

Emergency medical team interventions in Poland during out-of-hospital deliveries: A retrospective analysis

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Abstract

Background. Emergency medical teams are a crucial component of healthcare systems, routinely providing essential care to pregnant patients in various situations.

Objectives. To evaluate the rate and outcomes of out-of-hospital deliveries attended by Emergency Medical Services (EMS) in Poland and identify areas for improvement in the care provided by emergency medical teams.

Materials and methods. This retrospective study was based on 41,335 EMS emergency calls to women in advanced pregnancy, of which 879 births were delivered directly by medical teams between January 2018 and December 2022. Data were obtained from the Polish National Monitoring Center for Emergency Medical Services, encompassing all EMS interventions in Poland.

Results. The study involved 879 EMS team interventions for pregnant women, with an average patient age of 29.87 years. Most patients were in their 2nd pregnancy (28.26%) and delivering for the 2nd time (25.77%). The postnatal condition of newborns, assessed using the Apgar score, was missing in 408 cases (46.52%) due to incorrect completion of documentation. Emergency Medical Services teams, predominantly P-type (basic) teams, handled 69.78% of deliveries, while S-type (specialist) teams were involved in 30.22% of cases. Medical procedures often performed during childbirth included manual assistance in spontaneous delivery, pulse oximetry, physical examination, examination of systemic blood pressure, obtaining peripheral intravenous access, and gynecological examination.

Conclusions. Given the rate of encountered cases and the gaps identified in medical documentation, there is merit in potentially implementing a dedicated form to be completed by medical teams when caring for a pregnant patient. Ongoing training and enhancements in the range of assistance provided to the mother and newborn are imperative for ensuring appropriate care.

Key words: pregnant women, health care, Emergency Medical Team, out-of-hospital birth

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Background

As in many other countries, the number of births in Poland is progressively decreasing.¹ In the first half of 2023, 139,000 live births were registered in Poland, reflecting a decrease of 14,700 compared to the corresponding period during the previous year. The natural increase, calculated as the difference between live births and deaths, was negative, reaching about 70,400. Such a reduction in the number of deliveries necessitates further measures to optimize the care of pregnant women and make every possible effort to reduce the risk to the newborn, which is particularly important in the case of out-of-hospital (OOH) deliveries.

In Poland, the primary location for childbirth is centralized in hospitals, with very limited alternatives. Despite the option for patients to choose the delivery location based on perinatal care standards, no public national maternity program is available. Home births are exclusively facilitated by midwives operating within their private practices.²

Examining the situation in other European countries, such as Finland, reveals that when the number of deliveries declines, maternity wards with fewer than 1,000 deliveries per year are often closed. This trend leads to a centralization of births in larger units, aiming to guarantee the highest standard of care for the mother and the newborn. Consequently, the risk of intervention by emergency medical teams in pre-hospital deliveries increases.³

In 2019, the total number of Emergency Medical Services (EMS) teams in Poland was 1,585, including those operating on a seasonal basis. The current organized EMS system is referred to as the National Monitoring Center for Emergency Medical Services (NMC-EMS). Modern EMS also incorporate specialized medical staff and are integral to the system. In addition to established professions like physicians and nurses, there is the (relatively new in Poland) profession of paramedics.⁴

Polish EMS constitutes a critical pillar of the healthcare system, designed to deliver timely and specialized care to individuals confronted with life or health-threatening emergencies. This all-encompassing system comprises essential elements, ranging from hospital emergency departments and EMS teams to advanced units like Helicopter Emergency Medical Services (HEMS) teams. Within this structure, both EMS and HEMS teams share the unified goal of providing on-site emergency medical care and ensuring the secure transport of patients to hospitals. Emergency Medical Services teams consist of diverse healthcare professionals, including physicians, emergency medical technicians and nurses. Notably, Polish EMS teams are classified as basic (non-physician-staffed) or specialist (physician-staffed), with team size of 2 or 3 responders.

The foundation of EMS in Poland rests on paramedic emergency medical teams, comprising paramedics trained

to meet legal requirements. Notably, an increasing number of paramedics in Poland hold bachelor's degrees in medical rescue. Their education includes courses in obstetrics and the practical and theoretical aspects of providing emergency care to women in pregnancy-related emergencies, encompassing pre-hospital deliveries. As the landscape of EMS in Poland undergoes evolution, there is a decreasing inclusion of physicians within these teams. While a minority specialize in emergency medicine, their expertise significantly enhances the overall capabilities of the teams. The integration of diverse healthcare professionals and the continuous development of skill sets underscore the adaptability and effectiveness of the Polish EMS in addressing a wide array of medical emergencies.⁵ Current provisions in the law on state EMS stipulate the existence of 1 specialist team for every 10 basic teams.

The current landscape is changing, with a noticeable decrease in ambulances with on-board physicians. This trend implies an increasing need for emergency medical responders to take proactive measures and decisions, especially in rare but perilous situations such as assisting a pregnant patient or performing neonatal resuscitation. Such transformation underscores medical professionals' need to be well-prepared to handle critical scenarios. It is crucial to reference established guidelines, such as those outlined by the European Resuscitation Council (ERC), to ensure the highest standards of care.^{6,7}

Numerous scientific studies underscore the pivotal role of pre-hospital care as one of the pillars of care in managing emergencies. Proper optimization, thorough staff preparation and prompt transportation consistently and substantially influence the patient's subsequent outcomes.⁸

An important point is that pregnant women and childbirth represent a small percentage of all realized calls for emergency medical teams. In the period during which the calls were analyzed (2018–2022), 41,335 calls involved assisting a pregnant woman. According to data from the Statistics Poland, the EMS realized a total of 15,139,193 notifications during this period, with calls related to pregnancies accounting for only 0.273% of the total. Therefore, we can assume that working with pregnant women is rare for members of the emergency medical teams, which makes it challenging for them to maintain proper standards of care and current medical knowledge.

Objectives

The study aimed to determine the rate of births attended by EMS teams in Poland, identify the procedures performed by them, compare the procedures performed based on the presence of a physician in the team, and assess newborn condition following delivery by the EMS team.

Materials and methods

Study design

We conducted a cross-sectional study using data from the NMC-EMS from 2018–2022, encompassing all interventions conducted by EMS within the country. As no specific diagnostic code reliably identified OOH deliveries, we employed multiple search strategies to identify OOH deliveries that EMS took, defined as the 2nd stage of labor.

Before commencing the study, ethical approval was obtained from the Bioethics Committee of Wrocław Medical University, Poland (approval No. KB-975/2022).

Participants

In the International Classification of Diseases, 10th Revision (ICD-10), the range designated by codes O30 to O92 encompasses categories related to pregnancy, childbirth and puerperium complications. Specifically, O30–O48 addresses complications associated with pregnancy and fetal development, O60–O77 pertains to issues related to childbirth, O80–O84 involves complications during the puerperium, and O85–O92 focuses on complications related to maternal healthcare.

Variables

The original database was filtered within the range of ICD-10 codes from O30 to O92 to isolate those involving pregnant women, amounting to 41,335 cases. Subsequently, 2 independent researchers conducted a manual search within the descriptions of interventions prepared by emergency medical teams. The focus of the search was to gather information about direct EMS involvement during childbirth. The 2nd stage of labor, involving the actual birth of the newborn, was defined as the focal point of the analysis.

Relying on the descriptions provided by the EMS, we identified 879 cases of interventions involving childbirth. Instances in which the delivery occurred in a gynecological emergency room in the presence of a physician or midwife were excluded from the analysis. Adhering to the definition outlined by the World Health Organization (WHO), individuals who experienced labor after the 22nd week of pregnancy were considered to have given birth.

Statistical analyses

The relationships between qualitative variables were analyzed using Pearson’s χ^2 independence test followed by Bonferroni correction to reduce the chances of obtaining false positive results (type I errors). The Kolmogorov–Smirnov (K–S) test was used to verify the normal distribution of the participant’s age (K–S test: $D = 0.053$, $n = 818$; $p < 0.001$). A significance level of $p < 0.05$ was adopted

to indicate the presence of statistically significant relationships or differences. Statistical analysis employed IBM SPSS v. 26 software (IBM Corp., Armonk, USA).

Results

The survey encompassed 879 interventions by EMS teams for pregnant patients. The median patient age was 30 years (1st quartile (Q1) = 25 and 3rd quartile (Q3) = 34), with the youngest being 15 and the oldest 45. Most patients were in their 2nd pregnancy (249, 28.33%), and 227 (25.82%) were experiencing their 2nd childbirth. Unfortunately, some reports from EMS teams were incomplete, leading to missing information about the specific pregnancy and childbirth in 138 cases (15.70%) and 268 cases (30.49%), respectively. Additionally, in 403 cases (45.85%), emergency medical teams omitted information about the week of pregnancy.

The cases considered included 360 instances of full-term pregnancy (after 37 weeks of pregnancy) (40.96%) and 116 cases (13.20%) involving premature deliveries (before 37 weeks of pregnancy). In the remaining cases, there was no information about the week of pregnancy (403, 45.85%). The postnatal condition of the newborn, assessed using the Apgar score, was evaluated in 471 cases. Among these, 428 (48.69%) were rated as having a good condition (8–10 points), 23 (2.62%) an average condition (4–7 points) and 20 (2.28%) a poor condition (0–3 points).

Table 1. Characteristics of the study population

Variable		Value
Age [years] median (Q1–Q3)		30 (25–34)
Number of pregnancies n (%)	1 st	51 (5.80)
	2 nd	249 (28.33)
	3 rd	193 (21.96)
	4 th	124 (14.11)
	5 th or more	124 (14.11)
	no data	138 (15.70)
Number of labors n (%)	1 st	52 (5.92)
	2 nd	227 (25.82)
	3 rd	158 (17.97)
	4 th	96 (10.92)
	5 th or more	78 (8.88)
	no data	268 (30.49)
Duration of pregnancy n (%)	preterm pregnancy	116 (13.20)
	term pregnancy	360 (40.96)
	no data	403 (45.85)
Apgar score n (%)	8–10 points	428 (48.69)
	4–7 points	23 (2.62)
	0–3 points	20 (2.28)
	no data	408 (46.42)

Q1 – 1st quartile; Q3 – 3rd quartile.

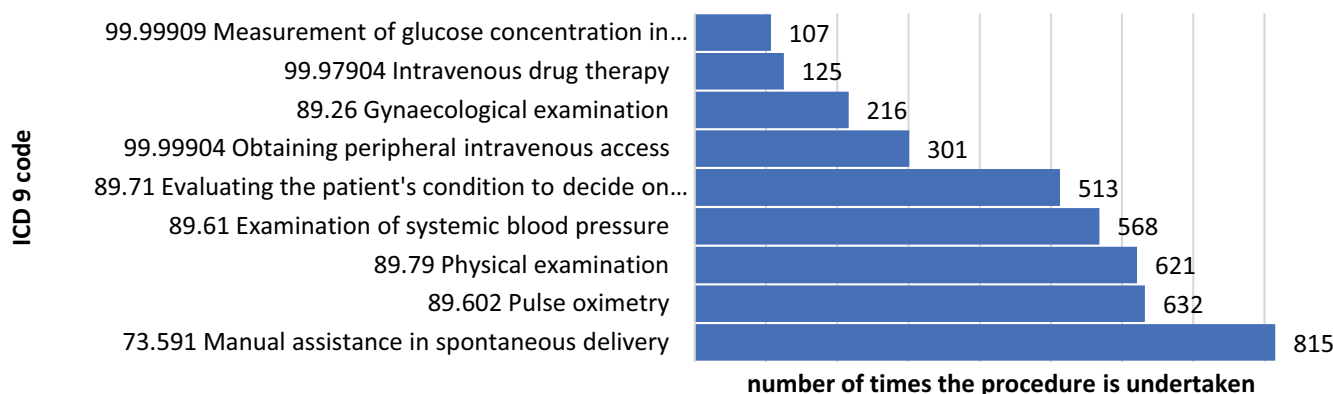


Fig. 1. Emergency medical procedures performed by Emergency Medical Services (EMS) teams attending a birthing patient

Table 2. Emergency Medical Services (EMS) group characteristics and intervention time

EMS team type, n (%)		Value, n (%)
Basic		612 (69.62)
Specialist		267 (30.38)
Intervention time, n (%)	6 AM–2 PM	273 (31.06)
	2 PM–10 PM	228 (25.94)
	10 PM–6 AM	378 (43.00)

However, in 408 cases (46.42%), no information was available regarding the Apgar score. Further details are presented in Table 1.

Most deliveries attended by emergency medical teams occurred under the care of P-type (basic) teams (612, 69.62%), with specialist teams handling deliveries in only 267 (30.38%) cases. The majority of deliveries occurred between 10 PM and 6 AM, totaling 378 (43.00%), followed by 273 (31.06%) interventions between 6 AM and 2 PM, and 228 (25.94%) between 2 PM and 10 PM (the data are presented in Table 2).

The medical procedures most frequently performed during the care of women giving birth included manual assistance in spontaneous delivery (815 cases, 92.72%), pulse oximetry (632 cases, 71.90%), physical examination (621 cases, 70.65%), examination of systemic blood pressure (568 cases, 64.62%), obtaining peripheral intravenous access (301 cases, 34.24%), and gynecological examination (216 cases, 24.57%). Detailed data are presented in Fig. 1. Emergency medical teams included oxytocin administration during labor in their reports in only 9 cases. However, there were no detailed descriptions of the reasons and purposes of its administration.

Table 3 contrasts the activities conducted based on the type of medical team, i.e., basic compared to specialized. Medical procedures, including physical examination, blood pressure measurements and pulse oximetry, were undertaken more frequently by primary emergency medical teams ($p < 0.05$). There were no significant differences in the frequency of gynecological examination, obtaining peripheral intravenous access and measurement of glucose concentration in arterialized capillary blood. However, it is worth emphasizing that these examinations were conducted less frequently than those mentioned above, being undertaken in 1 in 3 women at most.

Table 3. Comparison of the frequencies of procedures conducted by EMS P-type and EMS S-type medical team

Procedures conducted by EMS		EMS P-type	EMS S-type	χ^2 p-value*
Pulse oximetry, n (%)	yes	487 (79.58)	152 (56.93)	48.03
	no	125 (20.42)	115 (43.07)	<0.001
Physical examination, n (%)	yes	463 (75.65)	165 (61.80)	17.49
	no	149 (24.35)	102 (38.20)	<0.001
Examination of systemic blood pressure, n (%)	yes	439 (71.73)	136 (50.94)	46.73
	no	173 (28.27)	131 (49.06)	<0.001
Gynecological examination, n (%)	yes	157 (25.65)	59 (22.10)	1.27
	no	455 (74.35)	208 (77.90)	1.000
Obtaining peripheral intravenous access, n (%)	yes	228 (37.25)	76 (28.46)	6.35
	no	384 (62.75)	191 (71.54)	0.072
Measurement of glucose concentration in arterialized capillary blood, n (%)	yes	89 (14.54)	22 (8.24)	6.69
	no	523 (85.46)	245 (91.76)	0.060

χ^2 – χ^2 statistic value, degrees of freedom for all comparisons = 1; p-value considers the Bonferroni correction for multiple comparisons; EMS – Emergency Medical Services; P-type – basic team; S-type – specialized team.

Discussion

The current study illustrates the clinical support extended by EMS teams to women delivering OOH, shedding light on the most prevalent medical procedures and the postnatal condition of newborns. To the authors' knowledge, no prior studies in Poland, except for one describing the actual rate of deliveries attended by EMS, explored this aspect.⁹

The choice of birthplace is a subject of ongoing discussion among various organizations and associations in many countries, as is defining the necessary conditions and criteria for qualifying pregnant individuals for a planned home or hospital birth. The Polish Society of Gynecologists and Obstetricians (Polskie Towarzystwo Ginekologów i Położników (PTGiP)) has not formulated a clear position on home births.¹⁰

Hospital-based maternity care is frequently criticized for its medicalization of childbirth, and patients opting for community birth often intend to avoid, in their opinion, unnecessary interventions such as cardiotocography, episiotomy and epidural anesthesia. They consider an OOH birth to be safer than a hospital birth.¹¹

The American College of Obstetricians and Gynaecologists (ACOG) recognizes that "many common obstetric practices are of limited or uncertain benefit for low-risk women in spontaneous labor."¹² However, it is important to note that childbirth is unpredictable and may sometimes occur in an unplanned setting, in which case medical assistance from EMS personnel may be required.^{13,14}

Our study highlights deficiencies in the medical documentation maintained by emergency medical teams. It is crucial to underscore that deliveries are exceptional situations that do not occur daily, making them the most stressful emergency for EMS providers.¹⁵ Therefore, it is understandable that documentation gaps may arise due to significant effort, exhaustion and lack of experience. However, the authors advocate for creating a dedicated card for OOH deliveries to enhance monitoring analysis and improve staff performance, ensuring comprehensive and appropriate information collection. Documentation deficiencies have also been acknowledged in other countries, indicating that the issue can also be expected in Poland.^{13,16}

The additional documentation should be an integral part of the Command Support System for Polish EMS, in which the EMS team leader maintains each patient's medical records. The system should automatically run additional options for the assessment of a pregnant woman and possibly a newborn baby whenever a pregnant woman is assisted. Such a solution would not only guide the members of the EMS on the correct procedures but also provide better opportunities to monitor the quality of care.

Considering the declining birth rates in Poland and the consequent decrease in the number of gynecological and maternity hospitals, there is a significant likelihood that medical care will encounter new challenges. Many studies suggest a correlation between prolonged travel time

for OOH births and an increased risk of neonatal mortality.^{17,18} In light of the above, emergency medical team interventions could increase despite the declining number of deliveries. This would entail heightened expectations and encountering progressively complex clinical scenarios. It appears essential to proactively prepare to prevent dramatic situations in the future.

Mothers exhibiting abnormal vital signs during the intrapartum period may be experiencing conditions that pose potential complications for both the birthing process and the newborn's wellbeing.¹⁹ Paramedics may overlook these conditions unless they are familiar with typical maternal vital signs during pregnancy and understand the physiological changes that occur in the mother. For example, hypertensive disorders are linked to elevated maternal and fetal morbidity and mortality levels.²⁰ Increased blood pressure during labor can contribute to placental insufficiency and fetal hypoxia.²¹ Additionally, it has been demonstrated to elevate the incidence of postpartum pre-eclampsia.²² Due to the above, it is essential not to forget basic activities such as measuring blood pressure, even in non-standard situations involving emergency medical teams.

In their 2021 study, Schultz et al. underscored the pivotal role of active management in the 3rd stage of labor, particularly the immediate administration of oxytocin postpartum.²³ Given the potential life-threatening implications of primary postpartum hemorrhage (PPH) for the mother, this practice is a standard preventive measure against it in many Polish hospitals. Analyzing Queensland Ambulance Service data, Schultz et al. reported a robust 63.4% administration rate of oxytocin postpartum. Contrastingly, our research, derived from the available data, indicates a notably lower frequency of oxytocin administration, with only 9 mission descriptions of its use. The reasons for the infrequent use of oxytocin by emergency medical services are not apparent from the mission descriptions alone.

Nevertheless, aligning with WHO guidelines and the recommendations of various scientific societies, e.g., the Royal College of Obstetricians and Gynecologists, it is prudent to consider oxytocin administration in every woman giving birth without risk factors.^{24,25} In cases where the administration is declined, this refusal should be fully documented in adherence to best practices and WHO recommendations. Further investigation into the factors influencing the variance in oxytocin administration rate is warranted to ensure the optimal application of preventive measures for PPH in emergency obstetric care.

The Polish Ministry of Health regulations define EMS activities performed autonomously by a paramedic in a type P-team, and the medications listed therein to be administered by the paramedic do not include oxytocin – therefore, the paramedic can only administer it on a physician's orders.²⁶ The Polish National Health Service's guidelines for the minimum equipment of a P-team do not specify what medications the P-team should be equipped

with. As a result, dispatchers do not equip the EMS teams with oxytocin. Therefore, it is worth considering expanding the table of pharmacological agents administered by the paramedic autonomously, which will give the possibility of introducing it to the EMS. It can be considered that the introduction of its administration is similar to drugs such as clopidogrel and ticagrelor, which are administered after consultation with the physician on duty at the facility to which the patient is transported.

An essential aspect of our study was the exploration of rarely addressed, real challenges encountered by EMS teams involved in delivering babies in Poland. Further research appears imperative to enhance education and support for emergency medical teams, ultimately ensuring the highest level of safety for both the delivering patient and her newborn. The authors believe a discourse on developing a new card tailored for EMS teams during visits to pregnant women is necessary to ensure the comprehensive inclusion of essential data. Our working group is poised to submit its proposal for these changes to decision-makers shortly.

Paramedics in emergency medical teams proceed mainly based on guidelines from recognized organizations such as the ERC. Therefore, instead of the Apgar scale, one could consider introducing a simplified assessment following the Newborn Life Support (NLS) guidelines for the resuscitation of a newborn based on the evaluation of 4 parameters: skin color, muscle tone, respiratory rate, and heart rate.⁷ The compatibility of such an assessment with current guidelines will provide consistency in the algorithm and completed documentation.

Within medical records, it is worth considering introducing a separate section for evaluating the newborn and the procedures performed, activated when the field “childbirth” is marked in the existing documentation. The study showed that intravenous access was performed in 301 cases. However, the design of the current documentation does not allow for an unambiguous statement of whether the access was performed on the woman giving birth or the child. There is no clear place in the current documentation to record whether the child had an assessed level of saturation, required oxygen support or lung ventilation, given that the teams assessed 23 cases (2.62%) as medium (3–7 points) and 19 cases (2.16 %) as poor (0–2 points).

Considering some specific aspersions of the assessment and management of a woman in labor, it is worth considering the development of “Good Practices for the Management of a Woman in Labor,” employing the necessary elements of assessment, management and documentation in such cases. Similar documents already exist, approved and published by the Polish Ministry of Health, including “Good Practices for the Conduct of Medical Dispatchers, Emergency Medical Teams and Emergency Department to a Patient with Hemophilia or Related Hemorrhagic Diathesis” and “Good Practices for the Management of a Patient with Suspected Stroke.”²⁷

Limitations

Despite the valuable insights gained from this study, several limitations merit consideration. The retrospective nature of the study is one of the most significant limitations. The reliance on EMS team reports, some of which needed to be completed, poses a challenge in constructing a comprehensive understanding of each obstetric intervention. Additionally, we are concerned that some paramedics may misunderstand the ICD-9 procedures associated with childbirth and birth assistance. Missing Apgar scores further limit the depth of the analysis and hinder a comprehensive assessment of neonatal outcomes.


The study’s focus on EMS team reports might only capture some clinical context, potentially leading to underestimating or misrepresenting certain variables, though the focus on basic and specialized EMS teams offers valuable insights into their distinct roles. However, the specific criteria determining the assignment of teams to cases were not explored. This lack of clarity limits the depth of understanding regarding the decision-making process for team allocation. Despite these limitations, this study constitutes a foundational exploration of the challenges and complexities associated with emergency obstetric care. A noteworthy strength of this work is the meticulous manual examination of all descriptions of medical interventions, a process that demanded a considerable investment of time and thorough analytical scrutiny.


Conclusions


Childbirth is inherently unpredictable and can take place in unplanned pre-hospital settings, posing a significant risk of requiring the intervention of emergency medical teams. This is particularly important considering the decreasing number of deliveries and gynecological wards, and the distance from the patient’s home to the nearest hospital. According to our study, significantly more medical procedures were conducted by teams lacking a doctor. The challenges posed by unique situations for emergency medical teams, such as childbirth, contribute to a need for sufficient diligence in maintaining documentation. Developing new forms for EMS teams to enhance documentation quality is crucial. Further research is warranted to enhance our understanding of the factors influencing emergency obstetric outcomes and to guide the development of targeted interventions for pregnant patients in emergency settings.

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