**Chapter 43  
Normal childbirth**

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**Introduction**

Pregnancy is commonly encountered in the prehospital setting, and its management typically requires little more than a focused history and physical examination along with safe and timely transport to an appropriate hospital. There are notable exceptions, such as imminent delivery, that have the potential to be catastrophic. These are stressful, time-sensitive emergencies.

**Pregnancy**

**Definitions**

Gravidity is the number of times a woman has been pregnant and parity is the number of times a woman has given birth to a fetus of 20 weeks or more, regardless of whether the fetus was alive or stillborn. Neither gravidity nor parity is increased for twin pregnancies. For example, a woman who has one twin pregnancy with successful delivery of both infants is denoted G1P1.

**Gestational age**

Ovulation occurs around day 14 of the menstrual cycle. The egg is fertilized usually in the oviduct and migrates through the fallopian tubes into the uterus. The egg implants in the uterus around day 6 following fertilization. The heartbeat is first detected by ultrasound in weeks 8–12. The first fetal movements are felt in weeks 18–20 for a primigravid patient and 2 weeks earlier in the multiparous patient [1]. A full pregnancy lasts approximately 40 weeks. It is divided into trimesters and usually measured by weeks. The first trimester is weeks 0–13, the second trimester is weeks 14–27, and the third trimester is weeks 28–42. A pregnancy is considered viable between 22 and 26 weeks [2]. Term pregnancy is carried to at least 37 weeks.

Gestational age can be estimated by both last menstrual period and fundal height. Nine months and 7 days are added to the first day of the last menstrual period (Nagele rule) to obtain the estimated due date. Calculation from the last menstrual period usually overestimates gestational age. Fundal height is a rapid clinical tool to estimate gestational age. It is measured in centimeters from the pubic symphysis to the top of the fundus. Centimeters = weeks of gestation +/- 2 weeks. Using this estimation, a 20-week pregnancy reaches the umbilicus.

**Physiological changes of pregnancy**

Many physiological changes occur in pregnancy induced both by hormones and/or by the enlarging uterus ([Box 43.1](https://jigsaw.vitalsource.com/books/9781118990827/epub/OPS/c43.xhtml#c43-fea-0001)) [1].

**Box 43.1 Physiological changes in pregnancy**

1. Blood volume increased by greater than 50%
2. Baseline heart rate increased by 10–15%
3. Cardiac output increased
4. Blood pressure decreased or normal
5. Respirations increased 10–15%
6. Delayed gastric emptying
7. Increased kidney size and renal blood flow

**Evaluation of the pregnant patient**

All levels of EMS providers, from first responders to physicians, should be capable of rapidly ascertaining pertinent information from the ill or injured pregnant patient. In addition to questions relating to the chief complaint, an obstetrical and gynecological history is important to elicit, including last menstrual period, contraceptive use, gravidity, and parity. Providers should be expected to expand that history and determine if the patient has had complications associated with the current pregnancy such as gestational diabetes, preeclampsia, or preterm labor or if the patient has had complications with prior pregnancies. If delivery is imminent, history should include frequency and strength of contractions, and fluid/water leakage. As soon as it is determined that the patient is not going to deliver imminently, vital signs should be obtained and viewed in context of the normal physiological changes of pregnancy.

Examination includes thorough evaluation of the mother as well as the fetal status. If the patient has signs of active labor such as contractions, urge to defecate or push, rupture of membranes, or any other concerning signs, a visual examination of the perineum should be performed. Medical directors should carefully craft protocols that specify when visual inspection of the perineum is appropriate. Failure to have a written document for the EMS provider to follow opens the provider, medical director, and system to potential liability.

**Ultrasound in pregnancy**

Many prehospital providers are including ultrasound in the evaluation of patients (see Volume 1, [Chapter 69](https://jigsaw.vitalsource.com/books/9781118990827/epub/OPS/c69.xhtml)). Ultrasound is especially useful in the evaluation of pregnant patients to confirm intrauterine pregnancy as well as to evaluate fetal well-being with heartbeat and fetal movement.

The earliest definitive sonographic finding in pregnancy is the gestational sac, detected at 6–8 weeks on transabdominal ultrasound [1,3]. Later in pregnancy, fetal viability can be assessed by observing fetal movement and fetal heart tones. Fetal heart tones should be 120–160 beats per minute after 12 weeks’ gestation. They are first detected on ultrasound around 8 weeks’ gestation but it may be up to 12 weeks before heart tones are seen, depending on the habitus of the patient and quality of ultrasound used [3].

A major concern in pregnant patients with abdominal pain is ectopic pregnancy. While it is not expected to be diagnosed in the field, ultrasound can assist in the recognition of ectopic pregnancy. An intrauterine pregnancy visible on ultrasound essentially excludes ectopic pregnancy. Some ultrasound findings suspicious for ectopic pregnancy include pelvic free fluid and adnexal mass other than simple cyst. A gestational sac, yolk sac, or fetal pole with heartbeat outside the uterus confirms the diagnosis of ectopic pregnancy [3].

**Labor and delivery**

**Active labor**

Labor is “the presence of uterine contractions of sufficient frequency, duration, and intensity to cause demonstrable effacement and dilation of the cervix [4].” Active labor is divided into three stages [5] ([Box 43.2](https://jigsaw.vitalsource.com/books/9781118990827/epub/OPS/c43.xhtml#c43-fea-0002)). A nulliparous woman has a longer labor phase (slower cervical dilation) than does a multiparous woman.

**Box 43.2 Stages of active labor**

|  |  |
| --- | --- |
| Stage 1 | Begins with uterine contractions causing progressive dilation of the cervix and ends with full dilation of the cervix (10 cm) |
| Stage 2 | Begins with full cervical dilation and ends when the fetus is delivered |
| Stage 3 | Begins when the neonate is separated from mother and ends with placenta delivery |

**Imminent delivery**

All women who are in active labor should receive supplemental oxygen and IV access. If a delivery is deemed imminent, crews should ensure they have appropriate personnel to provide resuscitative care for the mother and baby. Obstetric and neonatal resuscitation equipment should be readied. Direct medical oversight should be notified of an impending delivery, in case emergency assistance and advice are required, though deliveries in most cases progress with little intervention.

**Delivery of the neonate**

If the fetus’ head is visible in the vaginal outlet, the EMS providers should be prepared for imminent delivery. The patient should be placed in the lithotomy position. Using both hands on the anterior and posterior aspects of the head, constant pressure should be placed to maintain control of the delivery. Head delivery should be slow to decrease damage done to the perineum. The occiput should pass below the symphysis pubis and the face should be pointed toward the anus. Once the head is delivered, the nares then mouth should be suctioned out with a bulb syringe. The provider should use one finger at this point to evaluate for a nuchal cord (described in Volume 1, [Chapter 44](https://jigsaw.vitalsource.com/books/9781118990827/epub/OPS/c44.xhtml)). The baby then rotates, and shoulders begin to appear at the vulva. Both hands of the provider should be placed on either side of the infant’s head, maintaining control and applying downward pressure until the anterior shoulder passes under the symphysis pubis. An upward movement will then deliver the posterior shoulder followed by completion of the anterior shoulder. The rest of the body is typically delivered without difficulty, but some traction may be applied. The umbilical cord should be double-clamped and cut. Separation of the infant from the mother ends stage 2 of labor and marks the beginning of stage 3. The neonate should be immediately dried and evaluated [5,6].

**Post delivery**

**Care of the neonate**

Once the umbilical cord is clamped and cut, the neonate should be placed in a supine, head-down position with the head turned to the side. Normally, the newborn begins to breathe and cry almost immediately after birth. If respirations do not occur or are infrequent, suctioning of the mouth and pharynx should be performed. Stimulating the feet or back may also initiate breathing. The neonate should be dried and kept warm. If the neonate is stable, the infant can be held close to the mother’s chest to decrease heat loss and should be encouraged to nurse. This will aid in delivery of the placenta due to release of oxytocin in the mother.

A standardized method to evaluate the newborn’s condition is the 1- and 5-minute APGAR scores ([Table 43.1](https://jigsaw.vitalsource.com/books/9781118990827/epub/OPS/c43.xhtml#c43-tbl-0001)). Scores between 4 and 6 at 1 minute may indicate a mildly to moderately depressed infant, whereas scores below 3 represent a severely depressed infant [7]. If warming and stimulating the neonate do not initiate the infant’s respirations, the prehospital provider will need to begin resuscitating the infant according to standard Pediatric Advanced Life Support (PALS) algorithms.

[**Table 43.1**](https://jigsaw.vitalsource.com/books/9781118990827/epub/OPS/c43.xhtml#R_c43-tbl-0001) APGAR scoring system

| **Sign** | **0** | **1** | **2** |
| --- | --- | --- | --- |
| Heart rate | Absent | Below 100 | Over 100 |
| Respiratory effort | Absent | Slow, irregular | Good, crying |
| Muscle tone | Flaccid | Some flexion of extremities | Active motion |
| Reflex irritability | No response | Grimace | Vigorous cry |
| Color | Blue, pale | Body pink, extremities blue | Pink |

Intravenous access is not necessary in the prehospital setting unless the neonate requires ongoing and active resuscitation. Even then, it should only be performed if adequate resources exist to accomplish all other first-line resuscitative efforts. Consider umbilical vein cannulation or intraosseous access if required. If the baby is in distress, transport should be immediately initiated to the closest appropriate facility.

**Delivery of the placenta**

Stage 3 of labor is the delivery of the placenta, which usually occurs spontaneously about 10–30 minutes after delivery of the fetus [6]. The prehospital care provider should not delay transport for delivery of the placenta. Physical signs that the placenta is about to be delivered include the uterus becoming globular in shape, the umbilical cord lengthening, and a potential gush of blood just prior to the delivery. The gush of blood marks the separation of the placenta from the uterus. The uterus should be externally massaged at the fundus to assist with contractions. Avoid strong traction on the umbilical cord due to possible complications such as separation of the umbilical cord or uterus inversion [5]. Loss of approximately 500 mL blood is expected throughout the delivery.

**Challenges of prehospital deliveries**

Complicated in-hospital deliveries are often attended by multiple providers including obstetricians, labor nurses, and a neonatal resuscitation team composed of neonatologists and neonatal intensive care unit (NICU) nurses. In contrast, unplanned out-of-hospital deliveries have limited equipment and personnel resources and unpredictable environments. They are often managed by two or three EMS providers who likely have limited experience in labor and delivery. Successful delivery of the neonate also doubles the patient load for the EMS providers.

Deliveries encountered in the prehospital setting are frequently from known high-risk pregnancies and can be significantly premature. One study found that four factors contribute to unplanned out-of-hospital deliveries: multiparity, lack of or poor prenatal care, extended travel time to the hospital, and unemployment [8]. These factors lend to the increased maternal and infant morbidity and mortality found in the prehospital setting [9].

The role of the EMS medical director is to ensure that crews are properly trained and equipped. This includes adequate high-quality educational offerings for the field crews on this broad range of topics and aggressively reviewing patient care reports to ensure that appropriate, compassionate, and evidence-based care is being consistently delivered. Clear protocols and guidelines must be in place to protect and guide the EMS provider.

**Special considerations**

**Pregnant trauma patient**

The pregnant trauma patient represents an especially difficult challenge in the prehospital setting. Basic trauma life support should be carried out according to local trauma management protocols. Airway and hemorrhage control, high-flow oxygen, immobilization, and rapid transport to an appropriate facility remain top priorities. Severity of injury can be difficult to determine in the pregnant trauma patient. Although normal physiological vital sign changes seen with pregnancy can mimic shock (see [Box 43.1](https://jigsaw.vitalsource.com/books/9781118990827/epub/OPS/c43.xhtml#c43-fea-0001)), the pregnant patient’s elevated blood volume can allow for massive blood loss before decompensation. Respiratory reserve becomes increasingly limited as the pregnancy advances. EMS protocols should reflect that seemingly minor trauma (e.g. ground-level falls, low-speed motor vehicle collisions) can cause placental abruption and require transport to an appropriate facility.

All supine pregnant trauma patients in the second and third trimester should be transported tilted roughly 15° to the left. (The right side of a long backboard can be lifted approximately 15° with blankets.) This positioning allows the uterus to be moved off the inferior vena cava, facilitates blood return to the heart, and maintains uterine perfusion [10–13].

**Pregnant patient in cardiac arrest**

Cardiac arrest resuscitation strategy for the pregnant patient who is more than 20 weeks differs fundamentally from the non-pregnant patient in that scene interventions should be minimal and immediate transport is the highest priority. Similar to the scene evaluation of a trauma patient, EMS providers are directed to “load and go” and perform all interventions and resuscitation measures en route to the hospital. The primary directive during transport is to maximize maternal resuscitative measures. EMS providers must focus on external chest compressions in an attempt to maintain some degree of perfusion to the fetus. The success of perimortem cesarean section in the ED correlates directly with the length of time the patient has been in cardiac arrest (see Volume 1, [Chapter 45](https://jigsaw.vitalsource.com/books/9781118990827/epub/OPS/c45.xhtml)). There are reported cases of good neurological outcome of the neonate if the cesarean section is done within the first 5 minutes of the arrest [14–16].

**References**

1. 1 Bardsley CH. Normal pregnancy. In: Tintinalli JE, Kelen GD, Stapczynski JS, Ma OJ, Cline DM (eds) *Tintinalli’s Emergency Medicine: A Comprehensive Study Guide*, 7th edn. New York: McGraw-Hill, 2011.
2. 2 Kaempf JW, Tomlinson M, Arduza C, et al. Medical staff guidelines for periviability pregnancy counseling and medical treatment of extremely premature infants. *Pediatrics* 2006;177:22–9.
3. 3 Broder J. Imaging the genitourinary tract. In: *Diagnostic Imaging for the Emergency Physician*. Philadelphia: Saunders, 2011.
4. 4 ACOG Practice Bulletin Number 49. Dystocia and augmentation of labor. *Obstet Gynecol* 2003;102:1445–54.
5. 5 Mercado J, Brea I, Mendez B, et al. Critical obstetric and gynecologic procedures in the emergency department. *Emerg Med Clin North Am* 2013;31:207–36.
6. 6 Drage JS, Berendes H. APGAR scores and outcome of the newborn. *Pediatr Clin North Am* 1966;13:637–43.
7. 7 VanRooyen MJ, Scott JA. Emergency delivery. In: Tintinalli JE, Kelen GD, Stapczynski JS, Ma OJ, Cline DM (eds) *Tintinalli’s Emergency Medicine: A Comprehensive Study Guide*, 7th edn. New York: McGraw-Hill, 2011.
8. 8 Renesme L, Garlantezec R, Anouilh F, et al. Accidental out-of-hospital deliveries: a case-control study. *Acta Paediatr* 2013;102:e174–7.
9. 9 Verdile VP, Tutsock G, Paris PM, Kennedy R. Out-of-hospital deliveries: a five-year experience. *Prehosp Disaster Med* 1995;10:10–13.
10. 10 Cruikshank DP. Anatomic and physiologic alterations of pregnancy that modify the response to trauma. In: Buchsbaum HJ (ed) *Trauma in Pregnancy*. Philadelphia: WB Saunders, 1979.
11. 11 Pearlman MD, Tintinalli JE. Evaluation and treatment of the gravida and fetus following trauma during pregnancy. *Obstet Gynecol Clin North Am* 1991;18:371–81.
12. 12 Lavery JP, Staten-McCormick M. Management of moderate to severe trauma in pregnancy. *Obstet Gynecol Clin North Am* 1995;22:69–90.
13. 13 Neufield JD, Moore EE, Marx JA, Rosen P. Trauma in pregnancy. *Emerg Med Clin North Am* 1987;5:623–40.
14. 14 Weber CE. Postmortem caesarean section: review of the literature and case reports. *Am J Obstet Gynecol* 1971;110:158–65.
15. 15 Katz VL, Dotters DJ, Droegemueller W. Perimortem caesarean delivery. *Obstet Gynecol* 1986;68:571–6.
16. 16 Lopez-Zeno JA, Carlo WA, O’Grady JP, et al. Infant survival following delayed postmortem ceasarean delivery. *Obstet Gynecol* 1990;76:991–2.