

Glasgow Coma Scale in Acute Poisonings before and after Use of Antidote in Patients with History of Use of Psychotropic Agents

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SUMMARY

Introduction Data on emergency interventions in poisonings are scarce.

Objective To determine the effectiveness of antidote therapy in acute poisoning-related emergency medical services (EMS) interventions.

Methods A prospective observational study included all poisoning-related intervention cases over 3 years (1999-2001) in the Celje region, Slovenia, covering 125,000 inhabitants. Data were recorded on an EMS form.

Results Psychoactive agents were present in 56.5% out of 244 poisoning-related EMS interventions. Prescription drugs were a cause of intoxication in 93 (39.2%) cases alone or in combination with alcohol or illegal drugs. More than one fifth of poisonings were due to the use of illegal drugs in 52 (21.9%) cases, 43 (18.1%) out of them heroin related. At the time of EMS arrival, more patients who ingested illegal drugs were in coma or comatose than the rest. 24 (45.3%) vs. 32 (17.3%) of poisoned patients were in coma ($p<0.001$). Glasgow Coma Scale (GCS) at the first contact was lower in patients who ingested illegal drugs than in the remaining patients (9.0 vs. 11.6, $p=0.001$). In 23.2% of the cases, an antidote was administered. In 29 (12.2%) naloxone and in 16 (6.7%) flumazenil was administered. Mean GCS after intervention was higher in all cases but significantly higher in illegal drug cases, 13.4 vs. 12.2 ($p=0.001$), with a mean positive change in GCS of 4.5 vs. 0.6 ($p<0.001$). In illegal drug users, mean change after antidote administration was 8.2 vs. 0.5 without antidote administration ($p<0.001$).

Conclusion High rate of successful antidote use during the intervention indicated the importance of good EMS protocols and the presence of a skilled doctor in the EMS team.

Keywords: Emergency Medical Service Utilization; coma; unconsciousness; poisoning; substance-related disorders; Glasgow Coma Scale

INTRODUCTION

Acute poisonings in the age group between 2 and 30 years present a leading cause of visits to emergency departments in developed countries and the second cause after infectious diseases in undeveloped countries [1]. Poisonings in the world account for 5-10% of all interventions [2]. In Slovenia, this rate is little above 5%, and the national register shows 0.35 poisonings per 1,000 inhabitants per year and 0.66/1,000 patients hospitalised due to poisoning, which is lower in comparison to the reports from the States, where there are 8.1 poisonings per 1,000 inhabitants per year [3, 4]. Half of the poisoning cases are accidental and half of them are intentional [4]. The adults aged 20 years or less, and the children, aged less than 6 years in USA account for up to 50% of all poisoning cases [5]. In Slovenia, there are only 20% of all poisoning victims in the age group below 20 years [3].

In UK, 23% of patients who tried to commit suicide by ingestion of different poison agents reached hospital alive [6]. Early intubations and transfer to an intensive care unit are important factors which can lower mortality rates. Thus, one fifth of hospital deaths may be preventable [7]. Epidemiological data on cases of poisoning are scarce in many countries as well as in Slovenia, although there is some experience in assessing

functional status in poisoned patients with coma [8, 9]. Slovenia, like other Eastern European countries, has undergone a transition which put a greater emphasis on primary care [10]. Health care system in Slovenia is characterized by a very good access to free emergency medical services (EMS), which are organised and delivered on primary care basis by family doctor services [11]. A network of regionally based prehospital EMS units for approximately 100,000 citizens universally covers the whole population in the country. The services are located at primary health care centres. The patients with any type of urgent problem can walk in an emergency office, call for an urgent home visit, seek information on urgent problem or activate prehospital intervention. The unique phone number allows dispatcher to connect the patient and the EMS doctor in the respective health care centre. The doctor on duty decides on the type of intervention and, in the case of emergency, dispatches ambulance EMS. The ambulances for EMS are also based in primary care centres occupied by two paramedics – health care technicians and a family doctor additionally trained and certified in emergency interventions. Protocols on emergency interventions are agreed on a national basis, enacted by Minister of Health in the bylaws [11], and published as guidelines [12]. Each EMS has its own written protocol [11]. Glasgow

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Coma Scale (GCS) is routinely used for the assessment of illness severity in non-traumatic coma [8]. Due to scarce data on emergency care of poisoned patients during EMS interventions in prehospital settings, we conducted a cross-sectional study on management of acute poisonings with the history of the use of psychotropic agents in one of the Slovenian EMS centres.

OBJECTIVE

The aim of this study was to determine the effectiveness of antidote therapy in acute poisoning-related EMS interventions.

METHODS

Patients

We conducted a cross-sectional retrospective study of all EMS interventions in the Celje district in Slovenia from January 1st 1999 to December 31st 2001. The EMS centre of Celje covers population of 125,000 inhabitants. In the observed period, 4.6 emergency interventions on average were performed per day. We extracted data from all routine EMS reports [11], which are mandatory, filled in by the attending doctor. Data were recorded on an EMS form [11] for all EMS interventions.

Variables

GCS, doctor evaluation of the patient's consciousness, type of poisoning, location of poisoning, accidental or self-inflicted poisoning, patient demographics, routine physical measurements and medical interventions were collected. An experienced attending doctor assesses the level of patient's health status. In low-grade impaired patients, they are assessed by their ability to provide history, time and space orientation. In more severely impaired patients, we assessed their cognitive status as somnolence, sopor or coma. Cognitive status on site of the intervention was assessed more precisely also by GCS.

Interventions

Appropriate interventions according to the emergency care protocols [12, 13, 14] have been administered on site

by the attending physician in each case and the interventions recorded on the EMS forms [11].

Statistical analysis

The data were analysed by SPSS 13.0 statistical package (SPSS Inc., Chigaco, IL, USA). We calculated the descriptive statistics. We used independent samples, t-test and χ^2 test. We considered $p < 0.05$ to be statistically significant.

RESULTS

Among the total of 4,486 EMS interventions, 244 poisoning-related EMS interventions were recorded (5.4%) corresponding to an average annual rate of 0.56 poisonings per 1,000 inhabitants per year. During the interventions, 7 patients were found dead on arrival of the EMS team (6 heroin overdoses, 1 ecstasy poisoning) and were not included in the sample (2 women, aged 16 and 17 years, and 5 men aged 20 to 27 years). So, the final sample consisted of 237 patients, 140 (59.1%) of whom were men. Mean age of poisoned patients was 33.4 ± 16.0 years. The youngest patient was 7 years old (alcohol and drug ingestion), the eldest 78 years (poisonous mushroom ingestion). Male patients were younger than female patients (30.2 ± 14.6 years vs. 38.2 ± 16.7 years, $p = 0.01$). 55 patients (22.5%) were younger than 20 years. Mean age of all other 4,242 emergency patients was 51.1 ± 21.2 years.

Prescription drugs, alone or in combination with alcohol or illegal drugs, were the cause of poisonings in 93 (39.2%) cases. More than one fifth of poisoning cases were due to the use of illegal drugs (52; 21.9%), 43 (82.7%) out of them were heroin related (18.1% of all cases).

At the time of EMS arrival, more patients who ingested illegal drugs were in coma or comatose than the rest: 24 (45.3%) vs. 32 (17.3%), $p < 0.001$ (Table 1). GCS at the first contact was lower in patients who ingested illegal drugs than in the remaining patients (9.0 ± 5.0 vs. 11.6 ± 3.7 , $p = 0.001$) (Table 2).

GCS readings in 24 (46.1%) patients who ingested illegal drugs and in 21 (22.6%) patients who ingested prescription drugs, i.e. benzodiazepines, were 8 or below and comprised 69.2% of severe cases, demanding intubation and/or other intensive intervention, i.e. administration of an adequate antidote. EMS teams instituted several interventions: antidote application in 55 (23.2%), gastric lavage in 9 (3.8%), oxygen supply in 49 (20.7%),

Table 1. Health status as assessed by attending emergency doctor before the intervention

State of consciousness	Number of patients (%)			
	Benzodiazepines	Alcohol	Heroin	Total
In coma	29 (19.6)	18 (16.8)	23 (53.5)	56 (23.5)
Comatose	23 (15.5)	25 (23.4)	4 (9.3)	38 (16.0)
Somnolent	38 (25.7)	25 (23.4)	3 (7.0)	54 (22.7)
Disoriented	20 (13.5)	21 (19.6)	7 (16.3)	32 (13.4)
Clear consciousness	38 (25.7)	18 (16.8)	6 (14.0)	58 (24.4)
Total number (%)	148 (100.0)	107 (100.0)	43 (100.0)	238 (100.0)

Table 2. Glasgow Coma Scale (GCS) scores of the patients before and after the field intervention in illegal drugs and prescription drug patient poisonings

GCS scores	Number of patients (%)					
	GCS 1			GCS 2		
	Total	Illegal drugs	Benzodiazepines	Total	Illegal drugs	Benzodiazepines
3	23 (9.7)	15 (28.8)	7 (7.5)	3 (1.3)	1 (1.9)	1 (1.1)
4	6 (2.5)	3 (5.8)	2 (2.2)	1 (0.4)	0 (0)	0 (0)
5	2 (0.8)	0 (0)	1 (1.1)	3 (1.3)	0 (0)	2 (2.2)
6	13 (5.5)	3 (5.8)	7 (7.5)	7 (3.0)	0 (0)	4 (4.3)
7	11 (4.6)	2 (3.8)	1 (1.1)	9 (3.8)	2 (3.8)	2 (2.2)
8	10 (4.2)	1 (1.9)	3 (3.2)	10 (4.2)	2 (3.8)	2 (2.2)
9	14 (5.9)	2 (3.8)	3 (3.2)	14 (5.9)	1 (1.9)	4 (4.3)
10	13 (5.5)	3 (5.8)	4 (4.3)	11 (4.6)	0 (0)	4 (4.3)
11	11 (4.6)	1 (1.9)	5 (5.4)	10 (4.2)	7 (13.5)	7 (7.5)
12	18 (7.6)	2 (3.8)	8 (8.6)	26 (11.0)	5 (9.6)	9 (9.7)
13	14 (5.9)	3 (5.8)	6 (6.5)	16 (6.8)	13 (25.0)	7 (7.5)
14	25 (10.5)	6 (11.5)	8 (8.6)	35 (14.8)	21 (40.4)	9 (9.7)
15	77 (32.5)	11 (21.2)	38 (40.9)	92 (38.8)	1 (1.9)	42 (45.2)
Total number (%)	237 (100.0)	52 (100.0)	93 (100.0)	237 (100.0)	52 (100.0)	93 (100.0)

intravenous liquids in 119 (50.2%), 10 (4.2%) of patients underwent intubation and 3 (1.3%) were mechanically ventilated, which led to improvement in GCS readings in 8 or below in only 1 (1.9%) patient who ingested illegal drugs and in 11 (12.0%) patients who ingested benzodiazepines (Table 2). In 29 (12.2%) patients, naloxone and in 16 (6.7%) flumazenil was administered during EMS interventions. Poisoned patients with illegal drug history were more likely to receive an antidote than others: 26 (49.1%) vs. 22 (11.9%), $p < 0.001$. After emergency care, 22 (9.3%) patients were still in coma, 37 (15.6%) comatose, 63 (26.6%) somnolent, 44 (18.6%) disoriented and 71 (30.0%) with clear consciousness. GCS improvement after the intervention was observed in 51 (21.5%), deterioration in 1 (0.4%) and in the remaining patients we found no improvement in GCS. The difference ranged from -3 to 12 points, with a mean difference 1.4 ± 3.3 points, in those who improved even 6.6 ± 4.0 points. GCS deteriorated only in one 52-year-old female patient after ingestion of alcohol and benzodiazepines, and not receiving any antidote, due to high initial GCS of 12 points. There were not any changes in GCS readings in 185 (78.1%) of cases. Mean GCS after intervention was significantly higher in illegal drug cases (13.5 ± 2.3 vs. 12.2 ± 3.2 , $p = 0.001$, with a mean positive change in GCS of 4.5 ± 5.0 vs. 0.6 ± 1.9 , $p < 0.001$). Patients that were poisoned with psychotropic agents and illegal drugs had statistically significant improvement in GCS readings as compared to the others. Patients that were given any antidote, naloxone alone or flumazenil alone had significant improvement of GCS than others (Table 3).

DISCUSSION

The strengths of our study are the long observational time and relatively large numbers of patients poisoned with different agents and in different health states. Our study has shown that illegal drugs and especially alcohol are very common causes of acute poisonings in the Celje district in Slovenia and that the use of an antidote early in out-of-hospital settings could dramatically improve the patients'

Table 3. The improvement in GCS scores in poisonings caused by different and in cases of different antidote application

Parameter		GCS score	SD	p
Type of poisoning	Psychoactive agents	1.5 ± 3.4	0.4 ± 1.1	0.006
	Illegal drugs	4.5 ± 5.0	0.6 ± 1.9	< 0.001
	Prescription drugs	1.0 ± 2.7	1.7 ± 3.6	0.084
Antidote	Any	5.9 ± 4.8	0.3 ± 1.2	< 0.001
	Naloxone	7.5 ± 4.5	0.6 ± 1.9	< 0.001
	Flumazenil	4.2 ± 4.4	1.2 ± 3.1	0.012

health status as measured by GCS. Our data on the incidence of illegal drugs and alcohol poisonings are in contrast to the Oman experience, where therapeutic agents were most commonly involved (39% versus 50%) [15]. It is known that there is a high rate of alcohol abuse also among adults and teenagers in Slovenia [16]. This is probably also one of the reasons for high rates of such poisonings. Our data justifies the use of antidote early in out-of-hospital intervention in patients with the history of use of psychotropic agents as recommended in the guidelines [12, 13, 14].

This study has also some limitations, which must be taken into account before generalising the results to other EMS systems. We surveyed only one of the regions in the country. However, the universal structure, organisation and delivery of prehospital emergency services in our country makes us confident in good coverage of all serious poisonings in the region, making the sampling identical to the methods used in other cases, when hospital emergency room was the entry point to the health care system [15]. The intervention protocols of Slovenian emergency services comply with the international standards and the report sheets are uniform for all cases and all interventions, making the comparison more reliable [11, 12]. A high number of cases and a three-year-data pool give us good insight in the number of individual causes. Also, an average annual rate of 0.56 interventions due to acute poisonings per 1,000 population is, together with 5.4% of all the interventions, close to the national data on hospitalizations due to poisoning [3], which gives us confidence on the reliability of collected data.

CONCLUSION

In spite of relatively low incidence of poisonings, illegal drugs and benzodiazepine poisonings are more often present in patients in Slovenia and can pose a serious threat to them. High rate of successful antidote use during the intervention indicated the importance of good EMS protocols and the presence of a skilled doctor in the EMS team.

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Глазговска кома-скала код акутних тровања пре и после примене противотрова код болесника који су узимали психотропне агенсе

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КРАТАК САДРЖАЈ

Увод Мало је података о хитним интервенцијама код тровања.

Циљ рада Циљ рада је био да се одреди ефикасност противотрова код хитних интервенција везаних за тровање.

Методе рада Проспективна опсервациона студија обухватила је све случајеве интервенција повезаних с тровањем током три године (1999-2001) у региону Цеља, у Словенији, где живи 125.000 становника. Подаци су забележени у формулару Службе за хитне интервенције.

Резултати Психоактивни агенси су били узрок 56,5% хитних интервенција повезаних с тровањем од укупно 244. Лекови на рецепт били су узрок тровања у 93 случаја (39,2%), било сами за себе, било у комбинацији с алкохолом или недозвољеним супстанцама. У 52 случаја (21,9%) тровање се десило услед узимања недозвољених супстанци, од чега су 43 (18,1%) била повезана с херином. У време доласка службе хитне медицинске помоћи неколико болесника који су удисали недозвољене супстанце било је у коми или коматозном стању. Од 32 отроване особе (17,3%), 24 (45,3%) су биле у коми ($p < 0,001$). Вредности на

Глазговској кома-скали (*Glasgow Coma Scale*; ГКС) при првом контакту биле су ниже код болесника који су удисали недозвољене супстанце него код осталих (9,0 према 11,6; $p = 0,001$). У 23,2% случаја дат је противотров. Код 29 болесника (12,2%) примењен је налоксон, а код 16 (6,7%) флумазенил. Средња вредност скопа на ГКС после интервенције била је већа у свим случајевима, али значајно већа код особа које су узимале недозвољене супстанце (13,4 према 12,2; $p = 0,001$); средња позитивна промена скопа била је 4,5 у односу на 0,6 ($p < 0,001$). Код корисника недозвољених супстанци средња промена после примене противотрова била је 8,2, а код болесника којима противотров није дат 0,5 ($p < 0,001$).

Закључак Висока стопа успешне примене противотрова током интервенције показала је значај добрих протокола службе хитне медицинске помоћи и присуства обученог доктора у тиму ове службе.

Кључне речи: служба хитне медицинске помоћи; кома; несвесност; тровање; поремећаји у вези са супстанцама; Глазговска кома-скала