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Analysis of Emergency Medical Services at Pediatrics Department in Trnava University Hospital

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Abstract

The aim of the study is analysis of the average annual percent change indicator (AAPC) of the most common selected ambulance departures causes (%) in the period of six years (2011-2016), divided into two sub-periods (2011-2013 and 2014-2016) at the Pediatrics Department in the Slovak Republic (Trnava University Hospital). The data were collected from the personal health records; where 1,437 the most common causes of ambulance departures were analyzed. In this study was used the trend analysis of average annual percent change (growth/decline) indicator. In the period of 2011-2016, the highest AAPC of causes of ambulance departures rate was observed due to neuro-circulatory asthenia (AAPC 40.0%; $P < 0.001$) as well as in sub-period 2011-2013 (AAPC 66.7%; $P < 0.001$). In this six-year period, a permanent high decrease in AAPC of ambulance departures causes rate can be observed with lack of appetite. The highest number of ambulance departures was found in injuries, a permanent high increase AAPC of ambulance departures causes rate can be observed in the sub-period 2011-2013 (AAPC 11.8%; $P < 0.01$), and the decrease in sub-period 2014-2016 (AAPC 0.6%). The present analysis of the most common ambulance departures causes could bring benefits regarding the social losses and economic in the Slovak Republic.

Keywords: Emergency medical services; Average annual percent change; Ambulance departures causes rate

Introduction

The National Emergency Centre of Slovakia is a state contributory organization, which controls all components of emergency medical services. Administratively it is divided into headquarters, and eight regional operation centers of emergency medical services, which are located in every region and form the control and coordination center of the integrated

rescue systems, together with focal points of the integrated rescue systems. It is responsible for admission and processing all telephone emergency calls, as well as cooperating with all other components of the integrated emergency system. In the Slovak Republic, Emergency Health Services (EHS), and Emergency Medical Services (EMS) belong to the Emergency Medical Ambulance Services.

The amount of 0.4% of contributions collected by health insurance companies is allocated to fund the operational centers of EMS [1].

Emergency care is now available within 15 minutes of the emergency call in 95.0% of Slovak territory. In the remaining 5.0%, emergency care is much more difficult to access. The number of emergency stations has increased from 92, before the health reform, to 264 after the reform took effect. In 2011, the emergency stations were divided into 118 stations with a physician in the team, 155 stations without a physician and 7 helicopter emergency medical service bases, altogether managed by 27 providers. The geographical location of emergency stations is set by the Ministry of Health [2].

The pediatricians have one of the key roles in the implementation and development of EMS for children [3].

Incidence of intoxications caused by drugs, predominantly alcohol, is rising in group of children and young adults in last years. Over 95% of all poly-traumas at teenagers are connected with using alcohol or other psychoactive substances. Alcohol poisoning always means the threat to life, especially when combined with other substances (medicaments, drugs, etc.), so the situation of the intoxicated person depends on correct and timely treatment [4].

Recurrent viral infections in children are a one of causes of hospitalization where the patients are often allergic and immunodeficient. Prolonged course of infections during the vulnerable developmental stage of lungs predisposes for subsequent chronic respiratory diseases in adults. In children, the infection is placed in the developing lung environment - in the post-natal alveologenes phase it has other negative consequences [5]. Recently, the incidence and prevalence of bronchial asthma [6] has increased, which may lead to the

increased hospitalization in children, what may correlate with an increasing number of child smokers [7].

In the Slovak Republic, the home environment is one of the most common places for injuries of children and youth. The injury rate in children have been steadily rising since the 10 years of age, and the highest rate is between the 13th and 15th years of life. The most common mechanism of injury occurrence based on the age groups is hit or fall [8].

The aim of the study is analysis of the average annual percent change indicator (AAPC) of the most common selected ambulance departures causes (%) in the period of six years (2011-2016), divided into two sub-periods (2011-2013 and 2014-2016) at the Pediatrics Department in the Slovak Republic (Trnava University Hospital).

Materials and Methods

The data were collected from the personal health records; where 1,437 the most common causes of ambulance departures were analyzed (Table 1).

In this study was used the trend analysis of average annual percent change (growth/decline) indicator [9], using the following equation:

$$AAPC = \frac{1}{n} \sum \frac{x_i - x_{i-1}}{x_{i-1}} * 100$$

where x is the sum of the most common ambulance departures causes in year i, in period n.

For statistical evaluation we used the Theil-Sen estimator [10]. The statistical significance (P-value is <0.05) was tested by nonparametric Wilcoxon test.

Results

During the period 2011-2016, were recorded 10.2% outposts of EHS and EMS with recorded drug addiction diagnosis, respectively the indication of addictive substance ingestions. Alcohol was taken by 79.5% of children. From Friday to Sunday, EHS and EMS crews intervened in 61.5% cases where children used alcohol, where the most common EHS and EMS crew interventions were at home environments (38.6%), where intoxication was often observed by parents after their arrival home. In 27.8% cases the crews intervened in the streets, in 10.9% cases in the cottage area, in 9.6% cases in the entertainment facilities, pubs, and in other cases was the place of intervention mentioned as other, eventually as unknown locality.

Six-year trends of the AAPC of ambulance departures causes, according to selected causes of ambulance departures can be seen in Table 2.

In the period of 2011-2016, the highest AAPC of causes of ambulance departures rate was observed due to neuro-circulatory asthenia (AAPC 40.0%; P<0.001) as well as in sub-period 2011-2013 (AAPC 66.7%; P<0.001). In this six-year period, a permanent high decrease in AAPC of ambulance

departures causes rate can be observed with lack of appetite (Table 2).

Table 1 Selected causes of ambulance departure at pediatric department in period 2011-2016 (n=1437).

Selected causes of ambulance departures	2011-2016 n (%)
Substances intoxication	159 (11.1)
Injuries	419 (29.2)
Infections of respiratory diseases	144 (10.0)
Asthma	38 (2.6)
Febrile states	25 (1.7)
Hypertension	13 (0.9)
Arrhythmia	9 (0.6)
Collapses	60 (4.2)
Unconsciousness	21 (1.5)
Spasms	155 (10.8)
Epilepsies	31 (2.2)
Dyspepsia	79 (5.5)
Painful abdominal syndrome	22 (1.5)
Mental diseases	95 (6.6)
Neuro-circulatory asthenia	21 (1.5)
Allergic reactions	37 (2.6)
Urogenital disease	9 (0.6)
Parturition	6 (0.4)
Cefalea	19 (1.3)
Dorsalgia	28 (1.9)
Lack of appetite	24 (1.7)
Heatstroke	15 (1.0)
Exitus	8 (0.6)
Total (n)	1,437

The AAPC of ambulance departures causes rate trend due to the lack of appetite was decreasing in the both sub-periods. The decrease is more pronounced in sub-period 2014-2016 (AAPC -8.4%; P<0.05), although in the period of 2011-2016 AAPC of ambulance departures causes rate was not found significant (Table 2).

The highest number of ambulance departures was found in injuries, a permanent high increase AAPC of ambulance departures causes rate can be observed in the sub-period 2011-2013 (AAPC 11.8%; P<0.01), and the decrease in sub-period 2014-2016 (AAPC 0.6%).

The AAPC of ambulance departures causes rate, due to Cefalea, had in the first sub-period (2011-2013) downward trend. However, in the next sub-period (2014-2016) the

opposite trend can be noticed, significant in Cefalea: AAPC 36.7%; $P < 0.001$ (Table 2).

The AAPC of ambulance departures causes rates due to substances intoxication, injuries, infected respiratory diseases,

spasms, dyspepsia, mental diseases and lack of appetite had in the six-year period fluctuating course with the not significant AAPC of ambulance departures causes rates (Table 2).

Table 2 The AAPC of ambulance departures causes at the pediatrics department (2011-2016).

Selected causes of ambulance departure	2011 n (%)	2012 n (%)	2013 n (%)	2011-2013 AAPC (%)	2014 n (%)	2015 n (%)	2016 n (%)	2014-2016 AAPC (%)	2011-2016 AAPC (%)
Substances intoxication	28 (12.4)	21 (10.1)	24 (10.2)	-5.4*	27 (11.0)	30 (12.1)	29 (10.5)	3.8	1.9
Injuries	58 (25.7)	70 (33.8)	72 (30.5)	11.8**	75 (30.6)	70 (28.3)	74 (26.8)	-0.6	5.4
Infections of Respiratory Diseases	23 (10.2)	24 (11.6)	23 (9.7)	0.1	22 (9.0)	25 (10.1)	27 (9.8)	10.5**	3.5
Asthma	9 (4.0)	3 (1.4)	6 (2.5)	16.7**	5 (2.0)	7 (2.8)	8 (2.9)	26.3***	14.2**
Febrile states	5 (2.2)	2 (1.0)	4 (1.7)	20.0**	3 (1.2)	5 (2.0)	6 (2.2)	41.7***	20.3***
Hypertension	2 (0.9)	0 (0.0)	2 (0.8)	- a	3 (1.2)	1 (0.4)	5 (1.8)	6.7*	- a
Arrhythmia	1 (0.4)	0 (0.0)	2 (0.8)	- a	2 (0.8)	1 (0.4)	3 (1.1)	8.3*	- a
Collapses	8 (3.5)	10 (4.8)	9 (3.8)	7.5*	10 (4.1)	11 (4.5)	12 (4.3)	9.2*	9.0*
Unconsciousness	3 (1.3)	2 (1.0)	2 (0.8)	-16.7**	4 (1.6)	4 (1.6)	6 (2.2)	16.7**	23.3**
Spasms	28 (12.4)	20 (9.7)	28 (11.9)	5.7	26 (10.6)	25 (10.1)	28 (10.1)	3.4	2.5
Epilepsies	9 (4.0)	6 (2.9)	4 (1.7)	-33.3***	4 (1.6)	2 (0.8)	6 (2.2)	8.3*	16.7**
dyspepsia	12 (5.3)	13 (6.3)	13 (5.5)	4.2	14 (5.7)	13 (5.3)	14 (5.1)	0	3.3
Painful abdominal syndrome	3 (1.3)	2 (1.0)	4 (1.7)	33.3***	2 (0.8)	5 (2.0)	6 (2.2)	83.3***	37.3***
Mental diseases	14 (6.2)	10 (4.8)	16 (6.8)	15.7**	18 (7.3)	18 (7.3)	19 (6.9)	2.6	9.9
Neuro-circulatory asthenia	3 (1.3)	1 (0.5)	3 (1.3)	66.7***	6 (2.4)	4 (1.6)	4 (1.4)	-16.7**	40.0***
Allergic reactions	5 (2.2)	6 (2.9)	7 (3.0)	18.3**	5 (2.0)	6 (2.4)	8 (2.9)	22.5**	12.3**
Urogenital disease	1 (0.4)	2 (1.0)	3 (1.3)	75.0***	1 (0.4)	1 (0.4)	1 (0.4)	0	16.7**
Parturition	0 (0.0)	1 (0.5)	1 (0.4)	- a	1 (0.4)	2 (0.8)	1 (0.4)	0	-
Cefalea	3 (1.3)	2 (1.0)	1 (0.4)	-41.7***	3 (1.2)	6 (2.4)	4 (1.4)	25.0***	36.7***
Dorsalgia	2 (0.9)	3 (1.4)	5 (2.1)	58.3***	6 (2.4)	5 (2.0)	7 (2.5)	6.0*	32.0***
Lack of appetite	6 (2.7)	8 (3.9)	4 (1.7)	-8.3*	3 (1.2)	1 (0.4)	2 (0.7)	-8.4*	-1.7
Heat stroke	2 (0.9)	1 (0.5)	2 (0.8)	25.0***	3 (1.2)	4 (1.6)	3 (1.1)	0	21.7* *
Exitus	1 (0.4)	0 (0.0)	1 (0.4)	- a	2 (0.8)	1 (0.4)	3 (1.1)	8.3*	- a
Total (n)	226	207	236	2.8	245	247	276	5.7*	4.4

* $P < 0.05$; ** $P < 0.01$; *** $P < 0.001$; a: Impossible to evaluate

Discussion

Acute intoxication in children has been a very recent problem. Children form the half of all intoxications in the Slovak Republic, what is a very high percentage compared to other EU countries. In 2013, the highest number of intoxicated children (1,476) was in the age group 0-5 years, which accounted 75.2% of all intoxications in children. There were always accidental intoxications, mostly at home, usually with

one nox, where most often were recorded medicaments (528 cases), household cleaning products (493 cases), but also alcohol [11]. In our study was observed 3.8% increase in the AAPC of ambulance departures causes rate during the second sub-period (2014-2016), but in the first sub-period (2011-2013) there was a significant decrease in the AAPC of ambulance departures causes rate of 5.4%. The increase in the AAPC of ambulance departures causes rate in the second sub-period can be partly explained by the lowered age of children

drinking alcohol for the first time, which in many cases causes intoxication in children. In the Slovak Republic, in 2013 was a slightly lower consumption of pure alcohol (9.9 L per capita 15+) than the average alcohol consumption in the European Union (10.1 L per capita 15+) [12]. The frequent cause of accidental poisoning in children is the medication used by their grandparents.

Child injuries are becoming a growing global public health problem. Hundred thousand of children die each year from injuries or violence, and millions of other suffer from the consequences of non-fatal injuries. Traffic injuries are the leading causes of death among 15-19-year-olds and the second leading cause among 10-14-year-olds. In addition to the deaths, ten million of children require hospital care for non-fatal injuries and many are left with some form of disability, often with life-long consequences. Overall, more than 95% of all injury deaths in children occur in low-income and middle-income countries. Although the child injury death rate is much lower among children from developed countries, injuries are still a major cause of death, accounting for about 40% of all child deaths [13]. In the Slovak Republic are the most common home injuries (36.0%), sport injuries (23.0%), car accidents (21.0%), school injuries (17.0%) and others, i.e. ear injuries from noise that can further influence the other injuries [14-16]. Injuries in children are in our study the causes of the ambulance departures with the significant decrease of the AAPC of ambulance departures causes rate in the sub-period (2011-2013) (-5.4%; $P < 0.05$). For each area of injury in children are proven ways to reduce both the likelihood and severity of injury—yet awareness of the problem and its prevention, as well as the political commitment to act and prevent child injury remains unacceptably low.

Infections of the respiratory tract are grouped according to their symptomatology and anatomic involvement. Acute upper respiratory infections (URI) include the common cold, pharyngitis, epiglottitis, and laryngotracheitis. These infections are usually benign, transitory and self-limited, although epiglottitis and laryngotracheitis can be serious diseases in children and young infants. Etiologic agents associated with URI include viruses, bacteria, mycoplasma and fungi. Respiratory infections are more common in the fall and winter when school starts and indoor crowded facilitates allow transmission. Initial symptoms of a cold are runny, stuffy nose and sneezing, usually without fever. Other upper respiratory infections may have fever. Children with epiglottitis may have difficulty in breathing, muffled speech, drooling and stridor. Children with serious laryngotracheitis (croup) may also have tachypnea, stridor and cyanosis. Pediatric respiratory disease has changed in the past 20 years. The many great prospective birth cohort studies have shed light on the different patterns of wheezing, their risk factors and their evolution through childhood. It is becoming increasingly clear that even for “adult” diseases, such as chronic obstructive pulmonary disease (COPD), antenatal and early life events are at least as important as smoking in adulthood 1. Cystic fibrosis (CF) has become a disease also of adults 2. Although many factors have contributed, the main reason has been the development of expert special CF centers, a model increasingly adopted by

adult teams. This can serve as a model for other diseases; how a well-structured multidisciplinary approach to treatment can translate into benefits for patients. Perhaps numerically the most important achievement is in the field of public health. The benefit of the decrease in invasive bacterial infections, due to vaccination programmes for infants, is among the most important achievements of the past. Other areas of change include the survival of ever smaller preterm neonates. These children are reaching adult life with impaired lung function and abnormal computed tomography scans. What will happen to their ageing lungs? Interstitial lung disease (ILD) is becoming increasingly well understood, with new genetic entities, such as surfactant protein C mutations, having relevance to adult ILD 3. The advent of powerful new therapies, in particular antibiotics and anti-inflammatories, has led to the need for better monitoring tools, including bronchoscopes small enough to examine even preterm babies, and novel physiological testing. Specific future challenges are dealt with below; first, specific disease areas; secondly, monitoring tools; and, thirdly, paediatric intensive care [17]. The highest incidence of children brought by the ambulances was gained in 2016 with the highest significant increase in the AAPC of ambulance departures causes rate in the second sub-period (10.5%), compared to the first period where the increase the AAPC of ambulance departures causes rate is of 10.4%.

Conclusion

In the period 2011-2016 was observed the highest the AAPC of ambulance departures causes rate of neuro-circulatory asthenia.

The significant increasing ($P < 0.001$) six-year trends of the AAPC of ambulance departures causes rate were found in febrility, painful abdominal syndrome, neuro-circulatory asthenia, cefalea, dorsalgia and heat stroke, while the significant decrease in the same period was not found.

The present analysis of the most common ambulance departures causes could bring benefits regarding the social losses and economic in the Slovak Republic.

All available means (social prevention, family, school and medical prevention) must be used to keep the number of ambulance departures in constant decrease.

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