domain of SF. This could delay brain resuscitation to be performed in hospitals with increased resources and possibilities. In conclusion, cephalic trauma management and trauma resuscitation may be the greatest gift to our society.

Advanced care for traumatized patients is still being analyzed and discussed from the point of view of prehospital organization compared to hospital care, but there is no doubt that the rapid recovery and transfer of critically ill traumatized patients to trauma centers makes a significant difference in saving lives.

Various triage protocols for trauma have been implemented in order to avoid certain centers that do not correspond and this depending on the mechanism of action, the lesion or physiological status present in the patient in question. Also, the configuration of therapeutic

maneuvers applied to traumatized patients in the field and during the transfer, opinions are divided.

## **2. Purpose and objectives**

The main objective of this paper is to propose a series of improvements for addressing medical emergencies, especially those with traumatic component at the level of the cephalic extremity. The integrated interdisciplinary clinical practice, based on guidelines and protocols of emergency situations in our country is still at its beginning.

Prehospital medical services are limited and expensive anywhere in the world. The management of material and human resources in Romania is done according to algorithms that are not always synchronized with what is actually happening in the field. Thus, there is a need to implement new methods of allocating and organizing these resources according to various variables that we will detail below. It is a central objective to propose models of approach that can lead to improved management of them.

In current practice, at this moment, most of the time immediately after the emergency call, the polytraumatized patient is taken from the field by the pre-hospital teams (SMURD or SAJ) who provide the first care and maintenance of vital functions, then the patient is transported and handed over to the emergency unit (UPU). At the hospital, if maintaining vital functions is a problem, intensive care is called or the patient is sent to one of the departments: surgery, ophthalmology, orthopedics, neurology, etc. The specialized clinical consultation is done in an iterative way, the doctors who take over the patient ask for the consultation of other specialties. At this step, priorities are not always evaluated and established.

The performance of the crews is essential for providing modern and qualified care for this decade. At this moment there are a series of guidelines and protocols issued at European level and the Romanian emergency system has adopted them. Training and checking the application of these protocols in practice are always useful tools.

The injury profile of traumatized patients is useful to field and hospital medical teams who, having such information, can optimize the medical act for a better evolution. Thus, we aim to highlight some working models to create tools for modern optimization and management of these aspects.

### **3. Methodology and method**

It involves collecting and analyzing databases obtained with IGSU permission to develop and find concepts that can be verified. For the analysis at national level, the **SMURD database** for 4 years was used, it has almost 900,000 cases. In order to illustrate more clearly the phenomena at local level, we used the SMURD Sibiu database with a number of 75,000 interventions over a period of 8 years between 2010-2017.

The SMURD service records the details of each case at the end of the intervention in a standardized way, making possible further analyses. The data from the SMURD database were received in the form of datasets in text files, csv format. For data manipulation, SQL language and MySQL server were used to host and analyze tables in databases.

Data files were imported into the MySQL server to allow them to be analyzed using SQL language. SQL is short for Structured Query Language and is a standardized programming language that is used to query and manage relational databases and perform various operations on data. Tables in the newly created database have been corrected and normalized, and helper tables have been created to enable advanced queries.

The resulting datasets were obtained through SQL routines after which they were statistically processed in specialized programs. The interface with MySQL server was done using HeidiSQL application that allows editing complex queries. In order to extract relevant and useful data sets for the analyses of these studies, new tables were created with which correlations could be made using complex functions programmed by the author.

The extracted resulting datasets were then imported into the Microsoft Excel application where they were statistically processed and the charts and tables used to communicate the analysis results were generated.

Advanced statistical mathematical methods such as **ARIMA and PEARSON factors** were used for dynamic analysis of observed phenomena.

## **4. STUDY 1 - ABUSE OF 112 CALLS. CONTEXTUAL RESPONSE OF CREWS**

### **INTRODUCTION**

The activity of SMURD Romania emergency crews is dependent on the severity of the call. The more critical the patient, the faster crews should react.

We studied aspects of how the population uses the **112** system and for this we chose the cases called as unconsciousness and to what extent this emergency is found in the caller. The incorrectness of the initial assessment can be attributed both to a lack of medical education and to a tendency to present the situation in a more serious way than it is to knowingly require a higher-level crew.

"Any action taken based on emotions is not a decision, it is a reaction" (David Givot – ems1.com), so the purpose of this national study is to identify how SMURD crews prioritize their reaction time. The study also aims to highlight an important emotional component, based on the previous subjective experience of the crews.

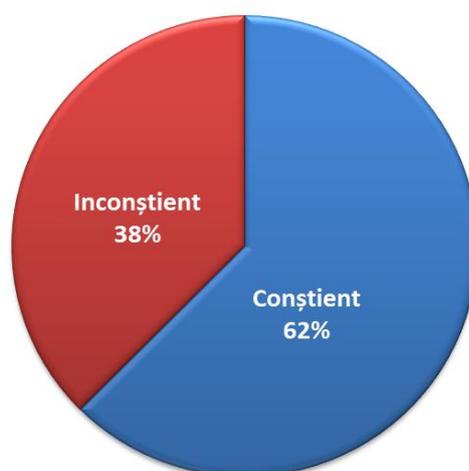
## **MATERIAL AND METHOD**

This retrospective analysis was done over a period of 3 years using the national SMURD database. Thus, **589873 cases were analyzed** between the years (**2010 - 2012**).

For the analysis of system abuse, we selected the cases called as unconscious and then compared what was found on the spot

## **RESULTS AND DISCUSSION**

Analyzing the cases reported as unconscious, it was revealed that out of **87812** cases (urban and rural) reported as unconscious, only **38%** were indeed states of unconsciousness. Figure no. 1)



**Figure No 1.** Status of patients on call of unconsciousness

In urban intensive care ambulance, analyzing this phenomenon over the time period showed an improvement from **57%** to **54%** for patients in unconscious state alarms. For Sibiu, we have a particular situation where it is observed that there is generally a much better level than the national average, but with an increasing abuse rate, namely from **42%** to **47%**.

This phenomenon can also be explained by the fact that in rural areas people often try to solve their own problems and perhaps become more responsible than city dwellers who usually abuse the system more. Over time, it is also observed that this curve continues to worsen (**38%** to **35%**).

Road accidents (43129 cases) recorded an average speed of around **51 km/h** (sd = 24). In contrast, alerts for the unconscious person (87127 cases) recorded an average speed of **39 km/h** (sd=21).

A possible explanation for such a weaker reaction is also the fact that on this type of alarm there are many false alarms or with exaggerated diagnosis, an abuse of the emergency service. We have shown that only **38%** of cases reported as unconsciousness are actually found as unconsciousness.

When announced unconsciousness is potentially associated with cardiorespiratory arrest (announced as possible cardiorespiratory arrest), response speed improves by about 15%. So the reaction speed increases from **39 km/h** (sd=21) to **45 km/h** (sd=23 ). Due to this association with a possible cardio-respiratory arrest, intervention teams realize that it is indeed a life-threatening situation and thus the reaction speed improves remarkably. The same phenomenon can be seen in cases of chest pain where the speed increases from 47 km/h to 51 km/h and even in road accidents with an increase from 51 km/h to **63 km/h**. (Figure no. 6)

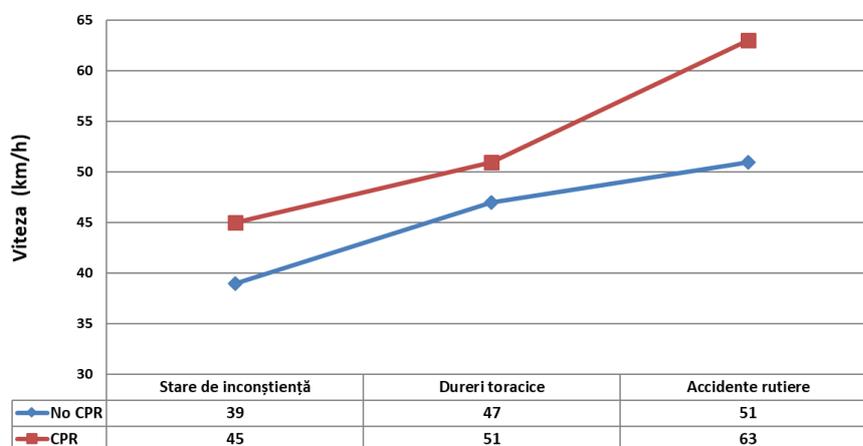


Figure No 6. Reaction speed of crews depending on the possibility of cardiac arrest

Another aspect that is analyzed is the type of patient. Mobile intervention crews increase the reaction speed when it comes to pediatric cases compared to situations involving adults.

## CONCLUSIONS

Emergency calls are often misreported when the population is not properly educated and system abuse inherently occurs. If the assessment is not done correctly we have the following consequences:

1. Life-saving manoeuvres are not instituted quickly
2. The manoeuvres applied are not the correct ones
3. The dispatcher informs and misguides the caller
4. Sending the wrong medical resource to the incident

Never has anything good or productive come out of a subjective or emotional reaction of mobile emergency crews. This has been shown to be generally true and not just for pre-hospital crews. The current study highlights that these phenomena are also found in SMURD crews.

However, when potentially traumatized cases are looming, things change and crews mark a significantly better reaction time.

How prehospital emergency crews respond is often influenced by their own experience and this is not always desirable. How crews should react must be based on an objective approach depending on the severity and context of the medical case.

## 5. STUDY 2 - MATHEMATICAL MODEL FOR PROTOCOL ANALYSIS IN PREHOSPITAL

### INTRODUCTION

The guidelines and protocols are central to modern emergency medicine and are based on evidence-based medicine research as mentioned in the first chapters of the thesis. Guidelines and protocols are designed to extend an accumulated medical experience to reach each medical case. We used a color system starting with red indicating the greatest protocol distance to blue, which indicates a correctly used protocol component. The study attempts to answer the question: **"To what degree are the protocols in place really applied correctly?"**

## MATERIAL AND METHOD

The study was conducted over 4 years using the national SMURD database. The years taken into account are **2010 – 2013**. The database contains about 900,000 emergency cases. They were selected using computer methods, data to represent the basis on which a visual tool was built to reflect in a simple and intuitive way their correctness.

To be more intuitive, use this color code from red, which indicates a very large difference, to blue, which indicates a minimal difference from the protocol. The yellow color indicates the middle, and orange and green almost faintly and almost well, respectively. Thus, the color blue means that the protocol is respected and red reflects a problem in the application of protocols.

## RESULTS

In order to graphically represent compliance with protocols, we created a matrix system, where each cell of the matrix shows the percentage of situations in which the specific medical maneuver was applied.

We created a model to visualize the performance of intervention crews in terms of trauma and more specifically road accidents. Road accident is a very complex and very frequent type of emergency, which, in addition to complex trauma medical situations, also associates multiple technical and logistical complications.

Managing an extrication road accident with multiple victims requires an extended team of as many members as possible to work together in a synchronized and organized way.

It was calculated as a percentage in how many situations the manoeuvres were applied.

	<b>GCS &lt; 9</b>	<b>SpO2 &lt; 85</b>	<b>Dureri cervicale</b>	<b>Fracturi</b>	<b>Arsuri</b>
<b>Căile aeriene</b>	72.22	73.08			
<b>Ventilație</b>	68.72	70.09			
<b>Intubare</b>	63.58	62.24			
<b>Oxigen</b>	76.03	74.58			
<b>Abord venos</b>	68.11	68.79	68.98	76.48	50
<b>Analiză ECG</b>	91.77	89.72			95.83
<b>Medicație</b>	64.4	62.24		65.13	58.33
<b>Fluide</b>	66.26	66.36		70.29	62.5
<b>Bandaje</b>					58.33
<b>Guler cervical</b>	76.13	75.89	86.42	88.46	
<b>Atelă</b>				39.49	
<b>Targă vacum</b>				42.34	

**Tabel nr. 10.** Calcul procentual pentru aplicarea unei manevre pe tip de leziune pt TIM

	<b>GCS &lt; 9</b>	<b>SpO2 &lt; 85</b>	<b>Dureri cervicale</b>	<b>Fracturi</b>	<b>Arsuri</b>
<b>Căile aeriene</b>	100	100			
<b>Ventilație</b>	100	100			
<b>Intubare</b>	100	100			
<b>Oxygen</b>	100	100			
<b>Abord venos</b>	100	100	100	100	100
<b>Analiză ECG</b>	100	100			100
<b>Medicație</b>	100	100		100	100
<b>Fluide</b>	100	100		100	100
<b>Bandaje</b>					100
<b>Guler cervical</b>	100	100	100	100	
<b>Atelă</b>				100	
<b>Targă vacum</b>				50	

**Tabel nr. 11.** Manevrelle ce ar trebui aplicate de TIM conform protocoalelor

The visual representation of the correctness of the application of protocols is done by overlapping the two matrices, making the difference between what we expect and what is actually done in the field with color representation of the difference. 

	<b>GCS &lt; 9</b>	<b>SpO2 &lt; 85</b>	<b>Dureri cervicale</b>	<b>Fracturi</b>	<b>Arsuri</b>
<b>Căile aeriene</b>	27.78	26.92			
<b>Ventilație</b>	31.28	29.91			
<b>Intubare</b>	36.42	37.76			
<b>Oxygen</b>	23.97	25.42			
<b>Abord venos</b>	31.89	31.21	31.02	23.52	50
<b>Analiză ECG</b>	8.23	10.28			4.17
<b>Medicație</b>	35.6	37.76		34.87	41.67
<b>Fluide</b>	33.74	33.64		29.71	37.5
<b>Bandaje</b>					41.67
<b>Guler cervical</b>	23.87	24.11	13.58	11.54	
<b>Atelă</b>				60.51	
<b>Targă vacum</b>				7.66	

**Tabel nr. 12.** Visual percentage based on field comparison and protocols for TIM

Most colors veer towards green-blue, which indicates behavior according to the lines drawn by the protocols in force. Yellow areas appear in peripheral venous access necessary in burns and the use of splints in fractures. (Table 12)

From this model, slight problems in burn management are observed, indicating a potential need for additional training.

## CONCLUSIONS

As far as we know, this is the first visual feedback system for assessing the correctness of implementing protocols at national level in Romania.

The purpose of this study is not to extract specific areas where improvements can be made in crew training, but to demonstrate that this approach can be useful, representing an immediate feedback system. The granularity of this type of report can be extended depending on the area of interest or crew up to specific ambulance level.

This is a prototype, a model tool for verification and learning with the ability to highlight problems that arise in managing certain types of emergencies. These tools can be used on different regions, different types of ambulances so that resource management can be done more optimally based on field data.

## **6. STUDY 3 - MODELS FOR PREDICTING TRAUMATIC EMERGENCIES**

### **INTRODUCTION**

The idea of this study is to test several possible mathematical models by which events or phenomena based on previously recorded history can be predicted. Such a tool would be extremely useful to optimise the organisation and planning of pre-hospital emergency services.

The main objective of the study is to determine and prove that a mathematical model based on a dynamic history (contextual factors) can produce a useful prediction for the distribution and allocation of resources, based on an anticipated need.

### **MATERIAL AND METHOD**

The retrospective study investigates the number, type and severity of emergency cases, correlated with social events impacting the Romanian population. The source database used is the national SMURD database created and maintained by IGSU. The database includes almost one million cases over a period of 4 years (2010 - 2013).

To implement a prediction model, an ARIMA model (autoregressive moving mean model) was used and a method of predicting a variable based on past and present in the future was used. The past and present are represented by a database that records real events.

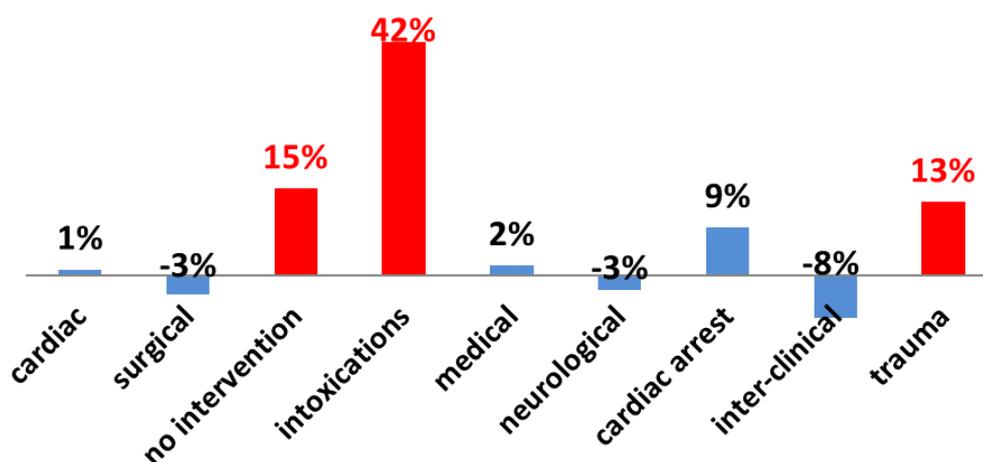
### **RESULTS**

Case models are evaluated, at least initially, with data describing an association or correlation between variables. The study highlights several correlations that may raise causal speculation about these phenomena.

In order to highlight the fact that the frequency of certain types of pathologies is strongly influenced by the social and religious context and that certain periods of special significance for the frequency of **112 calls** , we have selected 3 parameters that may be relevant for the population in Romania.

So we chose public holidays, religious fasts and school holidays. These parameters are important prametries that strongly influence the Romanian social context.

During national holidays (Figure No. 11) it is observed that the number of medical emergencies increases regardless of the type of pathology. Poisoning, among which ethanol poisoning is most likely, increases by an extremely significant percentage of 42%. Incidents of trauma also increase significantly by 13%, including assaults and traffic accidents. It is also observed that the incidence of false alarms also increases by 15%.



**Figure No 11.** Distribution of emergencies on national holidays

Other periods that indicate a dynamic to highlight are those during religious fasts. (Figure no. 12) Thus, analyzing cases by type of pathologies, we note the following interesting phenomena. Poisoning increases by over **24%**, followed by cardiorespiratory arrests by **19%**. Heart problems increase by **14%**. Neurological and medical cases are also seeing significant increases.

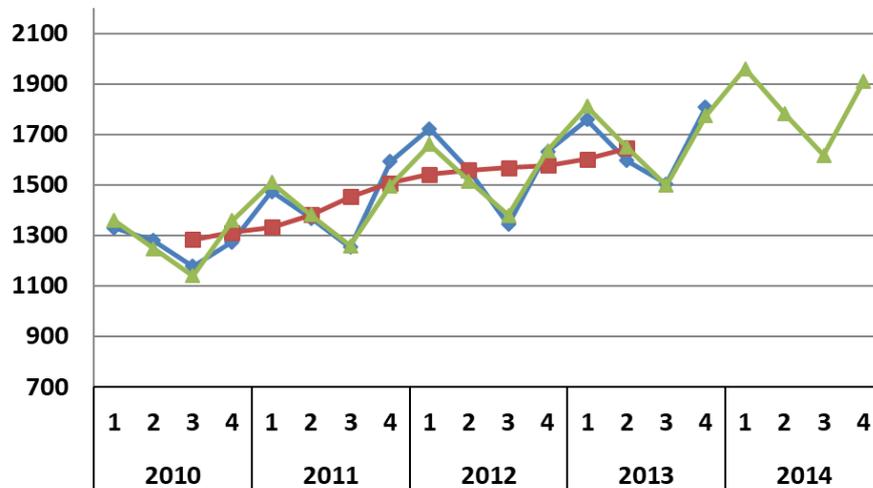
The most surprising and remarkable result is that during school holidays the vast majority of cases by type of pathologies are decreasing. Decrease cardiac emergencies and cardiac arrests by **15%** .

Locally, during national holidays it is observed that the number of medical emergencies increases for poisoning, similar to the national trend, but still somewhat more pronounced. Of the poisonings, ethanolic ones are probably the majority. Incidents of trauma also increase only 9% less than 13% nationwide.

The big difference is the increase in cardio-respiratory arrest incidents, with a value of 32%, much higher than the 9% value we currently encounter at national level. In religious fasting, local behavior remains similar to the national one, with poisoning 19% more frequent and cardio-respiratory arrests and cardiac emergencies significantly more pronounced than in other periods. ARIMA **methods** have proven their effectiveness especially in the economic field, being an important part of econometrics.

For this study, a mathematical model was created so that we try to predict the number of cardio-respiratory arrests, calculation based on 3 years (2010, 2011, 2012) to get a prediction for the 4th year (2013). We use the 4th year as a term of comparison to evaluate the accuracy and quality of the prediction. (Figure no. 17)

**The green prediction curve** is compared to **the blue line** representing the historical data used to calculate the prediction. The centered midline is represented by the **red line**. In order to observe the accuracy of this prediction model, the comparison between **the blue line** and **the green line** for 2013 must be analyzed.



**Figure No 17.** Cardio-respiratory arrest case prediction curve

The purpose and usefulness of these results is to anticipate increased needs for medical resources for certain periods.

The goal is to produce tools that can help manage advanced medical resources that are limited and costly financially.

## CONCLUSIONS

This mathematical model has proven valid in predicting some types of prehospital emergencies.

The mathematical model based on social context can reveal significant changes in certain types of emergencies. Thus, public holidays, religious fasts, and school holidays significantly alter the frequency of some types of pathologies.

Classical medical resource planning techniques, which make a static estimate of crew resources. This has often proved insufficiently accurate because such events are in a permanent dynamic and there is a need for tools to build solutions based on this dynamic to correspond to as many emergencies as possible.

## **7. STUDY 4 - TRAUMATIZED PATIENT PROFILE**

### **INTRODUCTION**

The management of a traumatized patient often requires an extensive deployment of human forces and medical technology. Always any additional information about what can be found at the intervention site can only help. Thus, when the ambulance arrives at the scene of the incident and the crew descends taking the most appropriate equipment for the case in the field. The next study aims to answer the age-old question: "What equipment is prioritized to resolve this injury?"

Efforts to anticipate as accurately as possible the profile of an emergency case, of medical complications that may occur in traumatized patients have been preoccupying researchers in this field since the beginning of the organization of modern emergency services.

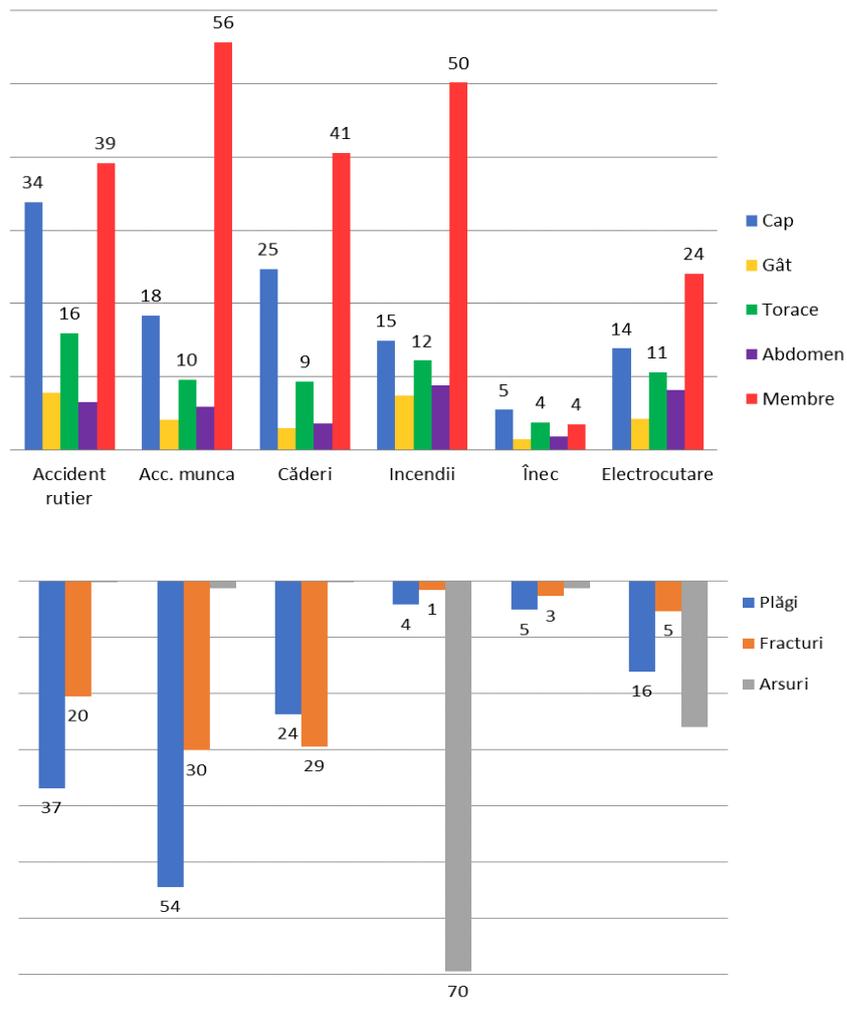
The objective of this study is to provide a model for profiling the characteristics of the traumatized patient to complement efforts in the area of anticipation, to establish guidelines of conduct that allow the efficiency of these services.

### **MATERIAL AND METHOD**

For this study, the SMURD Romania database for 4 years, between 2010 and 2013, was used, from which trauma cases were selected in order to create a profile of the traumatized patient. Thus, several categories of trauma cases such as road accidents, work accidents, burns, drowning patients, electrocution and falls from height were analyzed. On these cases, reports were followed on the materials used so that we could select a minimum requirement for a particular case of trauma.

**RESULTS**

The first analysis was made to establish the frequency of various types of trauma, recording the highest frequencies for falls from height and road accidents, with a much lower incidence in terms of drowning and electrocution. In support of this need, we have made a complex diagram on several dimensions to illustrate, depending on the type of trauma, what area is affected and what type of trauma we find. Based on this information, the crew can apply a personalized protocol to the type of intervention.



**Figure No 23.** Profile of the traumatized patient depending on the type of trauma

**CONCLUSIONS**

Cases of electrocution and drowning affect vital functions up to 5 times higher.

The most affected body segments in trauma are the head and limbs compared to lower values for the chest, abdomen and cervical trauma.

The most common types of trauma are wounds, followed by fractures.

Some cases of trauma require a specific equipment configuration. This can be anticipated by such an analysis.

The obligation to manage vital functions in conjunction with adapted equipment configuration protocols can significantly reduce morbidity and mortality by increasing the efficiency of prehospital crews.

## **8. STUDY 5 - MANAGEMENT OF HEAD TRAUMA IN PREHOSPITAL**

### **INTRODUCTION**

At international level, head injuries occupy a significant percentage of all general traumas, representing both a significant public health problem and an economic problem, due to the need for resources, both material and human, and especially logistical. Head trauma management in the 21st century requires careful attention due to both the increasing incidence and complexity of interventions to meet expectations that raise standards ever higher.

Studies show that the main causes of brain trauma differ depending on the age range of the victim and that men are more prone to head trauma than women at least 3 times higher.

The main objective of this study is to highlight the profile of the patient with trauma to the cephalic extremity in order to provide an additional tool in the process of optimizing both the allocation of resources for the emergency service and to increase predictability at the incidence level.

### **MATERIAL AND METHOD**

Our retrospective study was conducted on the SMURD service database for the entire county of Sibiu, over a period of 8 years, between 2010 and 2017, totaling a number of **68507** interventions in pre-hospital both in urban and rural areas.

For this period of 8 years, interventions involving traumatic diseases total a number of **13828** cases, of which **5471** are head trauma.

## **RESULTS**

The environment in which emergencies occur is an important factor, especially in terms of allocation of emergency medical resources. Analyzing the incidence of accidents in urban areas (**58%**) compared to rural areas (**42%**), we see that they are more frequent as population density increases.

Traumatic emergencies are among the most common (**20.18%**), ranking second after medical emergencies (**56.68%**), followed by cardiological (**9.50%**) and neurological (**6.49%**) emergencies.

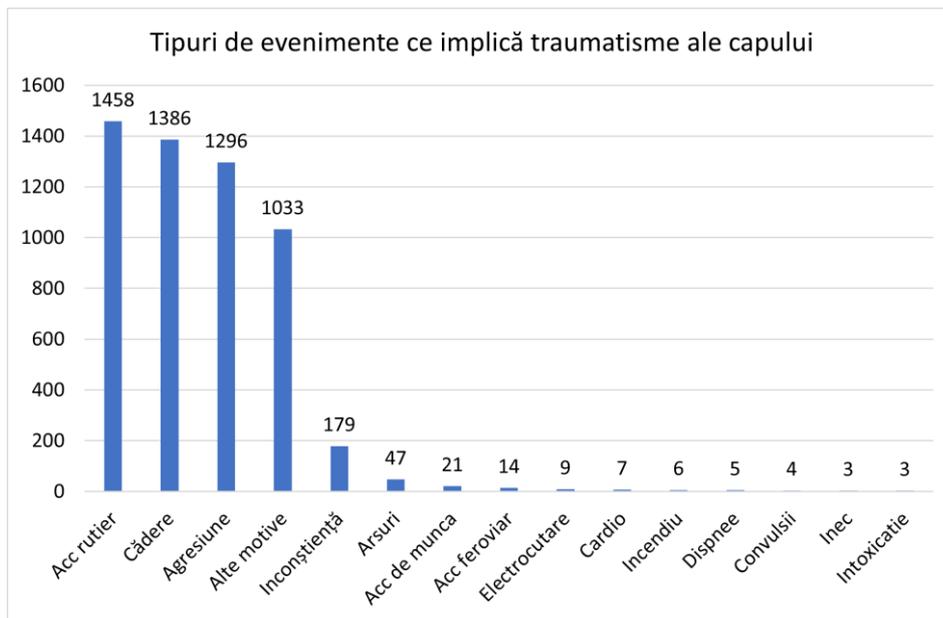
It is observed that the incidence of emergencies characterized by trauma is at its highest levels around the extended decade of 18-29 years, both in number of cases and in share compared to other emergencies in the same age range.

In the case of interventions with traumatic component, it is observed for the interval 18 – 29 that they represent **35.22%** of all emergencies in this category, at the opposite pole being the advanced ages over 60 years, where the percentage decreases to 11% – 12%, ages at which internal and cardio emergencies prevail. For young people, these emergencies have a significantly lower representation.

Of the total injuries recorded during this period (**13828**), a total number of **5471** head injuries are noted, constituting a significant percentage of **39.56%**.

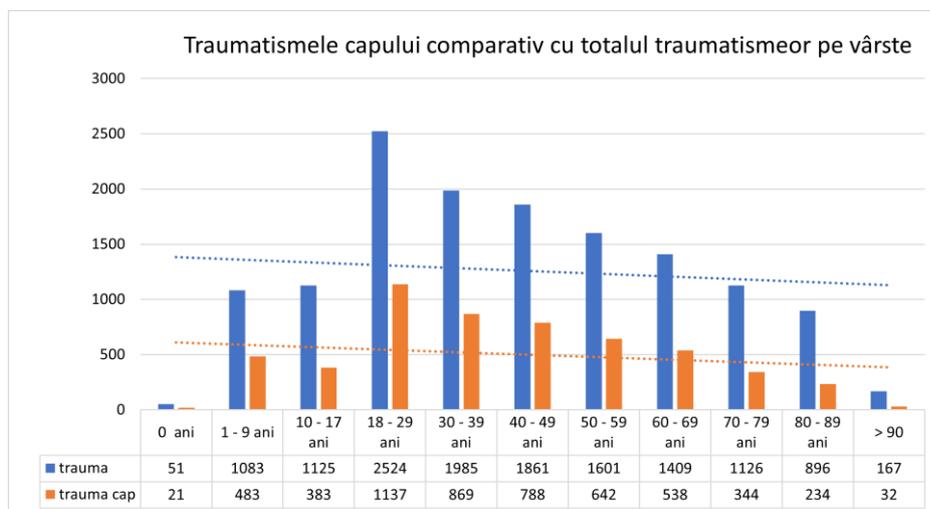
Analyzing emergency situations in which such traumas occur, it is observed that most head traumas occur in road accidents (1458 cases - 26.64%), **followed by falls from the same level and height (1386 cases - 25.33%) and various aggressions (1296 cases - 23.68%)**, these 3 representing 3/4 of the total incidents. There are also situations associated with unconsciousness (179 cases – **3.27%**).

It is noted in this study that for head injuries, road accidents occupy the first place, unlike Western statistics where they are found on the 3rd or 4th place. Assaults also occupy a significant leading place compared to the same statistics, being an indicator of increased violence. It may not just be a local phenomenon and be a nationwide trend.



**Figure No 28.** Types of events in head trauma

The share of head injuries by age groups keeps the same behavior, being proportional to that of general trauma with a relatively constant weight along age ranges with a maximum incidence in the second and third decade of life. It can be interpreted that these age groups are those that are most characterized by activities with a risk of accidents and aggression.



**Figure No 29.** Head trauma by age

In the case of cervical trauma, road accidents are once again the main cause, followed by falls from the level / height and aggression.

Age range is one of the parameters analyzed in this study. Thus, for each age category, it is analyzed what types of events cause the most head trauma.

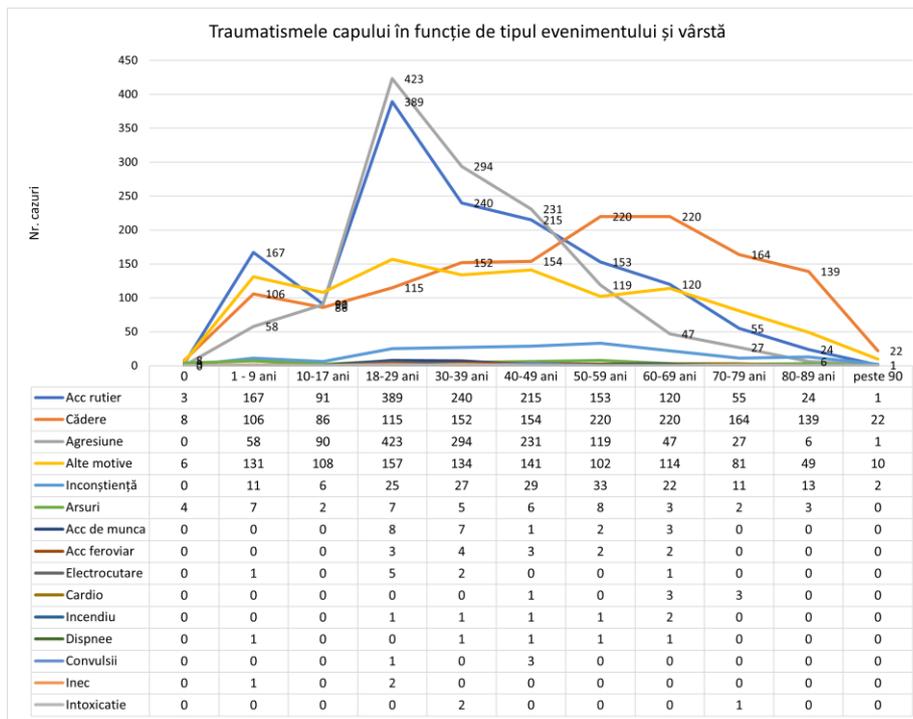


Figure no. 31 Head trauma by type of events and age

The age group 18-29 years stands out with the most cases involving head trauma. We can speculate that it is probably the least responsible decade of age, but also with unlimited social rights and possibilities.

As a result, most cases are recorded in events involving aggression and violence (37.24%) followed at a short distance by road events (34.24%).

This age group is then followed by the 30-39 age group, where the same emergency contexts predominate (aggressions – 33.83%, road accidents – 27.62%), so that from the next decades road accidents become the most frequent, followed by aggressions and other situations. Instead, at the age decade of 50-59 years, drops from level and height increase in incidence, reaching higher and higher percentages, to the detriment of other types of emergencies.

Simply put, the cause of a head injury in an elderly person is a fall from the level rather than an aggression or a road accident characteristic of young people.

## CONCLUSIONS

In the case of traumatic accidents, young people in the second decade of age are observed to occupy a leading place with a percentage of over a third (35.22%) of all emergencies in this category, unlike ages over 60 where the percentage of traumatic accidents decreases to about

10%, most emergencies being in the internal and cardiac category prevail. For young people, these emergencies have a significantly lower representation.

In emergency situations with a traumatic component, it is observed that most head trauma occurs in road accidents, followed by falls from the same level and height and various aggressions, these three categories representing 3/4 of the total incidents.

In the case of head injuries, road accidents occupy the first place unlike Western statistics where they are found on the 3rd or 4th place.

In the case of cervical trauma, road accidents are once again the main cause, followed by falls from the level / height and aggression. Most cases occur at events involving aggression and violence, followed at a short distance by road events. In the case of the elderly, the cause of a head injury is a fall from the level rather than an aggression or a road accident that is rather the prerogative of young people.

## **9. STUDY 6 - MANAGEMENT OF EYE TRAUMA**

### **INTRODUCTION**

Eye trauma is a serious public health problem and a leading cause of visual impairment, and is most often present in head trauma. The medical measures that were applied in case of trauma were the assessment of the emergency factor, both general and local, as well as the rapid realization of the mandatory radiography for intraocular detection of the foreign body. In case of an ocular ophthalmologic emergency with the possibility of the presence of intraocular foreign body, it is necessary to perform a radiological investigation related to the presence of the foreign body such as face and RX profile, CT of orbit. Urgent suture of the wound was performed with separate threads of size 10.0 to reposition the herniated intraocular membranes.

The purpose of this analysis is to highlight the emergency management protocol in the traumas of the previous segment that occurred in the Ophthalmology Department of Sibiu County Hospital over a certain period of time. The main objective is to highlight the profile of the patient with ophthalmic emergencies in order to improve the first emergency maneuvers.

### **MATERIAL AND METHOD**

This study is based on a total of 92 cases, with different types of injuries for a period of 5 years between 2013 - 2017. Data were extracted from patient medical records related to therapeutic conduct and final results from specialized outpatient clinic records.

## RESULTS

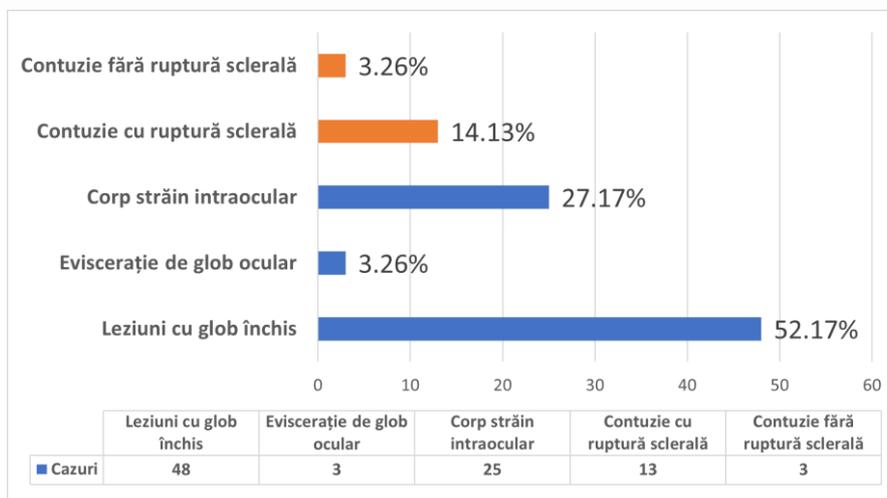
The total number of trauma cases occurring in the emergency ophthalmology service of Sibiu County Hospital is 92. The distribution depending on the type of lesion and the course of treatment is as follows:

### -17.39% contusions (16 cases):

- 14.13% anterior segment contusion with scleral rupture (13 cases)
- 3.26% anterior segment contusion without scleral rupture (3 cases)

### - 82.60% penetrating trauma (76 cazuri)

- 27.17% intraocular foreign body trauma (25 cases)
- 52.17% types of closed globe injuries in the form of contusion (48 cases)
- 3.26% cases with eyeball evisceration (3 cases)



**Figura nr. 32** Distribuția cazurilor de traumatisme oculare după tip

### After localization of trauma lesion (79)

- cornea 33 cases,
- Corneo-scleral 24 cazuri,
- scleral 22 cases.

Always, the main therapeutic goal is to restore both functionality and anatomy of the eye. Most eye injury incidents can be diagnosed and treated in the emergency department if appropriate equipment, such as radiology or basic eye equipment, is available.

Hyphaema is treated with bed rest, topical atropine drops and topical corticosteroids, as well as measures to prevent rebleeding. Radiological investigations are carried out when we suspect the foreign object. Local anesthesia and the ophthalmologic slit lamp facilitate the removal of foreign bodies from the cornea.

Contusive syndrome of the anterior pole (Frenkel) is the condition was one of the following structures may be of interest: cornea, resulting in traumatic keratopathy, with corneal edema and folds on the Descemet membrane.

## **CONCLUSIONS**

In the case of craniofacial polytrauma, eye trauma should be treated with high priority from the first moments of advanced medical care.

The therapeutic attitude should be dictated by the ophthalmologist, although most of the time the patient presents other immediate emergencies and most likely is not in the ophthalmology department.

The most important objective of evaluation and management of ophthalmic emergency and beyond is to prevent vision loss, because the therapeutic window can be lost quickly, after which little can be done. The integrity of the eyeball must be restored. In most cases, functional recovery was partly due to the following conditions: corneal leucomas, traumatic cataracts, uveitis, and secondary posttraumatic glaucoma.

Eyeball evisceration was not performed in an emergency.

## **10. General conclusions**

This battery of research proposes a series of recommendations for both the structure and operation of interdisciplinary emergency teams in order to increase efficiency. Among them we mention:

1. Medical emergencies are often misreported to 112 when the population is not sufficiently educated. This aspect is not to be ignored because the losses of material and human resources are very high when the population unknowingly or simply carelessly abuses the emergency system. Thus, it is necessary to implement mass information and education programs not only for children in the education system, but also for most adults. Although education in the first phase involves an increase in resource consumption, over time, it will most likely bring substantial savings.
2. The subjective or emotional reaction of mobile emergency crews proved to have undesirable effects. The human component of the emergency service requires additional training and case simulation effort so that the affective component is significantly reduced. The current study sheds light on how prehospital crews make decisions influenced by emotions, something that is not desired in a professional service.

3. We have demonstrated that starting from the database already used by the emergency service, a visual feedback system can be created for the performance of crews vis-à-vis compliance with emergency protocols. These tools can be used on different regions, different types of ambulances so that resource management can be done more optimally based on field data.
4. Analyzing the social context and location of medical emergency events in time and space, it has been demonstrated that to some extent, using evolved mathematical models, we can have a degree of surprise of seemingly chaotic behavior with predictive possibilities. Thus, public holidays, religious fasts, and school holidays significantly alter the frequency of some types of pathologies.
5. The most affected body segments in trauma are the head and limbs, compared to lower values for the chest, abdomen and cervical trauma. The analysis of the profile of the patient with head trauma shows that the age at which we have the maximum incidence is in the decade of age 20-29 years, where the events involving aggressions and road accidents are noted. Road accidents and aggressions prevail in incidence, representing a deviation from Western statistics, where these events rank third and fourth respectively in terms of incidence.
6. Eye trauma frequently occurs in the case of craniofacial polytrauma and they must be treated with high priority because the therapeutic window to avoid severe complications is limited.

So it is necessary that the specialist is present from the first moments and dictates the therapeutic attitude. The most important goal of evaluation and management is to prevent vision loss. The integrity of the eyeball must be restored and if the situation still requires it, evisceration of the eyeball is not done in case of emergency.

## **11. Research directions and proposals**

The purpose of these studies is to highlight the current way of managing head trauma emergencies both nationally and in Sibiu County, in order to propose approaches and measures that will lead to their efficiency both medically and economically.

These results are intended to constitute a basic beginning of argumentation for the implementation of measures to increase the performance and success of the treatment of patients with head trauma in prehospital and beyond. The contributions will be addressed

specifically to the Sibiu area, offering at the same time a potential starting point for generating other related research.

We have exposed and demonstrated in each of the previous analyzes what are the direct benefits in order to motivate decision makers to create a specialized working group to develop these analysis models in order to adjust the protocols applied in the medical act.

These analyses are intended to be prior to the implementation of a prototype of a mathematical model of analysis, a beginning of new series of research and analyzes in order to discover other useful correlations in order to improve emergency management in general. These results can be analyzed and processed both by directly interested institutions, such as ISU or Sibiu County Hospital, as well as by the academic environment, in order to open new research directions.

Given the strong technical nature of our analyzes, we dare to advance the idea of implementing a set of **permanently functioning software programs** for the management of trauma medical cases, so that, with the help of **Artificial Intelligence**, we offer concrete proposals for allocating resources depending on what happens in the field.