Knowledge of newborn resuscitation among emergency medical personnel

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ABSTRACT

Background. Immediately after birth, approximately 10% of newborns need interventions to facilitate lung recruitment and begin spontaneous respiration. A full resuscitation procedure is required by <1% of newborns. Because you can’t always predict the need to perform CPR, at every birth someone trained to conduct such operations should be in attendance.

Aim of the study. The aim of this study was to investigate the understanding of neonatal resuscitation at birth among emergency medical personnel.

Methods. This study was conducted in 2012 among a group of 270 people (doctors, nurses and paramedics) working in teams of emergency medical services in Poland. The study involved the issue of a questionnaire, checking knowledge of neonatal resuscitation.

Results. 79% of respondents knew the time limits for the use of the term 'newborn'. All respondents had knowledge of the order of proceedings in CPR (76–100%) and the ratio of compressions to ventilation during neonatal resuscitation (76–100%). The group of nurses, compared to doctors and paramedics, knew very little about the following topics: energy shock (44% vs. 100% vs. 100%), tidal volume (24% vs. 92% vs. 78%), and the dose of sodium bicarbonate (32% vs. 96% vs. 87%).

Conclusions. The best prepared professional groups regarding newborn resuscitation are doctors and paramedics. The incomplete knowledge found in nurses should lead to intensified training in this occupational group.

Key words: resuscitation, newborn; medical personnel, knowledge; resuscitation, pharmacotherapy

Proper knowledge of newborn resuscitation can prevent the consequences of perinatal asphyxia [1, 2]. In 2008, the infant mortality rate in Poland was estimated to be 7.6% [3]. To deliver effective resuscitation, the medical personnel must understand the differences between adult and infant management [4]. An organised knowledge and awareness of the necessity to undertake resuscitative procedures in the newborn play an important role in proper, early diagnoses, suitable management and reducing the number of complications in newborns with life-threatening conditions. In several countries, including Poland, the medical curriculum includes classes in the resuscitation of adults and children of various ages [1, 4].

Unfortunately, the literature does not offer any reports on newborn cardiopulmonary resuscitation in the practice of emergency medical services (EMS) teams. Therefore, studies that assess the level of knowledge of advanced resuscitative procedures in newborns among the emergency medical personnel are necessary.

METHODS

The diagnostic survey was conducted among national EMS teams in 2012. The EMS personnel included physicians (with emergency medicine specialty or in the second year of emergency medicine residency), nurses and paramedics. We used the questionnaire that was designed for the purposes...
of the present study. The questionnaire contained the following two sections: sociodemographic (5 questions) and factual (17 questions).

First, the respondents were asked to assess their knowledge of neonatal resuscitation according to the 1- to 5-point scale, where “1” indicated lack of knowledge and “5” denoted very good knowledge.

We divided the respondents into the following three groups according to their profession: group I consisted of physicians; group II consisted of nurses; and group III consisted of paramedics.

We coded the results using the Excel program and processed the data using STATISTICA 8.0 (Statsoft, Tulsa, USA). We checked the normality of distribution of variables by evaluating the significance level of P based on the Kolmogorov-Smirnov test. For normal distributions, we determined the mean differences using Student’s t test. We checked intergroup differences using the nonparametric test. We calculated statistically significant intergroup differences using the nonparametric Kruskal-Wallis test for more than two independent groups (H). P < 0.05 was considered to be statistically significant.

RESULTS

The study consisted of 270 respondents: group I had 50 respondents; group II had 62 respondents; and group II had 158 respondents.

The average work experience was 10.2 ± 6.43 years for physicians, 15.5 ± 11.56 years for nurses and 5.6 ± 4.8 years for paramedics.

The majority of respondents were men (53%), 78% in group I and 59% in group III, whereas group II had predominantly women (85% vs. 15%). Significant gender-related differences were found in individual groups (P < 0.0001).

The mean level of self-assessment was 4.25 ± 0.68 pts. The highest scores were reported by group II respondents (4.62), followed by group I (4.52) and group III (4.01). An analysis showed significant differences in self-assessment in individual groups (P < 0.0001) (Fig. 1).

Fifty-three individuals performed newborn cardiopulmonary resuscitative procedures during their professional activities, i.e., 20% of all of the respondents.

Moreover, 79% of the respondents understood the time frame in which the term “newborn” could be used. The percentage of proper answers was 90% in group I, 40% in group II and 89% in group III (P < 0.0001).

In groups I and III, 96% of the individuals managed to list the parameters that were assessed according to the Apgar scale, whereas in group II, only 44% of respondents were able to perform this function (P < 0.0001).

The next questions assessed the respondents’ theoretical knowledge of neonatal physiology; 79% knew the normal pulse rate in the umbilical cord; group III had the highest percentage (92%) of proper answers; and group II exhibited the lowest percentage (40%) of proper answers (P < 0.0001).

The normal range of the newborn respiratory rate was correctly defined by 88% of the respondents: 96% in group I, 77% in group II and 90% in group III (P = 0.0061). A similar percentage (85%) of the respondents correctly defined the normal heart rate in the newborn. Proper answers were provided by 92% of the respondents in group I, 69% in group II and 89% in group III (P = 0.0003).

The vast majority (89%) of the respondents knew that the presence of thick meconium in the oropharynx was an indication for aspiration. Correct answers were provided by 98% of the individuals in groups I and III versus 56% in group II (P < 0.0001).

All of the respondents in groups I and II knew that cardiopulmonary resuscitation in a newborn baby should be initiated with five initial rescue breaths. In group II, 76% of the respondents was familiar with this procedure (P < 0.0001). The correct chest compression/breath ratio was known by 90% of the respondents; the lowest percentage (only 67%) of correct answers was found in group II (P < 0.0001). The proper depth of chest compressions was known by 92% of the respondents, with the highest percentage (99%) in group III, followed by 98% in group I and 71% in group II (P < 0.001). Moreover, 89% of the respondents knew that chest compressions should be discontinued once the heart rate increased above 60 min⁻¹ (100% in groups I and III and 52% in group II) (P < 0.001).

The correct respiratory volume in newborns was given by 68% of the respondents. The percentage of proper answers varied in the individual groups; group I had the hi-
highest percentage (92%) of correct answers and group II had the lowest percentage (24%) of correct answers \( (P < 0.0001) \).

Moreover, 91% of the individuals correctly indicated that the umbilical vein was the most suitable route of administration for pharmacological agents \( (P < 0.0001) \).

The subsequent questions assessed the knowledge of pharmacotherapy used for neonatal resuscitation. The correct dose of adrenaline was provided by 89% of the respondents; groups I and III had the highest percentage (100% in each) of correct answers and group II had the lowest percentage (52%) of correct answers \( (P < 0.001) \).

Furthermore, 76% of the respondents correctly defined the dose of sodium bicarbonate administered during neonatal resuscitation: 96% in group I, 32% in group II and 87% in group III \( (P < 0.001) \). In groups I and III, all of the respondents knew that according to the ERC 2010 guidelines, atropine is not recommended for the resuscitation of newborns; in group II, 48% of the respondents was familiar with this information \( (P < 0.001) \).

The question concerning the energy defibrillation dose during ventricular fibrillation \( (4 \, \text{J kg b.w.}^{-1}) \) was correctly answered by 87% of the respondents. In groups I and III, 100% gave correct answers, whereas in group II, only 44% gave the proper responses \( (P < 0.001) \).

The detailed distribution of correct answers provided by the respondents is presented in Table 1.

**DISCUSSION**

Interventions in patients with sudden cardiac arrest are common in EMS practice. The interventions require both broad knowledge and skills because each minute of delay in resuscitative procedures reduces the chance of survival by 10–12% [1, 2, 4]. Moreover, the medical personnel should be aware of the differences in paediatric and adult resuscitation that result from different physiology and anatomy or pathophysiology of sudden cardiac arrest in children.

Because the information about newborn resuscitation in emergency medical cases is lacking in the literature, it seemed reasonable to compare the present results with other findings regarding the assessment of knowledge of resuscitation in other age groups.

In the group of nurses, there was a substantial difference between self-assessment and test results, which demonstrates that nurses overestimate their knowledge of neonatal resuscitation. In contrast, the physicians and paramedics tended to underestimate their knowledge. The above results confirm our earlier findings concerning the knowledge of resuscitative procedures in children, which demonstrated the highest level of assessment among nurses, followed by physicians and paramedics [5].

In the study group, a high percentage of nurses did not know what the term “newborn” meant. Their knowledge of the parameters that are used for the Apgar scale, which is commonly used in many countries, was slightly better [6, 7].

To evaluate children (including newborn babies), the medical personnel should know the differences in vital parameters between adults and children. Nurses showed the lowest level of knowledge in this regard.

The European Resuscitation Council guidelines contain algorithms of management that are recommended for life-

**Table 1. Percentages of correct answers concerning neonatal resuscitation**

<table>
<thead>
<tr>
<th>Questions</th>
<th>Group I (n = 50)</th>
<th>Group II (n = 62)</th>
<th>Group III (n = 158)</th>
<th>Total (n = 270)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Delivering resuscitation</td>
<td>26%</td>
<td>19%</td>
<td>18%</td>
<td>20%</td>
</tr>
<tr>
<td>Term “newborn”</td>
<td>90%</td>
<td>44%</td>
<td>89%</td>
<td>79%</td>
</tr>
<tr>
<td>Apgar scale</td>
<td>96%</td>
<td>74%</td>
<td>96%</td>
<td>91%</td>
</tr>
<tr>
<td>Placental pulse as a reliable symptom</td>
<td>88%</td>
<td>40%</td>
<td>92%</td>
<td>79%</td>
</tr>
<tr>
<td>Respiratory rate</td>
<td>96%</td>
<td>77%</td>
<td>90%</td>
<td>88%</td>
</tr>
<tr>
<td>Heart rate</td>
<td>92%</td>
<td>69%</td>
<td>89%</td>
<td>85%</td>
</tr>
<tr>
<td>Indication for oropharyngeal aspiration</td>
<td>98%</td>
<td>56%</td>
<td>98%</td>
<td>89%</td>
</tr>
<tr>
<td>Time to administer 5 rescue breaths</td>
<td>100%</td>
<td>76%</td>
<td>100%</td>
<td>90%</td>
</tr>
<tr>
<td>Chest compression/respiration ratio</td>
<td>100%</td>
<td>76%</td>
<td>99%</td>
<td>97%</td>
</tr>
<tr>
<td>Depth of chest compressions</td>
<td>98%</td>
<td>71%</td>
<td>99%</td>
<td>92%</td>
</tr>
<tr>
<td>Discontinuation of chest compression</td>
<td>100%</td>
<td>52%</td>
<td>100%</td>
<td>89%</td>
</tr>
<tr>
<td>Tidal volume</td>
<td>92%</td>
<td>24%</td>
<td>78%</td>
<td>68%</td>
</tr>
<tr>
<td>Route of drug administration</td>
<td>94%</td>
<td>68%</td>
<td>99%</td>
<td>91%</td>
</tr>
<tr>
<td>Dose of adrenaline</td>
<td>100%</td>
<td>52%</td>
<td>100%</td>
<td>89%</td>
</tr>
<tr>
<td>Dose of sodium bicarbonate</td>
<td>96%</td>
<td>32%</td>
<td>87%</td>
<td>76%</td>
</tr>
<tr>
<td>Dose of atropine</td>
<td>100%</td>
<td>48%</td>
<td>100%</td>
<td>88%</td>
</tr>
<tr>
<td>Defibrillation energy</td>
<td>100%</td>
<td>44%</td>
<td>100%</td>
<td>87%</td>
</tr>
</tbody>
</table>
Improvement in resuscitation knowledge in comparison to other studies \[11, 13\]. The percentage of respondents who had knowledge of resuscitative sequences among internists to be 12\% \[9, 10\].

In many cases, the emergency medical personnel assist women in labour in designated delivery areas, irrespective of whether delivery occurs in a home setting or a public place. In many cases, the newborns are delivered asphyxiated. The ERC 2010 recommendations list only one indication for considering immediate aspiration of the oropharynx in an asphyxiated baby \[2\].

The depth of chest compressions was known by a higher percentage (89\%) of the respondents compared with an earlier study concerning resuscitation in children \[5\].

In addition to chest compressions and rescue breaths, the key element of advanced resuscitative procedures in newborns is pharmacotherapy. Compared to the findings of other authors \[11, 12\], our respondents had similar knowledge regarding the appropriate dose of adrenaline for use in neonatal resuscitation. In another study that assessed the knowledge of resuscitation in children and demonstrated positive results, 94\% of the respondents provided the correct dose of adrenaline \[5\].

Moreover, 88\% of the respondents knew that the most recent guidelines did not recommend the use of atropine during the resuscitation of children. The dose of sodium bicarbonate was least known of all the evaluated questions; the results of the present study were worse in comparison to earlier studies \[5\].

Although the majority of neonatal infants with sudden cardiac arrest are primarily affected by obstructed airways, there are neonatal infants in which the medical personnel observed defibrillation rhythms, which were recorded by ECG. The treatment of choice in neonates with ventricular fibrillation or pulseless ventricular tachycardia is defibrillation. The percentage of respondents who had knowledge about defibrillation energy in the present study was higher in comparison to other studies \[11, 13\].

**CONCLUSIONS**

Physicians and paramedics are best prepared to deliver newborn resuscitation. Incomplete knowledge observed among the nurses in this study suggests that intensive training in newborn resuscitative procedures should be recommended for this professional group.

**References:**


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