

Ilona Skitek-Adamczak¹, Natalia Ciepluch, Tomasz Klosiewicz²

Department of Medical Rescue, Chair of Emergency Medicine, Poznan University of Medical Sciences, Poznan, Poland

The level of knowledge of healthcare professionals about child restraint systems

Corresponding author:

Ilona Skitek-Adamczak
 Department of Medical Rescue,
 Chair of Emergency Medicine, Poznan
 University of Medical Sciences, Poznan,
 Poland
 e-mail: ilonaskitek@ump.edu.pl

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ABSTRACT

Introduction: Knowledge of how to correctly use the safety car seat is important to ensure that children are properly protected during their journey. European child transportation standards apply in Poland, which also indicate the type of car seat appropriate for the youngest children. The purpose of this survey is to assess the healthcare professionals knowledge in this field and estimate the percentage of children transported in rearward facing car seats. Currently, in Poland, there is a lack of collected data about the direction of the car seats in which the child traveled. This deficit is being initially supplemented by the results of the conducted study.

Material and methods: 105 healthcare professionals participated in the study. They filled in questionnaires consisting of 29 questions that assess their level of knowledge about child restraint systems.

Results: More than half of the respondents ($n = 63$; 61.76%) were convinced that a 2-year-old child traveling in a rearward facing car seat (RWF) is safer than if it traveled in a forward-facing car seat (FWF). Despite this, most of the healthcare professionals transported children over 1 year of age in FWF. In addition, not all healthcare workers are aware that the airbag should be deactivated when the child is transported in RWF in the front passenger seat.

Conclusions: Healthcare professionals have insufficient knowledge about the safest way of how to transport children in their safety seat. This indicates a need to implement appropriate means to raise their awareness of this subject.

Key words: traffic accidents, health care professionals, child restraint system, injuries, accident prevention

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Introduction

28,660 people were injured in 2021 as a result of accidents on Polish roads — over two thousand of them died. The Police Headquarters also announced that in 2021, the most injured people in road incidents were drivers and passengers (51.6% of the total number of injured). Among the youngest injured children (0–6 years old) in road accidents — 73.5% were car passengers. Police data also shows that over 82% of children involved in the car accidents died [1].

The issue of safe transportation of children and reducing the consequences of road accidents is a serious problem in many countries, including Poland. The National Highway Traffic Safety Administration (NHTSA) estimated that in the first nine months of 2021, the US experienced a 12% increase in the total number of fa-

talities compared to 2020 and the highest percentage increase in the history of the Fatality Analysis Reporting System. The latest data on accidents involving children come from 2020, when the number of fatalities in road accidents increased by 3% compared to 2019 [2, 3]. Hence, it is so important to explore the topic, as well as search for tools that will improve the situation.

It was of particular importance in the search for solutions for the safety of transporting children in passenger vehicles. It has been shown that children have special needs for protection in the car because the factory safety mechanisms used in cars are designed to protect adults. The problem was solved by introducing car seats that had been refined. Over the years, standards for car seats have been developed, specifying a number of parameters to ensure the child's safety during travel [4, 5].

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Traffic accidents are usually associated with the occurrence of various types of injuries, often very serious. Because of the risk of head injuries in younger children up to approximately 4–5 years of age the rearward facing car seats (RWF) should be used mainly, as the best protection for the parts of the child's body that are susceptible to serious injuries [6–8]. Tingvall estimated that the use of RWF reduced injuries by up to 90% compared to forward-facing car seats (FWF), where the result was 50% [9].

Currently, in Europe, there are two basic standards that allow car seats to be sold in the European Union: ECE R44 (Economic Commission for Europe R44) and ECE R129 (called i-Size). Both standards require to transport of babies rear-facing in the so-called car cradles and also to turn off the passenger's airbag if the child is transported in the front passenger seat [10, 11]. In addition, Poland is also subject to the Road Traffic Act, which specifies the permissible method of transporting children in a passenger car. This legal act mainly contains information about disabling the airbag and the limit of height of the child that must be transported in the child's car seat. There is no information on how long children should travel in RWF [12].

No publication was found that would assess the knowledge about child restraint systems among health care professionals or estimate in what way they traveled with kids in their private cars. In the authors' opinion, aware and trained medical personnel is one of the key elements. Medical personnel are an authority for society — should have a high level of knowledge and also use this knowledge to safely transport children by themselves and to promote rearward facing car seats to reduce the negative effects of road accidents.

Aim of the study

The aim of the study was to investigate whether medics are aware of how to safely transport children in a car and find out how they drive children in a private car themselves.

Material and methods

To carry out the research an original questionnaire containing 29 questions (18 closed, 11 semi-open) was used. The research tool was presented to the Bioethics Committee at the Poznan University of Medical Sciences, which issued a statement that the planned study does not bear the characteristics of a medical experiment.

The questionnaire was subjected to a pilot study, which was carried out on a group of 20 people with char-

acteristics similar to those planned in the main study. The respondents from the pilot group responded for the first time in August 2018. One month later, a retest was performed, after which both rounds of responses were used to validate the research tool. Using the PQStat 1.6.6 program, the significance level was $\alpha = 0.05$ and the Kappa-Cohen coefficient was calculated for the key questions to determine the degree of repeatability of the answers. In the key questions of the pilot study, the lowest value of the kappa coefficient was 0.71, therefore it was assumed that the questionnaire could be used to conduct the main study.

Respondents were selected by purposive sampling. Participation in the study was voluntary. In the fourth quarter of 2018, 105 people with medical professions were surveyed using a previously validated questionnaire. The statistical analysis of the main study was performed using the Statistica 13 PL program. The chi-square test of independence ($\alpha = 0.05$) with Yates continuity correction was used to test the relationship between the variables. The results are presented in the form of the p value and the contingency coefficient (C), which ranges from 0 to 1 and indicates the strength of the estimated statistical significance.

Results

The female gender dominated among the respondents ($n = 63$; 60.58%). The median age of the healthcare professionals was 35 years. Most of the healthcare professionals lived in the city with over 100,000 population ($n = 66$; 63.46%). 43.81% of the respondents had a master's degree ($n = 46$) or at least a bachelor's degree ($n = 38$; 36.19%). A significant proportion of healthcare workers were paramedics ($n = 48$; 43.24%), followed by nurses ($n = 44$; 39.64%) and doctors ($n = 13$; 11.71%). Detailed data on the respondents' answers are included in Table 1.

The postgraduate trainings were the main sources of knowledge for medics about the safety of children in the car ($n = 43$; 40.95%), secondly, the respondents obtained knowledge from traditional media — television, radio, and newspapers ($n = 42$; 40.00%).

A statistical correlation was demonstrated between sex and the opinion on the fastening of a child in a puffer jacket ($p = 0.0013$, $C = 0.2998$). The strength of the relationship between the variables was not high.

There was no statistical correlation between the sex of the medic and the awareness of disabling the airbag ($p = 0.1693$), limited time use of child restraint system (CRS) ($p = 0.2471$), the correct handling of the CRS after an accident ($p = 0.6613$).

In the opinion of 61.76% of respondents ($n = 63$) a 2-year-old child traveling in an FWF seat during a frontal

Table 1. Respondents' answers and awareness of carrying children in safety seat

Assessed problem	Yes	No
Regular use of the passenger car	90 (86.67%)	15 (13.33%)
Regular use of seatbelts	100 (95.24%)	5 (4.76%)
Participation in the postgraduate training	81 (77.14%)	24 (22.86%)
Awareness of the limited time use of CRS	51 (48.57%)	54 (51.43%)
Awareness of the need to deactivate the airbag	77 (73.33%)	28 (26.67%)
Knowledge about the need to fasten child in the car seat	100 (95.24%)	5 (4.76%)
Awareness of the need to fasten a child in a seat without a puffer jacket	60 (57.14%)	45 (42.86%)
Knowledge of the correct handling of the CRS after an accident	73 (69.52%)	32 (30.48%)

Data are presented as numbers (n) with percentages (%)

accident will be exposed to a greater risk of serious injury compared to the same situation where a 2-year-old would use a RWF seat. There was no statistical relationship between sex and awareness of the risk of transporting a two-year-old child in FWF compared to RWF ($p = 0.7786$).

Table 2 presents data on the direction of the seat assembly and the age of children transported by the respondents.

A statistical relationship between daily use of the passenger car and knowledge about the correct handling of the seat after an accident has not been found ($p = 0.1865$). Also, no statistical relationship was found between the regular use of the car and the knowledge of the necessity to throw away the CRS that was involved in the accident ($p = 0.7564$).

However, it turned out that the use of the car was related to the awareness of fastening a child in a puffer jacket ($p = 0.0014$, $C = 0.3216$). Another statistical relationship was found between the use of a car and the knowledge of the need to turn off the airbag when the child travels in an RWF in the front passenger seat ($p = 0.0002$, $C = 0.3680$). The use of the passenger car in a daily basis was associated with greater awareness of both of these issues.

The correlation between the main issues and wearing seat belts was not calculated due to the insufficient size of the subgroups

Discussion

The use of seat belts is of great importance for the safety of the driver and passengers. A very high percentage of medics (over 90%) who participated in the study declared that they "always" fasten seat belts in the car. A slightly lower result was obtained in another questionnaire study among medical workers, where over 70% of people stated that they always fasten their

Table 2. Age categories of children differentiated by the direction of travel

Age	Forward facing	Rearward facing
≤ 1	3 (37.50%)	5 (62.50%)
$1 < x \leq 2$	3 (60.00%)	2 (40.00%)
$2 < x \leq 3$	12 (92.31%)	1 (7.69%)
$3 < x \leq 4$	4 (66.67%)	2 (33.33%)
$4 < x \leq 5$	3 (75.00%)	1 (25.00%)

Data are presented as numbers (n) with percentages (%)

seat belts in the car [13]. On the other hand, as it was shown in this work, the use of only car seat belts does not protect children properly against the tragic consequences of road accidents, therefore children need to be transported in child car seats.

When transporting a child in a car seat, it is important to remember a few general safety rules. First of all, we always install the seat in accordance with the manufacturer's instructions and fasten the seat belts during each journey [14]. Secondly, we avoid fastening the child in a car seat with a puffer jacket [15]. It is important to throw out the car seat that was involved in the accident [16].

The vast majority of respondents indicated that it is absolutely necessary to fasten the child's seat belt in the CRS. A similar result was obtained in the data collected for the National Road Safety Council, where 85–86% of the respondents declared the use of CRS or seat belts when transporting children [17].

The ECE standards divide the car seats into groups according to weight and/or height, in order to adjust the car seat parameters as the child grows [10, 11]. Each seat has a guarantee period for safe use specified by the manufacturer — it is longer or shorter depending on the type of restraint and is approximately 5 years for seats for the youngest children up to approximately 8 years

for seats intended for older children [18–20]. Often, an infant car seat is later replaced with a forward-facing seat, which reduces the safety of a child under 4 years of age. Unfortunately, the respondents did not have enough knowledge on this subject.

The newest ECE standard called i-Size requires that children up to 15 months of age drive in RWF CRS. As shown in the results, not all children of the respondents under the age of 1 were transported rearward facing. A reversal of the proportions of the dominant direction of travel of children was also observed in this survey. Until the age of 1, most of the respondents' children used RWF-type car seats, while between the ages of 1 and 2 the most popular seats were those mounted in front of the travel direction. According to the analysis by Huang et al., in the USA, the percentage of children under 1-year-old using rearward-facing car seats was estimated at 85.4%, while among children 1–2 years old it was only 23.9% [21]. Data from the USA indicate a disturbing trend of changing the direction of travel of the youngest children around the age of 1, which can also be observed in Poland.

Unfortunately, the number of children carried in RWF by medics wasn't high, thus increasing children's risk of serious injuries in the event of an accident. This problem was pointed out in case report presented by Gan et al., who compared the injuries of children aged 2 carried in FWF and RWF seats. In the conclusion of their work, they emphasized that the RWF seat protects a child against serious injuries much better than a forward-facing seat [22]. Whyte et al. also found that potential errors in the use of car seats have a smaller negative impact on a child traveling in RWF during an accident than in a forward-facing child seat [23]. Mistakes made by caregivers at the stage of assembling the car seat or fastening the child's seat belts are common — 83% of children traveled in the seat with at least one error related to the installation or fastening of the seat [24]. Due to the large possibility of an error that affects the safety of a child, medics should be aware of the importance of using RWF.

As many authors have shown in the example of the use of seat belts, one of the most effective methods of improving the use of seat belts is the introduction of adequate law and its enforcement [25, 26]. In Polish law there are no provisions imposing the obligation to transport children facing backwards, only the ECE standards apply, which allow the seats to be sold on the European market. Finally, the authors suggest implementing the mandatory provisions on transporting children in the RWF in Poland, which has the potential to increase the awareness of health care workers as well.

Conclusions

The knowledge and awareness of medical workers about the proper transport of the youngest children are insufficient. A number of activities, especially educational, should be designed and implemented to increase the level of knowledge among health workers.

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