ORIGINAL ARTICLE

Management of pregnancy-related emergencies: What do Polish anesthesiologists know?

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KEYWORDS
Anesthesiologists; Pregnancy; Emergencies in pregnancy; Obstetric emergencies; Amniotic fluid embolism; Eclampsia; Cardiopulmonary resuscitation

Abstract

Background: Emergencies can occur at any time during pregnancy. In addition to obstetricians and midwives, anesthesiologists should also be familiar with pregnancy-related emergencies. The aim of this study was to assess the basic and advanced knowledge regarding the management of pregnancy-related emergencies of anesthesiologists.

Methods: An anonymous questionnaire was distributed to anesthesiologists at two conferences (S1, n = 87; S2, n = 35), and to other groups comprising doctors during specialization (DS, n = 28) and postgraduate doctors (PD, n = 130). Ultimately, 280 doctors were included in the survey. The first part of the questionnaire collected demographics, and a second one evaluated both their basic and advanced knowledge by taxonomy.

Results: Basic knowledge regarding the management of pregnancy-related emergencies of the tested group was poorer compared with advanced knowledge. The DS group had better basic management skills than anesthesia specialists and the PD group. Significantly worse results of the tested group were obtained on the questions about maneuvers for choking pregnant women and time to cesarean section during cardiopulmonary resuscitation. The specialists and the DS group had results on advanced level questions better than the PD group.

Conclusions: Older specialists in anesthesiology did not know how to properly manage pregnancy-related emergencies at the basic level; however, anesthesiologists were familiar with advanced management. No relationship between recalling and using such knowledge in difficult situations was observed. The teaching process of acute obstetric emergencies must be improved through implementation of compulsory nationwide courses and verification of knowledge every few years.

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Introduction

Emergencies in pregnancy can occur at any time. The management of obstetric emergencies should be familiar to obstetricians and midwives, who are the first-line personnel for pregnant patients.

Several reports have assessed the knowledge and skills of maternity professionals, obstetricians, and midwives regarding obstetric emergencies.\(^1,2\) Many groups have proposed simulations as an effective method of acquiring knowledge and skills in obstetric emergencies.\(^1,5\) Some countries have created a special courses (e.g. Advanced Life Support in Obstetrics – ALSO in the USA, Maternity Emergency Care – MEC course in Australia) and training programs (e.g. Managing Obstetric Emergencies and Trauma – MOET in the UK) to improve such knowledge.\(^6-10\) A review of training programs in acute obstetric emergencies using databases from 2003 concluded that “few training programmes have been described and even fewer have been evaluated”\(^11\) and that “further . . . research for this important intervention is urgently required.”\(^11\)

Anesthesiologists and intensive therapists should also be familiar with obstetric emergencies, but few articles have evaluated this knowledge in these specialists.\(^12,13\) The majority of studies evaluated knowledge and skills of maternity professionals, obstetricians, and midwives, and few of them assessed knowledge of family practice residents and health practitioners. We found only one article which presented assessment of knowledge regarding cardiopulmonary resuscitation of parturients among anesthesiologists.\(^12\) We did not find the studies which assessed knowledge regarding other emergencies in pregnancy among this group of physicians.

The aim of the study was to examine the acquisition of basic and advanced knowledge regarding the management of emergencies in pregnancy among specialists and physicians who specialize in anesthesiology during residency training.

Methods

This study was performed in 2010, wherein 280 physicians were included in the survey after agreeing to participate. We prepared a questionnaire, the first section of which obtained the respondents’ demographics; a second section included a multiple choice question (MCQ) test that evaluated the participants’ knowledge. The questionnaire was distributed to specialists in anesthesiology (S group, \(n = 122\)) who attended the national Polish meeting in Popowo, attended primarily by ward heads and their assistants (\(n = 87\)), or an international conference on obstetric anesthesia and perinatal medicine in Poznan (\(n = 35\)). The questionnaire was filled out anonymously. The response rate was 54% and 40%.
Physician-residents who were training for their specializations (DS group, $n = 28$) were also tested at the beginning of the obligatory courses for specialization. The control group comprised postgraduate doctors who have not started the residence (PD group, $n = 130$) that were tested at the beginning of an emergency course during postgraduate education. The response rate in the DS and PD groups was 100%.

Demographics are presented in Table 1.

The MCQ test was constructed based on Bloom taxonomy, which was transformed by Niemierko into ABC taxonomy. In increasing order of difficulty, the levels of knowledge that we assessed were: (1) retention of knowledge (i.e., remembering, which is a passive knowledge) and (2) use of the knowledge in difficult situations (e.g., if the algorithm is more complicated). Questions also evaluated both basic and advanced knowledge for the management of emergencies in pregnancy.

To examine the acquisition of knowledge regarding the management of emergencies in pregnancy from a broader perspective, we also inquired about the management of foreign body airway obstructions and cardiac arrest in pregnancy.

Table 1. Demographics.

<table>
<thead>
<tr>
<th>Demographic</th>
<th>Group 1</th>
<th>Group 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender (M/F)</td>
<td>113 (40)/165 (58.9)</td>
<td>2</td>
</tr>
<tr>
<td>Age range</td>
<td></td>
<td></td>
</tr>
<tr>
<td>24–30</td>
<td>156 (55.7)</td>
<td></td>
</tr>
<tr>
<td>31–40</td>
<td>32 (11.4)</td>
<td></td>
</tr>
<tr>
<td>41–50</td>
<td>45 (16.1)</td>
<td></td>
</tr>
<tr>
<td>51–60</td>
<td>39 (14)</td>
<td></td>
</tr>
<tr>
<td>61–70</td>
<td>4 (1.4)</td>
<td></td>
</tr>
<tr>
<td>NA</td>
<td>4 (1.4)</td>
<td></td>
</tr>
<tr>
<td>Occupational level</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chief or vice chief of the ward or operating theater</td>
<td>23 (8.2)</td>
<td></td>
</tr>
<tr>
<td>Consultant, senior assistant or assistant</td>
<td>53 (19.0)</td>
<td></td>
</tr>
<tr>
<td>Resident</td>
<td>30 (10.7)</td>
<td></td>
</tr>
<tr>
<td>Postgraduate doctor</td>
<td>130 (46.4)</td>
<td></td>
</tr>
<tr>
<td>NA</td>
<td>44 (15.7)</td>
<td></td>
</tr>
<tr>
<td>In-hospital intensive therapy unit</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Present</td>
<td>259 (92.5)</td>
<td></td>
</tr>
<tr>
<td>Absent</td>
<td>12 (4.3)</td>
<td></td>
</tr>
<tr>
<td>NA</td>
<td>9 (3.2)</td>
<td></td>
</tr>
<tr>
<td>In-hospital obstetric ward</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Present</td>
<td>147 (52.5)</td>
<td></td>
</tr>
<tr>
<td>Absent</td>
<td>122 (43.6)</td>
<td></td>
</tr>
<tr>
<td>NA</td>
<td>11 (3.9)</td>
<td></td>
</tr>
<tr>
<td>Participant’s opinion about having knowledge on the management of emergencies in pregnancy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>161 (57.5)</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>58 (20.7)</td>
<td></td>
</tr>
<tr>
<td>Not too much</td>
<td>6 (2.1)</td>
<td></td>
</tr>
<tr>
<td>NA</td>
<td>55 (19.7)</td>
<td></td>
</tr>
</tbody>
</table>

M: male; F: female; NA: no answer.

Data as number (%).

Questions that assessed the retention of knowledge asked respondents to choose the recommended maneuvers for pregnant women who are choking ineffectively, give the proper number of cycles of cardiopulmonary resuscitation (CPR) in pregnancy, and estimate the time to cesarean section during CPR and the risk of anesthesia in pregnancy (physiological changes that render intubation difficult). Questions that examined the use of knowledge in difficult situations were about case reports and the management of pulseless electrical activity (PEA) in a hypovolemic pregnant victim, the recognition of amniotic embolism and its treatment, and the recognition of eclampsia and its treatment.

The questions were developed based on the current literature and the 2005 European Resuscitation Council (ERC) Guidelines. We compared the number of correct answers between the groups (S, DS, PD). Additionally we divided the group of specialists in anesthesiology and residents during specialization into age ranges to find any correlation between them. Statistical analysis was performed using Fisher–Freeman–Halton and Fisher’s Exact tests with StatSoft Statistica 9.0. Fisher–Freeman–Halton test was used because there were three groups and low expected frequencies. In few cases, we had to use Fisher’s Exact test for the tables $2 	imes 2$ and low expected frequencies. $p$ values < 0.05 were considered statistically significant.

Results

The number of correct answers on the test and the statistical analysis are shown in Table 2.

Because the groups differed in age, we divided the specialists in anesthesiology and doctors during specialization into 5 age brackets and compared them according to age (Table 3).

Between all groups, the results did not differ by gender ($p > 0.05$).

When comparing all the tested groups together according to their position at work, a statistical significance was found for two questions (maneuvers for a pregnant woman who is choking with ineffective cough and cycles of CPR in pregnancy).

The presence of an intensive therapy unit at the hospital at which the test group worked was associated with the question on cycles of CPR in pregnancy.

The participant’s opinion on having the knowledge on the management of emergencies in pregnancy was linked to two questions – the maneuvers for a pregnant woman who is choking with an ineffective cough; but unfortunately, despite the tested group not answering that question properly, they did in contrast give a correct answer to the question about cycles of CPR in pregnancy.

Discussion

The questionnaire was based on the recommendations from recent experiences and reports regarding the instruction of critical obstetric problems. There is a need to understand physiological changes in pregnancy, availability of management in eclampsia, amniotic fluid embolism, blood loss, and awareness of cesarean section. Eclampsia occurs in
Management of pregnancy-related emergencies: What do Polish anesthesiologists know?

Table 2  The number of correct answers on the test, expressed as the number of participants – n (%) and statistical analysis between groups.

<table>
<thead>
<tr>
<th>Questions</th>
<th>S</th>
<th>DS</th>
<th>PD</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n = 122</td>
<td>n = 28</td>
<td>n = 130</td>
</tr>
<tr>
<td><em><strong>Questions assessing retention of knowledge</strong></em></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maneuvers for a pregnant woman who is choking*</td>
<td>11 (9.0)</td>
<td>12 (42.9)</td>
<td>37 (28.5)</td>
</tr>
<tr>
<td>Cycles of CPR in pregnancy^{**}</td>
<td>94 (77.0)</td>
<td>27 (96.4)</td>
<td>124 (95.5)</td>
</tr>
<tr>
<td>Time to cesarean section during CPR^{***}</td>
<td>41 (33.6)</td>
<td>14 (50)</td>
<td>65 (50)</td>
</tr>
<tr>
<td>The risk of anesthesia in pregnancy$</td>
<td>115 (94.3)</td>
<td>26 (92.9)</td>
<td>109 (83.8)</td>
</tr>
<tr>
<td><em><strong>Questions assessing the use of knowledge in difficult situations</strong></em></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Management in PEA – hypovolemic pregnant victim (case)$</td>
<td>101 (82.8)</td>
<td>20 (71.4)</td>
<td>77 (59.2)</td>
</tr>
<tr>
<td>Recognition of amniotic fluid embolism (case)$</td>
<td>89 (73.0)</td>
<td>17 (60.7)</td>
<td>57 (43.8)</td>
</tr>
<tr>
<td>Treatment of amniotic fluid embolism$</td>
<td>117 (95.9)</td>
<td>27 (96.4)</td>
<td>116 (89.2)</td>
</tr>
<tr>
<td>Recognition of eclampsia (case)</td>
<td>119 (97.5)</td>
<td>28 (100)</td>
<td>124 (95.4)</td>
</tr>
<tr>
<td>Treatment of eclampsia</td>
<td>121 (99.2)</td>
<td>28 (100)</td>
<td>123 (94.6)</td>
</tr>
</tbody>
</table>

S: specialists in anesthesiology; DS: doctors during specialization tested at the beginning of the obligatory courses for specialization; PD: postgraduate doctors tested at the beginning of the emergency course during postgraduate education.

* p < 0.01 S vs. DS, and S vs. PD.
^{**} p < 0.05 S vs. DS, p < 0.01 S vs. PD.
^{***} p < 0.01 S vs. PD.
$ p < 0.05 S vs. PD.
$ p < 0.01 S vs. PD.

1 in 2000 maternities and is associated with high rates of mortality. Embolism, the most common of which being thrombi and amniotic fluid embolisms, cause approximately 20% of deaths in pregnancy. We cannot avoid trauma, which are also a leading cause of death. Obstetric hemorrhage leads to roughly 25% of maternal deaths. Cardiac arrest in pregnancy is rare but occurs once in approximately 30,000 pregnancies.

We wanted to assess the acquisition of knowledge regarding the management of emergencies in pregnancy by anesthesiologists (specialists and doctors during specialization). Based on the low response rate (54% in Popowo and 40% in Poznan) of the questionnaires, one explanation is that anesthesiologists in Poland do not want their knowledge to be verified.

Our survey asked basic questions according to taxonomy about the maneuvers for a pregnant woman who is choking, cycles of CPR in pregnancy, time to cesarean section during CPR, and the risk of anesthesia in pregnancy and assess the retention of such knowledge. Basic knowledge was poorer compared with advanced knowledge. The DS group had better basic management skills than specialists in anesthesiology and the PD group, because they are completing the specialization, and their knowledge is current. Unfortunately, specialists have poor basic knowledge – poorer than postgraduate doctors. It appears as though they

Table 3  The number of correct answers on the test by specialists in anesthesiology and doctors during specialization by age, expressed as % of participants (n), and statistical analysis between age groups.

<table>
<thead>
<tr>
<th>Questions</th>
<th>24–30 years n = 29</th>
<th>31–40 years n = 31</th>
<th>41–50 years n = 44</th>
<th>51–60 years n = 38</th>
<th>61–70 years n = 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maneuvers for a pregnant woman who is choking (ineffective cough)^</td>
<td>10 (34.5)</td>
<td>8 (25.8)</td>
<td>2 (4.5)</td>
<td>1 (2.6)</td>
<td>1 (25.0)</td>
</tr>
<tr>
<td>Cycles of CPR in pregnancy^{**}</td>
<td>29 (100)</td>
<td>29 (93.5)</td>
<td>32 (72.7)</td>
<td>26 (68.4)</td>
<td>2 (50)</td>
</tr>
<tr>
<td>Time to cesarean section during CPR^{**}</td>
<td>16 (55.2)</td>
<td>5 (16.1)</td>
<td>19 (43.2)</td>
<td>12 (31.6)</td>
<td>2 (50)</td>
</tr>
<tr>
<td>The risk of anesthesia in pregnancy^{**}</td>
<td>27 (93.1)</td>
<td>31 (100)</td>
<td>43 (97.7)</td>
<td>34 (89.5)</td>
<td>2 (50)</td>
</tr>
<tr>
<td>Management in PEA – hypovolemic pregnant victim (case)^</td>
<td>20 (69.0)</td>
<td>28 (90.3)</td>
<td>34 (77.3)</td>
<td>33 (86.8)</td>
<td>2 (50)</td>
</tr>
<tr>
<td>Recognition of amniotic embolism (case)^</td>
<td>19 (65.5)</td>
<td>20 (64.5)</td>
<td>34 (77.3)</td>
<td>26 (68.4)</td>
<td>4 (100)</td>
</tr>
<tr>
<td>Treatment of amniotic embolism</td>
<td>28 (96.6)</td>
<td>30 (96.8)</td>
<td>40 (90.9)</td>
<td>38 (100)</td>
<td>4 (100)</td>
</tr>
<tr>
<td>Recognition of eclampsia (case)</td>
<td>29 (100)</td>
<td>31 (100)</td>
<td>42 (95.5)</td>
<td>37 (97.4)</td>
<td>4 (100)</td>
</tr>
<tr>
<td>Treatment of eclampsia</td>
<td>29 (100)</td>
<td>31 (100)</td>
<td>44 (100)</td>
<td>37 (97.4)</td>
<td>4 (100)</td>
</tr>
</tbody>
</table>

Four participants did not give their age.

\^ p < 0.01 between groups.
^{**} p < 0.05 between groups.
do not review basic knowledge, consistent with another report.\textsuperscript{13}

Worse results were achieved on the questions about maneuvers for a pregnant woman who is choking and time to cesarean section during CPR. Cohen et al. also reported inadequate awareness of essential basic knowledge regarding CPR in pregnancy.\textsuperscript{14} They noted that 88% of anesthesiologists answered the question on physiological changes in pregnancy correctly, similar to our question on the risk of anesthesia in pregnancy; in our study, however, we observed a higher percentage (91.9–100%). Fifty-nine percent answered correctly on the question about time to cesarean section during CPR in Cohen et al., vs. 29.8% to 50% in our survey.\textsuperscript{12}

On advanced level questions (assessing the use of knowledge in difficult situations by taxonomy), the specialists (S) and residents in anesthesiology (DS) group achieved very good, comparable results, outperforming the PD group, indicating that specialists and DS doctors know how to manage emergencies in pregnancy. Specialists have much experience, which likely helped them answer the questions correctly. They recognized PEA in hypovolemia and treated it properly. This skill is critical, because hemorrhage and hypovolemia often lead to maternal death. So the recognition of this emergency situation at early stage gives a chance to save the pregnant patient.\textsuperscript{20}

Based on the case in the test, all tested participants recognized eclampsia and amniotic embolism and treat these conditions properly: by oxygenation and magnesium sulfate administration in eclampsia, and oxygenation and fluid administration in embolism. Our results appear to be better than those of Ellis et al.\textsuperscript{5}

We did not observe any statistical significance between any groups concerning gender. Significance differences were noted on two questions at the basic level (maneuvers for a choking pregnant woman and cycles of CPR) with regard to the level of position at work. In Poland, it is common that the elder doctor assumes the highest position at work. Among specialists in anesthesiology and doctors during specialization, older doctors achieved significantly worse results – i.e., 41–60-year olds on the question about choking maneuvers and 61–70-year olds on the questions about cycles of CPR and the management in PEA. We conclude that older specialists are unfamiliar with current ERC guidelines. Einav et al. generated similar findings.\textsuperscript{13}

Significant differences were observed on two advanced questions with regard to participant age. Worse results were achieved by the 24–40-year old group on the question about recognition of amniotic embolism (64.5%) and by the 61–70-year old group on the question about the risk of anesthesia in pregnancy (50%). These doctors do not work in the obstetrics ward; thus, they are unfamiliar with this knowledge.

Although 161 doctors answered that they were familiar with the management of emergencies in pregnancy, we did not observe this correlation with regard to basic knowledge, as evidenced by the statistical significance on two questions (maneuvers for a choking pregnant woman and cycles of CPR). Such illusions are dangerous when doctors mistakenly believe that they know how to manage emergencies in pregnancy. Basic management should not be assumed to be simple, because problems arise as the emergencies progress, as shown in our survey.

A limitation of our study was that only physician knowledge was assessed, failing to translate our findings into clinical practice. However, the acquisition of advanced knowledge appears to benefit one’s practice. The other limitation is a small number of residents participating in this study.

Older specialists in anesthesiology do not know how to manage basic emergencies in pregnancy – particularly choking women and time to cesarean section during CPR. Anesthesiologists were familiar with the management of advanced problems, such as eclampsia and amniotic embolism. Thus, no relationship between remembering (passive knowledge) and using the knowledge in difficult situations was observed, suggesting that the fundamental elements of the teaching process from a didactic perspective deteriorated. The teaching process of acute obstetric emergencies is inadequate and requires improvement through the implementation of national obligatory courses and verification of knowledge every few years.

**Conflict of interest**

The authors have no conflict of interest to declare.

**Appendix A. MCQ test**

1. 30 years old pregnant woman (30 week) was admitted to a hospital. In the hospital when eating lunch suddenly she was choking. She was conscious but could not cough and speak. The emergency treatment is:
   A. Back blows between scapula 5× and abdominal thrusts 5×
   B. Back blows between scapula 5× and chest compressions 5×
   C. Only back blows between scapula
   D. Only chest compressions

2. A pregnant woman (25 week) who was admitted to the Emergency Department 15 min ago because of abdominal pain demonstrated a massive hemorrhage from genital tract. After 2 min she was in cardiac arrest. The recommended number of resuscitating cycles is:
   A. 30 chest compressions: 2 breaths
   B. 15 chest compressions: 2 breaths
   C. 30 chest compressions: 1 breath
   D. 15 chest compressions: 1 breath

3. A defibrillator was attached to a patient described above and QRS complexes with a rate of 30/min were observed on a monitor. A pulse was undetectable. The next step of treatment is:
   A. Continuing resuscitation and administering 1 mg of Adrenaline iv
   B. Continuing resuscitation, administering 1 mg of Adrenaline iv, administering fluids
   C. Performing defibrillation, continuing resuscitation
   D. Performing defibrillation, administering 1 mg of Adrenaline iv, continuing resuscitation

4. The resuscitation of a patient described above was not effective. A cesarean section should be done after ... minutes from a moment of cardiac arrest
   A. 2 min
   B. 4 min
5. 30-years old woman gave birth on time through the natural passage. The delivery was without any complications. After about 30 min she felt unwell. She had dyspnea, peripheral cyanosis, and after a while became unconscious. Vital signs: pulse 100/min, blood pressure 60/20 mmHg. After next 15 min a hemorrhage from genital tract was observed. What should be diagnosed?
A. Hypoxia due to massive hemorrhage
B. Eclampsia
C. Amniotic fluid embolism
D. Stroke

6. A treatment of a patient described above is:
A. Giving oxygen, administering fluids
B. Giving oxygen only
C. Administering fluids only
D. Administering 1 mg of Adrenalin IV

7. The risk of general anesthetia in pregnancy (later than 20 week) to cesarea section in emergency is high due to physiological changes. In this situation a personnel should take into consideration a risk of:
A. A full stomach
B. A full stomach and difficult intubation
C. There is no extra risk
D. It can be difficult intubation

8. 35-years old pregnant has got higher blood pressure 140/90 mmHg since 20 week of pregnancy. The edema was also observed. Yesterday she complained of headache, abdominal pain. Today morning she had seizure. What should be diagnosed?
A. Hypoxia due to massive hemorrhage
B. Eclampsia
C. Amniotic fluid embolism
D. Stroke

9. A treatment of a patient described above is:
A. Giving oxygen, administering fluids
B. Giving oxygen only
C. Administering fluids only
D. Giving oxygen and magnesium sulfate IV

References