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Prehospital Management Of Obstetric Emergencies: A Paramedic Perspective

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Abstract

Obstetric emergencies pose significant challenges in the prehospital setting, requiring prompt recognition and management by paramedics to optimize maternal and fetal outcomes. This review explores the paramedic's role in managing obstetric emergencies, focusing on epidemiology, clinical assessment, specific interventions, and future directions. Obstetric emergencies contribute substantially to global maternal morbidity and mortality, with higher incidence in low- and middle-income countries. Paramedic training in obstetric emergencies emphasizes systematic assessment, including primary maternal stabilization, recognition of shock, and continuous monitoring. Condition-specific interventions for antepartum, intrapartum, and postpartum emergencies are discussed, such as management of eclampsia, shoulder dystocia, and postpartum hemorrhage. Specialized obstetric equipment and resources in ambulances are highlighted. Effective communication with receiving hospitals and interprofessional collaboration during transport are crucial for optimal outcomes. Challenges include resource constraints in rural areas, variable scope of practice, and cultural considerations. Future directions explore the integration of telemedicine and artificial intelligence-assisted fetal monitoring tools in prehospital obstetric care. The development of enhanced international guidelines for paramedic involvement in maternity care is advocated to promote standardized, evidence-based practice and improve patient safety in obstetric emergencies globally.

Keywords Obstetric emergencies; prehospital care; paramedics; postpartum hemorrhage; eclampsia; shoulder dystocia; preterm labor; emergency medical services (EMS).

1. Introduction

Obstetric emergencies remain a significant global health challenge, with profound implications for maternal and neonatal morbidity and mortality. Their management in the prehospital setting is critical, especially given the varying resources and infrastructure in different regions worldwide. This section discusses the importance of obstetric emergencies within both global and local contexts, emphasizing the vital role of paramedics, the impact on health outcomes, and the challenges faced in resource-limited and remote environments (Almubarak et al., 2025).

1.1 Significance of Obstetric Emergencies Globally

Obstetric emergencies, including postpartum hemorrhage, preeclampsia, eclampsia, obstructed labor, and sepsis, are among the leading causes of maternal mortality worldwide. According to the World Health Organization (WHO), approximately 260,000 women died during and following pregnancy and childbirth in 2023, with about 92% of these deaths occurring in low- and lower-middle-income countries. These conditions significantly contribute to maternal morbidity and neonatal mortality, with complications during pregnancy, delivery, and postpartum being key factors. In particular, hemorrhage, infection, and hypertensive disorders are the predominant direct causes, accounting for a large proportion of maternal deaths globally (Indonesia et al., 2013).

1.2 Impact on Maternal and Neonatal Morbidity and Mortality

The consequences of obstetric emergencies extend beyond mortality, impacting long-term maternal health, neonatal outcomes, and broader societal functions. Neonatal mortality rates are notably higher among infants born to mothers at extreme reproductive ages or in settings with inadequate healthcare access. For instance, studies have documented neonatal mortality rates of approximately 28.96 per 1000 live births in low- and middle-income countries, with severe emergencies leading to birth complications, asphyxia, or prematurity. Maternal morbidity often includes postpartum hemorrhage, infection, and organ failure, emphasizing the necessity for prompt, effective management in the prehospital phase to preserve life and prevent long-term disability (Tamir, 2024).

1.3 Role of Paramedics in Obstetric Emergencies

Paramedics are frontline healthcare providers often called upon to manage obstetric emergencies outside of hospital settings. Their role is crucial in bridging delays between the onset of complications and definitive hospital care. Paramedics are responsible for early recognition of emergencies such as antepartum hemorrhage, eclampsia, and obstructed labor, initiating appropriate interventions, and facilitating rapid transportation. Their ability to execute life-saving procedures, administer emergency medications, and provide maternal and neonatal resuscitation has a significant impact on outcomes, especially in rural or remote areas where access to comprehensive obstetric services may be limited (Martin & Betts, 2025).

1.4 Challenges in Resource-Limited and Remote Settings

Managing obstetric emergencies in resource-constrained environments poses multiple challenges. Many low-income countries lack well-established emergency medical services (EMS), sufficient transportation, and trained personnel. These deficiencies contribute to delayed presentations and suboptimal emergency response, further increasing maternal and neonatal risks. In remote regions, distances to healthcare facilities and inadequate communication infrastructure exacerbate these issues, complicating timely interventions. Additionally, difficulties in training, limited availability of supplies, and cultural barriers further hinder effective prehospital obstetric care (Takoutsing & Zolo, 2023).

2. Epidemiology and Global Burden

Obstetric emergencies represent a critical subset of pregnancy-related complications requiring immediate medical intervention to prevent maternal and fetal morbidity and mortality. The prevalence and incidence of obstetric emergencies vary widely across regions and are influenced by healthcare accessibility, socioeconomic factors, and underlying health infrastructure (Lakshmi et al., 2021).

2.1 Prevalence and Incidence of Obstetric Emergencies

Obstetric emergencies are common and often life-threatening events during pregnancy, childbirth, and the postpartum period. Incidence rates vary depending on definition, healthcare settings, and population characteristics. For instance, one hospital-based study in a low-resource setting reported an incidence of obstetric emergencies at approximately 18.5% of all deliveries. Common emergencies include obstetric

hemorrhage (antepartum and postpartum), eclampsia, obstructed labor, sepsis, and complications related to unsafe abortion (Mustafa Adelaja & Olufemi Taiwo, 2011).

Globally, estimates indicate that millions of women annually experience obstetric complications that require emergency obstetric care (EmOC). However, access to such care is highly inequitable, with only around 45% of women with complications receiving appropriate emergency obstetric interventions worldwide. This unmet need translates to millions of untreated complications and associated risks (Holmer et al., 2015).

2.2 Global Statistics on Maternal Mortality and Primary Causes

Maternal mortality remains a pressing global health challenge, with an estimated 260,000 women dying annually due to pregnancy and childbirth complications as recently as 2023. These deaths predominantly occur in low- and middle-income countries (LMICs), accounting for over 90% of global maternal deaths. The maternal mortality ratio (MMR), representing maternal deaths per 100,000 live births, highlights significant disparities: approximately 346 per 100,000 in low-income countries versus 10 per 100,000 in high-income countries. The leading direct causes of maternal deaths include severe bleeding (postpartum hemorrhage being the most common), infections usually postpartum, hypertensive disorders such as pre-eclampsia and eclampsia, complications of delivery, and unsafe abortions. Secondary or indirect causes encompass anemia, malaria, HIV, heart disease, and other comorbidities exacerbated by pregnancy. These causes collectively account for about 75% of all maternal deaths globally (Cresswell et al., 2025).

2.3 Variation in Burden Between Income Settings

The burden of obstetric emergencies and maternal mortality exhibits stark variation between low-, middle-, and high-income countries due to differences in healthcare infrastructure, access to skilled birth attendants, and emergency obstetric care availability. In high-income settings, near-universal access to skilled care and timely interventions results in very low MMRs (around 10 per 100,000 live births) (Lawrence et al., 2022).

In contrast, low- and middle-income countries face a high prevalence of untreated obstetric emergencies and elevated mortality rates. The MMR can be 30 to 40 times higher than in high-income countries, driven largely by limited access to timely and quality EmOC, shortage of skilled health personnel, logistical challenges in prehospital and hospital care, and sociocultural factors. Additionally, conflict zones and fragile settings experience even higher maternal mortality ratios, compounding healthcare access challenges (Holmer et al., 2015).

The "met need" for emergency obstetric care proportion of women with obstetric complications who receive appropriate treatment, is significantly lower in low-income countries (~21%) compared to nearly universal coverage (~99%) in high-income countries. This disparity underscores the critical role of strengthening prehospital emergency services, including paramedic-led interventions, to bridge gaps in timely care (Holmer et al., 2015).

3. Scope of Paramedic Practice in Obstetric Care

The scope of paramedic practice in prehospital obstetric management encompasses defined capabilities and limitations shaped by clinical guidelines, legal frameworks, and interdisciplinary collaboration. Paramedics serve as critical frontline responders in managing childbirth and obstetric emergencies outside hospital settings, providing lifesaving interventions during unpredictable and often emergent situations. However, their role is bounded by scope of practice standards, which delineate permitted procedures and interventions to ensure patient safety and adherence to regulatory policies (Withanarachchie et al., 2025).

3.1 Definition and Limitations of Paramedic Scope in Obstetric Management

Paramedic scope in obstetric care generally includes assessment and management of laboring patients, assisting in uncomplicated childbirth, and addressing obstetric emergencies like postpartum hemorrhage, shoulder dystocia, malpresentation, and newborn resuscitation. Protocols typically authorize paramedics to

provide routine care such as fetal monitoring, placental delivery assistance, umbilical cord management, and initial stabilization of both mother and neonate. However, advanced obstetric procedures, including cesarean section, analgesia administration for labor, or invasive fetal interventions, fall outside their scope, necessitating urgent transport to definitive care facilities (McLelland et al., 2015).

Limitations arise from training boundaries, legal authorizations, and operational protocols. Paramedics practice under delegated authority from medical directors and must follow evidence-based guidelines and medical command instructions. The unpredictable nature of prehospital births, including sudden complications and lack of comprehensive prenatal data, further constrains interventions to primarily emergent stabilization and timely transport. For example, in Ontario, paramedics are trained under programs like the Paramedic Emergency Skills Program (PESP), which equips them with childbirth management skills tailored to out-of-hospital settings, emphasizing safe handling of uncomplicated births and emergency scenarios such as breech presentations and twin deliveries (Newman, 2022).

3.2 Integration with Midwifery and Emergency Medicine

Effective prehospital obstetric care necessitates collaboration and integration of paramedics with midwifery services and emergency medicine specialists to optimize maternal and neonatal outcomes. Midwives traditionally provide comprehensive maternity care and often manage home births and community deliveries. Initiatives like Ontario's PESP exemplify cross-disciplinary training efforts where midwives train paramedics in emergency childbirth care, enhancing paramedics' competence in managing childbirth complications until handover or further support arrives (Wagstaff & Mistry, 2020).

Moreover, paramedics act as vital links between the prehospital environment and hospital emergency departments. Coordination with emergency medicine professionals ensures smooth transition of care, with EMS providers communicating preliminary assessments, interventions performed, and identifying urgent clinical needs. This integration supports a continuum of care model where paramedics stabilize the patient and expedite access to definitive obstetric and neonatal care, implementing a "golden hour" approach to reduce morbidity and mortality. The evolving synergy among paramedics, midwives, and emergency medicine embodies a multidisciplinary framework that strengthens prehospital obstetric emergency readiness, enhances clinical outcomes, and aligns with contemporary maternal health strategies aimed at reducing preventable deaths and complications (Anto-Ocrah et al., 2020).

4. Classification of Obstetric Emergencies: A Paramedic Perspective

Obstetric emergencies encountered in the prehospital setting are critical situations requiring prompt recognition and management by paramedics to optimize maternal and fetal outcomes. These emergencies are broadly classified into three categories based on their timing relative to delivery: antepartum, intrapartum, and postpartum emergencies. Each category encompasses distinct clinical conditions that present unique challenges for prehospital care (Govender et al., 2025).

4.1 Antepartum Emergencies

Antepartum emergencies occur during pregnancy prior to the onset of labor and often involve risks related to bleeding, hypertensive disorders, or early labor complications.

- **Antepartum Hemorrhage (APH):** This includes bleeding from conditions such as placenta previa (placental implantation over the cervical os) and placental abruption (premature separation of the placenta). APH is a serious condition requiring immediate assessment of bleeding severity and maternal stabilization. Paramedics must monitor for signs of hypovolemia and fetal distress while preparing for rapid transport to definitive care (Yarrington, 2024).
- **Hypertensive Disorders:** Preeclampsia and eclampsia represent a spectrum of hypertensive emergencies that increase maternal and fetal morbidity. Management involves early recognition of

symptoms such as severe headache, visual disturbances, and seizures, supportive oxygen therapy, and urgent transport (Cash et al., 2021).

- **Preterm Labor:** The onset of labor prior to 37 completed weeks gestation poses significant risks including neonatal complications. Paramedics should assess contractions, cervical changes if possible, and prepare for possible prehospital delivery or rapid transfer (Cash et al., 2021).
- **Severe Hyperemesis Gravidarum:** Characterized by excessive nausea and vomiting, this condition can lead to dehydration and electrolyte imbalances requiring fluid resuscitation (Lloyd et al., 2013).

4.2 Intrapartum Emergencies

Intrapartum emergencies arise during labor and delivery, often necessitating immediate intervention to safeguard mother and child.

- **Shoulder Dystocia:** This occurs when the fetal shoulder cannot pass below the maternal pubic symphysis after the head is delivered, requiring prompt maneuvers to prevent fetal injury (Cash et al., 2021).
- **Cord Prolapse:** The umbilical cord descends through the cervix ahead of or alongside the presenting fetal part, risking cord compression and fetal hypoxia; immediate action to relieve pressure is vital (Cash et al., 2021).
- **Uterine Rupture:** A life-threatening tear of the uterine wall, usually in women with prior cesarean section scars, marked by sudden abdominal pain and fetal distress (Cash et al., 2021).
- **Precipitous Delivery:** Delivery occurring in less than 3 hours from labor onset, which may catch EMS unprepared (Cash et al., 2021).
- **Fetal Distress Indications:** Signs such as abnormal fetal heart rate detected via prehospital monitoring suggest hypoxia and demand rapid transport and possible prehospital delivery preparations (Cash et al., 2021).

4.3 Postpartum Emergencies

These emergencies occur following delivery and often relate to hemorrhagic or cardiovascular complications.

- **Postpartum Hemorrhage (PPH):** Excessive bleeding after birth is a major cause of maternal mortality. Paramedics must promptly identify PPH, administer uterotonic agents if within protocol, perform fundal massage, apply direct pressure, and ensure rapid transport (Leonardsen et al., 2021).
- **Retained Placenta:** When the placenta fails to deliver within 30 minutes post-birth, it can lead to severe bleeding and infection (Almubarak et al., 2025).
- **Uterine Inversion:** A rare but critical event where the uterus turns inside out, causing severe hemorrhage and shock (Almubarak et al., 2025).
- **Amniotic Fluid Embolism:** A rare obstetric catastrophe involving entry of amniotic fluid into maternal circulation, causing cardiovascular collapse (Almubarak et al., 2025).

5. Clinical Assessment in the Prehospital Setting for Obstetric Emergencies

When managing obstetric emergencies in the prehospital setting, paramedics must conduct a thorough and prioritized clinical assessment tailored to the physiological changes of pregnancy and the unique needs of both mother and fetus. This section guides through the systematic approach using the ABCDE method,

obstetric-specific evaluations, vital sign interpretations, fetal assessments, and risk stratification tools to optimize maternal and fetal outcomes in emergencies (Cash et al., 2021).

5.1 Primary Survey and Maternal Stabilization (ABCDE Approach)

The ABCDE approach remains the cornerstone for initial assessment and care of critically ill or injured patients, including pregnant women. However, pregnancy-specific adaptations are crucial:

- **Airway and Breathing Considerations**

Pregnant patients experience anatomical and physiological changes such as airway edema, increased oxygen demand, and reduced functional residual capacity, making airway management more challenging and urgent. Ensuring airway patency with appropriate maneuvers and oxygen delivery while avoiding aspiration is vital. Positioning the patient with a left lateral tilt (to avoid aortocaval compression) improves ventilation and circulation (Thim et al., 2012).

- **Circulatory Adaptations and Shock Recognition**

Circulatory changes include increased blood volume and cardiac output. Recognizing shock is complicated by physiological compensations masking hypovolemia. Rapid detection of altered perfusion signs alongside monitoring maternal vital signs, especially blood pressure and heart rate, is essential to prevent decompensation (Soma-Pillay et al., 2016).

- **Disability and Neurological Evaluation**

A quick neurological assessment should be performed to identify altered mental status or focal deficits, considering pregnancy-specific causes such as eclampsia. Glasgow Coma Scale or AVPU scale adaptations may be used (Thim et al., 2012).

- **Exposure and Rapid Examination**

Expose the patient safely to identify injuries, bleeding, or complications, while maintaining warmth to prevent hypothermia. Pay special attention to abdominal assessment considering uterine size and displacement of intra-abdominal organs after 12 weeks gestation (Thim et al., 2012).

5.2 Obstetric-Specific Secondary Survey

After stabilization, focused obstetric assessment includes:

- **Maternal vital sign interpretation:** Understanding pregnancy-altered normal ranges (e.g., elevated heart rate, decreased blood pressure) to identify deterioration.
- **Fetal status assessment:** Measure fundal height to estimate gestational age (1 cm ≈ 1 week of gestation), and if feasible, auscultate fetal heart tones to evaluate fetal wellbeing (Duchateau et al., 2010a).
- **Relevant patient history:** Document gestational age, previous pregnancies, antenatal care attendance, comorbidities, and current symptoms (e.g., bleeding, contractions) (Newman, 2022).

5.3 Risk Stratification and Rapid Decision-Making Tools

Use tools like the Modified Early Obstetric Warning Score (MEOWS) to detect early maternal deterioration and guide escalation of care. MEOWS integrates vital signs and clinical features, supporting prehospital triage and communication with receiving facilities (Singhal et al., 2022).

Paramedics should differentiate between high-risk emergencies (e.g., severe preeclampsia, hemorrhage) versus low-risk cases to prioritize rapid transport and specialist intervention appropriately (Newman, 2022).

6. Prehospital Interventions by Paramedics in Obstetric Emergencies

Prehospital management of obstetric emergencies by paramedics is a critical component of maternal and fetal outcomes, especially in scenarios where rapid identification and intervention can prevent serious morbidity or mortality. This section outlines both general emergency medical procedures adapted for pregnancy and condition-specific protocols that paramedics employ in the field, drawing on recent guidelines and evidence-based practices.

6.1 General Emergency Medical Procedures

Oxygen Therapy and Airway Management Adaptations for Pregnancy

Pregnancy induces physiological respiratory changes including increased oxygen consumption and decreased functional residual capacity, demanding tailored oxygen therapy and airway management. While oxygen therapy is commonly administered to improve maternal and fetal oxygenation, evidence regarding its routine prophylactic use during labor is inconclusive, and there is a need for tailored administration based on maternal-fetal status. Airway management must also consider increased aspiration risk and airway edema in pregnancy, requiring careful techniques and readiness for difficult airway scenarios. Supplemental oxygen is typically delivered at high flow (8–10 L/min) during acute emergencies such as eclampsia seizures to maximize oxygen delivery to the mother and fetus (Fawole & Hofmeyr, 2012).

Intravenous Access and Fluid Resuscitation Protocols

IV access remains paramount in managing obstetric emergencies, with large-bore cannulation (16- to 18-gauge) recommended to facilitate rapid fluid administration. Fluid resuscitation aims to maintain maternal hemodynamics and perfusion while preventing volume overload, especially in complications like preeclampsia or hemorrhage. Crystalloid fluids such as Hartmann's solution are used judiciously, with specific volume targets based on severity, e.g., up to 3.5 liters in massive hemorrhage scenarios. Proper hydration in pregnancy supports uteroplacental circulation and may improve biophysical profiles, while IV fluids also address dehydration and hypotension in emergencies (“EMERGENCY TREATMENTS FOR THE WOMAN,” 2015).

Pain Management Considerations

Pain control in pregnancy balances maternal comfort with fetal safety, prioritizing nonpharmacological approaches when feasible. Acetaminophen is the analgesic of choice due to its safety profile. NSAIDs are generally avoided in the third trimester but may be cautiously used earlier. For severe pain, short-term opioid use (morphine, fentanyl) is considered a safer option when necessary. Regional anesthesia techniques, including nerve blocks and epidurals, remain preferable where applicable but are typically beyond the prehospital scope. Complementary approaches such as acupuncture and manual therapy also show promise but require specialized providers. Paramedics must titrate medications carefully to avoid adverse fetal effects while maintaining adequate analgesia (Shah et al., 2015).

6.2 Condition-Specific Protocols

Antepartum Hemorrhage (APH)

Management of APH involves rapid assessment, stabilization, and expedited transport. Key prehospital interventions include placing the patient in the left lateral tilt position to relieve aortocaval compression and optimize uteroplacental blood flow. Strict monitoring for signs of shock and continuous vital signs assessment are essential. Establishing IV access and beginning fluid resuscitation using crystalloids is crucial to maintain hemodynamic stability. Vaginal examinations are avoided prehospitally unless the placental location is known to rule out placenta previa (Shah et al., 2015).

Eclampsia

Eclampsia management requires immediate seizure control and maternal stabilization. Seizures are primarily treated with magnesium sulfate administration, the anticonvulsant of choice, given intravenously as a loading dose followed by maintenance infusion. Airway protection is imperative during and after seizures to prevent aspiration. Supplemental oxygen at 8–10 L/min is administered to ensure adequate maternal-fetal oxygenation. Continuous monitoring of oxygen saturation, vital signs, and readiness for advanced airway management is required. Rapid transport with notification to the receiving facility is critical (Magley & Hinson, 2024).

Cord Prolapse

Umbilical cord prolapse is an obstetric emergency necessitating immediate intervention to prevent fetal hypoxia. Prehospital care involves manual elevation of the fetal presenting part off the cord via vaginal examination to relieve compression. The cord must be kept moist and protected using sterile, saline-soaked gauze to prevent drying and vasospasm. Maternal positioning in a steep Trendelenburg or knee-chest position helps reduce cord pressure. Bladder filling with saline may be used to sustain elevation if transport time is prolonged. Tocolytics such as terbutaline can be administered to relax uterine contractions if available and indicated (Boushra et al., 2023).

Shoulder Dystocia

Paramedics manage shoulder dystocia with maneuvers to relieve impaction of the fetal shoulder behind the maternal pubic symphysis. The McRoberts maneuver involves hyperflexion of the mother's hips onto her abdomen to widen the pelvic outlet. Suprapubic pressure is applied to dislodge the anterior shoulder. These interventions require prompt recognition and skillful execution to facilitate delivery and prevent fetal injury during prehospital delivery (Beaird et al., 2023).

Postpartum Hemorrhage (PPH)

PPH management focuses on uterine tone restoration and bleeding control. Uterine massage is a primary intervention to stimulate contraction and reduce bleeding. Within the paramedic scope, administration of uterotonics such as oxytocin can be life-saving. Rapid IV access and volume resuscitation continue as needed. Early recognition, continuous monitoring, and expedited transport to specialist care are vital components of prehospital PPH management (Beaird et al., 2023).

7. Equipment and Resources in the Ambulance

Effective prehospital management of obstetric emergencies relies heavily on the availability of specialized equipment and resources within the ambulance. Paramedics must be equipped to manage imminent deliveries and neonatal emergencies in the field with tools that support maternal and newborn safety.

7.1 Specialized Obstetric Kits

A designated emergency obstetric kit is essential in every ambulance, designed to be compact and accessible during prehospital care. These kits typically include sterile disposable products such as gloves, umbilical cord clamps, scissors for cord cutting, sterile towels or drapes, and clean blankets for newborn care. The contents are standardized but can be adapted based on regional needs or provider preference. These kits enable safe and hygienic deliveries outside the hospital environment (Beaird et al., 2023).

7.2 Fetal Monitoring Equipment Suitable for Prehospital Use

Portable fetal monitoring devices adapted for the prehospital environment are critical for assessing fetal well-being during transport. These include handheld Doppler devices to detect fetal heart tones and more advanced wireless fetal monitors that can provide continual heart rate and uterine contraction data. Such devices aid in the early detection of fetal distress and help guide maternal transport decisions (Duchateau et al., 2010b).

7.3 Sterile Delivery Sets

Sterile delivery sets in ambulances include everything necessary for hygienic delivery, such as sterile gloves, delivery drapes, sterile scissors, umbilical cord clamps, and sterile towels. Maintaining sterility during out-of-hospital delivery is crucial to prevent infection in both mother and newborn (Beaird et al., 2023).

7.4 Neonatal Resuscitation Equipment

Newborn resuscitation equipment must be part of the ambulance inventory to manage common neonatal emergencies such as respiratory distress or apnea immediately after birth. Key items include self-inflating bags with various-sized face masks for positive pressure ventilation, suction devices (bulb or mechanical suction), oxygen delivery systems, thermal care supplies (warm towels, hats, plastic wraps for preterm infants), laryngoscopes with appropriately sized blades, endotracheal tubes, pulse oximeters, and emergency medications like adrenaline. Regular training in neonatal resuscitation protocols is necessary to maintain paramedic competence in newborn support (Kariuki et al., 2021).

8. Communication and Coordination

Efficient and standardized communication protocols are vital to optimize care continuity and outcomes in obstetric emergencies within the prehospital context.

8.1 Prenotification to Receiving Hospital and Obstetric Teams

Paramedics must prenotify receiving hospitals and obstetric teams promptly upon encountering a maternal emergency, providing critical details including estimated time of arrival, maternal and fetal condition, and ongoing interventions. Advanced notification allows hospital teams to prepare appropriately for emergent deliveries or high-risk maternal care, ensuring prompt and coordinated reception (Ybarra, 2015).

8.2 Interprofessional Collaboration during Transport

Collaborative teamwork among paramedics, obstetricians, midwives, anesthesiologists, and neonatal specialists underpins successful obstetric emergency management. Interprofessional training, including simulation drills and shared protocols, enhances communication, clarifies roles and leadership during transport, and reduces errors. Such collaboration is shown to improve maternal and neonatal outcomes by streamlining decision-making and ensuring comprehensive care (Olvera et al., 2020).

8.3 Documentation Standards for Obstetric Emergencies

Accurate, thorough, and standardized documentation is mandatory in prehospital obstetric emergencies to capture maternal history, labor details, fetal monitoring data, interventions performed, and timing of critical events. Documentation supports clinical handover, legal accountability, quality improvement, and research. Guidelines advocate for the inclusion of maternal vital signs, contraction frequency and duration, fetal heart rate patterns, and neonatal assessment following delivery (Beaird et al., 2023).

9. Training and Competency Requirements

9.1 Obstetric Emergency Modules in Paramedic Curriculum

Since 1999, advanced obstetrics and gynecology have been mandatory components of paramedic education in several countries, aimed at equipping new paramedics with essential knowledge to manage obstetric emergencies effectively. These modules typically cover normal delivery procedures, recognition of complications during early and late pregnancy, and emergency management protocols for conditions such as pre-eclampsia, eclampsia, hemorrhage, and complicated deliveries (e.g., shoulder dystocia, breech presentation). Several paramedic training programs now include structured courses like Pre-Obstetric Emergency Training (POET), which is a focused 2-day course designed to build paramedics' ability to

identify and manage time-critical obstetric emergencies in prehospital settings. Such courses teach practical procedures to save maternal and fetal lives during emergencies and include both didactic and hands-on skill assessments (Woollard et al., 2009).

9.2 Simulation-Based Training for High-Risk Scenarios

Simulation-based training has become an invaluable tool in paramedic education, especially for managing high-acuity, low-frequency obstetric emergencies. These simulation programs combine lectures with hands-on practice using low- and high-fidelity obstetric manikins. Paramedics can practice maneuvers such as normal vaginal delivery, management of shoulder dystocia (e.g., McRoberts maneuver, suprapubic pressure), breech and twin deliveries, and postpartum hemorrhage techniques in a controlled environment that mimics real-life emergencies. Simulation training facilitates teamwork, communication, and decision-making under pressure, essential components for effective prehospital obstetric care. These sessions often require biannual completion and are integrated into continuous professional development frameworks for paramedics (Alalade & Sekar, 2023).

10. Challenges and Limitations

10.1 Resource Constraints in Rural Areas

Rural settings face stark resource limitations impacting prehospital obstetric care. Challenges include inadequate access to advanced obstetric facilities, limited availability of ambulances, fuel shortages, and poor road infrastructure. In some regions, multiple emergency patients may need to share a single ambulance due to scarcity of vehicles. These constraints delay timely and adequate prehospital interventions, increasing maternal and neonatal risks. Analysis shows that women in rural areas are significantly less likely to receive lifesaving obstetric interventions compared to urban populations, partly due to long distances and scarcity of equipped health centers. This inequity contributes to higher maternal mortality and unmet emergency obstetric care needs in rural communities (Ng'anjo Phiri et al., 2016).

10.2 Variable Scope of Care Across Jurisdictions

The scope of practice for paramedics in obstetric emergencies varies widely across regions and countries, influenced by local regulations, training standards, and healthcare infrastructure. Some paramedics may be authorized to administer certain medications (e.g., oxytocin for postpartum hemorrhage), perform advanced airway management, or initiate magnesium sulfate for eclampsia, while others have more limited roles. Such variability can lead to inconsistencies in prehospital obstetric care quality and outcomes (Martin & Betts, 2025).

10.3 Delays Due to Transport or Environmental Conditions

Prehospital care is frequently challenged by prolonged transport times, especially in low-resource or geographically difficult settings. Delays in reaching definitive obstetric care have been directly associated with increased maternal and perinatal mortality. Factors contributing to these delays include long distances, traffic conditions, weather, and ambulance availability. In some low-income countries, median prehospital times exceed 90 minutes, far beyond the optimal two-hour window critical for emergency obstetric interventions (Ayalew Tiruneh et al., 2021).

10.4 Cultural and Patient Consent Considerations

Cultural beliefs, language barriers, and ethical complexities complicate obtaining informed consent and shared decision-making during obstetric emergencies in the prehospital setting. Effective communication is essential, requiring cultural sensitivity and often the use of professional medical interpreters to ensure patients understand treatment options and risks. Obstetricians and paramedics must respect patient autonomy even in emergencies, balancing rapid decision-making with ethical consent standards. The dual concern for maternal and fetal well-being also adds complexity, requiring providers to navigate ethical

issues sensitively. Social determinants, including race, ethnicity, and cultural values, impact patient interactions and trust, necessitating ongoing provider education in cultural competence to mitigate disparities in care (Abiola et al., 2025).

11. Future Directions

11.1 Telemedicine Integration in Obstetric Emergency Response

The integration of telemedicine into prehospital obstetric emergency care holds transformative potential for paramedic practice. Telemedicine allows remote clinical support through real-time audio-visual communication between prehospital providers and medical specialists, enabling timely expert guidance during complex obstetric emergencies. Pilot studies have demonstrated the feasibility and safety of telemedicine-supported care in the prehospital setting, showing that emergency physicians can provide remote assistance to paramedics effectively, reducing the need for on-site deployment of physicians in less critical situations. This modality also facilitates rapid decision-making and resource utilization, which may be crucial in time-sensitive events such as hemorrhage or eclampsia in pregnant patients. Telehealth tools can enable paramedics to transmit vital signs, fetal monitoring data, and visual assessments directly to obstetric consultants throughout the emergency response, potentially improving patient outcomes and ensuring more tailored care (Jobé et al., 2023).

Future efforts should focus on optimizing telemedicine platforms for obstetric emergencies, ensuring high-quality, reliable communication that integrates seamlessly into paramedic workflows. Training paramedics to use telemedicine technologies confidently and updating dispatch protocols to prioritize telemedicine support in selected cases could expand the prehospital system's capabilities, particularly in rural or resource-limited environments (Janerka et al., 2023).

11.2 Development of AI-Assisted Fetal Monitoring Tools in Ambulances

Artificial Intelligence (AI) applications are rapidly advancing in maternal-fetal medicine and hold promising prospects for integration into prehospital care, particularly through AI-assisted fetal monitoring devices. Continuous monitoring of fetal heart rate (FHR), uterine activity, and other biophysical signals is critical during labor and obstetric emergencies to assess fetal well-being and detect signs of distress. Recent innovations in wearable, wireless maternal-fetal monitoring systems, powered by AI and machine learning algorithms, enable accurate, real-time analysis of fetal and maternal cardiac signals outside hospital settings. These devices can autonomously detect and classify patterns indicative of fetal compromise with high precision, even filtering out noise from maternal movement and obesity-related artifacts (Miskeen et al., 2025).

AI-driven fetal monitoring systems equipped in ambulances could empower paramedics by providing objective, algorithm-based assessments that supplement clinical judgment. This would facilitate early detection of fetal distress and timely interventions during transport to definitive care. Furthermore, cloud-based processing and predictive analytics could allow continuous remote monitoring and consultation during transfer. AI tools aiming for enhanced signal processing and interpretation promise to shorten learning curves for paramedics less specialized in obstetrics and help standardize fetal assessment quality under prehospital constraints (Ullah et al., 2025).

11.3 Enhanced International Guidelines for Paramedic Involvement in Maternity Care

As the scope of prehospital obstetric care expands with technological advances, standardized international clinical guidelines specifically addressing paramedic roles in maternity emergencies are essential. Presently, guidelines vary widely across regions and ambulance services, often focusing on general emergency obstetric principles without detailed operational protocols. Enhanced guidelines developed by international bodies could define minimum technical standards, competencies, and protocols for paramedic-delivered maternity care, including the use of telemedicine and AI tools (Flanagan et al., 2024).

Such guidelines should emphasize respectful maternal care principles, cultural considerations, early recognition of obstetric complications, emergency interventions (e.g., hemorrhage control, hypertensive crises management), maternal and neonatal resuscitation, and criteria for transfer versus on-site care. They should also outline frameworks for training, quality assurance, clinical audits, and interprofessional collaboration among paramedics, midwives, and obstetricians. In recent years, some humanitarian and emergency medical teams have introduced tiered models of maternal care with corresponding capacities at mobile and fixed sites, which can serve as references. International consensus on evidence-based standards will promote uniform care quality, improve patient safety, and support paramedics' expanding responsibilities in maternity emergencies globally (Flanagan et al., 2024).

Conclusion

Prehospital management of obstetric emergencies is a crucial component of maternal and neonatal survival, particularly in settings where delays in accessing definitive care can significantly worsen outcomes. Paramedics serve as the first point of contact, providing early recognition, stabilization, and timely interventions that bridge critical gaps in maternal health services. Their role extends beyond technical skills to include effective communication, interprofessional collaboration, and culturally sensitive care. While advances such as telemedicine and AI-assisted monitoring hold promise for the future, consistent training, simulation-based learning, and standardized international guidelines remain vital to ensure quality and equity of care across diverse health systems. Strengthening paramedic competencies and resources will contribute to reducing maternal and neonatal morbidity and mortality, supporting global efforts toward safer motherhood.

References

1. Abiola, L., Legendre, G., Koechlin, A., & Coutellec, L. (2025). Barriers to informed consent in obstetric care during childbirth from practitioner's perspective: A qualitative study. BMJ Open, 15(6), e101591. https://doi.org/10.1136/bmjopen-2025-101591
2. Alalade, A. O., & Sekar, S. (2023). Simulation-Based Education for Enhancing Obstetric Emergency Response: A Needs Impact Evaluation. Cureus. https://doi.org/10.7759/cureus.43908
3. Almubarak, A., Alshibani, A., & Walker, S. (2025). Exploring Maternity Related Emergencies in Prehospital Settings and Available Obstetric Training for Emergency Medical Services Personnel: An Integrative Review of Literature. Birth, birt.70014. https://doi.org/10.1111/birt.70014
4. Anto-Ocrah, M., Cushman, J., Sanders, M., & De Ver Dye, T. (2020). A woman's worth: An access framework for integrating emergency medicine with maternal health to reduce the burden of maternal mortality in sub-Saharan Africa. BMC Emergency Medicine, 20(1), 3. https://doi.org/10.1186/s12873-020-0300-z
5. Ayalew Tiruneh, G., Melkamu Asaye, M., Solomon, A. A., & Tiruneh Arega, D. (2021). Delays during emergency obstetric care and their determinants among mothers who gave birth in South Gondar zone hospitals, Ethiopia. A cross-sectional study design. Global Health Action, 14(1), 1953242. https://doi.org/10.1080/16549716.2021.1953242
6. Beaird, D. T., Ladd, M., Jenkins, S. M., & Kahwaji, C. I. (2023). EMS Prehospital Deliveries. In StatPearls [Internet]. StatPearls Publishing. https://www.ncbi.nlm.nih.gov/books/NBK525996/
7. Boushra, M., Stone, A., & Rathbun, K. M. (2023). Umbilical Cord Prolapse. In StatPearls [Internet]. StatPearls Publishing. https://www.ncbi.nlm.nih.gov/books/NBK542241/
8. Cash, R. E., Swor, R. A., Samuels-Kalow, M., Eisenbrey, D., Kaimal, A. J., & Camargo, C. A. (2021). Frequency and severity of prehospital obstetric events encountered by emergency medical services in

the United States. BMC Pregnancy and Childbirth, 21(1), 655. https://doi.org/10.1186/s12884-021-04129-1

9. Cresswell, J. A., Alexander, M., Chong, M. Y. C., Link, H. M., Pejchinovska, M., Gazeley, U., Ahmed, S. M. A., Chou, D., Moller, A.-B., Simpson, D., Alkema, L., Villanueva, G., Sguassero, Y., Tunçalp, Ö., Long, Q., Xiao, S., & Say, L. (2025). Global and regional causes of maternal deaths 2009–20: A WHO systematic analysis. The Lancet Global Health, 13(4), e626–e634. https://doi.org/10.1016/S2214-109X(24)00560-6

10. Duchateau, F.-X., Pariente, D., Ducarme, G., Bohbot, S., Belpomme, V., Devaud, M.-L., Max, A., Luton, D., Mantz, J., & Ricard-Hibon, A. (2010a). Fetal Monitoring in the Prehospital Setting. The Journal of Emergency Medicine, 39(5), 623–628. https://doi.org/10.1016/j.jemermed.2008.05.020

11. Duchateau, F.-X., Pariente, D., Ducarme, G., Bohbot, S., Belpomme, V., Devaud, M.-L., Max, A., Luton, D., Mantz, J., & Ricard-Hibon, A. (2010b). Fetal Monitoring in the Prehospital Setting. The Journal of Emergency Medicine, 39(5), 623–628. https://doi.org/10.1016/j.jemermed.2008.05.020

12. EMERGENCY TREATMENTS FOR THE WOMAN. (2015). In Pregnancy, Childbirth, Postpartum and Newborn Care: A Guide for Essential Practice. 3rd edition. World Health Organization. https://www.ncbi.nlm.nih.gov/books/NBK326667/

13. Fawole, B., & Hofmeyr, G. J. (2012). Maternal oxygen administration for fetal distress. Cochrane Database of Systematic Reviews, 2012(12). https://doi.org/10.1002/14651858.CD000136.pub2

14. Flanagan, B., Barr, N., Pearce, J., & Eastwood, K. (2024). A document analysis of clinical guidelines for the paramedic management of obstetric and neonatal presentations in Australian and New Zealand ambulance services. Paramedicine, 21(3), 121–131. https://doi.org/10.1177/27536386231223761

15. Govender, S., Khaliq, O., Abel, T., & Moodley, J. (2025). Knowledge, attitude and practice of emergency care providers on obstetric haemorrhage in KwaZulu-Natal, South Africa: A cross-sectional study. African Journal of Emergency Medicine, 15(4), 100909. https://doi.org/10.1016/j.afjem.2025.100909

16. Holmer, H., Oyerinde, K., Meara, J. G., Gillies, R., Liljestrand, J., & Hagander, L. (2015). The global met need for emergency obstetric care: A systematic review. BJOG: An International Journal of Obstetrics and Gynaecology, 122(2), 183–189. https://doi.org/10.1111/1471-0528.13230

17. Indonesia, J. C. on R. M. and N. M. in, Development, S., Affairs, P. and G., Council, N. R., & Sciences, I. A. of. (2013). Maternal, Fetal, and Neonatal Mortality. In Reducing Maternal and Neonatal Mortality in Indonesia: Saving Lives, Saving the Future. National Academies Press (US). https://www.ncbi.nlm.nih.gov/books/NBK201704/

18. Janerka, C., Leslie, G. D., Mellan, M., & Arendts, G. (2023). Review article: Prehospital telehealth for emergency care: A scoping review. Emergency Medicine Australasia, 35(4), 540–552. https://doi.org/10.1111/1742-6723.14224

19. Jobé, C., Carron, P.-N., Métrailler, P., Bellagamba, J.-M., Briguet, A., Zurcher, L., & Dami, F. (2023). Introduction of Telemedicine in a Prehospital Emergency Care Setting: A Pilot Study. International Journal of Telemedicine and Applications, 2023, 1171401. https://doi.org/10.1155/2023/1171401

20. Kariuki, E., Sutton, C., & Leone, T. A. (2021). Neonatal resuscitation: Current evidence and guidelines. BJA Education, 21(12), 479–485. https://doi.org/10.1016/j.bjae.2021.07.008

21. Lakshmi, G. S., Vijayalakshmi, U., Ramaraju, N. V., & Thota, S. (n.d.). EPIDEMIOLOGY OF OBSTETRIC EMERGENCIES PRESENTING TO A TERTIARY CARE CENTRE IN ANDHRA PRADESH – A RETROSPECTIVE STUDY. Retrieved October 4, 2025, from

https://www.semanticscholar.org/paper/EPIDEMIOLOGY-OF-OBSTETRIC-EMERGENCIES-PRESENTING-TO-Lakshmi-Vijayalakshmi/a0fb1890fc80b1bb3b14640ce7cfda209010a5d2

22. Lawrence, E. R., Klein, T. J., & Beyuo, T. K. (2022). Maternal Mortality in Low and Middle-Income Countries. Obstetrics and Gynecology Clinics of North America, 49(4), 713–733. https://doi.org/10.1016/j.ogc.2022.07.001

23. Leonardsen, A.-C. L., Helgesen, A. K., Ulvøy, L., & Grøndahl, V. A. (2021). Prehospital assessment and management of postpartum haemorrhage- healthcare personnel's experiences and perspectives. BMC Emergency Medicine, 21(1), 98. https://doi.org/10.1186/s12873-021-00490-8

24. Lloyd, J., Ramskill, N., & Sharma, B. (2013). Improving management of patients with hyperemesis. BMJ Quality Improvement Reports, 2(2), u201964.w1017. https://doi.org/10.1136/bmjquality.u201964.w1017

25. Magley, M., & Hinson, M. R. (2024). Eclampsia. In StatPearls [Internet]. StatPearls Publishing. https://www.ncbi.nlm.nih.gov/books/NBK554392/

26. Martin, L., & Betts, C. (2025). Unveiling paramedic confidence: Exploring paramedics' perceived confidence in out-of-hospital births and obstetric emergencies - a scoping review. Rural and Remote Health, 25(2), 9260. https://doi.org/10.22605/RRH9260

27. McLelland, G., Morgans, A., & McKenna, L. (2015). Victorian paramedics' encounters and management of women in labour: An epidemiological study. BMC Pregnancy and Childbirth, 15(1), 13. https://doi.org/10.1186/s12884-015-0430-6

28. Miskeen, E., Alfaifi, J., Alhuian, D. M., Alghamdi, M., Alharthi, M. H., Alshahrani, N. A., Alosaimi, G., Alshomrani, R. A., Hajlaa, A. M., Khair, N. M., Almuawi, A. M., Al-Jaber, K. H., Elrasheed, F. E., Elhassan, K., & Abbas, M. (2025). Prospective Applications of Artificial Intelligence In Fetal Medicine: A Scoping Review of Recent Updates. International Journal of General Medicine, 18, 237–245. https://doi.org/10.2147/IJGM.S490261

29. Mustafa Adelaja, L., & Olufemi Taiwo, O. (2011). Maternal and Fetal Outcome of Obstetric Emergencies in a Tertiary Health Institution in South-Western Nigeria. ISRN Obstetrics and Gynecology, 2011, 1–4. https://doi.org/10.5402/2011/160932

30. Newman, M. (2022). Research protocol for delivering on the front line: A qualitative exploration of paramedics' experiences of providing pre-hospital maternity care in the United Kingdom. British Paramedic Journal, 7(3), 44–50. https://doi.org/10.29045/14784726.2022.12.7.3.44

31. Ng'anjo Phiri, S., Fylkesnes, K., Moland, K. M., Byskov, J., & Kiserud, T. (2016). Rural-Urban Inequity in Unmet Obstetric Needs and Functionality of Emergency Obstetric Care Services in a Zambian District. PLOS ONE, 11(1), e0145196. https://doi.org/10.1371/journal.pone.0145196

32. Olvera, L., Smith, J. S., Prater, L., & Hastings-Tolsma, M. (2020). Interprofessional Communication and Collaboration During Emergent Birth Center Transfers: A Quality Improvement Project. Journal of Midwifery & Women's Health, 65(4), 555–561. https://doi.org/10.1111/jmwh.13076

33. Shah, S., Banh, E. T., Koury, K., Bhatia, G., Nandi, R., & Gulur, P. (2015). Pain Management in Pregnancy: Multimodal Approaches. Pain Research and Treatment, 2015, 987483. https://doi.org/10.1155/2015/987483

34. Singhal, S., Acharya, N., Madaan, S., Mohammad, S., & Acharya, S. (2022). Use of the modified early obstetric warning system chart as a predictor of peri-partum obstetric morbidity in a rural teaching institute: A two-year cross-sectional study. Journal of Family Medicine and Primary Care, 11(12), 7644–7651. https://doi.org/10.4103/jfmpc.jfmpc_320_22

35. Soma-Pillay, P., Nelson-Piercy, C., Tolppanen, H., & Mebazaa, A. (2016). Physiological changes in pregnancy. Cardiovascular Journal of Africa, 27(2), 89–94. https://doi.org/10.5830/CVJA-2016-021

36. Takoutsing, B. D., & Zolo, Y. (2023). Developing a prehospital care service in a low-resource setting: Barriers and solutions. Health Science Reports, 6(11), e1719. https://doi.org/10.1002/hsr2.1719

37. Tamir, T. T. (2024). Neonatal mortality rate and determinants among births of mothers at extreme ages of reproductive life in low and middle income countries. Scientific Reports, 14(1), 12596. https://doi.org/10.1038/s41598-024-61867-w

38. Thim, T., Krarup, Grove, Rohde, & Lofgren. (2012). Initial assessment and treatment with the Airway, Breathing, Circulation, Disability, Exposure (ABCDE) approach. International Journal of General Medicine, 117. https://doi.org/10.2147/IJGM.S28478

39. Ullah, A., Ul Haq, Q. M., Ullah, Z., Frnda, J., & Shahid Anwar, M. (2025). AI-Driven fetal distress monitoring SDN-IoMT networks. PloS One, 20(7), e0328099. https://doi.org/10.1371/journal.pone.0328099

40. Wagstaff, B., & Mistry, V. (2020). The integration of paramedics into primary care. British Journal of General Practice, 70(692), 123–123. https://doi.org/10.3399/bjgp20X708545

41. Withanarachchie, V., Todd, V., Dicker, B., & Maessen, S. E. (2025). Navigating emotions, communication, and pain during prehospital labour: A mixed-methods survey with emergency ambulance services. BMC Emergency Medicine, 25, 83. https://doi.org/10.1186/s12873-025-01236-6

42. Woollard, M., Hinshaw, K., Simpson, H., & Wieteska, S. (Eds.). (2009). Pre-Hospital Obstetric Emergency Training: The Practical Approach (1st ed.). Wiley. https://doi.org/10.1002/9781444309805

43. Yarrington, A. (2024). Maternity emergencies 1: Antepartum haemorrhage. Journal of Paramedic Practice, 16(8), 1–5. https://doi.org/10.12968/jpar.2024.16.8.CPD1

44. Ybarra, N. (2015). Notification of Obstetric Emergency. Journal of Obstetric, Gynecologic & Neonatal Nursing, 44, S19–S20. https://doi.org/10.1111/1552-6909.12687