Late preterm infants

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INTRODUCTION

Late preterm infants are born at a gestational age (GA) between 34 weeks and 0 days, and 36 weeks and 6 days. They have higher morbidity and mortality rates than term infants (GA ≥37 weeks) due to their relative physiologic and metabolic immaturity, even though they are often the size and weight of some term infants.

The epidemiology, outcomes, and management of late preterm infants will be reviewed here.

Specific disorders seen in late preterm infants and their management are discussed in greater detail separately:

- Sepsis (See "Management and outcome of sepsis in term and late preterm infants".)
- Hyperbilirubinemia (See "Unconjugated hyperbilirubinemia in term and late preterm infants: Management" and "Unconjugated hyperbilirubinemia in term and late preterm infants: Screening".)
- Breastfeeding (See "Breastfeeding the preterm infant", section on 'Late preterm infants'.)
- Perinatal asphyxia (See "Perinatal asphyxia in term and late preterm infants".)
- Incidence and mortality of preterm infants (See "Preterm birth: Definitions of prematurity, epidemiology, and risk factors for infant mortality".)

DEFINITIONS

Medical terminology related to neonatal maturation is standardized according to gestational age (table 1), which permits appropriate care and comparison of data from different studies.

- **Preterm birth** – Preterm birth is defined as a delivery of an infant before completion of 37 weeks gestation by the World Health Organization (WHO), the American Academy of Pediatrics (AAP), and the American College of Obstetricians and Gynecologists (ACOG). This occurs on or before the 259th day after the first day of the last menstrual period (LMP) of the mother.

  The National Center for Health Statistics (NCHS) of the Centers for Disease Control and Prevention (CDC) generally reports data on three categories of preterm birth:

  - Overall preterm (Gestational age [GA] <37 weeks gestation)
  - Moderately preterm (GA between 32 and 36 weeks)
  - Very preterm births (GA <32 weeks gestation)

  For the 2014 data year, NCHS transitioned to a new standard for estimating the gestational age of the newborn. The obstetric estimate of gestation at delivery (OE) is now the measurement used rather than the date of LMP [1]. (See "Prenatal assessment of gestational age, date of delivery, and fetal weight".)

- **Late preterm infants** – Late preterm delivery is defined as delivery of an infant born at a GA between 34 weeks, and 36 weeks and 6 days of gestation (ie, 239 to 259 days after the first day of the LMP) by the AAP, ACOG, and NCHS [2-4]. "Late preterm" has replaced "near term" to describe this group of infants, since the latter incorrectly implies that these infants are "close enough" to term and only require routine neonatal care [5].

- **Early term infants** – Early term infants are born at a GA between 37 and 38 6/7 weeks [2-4].

- **Term infants** – Term infants are born at a GA between 39 and 40 6/7 weeks [2-4].

- **Late term infants** – Late term infants are born at a GA between 41 and 41 and 6/7 weeks [2-4].

EPIDEMIOLOGY

The overall rate of preterm births in the United States is approximately 10 percent, of which 70 percent are late preterm (table 2).

Risk factors for preterm delivery preterm are discussed in greater detail separately (table 3) (see "Preterm birth: Risk factors, interventions for risk reduction, and maternal prognosis").

FACTORS ASSOCIATED WITH INCREASED LATE PRETERM BIRTH

Preterm deliveries occur as a result of spontaneous preterm labor, when premature rupture of membranes precedes the onset of labor, or as a result of medical interventions (ie, labor induction or cesarean delivery) intended to reduce poor outcome associated with specific maternal or fetal conditions (table 4). (See "Preterm birth: Risk factors, interventions for risk reduction, and maternal prognosis".)

The following factors are associated with higher risk of late preterm births compared with term deliveries [4,6]:

- **Obstetrical surveillance** to detect maternal, placental, and fetal conditions that result in medically indicated births (ie, induction of labor or cesarean delivery), as these disorders would result in worse outcomes if pregnancy was allowed to continue [7-10]. (See "Intrapartum fetal heart rate monitoring: Overview" and "Biophysical profile test for antepartum fetal assessment" and "Cesarean birth: Preoperative planning and patient preparation", section on 'Indications' and "Induction of labor with oxytocin", section on 'Contraindications' and "Induction of labor with oxytocin", section on 'Medical and obstetric indications'.)

- **Multiple births**, often associated with assisted reproductive technology, generally occur earlier in gestation than singleton births. (See "Assisted reproductive technology: Pregnancy and maternal outcomes".)

- **Inaccurate gestational age** – It appears that some late preterm births are a result of medically assisted deliveries of late preterm fetuses who were incorrectly thought to have reached term [11]. Prenatal gestational age may be determined by

several methods and is discussed separately. (See "Prenatal assessment of gestational age, date of delivery, and fetal weight".)

- Additional maternal factors:

  - **Maternal age** – Women in or beyond their thirties have an increased risk of preterm birth compared with women who are between 21 and 24 years of age. These women are more likely to conceive multiple fetuses spontaneously or seek assisted reproductive technology (ART), which also results in multiple births [8,12]. (See "Effects of advanced maternal age on pregnancy", section on 'Perinatal morbidity' and "Effects of advanced maternal age on pregnancy", section on 'Multiple gestation'.)

    Teen pregnancy is also a risk factor for late preterm delivery [13].

  - **Maternal chronic conditions** – Compared with full-term infants, late preterm infants are more often born to mothers with chronic conditions including obesity, diabetes, hypertension, antepartum hemorrhage, lung disease, infection, cardiac disease, renal disease, genital herpes, and smoking [14,15]. (See "Obesity in pregnancy: Complications and maternal management", section on 'Indicated and spontaneous preterm birth' and "Infants of women with diabetes", section on 'Preterm delivery' and "Chronic hypertension in pregnancy: Preconception, pregnancy, and postpartum issues and management", section on 'Fetal/neonatal risks' and "Cigarette and tobacco products in pregnancy: Impact on pregnancy and the neonate", section on 'Preterm birth'.)

MORBIDITY

Birth hospitalization — During the birth hospitalization, late preterm infants are at sevenfold increased risk for morbidity compared with term infants and are more likely to have one or more of the following complications [14-19]:

- Hypothermia
- Hypoglycemia
- Respiratory distress
- Apnea

- Hyperbilirubinemia
- Feeding difficulties
- Low Apgar scores (<4)
- Neurologic morbidity (eg, seizure, perinatal asphyxia)

The risk of complications increases if the late preterm infants have additional risk factors for neonatal morbidity. In a population-based study that compared 26,170 late preterm infants with 377,638 term infant, neonatal morbidity was seven times greater in late preterm than term infants (22 versus 3 percent) [15]]. Neonatal morbidity rates increased with increasing numbers of maternal risk factors (18 percent with no maternal risk factors, 29 percent with one, and 37 percent with two). Maternal conditions that increased morbidity for late preterm infants included hypertensive disorders of pregnancy, diabetes, antepartum hemorrhage, lung disease, infection, cardiac disease, renal disease, and genital herpes.

Hypothermia — Late preterm infants are more susceptible to hypothermia compared with term infants, as they have less white adipose tissue for insulation, cannot generate heat as effectively from brown adipose tissue, and lose heat more readily due to their larger ratio of surface area to weight [16,17,20,21].

Hypoglycemia — The risk of hypoglycemia is reported to be three to seven times greater in late preterm infants than in term infants [14,16,22]. The incidence of hypoglycemia increases with decreasing gestational age. (See "Pathogenesis, screening, and diagnosis of neonatal hypoglycemia" and 'Respiratory morbidity' below.)

Respiratory morbidity — Late preterm infants are at greater risk than term infants for respiratory morbidity, including respiratory distress syndrome (RDS), transient tachypnea of the newborn, pneumonia, respiratory failure, and the need for ventilator support [14,16,18,23]. Respiratory morbidity increases with decreasing gestational age.

In a population-based Swedish study of approximately 1.7 million live-born singleton births born between 1998 and 2016, late preterm infants (3.2 percent of the birth cohort) compared with the reference full-term infants defined as a gestational age (GA) of 39 to 40 weeks (56.6 percent cohort) had a greater risk for any respiratory morbidity (adjusted relative risk [aRR] 5.54, 95% CI 5.24-5.85), transient tachypnea (aRR 4.76, 95% CI 4.47-5.08), RDS (aRR 46.53, 95% CI 38.59-56.10), and pneumothorax (aRR 2.99, 95% 2.50-3.58) [14].

The increased risk of respiratory morbidity in late preterm infants is related to immature lung structure and decreased surfactant production, as lung development of the terminal respiratory sacs and alveoli continues beyond gestational weeks 34 to 36. This delayed pulmonary maturation increases the risk of RDS, especially for infants of mothers who did not receive antenatal steroids [16,17,24]. Since biochemical changes during labor enhance fetal lung maturation and clearance of pulmonary fluid, and retained fluid can inactivate surfactant, infants born via cesarean delivery without labor are more likely to have RDS [25]. (See "Pathophysiology, clinical manifestations, and diagnosis of respiratory distress syndrome in the newborn".)

Transient tachypnea (retained fetal lung fluid) and persistent pulmonary hypertension of the newborn are other causes of respiratory distress seen in late preterm infants [11,17,26]. Late preterm infants are at increased risk for respiratory failure and are more likely than term infants to require extracorporeal membrane oxygenation (ECMO) support, with a greater risk of subsequent mortality and morbidity [27,28]. (See "Overview of neonatal respiratory distress and disorders of transition" and "Transient tachypnea of the newborn" and "Persistent pulmonary hypertension of the newborn".)

Apnea — The reported incidence of apnea in late preterm infants (4 to 7 percent) is greater than in term infants (1 to 2 percent) [16,20,29,30]. Late preterm infants are also at increased risk for sudden infant death syndrome (SIDS) compared with term infants. (See "Pathogenesis, clinical manifestations, and diagnosis of apnea of prematurity" and "Sudden infant death syndrome: Risk factors and risk reduction strategies", section on 'Infant risk factors'.)

Hyperbilirubinemia — Due to immaturity of hepatic bilirubin conjugation pathways, late preterm infants are more likely than term infants to have prolonged jaundice with significantly elevated unconjugated serum bilirubin at five days of age [14,17,31,32]. In the population-based Swedish study described above, the risk of neonatal jaundice was 12.5-fold greater for late preterm infants compared with the reference group of full-term infants [14]. Feeding difficulties also can lead to a delay in the resolution of enterohepatic recirculation of bilirubin, also contributing to an increase in serum bilirubin.

Hyperbilirubinemia is the most common reason for neonatal readmission for late preterm infants [33]. At a given serum bilirubin concentration, the risks for bilirubin-induced brain injury and kernicterus are greater in late preterm infants compared with term infants due to the relative immaturity of the blood-brain barrier, lower circulating bilirubin-binding albumin concentrations, and higher risk of concurrent illness [33,34]. (See 'Post-birth discharge' below and "Unconjugated hyperbilirubinemia in the newborn: Pathogenesis and etiology" and "Unconjugated hyperbilirubinemia in term and late preterm infants: Management".)

Breastfeeding difficulties — Breastfeeding remains the optimal feeding choice for late preterm infants because of the benefits to both mother and infant [35]. However, late preterm infants require additional monitoring and support compared with term infants because their oro-buccal strength and coordination of swallowing/breathing mechanisms are not fully matured [16,17,35]. As a result, mothers of late preterm infants will need to express milk to fully establish their milk supply, and their infants will benefit from early supplementation.

Difficulty in establishing successful feeding increases the risk of readmission for dehydration and neonatal hyperbilirubinemia [16,36,37]. (See "Breastfeeding the preterm infant", section on 'Late preterm infants'.)

Length of stay — Because late preterm infants are more likely than term infants to have significant morbidities that require medical attention, they are less likely to be discharged early, which results in higher health care costs [38,39]. In a retrospective study that analyzed data from a cohort of commercially insured neonates in the United States, late preterm infants had a longer average birth hospital stay (8.8 versus 2.2 days) with a 10-fold higher cost of care ($26,054 versus $2061) [40].

Post-birth discharge — Once discharged from the birth hospitalization, late preterm infants have greater health care needs and utilization than term infants, which includes a higher rate of hospital readmission [39,41-44].

In a review of observational studies, late preterm infants had higher rates of all-cause admissions than term infants throughout childhood [43]. The difference in the rate of readmission between the two groups decreased from the neonatal period (≤30 days of age; adjusted odd ratios [aOR] 2.34, 95% CI 1.19-4.61) to adolescence (12 to 18 years old; aOR 1.09 95% CI 1.05-1.13). The most common causes for readmission varied throughout childhood and included jaundice, infection, respiratory problems, asthma, and neurologic and/or mental health problems.

The increase in morbidity for preterm infants may be in part due to poorer adherence to safe and healthy home practices. In a study that analyzed data from the Centers for Disease Control and Prevention's (CDC) Pregnancy Risk Assessment Monitoring System from 2000 to 2008, late preterm infants were more likely to be exposed to maternal tobacco smoke, less likely to be placed in a supine sleep position, and less likely to be breastfed both initially and over time [38]. These factors may lead to increased morbidity and mortality, including respiratory illness and sudden infant death. The results of this study highlight the need for engaging families in appropriate home care. (See 'Neonatal management and discharge criteria' below and "Secondhand smoke exposure: Effects in children", section on 'Effects in childhood' and "Sudden infant death syndrome: Risk

factors and risk reduction strategies", section on 'Sleep position and environment' and "Infant benefits of breastfeeding", section on 'Prevention of illnesses while breastfeeding'.)

Long-term morbidity

Neurodevelopmental outcome — Interpretation of the neonatal long-term neurodevelopmental outcome literature is challenging because of differences in clinical practice, study design (evaluation tools, timing of assessment, and outcome definition), and changes in perinatal care over time. These factors likely have contributed to the inconsistent findings from observational studies. (See "Long-term neurodevelopmental impairment in infants born preterm: Epidemiology and risk factors", section on 'Limitations of the data'.)

Some observational studies have reported that individuals born late preterm and/or early term, compared with those born at term, are at increased risk for impaired neurodevelopmental outcome including the following [19,45-52]:

- Cognitive impairment based on lower scores on intellectual tests after adjusting for confounding factors [19,49].
- Poorer school performance based on school achievement testing and teacher evaluation [46,48,52].
- Motor deficits including cerebral palsy [19,45].
- Psychological and behavioral disorders [49,50].
- Sensorineural defects (eg, vision and hearing loss) [19].

In contrast to the above studies, the National Institute of Child Health and Development Study of Early Child Care and Youth Development demonstrated no significant consistent differences between **healthy** late preterm and term infants born in 1991 based upon standard measures of cognition, achievement, social skills, and behavioral/emotional problems from 4 to 15 years of age [53]. In addition, a population-based birth cohort study found that by 19 years of age, individuals born late preterm in the late 1970s to early 1980s did not have an increased risk of learning disability or attention deficit hyperactivity (ADHD) compared with those born at term [54].

Brain immaturity at birth may affect outcomes for some individuals who were born late preterm. Although data are limited on the brain maturation of late-preterm infants, autopsy and magnetic resonance imaging demonstrate that at 35 weeks gestation, the brain weighs 65 percent of a full-term infant's brain, and the external surface has fewer sulci [55,56]. This immaturity may increase the brain's vulnerability to long-term injury

Other potential long-term effects — It remains uncertain whether late preterm birth has other long-term effects. Some data suggest that children who are born late preterm may be at risk for poor weight gain during infancy, and long-term respiratory morbidity [57-61]. In addition, there are population studies that report that individuals who were born late preterm are at a higher risk of chronic kidney disease and mid-adult mortality than those born at early term or term [62,63].

MORTALITY

Although the relative risk of mortality for late preterm infants versus term infants is modest compared with that for infants born at <32 weeks gestational age (GA), approximately 8 percent of all neonatal deaths in the United States occur in late preterm infants [64]. Late preterm infants have a greater risk of neonatal mortality and infant mortality, which increases with decreasing gestational age [4,6,45]. For example, the risk for an infant born at 36 weeks GA has a threefold increase for neonatal mortality and 2.5-fold increase for infant mortality compared with one born full term, whereas an infant at 34 weeks gestation compared with one born full-term has a sevenfold greater risk for neonatal mortality and sixfold greater risk for infant mortality.

MANAGEMENT

Prevention — Prevention is one of the keys to decreasing the mortality and morbidity associated with late preterm births. An important component of prevention is to avoid induced vaginal or planned cesarean delivery before 39 weeks gestation (as determined by preinduction assessment) unless medically indicated. (See "Preterm birth: Risk factors, interventions for risk reduction, and maternal prognosis" and "Prenatal assessment of gestational age, date of delivery, and fetal weight" and "Induction of labor with oxytocin".)

In addition, further research is needed to refine the management of the fetus and mother at late preterm gestation, such as better identification of pregnancies that require early delivery for medical conditions [7]. Areas of research include [5]:

- Assess the risk/benefit ratio for diagnosis-specific indications for late preterm delivery, such as more accurate estimation of fetal well-being and outcome in the presence of maternal diseases (eg, hypertension and diabetes).
- Identify management strategies to improve specific outcomes in late preterm infants. One proposed strategy under investigation is the use of antenatal steroids in late preterm pregnancies.
- Improve the precision of determining gestational age.
- Improve the ability to identify the fetus at risk for late-pregnancy intrauterine demise (ie, stillbirth). (See "Stillbirth: Incidence, risk factors, etiology, and prevention", section on 'Strategies for preventing a first stillbirth in the general obstetric population'.)

Neonatal management and discharge criteria — Clinicians who care for late preterm infants need to be aware that this population is at increased risk for neonatal morbidity and mortality. They need to be familiar with the associated complications of late preterm birth and provide appropriate intervention. The National Perinatal Association's Multidisciplinary Guidelines for the Care of Late Preterm Infants, available online, is an excellent resource to guide management during hospitalization and transition to home. (See 'Birth hospitalization' above.)

Prior to hospital discharge, parents need to be aware that their infant is at increased risk for hyperbilirubinemia, feeding difficulties, and dehydration. Teaching should focus on developing the parents' ability to recognize these conditions and seek appropriate care after hospital discharge.

We concur with the American Academy of Pediatrics published guidelines for discharge criteria for late preterm infants, most of whom will not be ready for discharge before 48 hours [17]:

- Determine the accurate gestational age, and ensure that there are no abnormalities or medical conditions (ie, poor feeding and/or hyperbilirubinemia) that require further hospitalization.

- The infant should demonstrate physiologic stability by showing competency in the following:
  - Maintaining thermoregulation, defined as an axillary temperature of 36.5 to 37.4ºC (97.7 to 99.3ºF), in an open crib.
  - Feeding, defined as coordinated sucking, swallowing, and breathing while feeding, and weight loss not to exceed 7 percent of birth weight during birth hospitalization (or 2 to 3 percent per day). If the infant is breastfed, at least twice daily documented observation by trained caregivers of successful position, latch, and milk transfer also should be performed [37]. (See "Breastfeeding the preterm infant", section on 'Late preterm infants'.)
  - Maintaining cardiorespiratory control with stable vital signs of a respiratory rate less than 60 breaths per minute and a heart rate between 100 and 160 beats per minute, and absence of medical illness.
  - Passing at least one stool spontaneously.
- Completion of other routine newborn care. This includes screening tests (ie, hearing, critical congenital heart disease, and other disorders that are threatening to life or long-term health), vaccinations (ie, hepatitis B vaccine), and prophylactic treatment (ie, vitamin K prophylaxis). (See "Overview of the routine management of the healthy newborn infant".)
- Assessment of the family and home environment to identify any risk factors that may have an impact on the health of the infant. As noted previously, these infants may be at higher risk for maternal tobacco smoke exposure, non-supine sleep position, and lack of breastfeeding [38]. (See 'Post-birth discharge' above.)
- Successful training of the parents who have demonstrated competency in the care of their infant and the ability to assess for hyperbilirubinemia, feeding difficulties, and dehydration.
- A follow-up visit for 24 to 48 hours after discharge is scheduled with an identified primary care provider.

In addition, it remains uncertain whether late preterm infants are at significant risk for cardiopulmonary events when placed in a car seat. In our center, car seat tolerance testing is performed for late preterm infants prior to discharge along with educating parents and caregivers about the potential risk of cardiopulmonary events in an upright position. If an infant does not pass the car seat screen but is otherwise clinically stable, discharge is allowed with the advice to the family/caregivers that an adult is

seated in the back seat of the car to visually monitor the infant during travel. All families are advised to limit time in the upright position.

The concern for cardiopulmonary events in the car seat position was highlighted by a study of 918 late preterm infants that reported a 5 percent initial failure rate for a car seat screening test [65]. The risk of failure was associated with respiratory findings of obstructive apnea and oxygen desaturations and admission to a neonatal intensive care unit (NICU) during a portion of the birth hospitalization. In the United States, although most newborn nurseries perform a predischarge car seat screening test, there is a large degree of variability in implementation [66]. Nevertheless, car seat testing for late preterm infants remains advisable, but further study is needed to provide guidance on determining infants who would most benefit from screening and failure criteria. (See "Discharge planning for high-risk newborns", section on 'Car seat/bed use'.)

Primary care follow-up — Primary care for late preterm infants encompasses routine primary care (eg, immunization and growth) and identifying infants at risk for jaundice, feeding difficulties, and dehydration [17]. The National Perinatal Association's Multidisciplinary Guidelines for the Care of Late Preterm Infants, available online, is an excellent resource to guide the management of late preterm infants following discharge.

Growth and nutrition — We advise weekly weight checks with the primary care provider to assess growth using an initial target growth velocity of at least 20 g/day. During this time, dietary adjustments can be made to maintain adequate growth. Once adequate growth is established without need for supplementation or fortification, the frequency of visits can be decreased.

The usual caloric intake for adequate growth during the weeks after hospital discharge is approximately 100 to 130 kcal/kg per day. Although otherwise healthy late preterm infants are able to learn to breastfeed, they often experience more difficulty than term infants in establishing successful latch and milk transfer. To maintain adequate caloric intake, they usually require supplementation, optimally with expressed maternal milk. Thus it is crucial to support early establishment of the maternal milk supply, beginning within the first hour after delivery if at all possible. (See "Breastfeeding the preterm infant", section on 'Late preterm infants' and "Growth management in preterm infants", section on 'Routine nutrient supplementation'.)

If there is insufficient maternal milk volume to support adequate growth, donor human milk or formula may be used to supplement feeds. It remains uncertain whether the use of nutrient-enriched formula (transitional preterm formula) is

beneficial after hospital discharge either for infants who require supplemental use or for exclusively formula-fed infants. (See "Growth management in preterm infants", section on 'Formula-fed infants'.)

Human milk-fed preterm infants should also receive iron and vitamin D supplementation, as they are not adequately supplied in human milk alone. (See "Iron deficiency in infants and children <12 years: Screening, prevention, clinical manifestations, and diagnosis", section on 'Recommendations for iron supplementation' and "Vitamin D insufficiency and deficiency in children and adolescents", section on 'Prevention in the perinatal period and in infants'.)

SOCIETY GUIDELINE LINKS

Links to society and government-sponsored guidelines from selected countries and regions around the world are provided separately. (See "Society guideline links: Late preterm infants".)

SUMMARY AND RECOMMENDATIONS

- **Definition** – Late preterm infants are those with a gestational age from 34 weeks and 0 days to 36 weeks and 6 days. They have higher morbidity and mortality rates than full-term infants. (See 'Definitions' above and 'Morbidity' above and 'Mortality' above.)

- **Morbidity** – Late preterm infants have a reported sevenfold-increased risk of morbidity compared with term infants during birth hospitalization, leading to a longer hospital stay and higher medical costs. The most common causes of morbidity include hypothermia, hypoglycemia, respiratory distress, apnea, hyperbilirubinemia, and feeding difficulties. The risk of neonatal morbidity also increases if there are additional maternal conditions (eg, maternal diabetes and hypertension) that contribute to neonatal complications. (See 'Birth hospitalization' above.)

- **Readmission after birth hospitalization** – Post-birth discharge, readmission rates are greater for individuals born late preterm compared with those born at term. The most common causes for readmissions vary throughout childhood and include jaundice, infection, respiratory problems, asthma, and neurologic and/or mental health problems. Many of these

readmissions can be prevented by careful initial monitoring; early establishment of maternal milk production, with supplementation in addition to direct feeding at breast; early outpatient follow-up; and support for families to provide appropriate home care after discharge. (See 'Post-birth discharge' above.)

- **Long-term neurologic impairment** – It remains uncertain whether late preterm infants are at greater risk for long-term neurodevelopmental impairment compared with term infants due to inconsistency of results from published outcome. This is likely due to the challenge of interpretation of the literature because of differences in clinical practice, study design (eg, evaluation tools, and outcome definition), and changes in perinatal care over time. (See 'Neurodevelopmental outcome' above.)

- **Mortality** – The neonatal and infant mortality rates for late preterm infants are greater than that of term infants. The mortality risk increases with decreasing gestational age for late preterm infants. (See 'Mortality' above.)

- **Management** – Strategies to decrease the morbidity and mortality associated with late preterm infants include prevention of late preterm delivery, successful establishment and support of milk production and breastfeeding, and management to prevent and treat the associated complications of late preterm birth during birth hospitalization and post-birth discharge. The National Perinatal Association's Multidisciplinary Guidelines for the Care of Late Preterm Infants, available online, is an excellent resource to guide the care of these patients during hospitalization, and as they transition to home and are managed by primary care providers.(See 'Management' above.)

DISCLOSURE

The opinions expressed herein are those of the authors and do not represent the official position or policy of the Centers for Disease Control and Prevention (CDC).

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Topic 5034 Version 47.0

GRAPHICS

Classification of prematurity categorized by birth weight or gestational age

	Birth weight
Low birth weight (LBW)	<2500 g
Very low birth weight (VLBW)	<1500 g
Extremely low birth weight (ELBW)	<1000 g
	Gestational age
Term	≥37 weeks
Late preterm	34 weeks to <37 weeks
Moderate preterm	32 weeks to <34 weeks
Very preterm	<32 weeks
Extremely preterm	<28 weeks

In using these definitions, the definition of VLBW infants includes ELBW infants, and the category of very preterm infants also includes those who are extremely preterm. This is an important consideration when one is reviewing published data of VLBW and very preterm infants.

Graphic 119362 Version 3.0

Percentage of preterm births based on gestational age in the United States

Year	Total preterm*	Late preterm¶	32 to 33 weeks	28 to 31 weeks	<28 weeks
2019	10.23	7.46	1.18	0.93	0.66
2017	9.93	7.17	1.17	0.92	0.67
2015	9.62	6.87	1.17	0.91	0.68
2010	9.98	7.15	1.18	0.94	0.71
2007	10.44	7.51	1.22	0.97	0.74

* Preterm is less than 37 completed weeks of gestation.

¶ Late preterm is 34 to 36 completed weeks of gestation.

Data from:

1. *Martin JA, Hamilton BE, Osterman M, et al. Births: Final data for 2019. Natl Vital Stat Rep 2021; 70:1.*
2. *Martin JA, Hamilton BE, Osterman M, et al. Births: Final data for 2017. Natl Vital Stat Rep 2018; 67:1.*

Graphic 61972 Version 15.0

Risk factors for preterm birth

Prior OB/GYN history
▪ Prior PTB (especially multiple PTBs or PTB at an early gestational age)
▪ Prior cervical surgery (eg, cone biopsy, LEEP)
▪ Multiple D&Es
▪ Uterine anomalies
Maternal demographics
▪ <17 or >35 years of age
▪ Non-Hispanic Black race, Indigenous women
▪ Lower educational level (eg, <12 grades)
▪ Single marital status
▪ Lower socioeconomic status
▪ Short interpregnancy interval (eg, <18 months)
▪ Other social factors (eg, poor access to medical care, physical abuse, acculturation)
Nutritional status/physical activity
▪ BMI <18.5 kg/m^2 or prepregnancy weight <50 kg (<120 lb)
▪ Poor nutritional status
▪ Long working hours (eg, >80 hours/week)
▪ Hard physical labor (eg, shift work, standing >8 hours)
Current maternal/pregnancy characteristics

- Conception by assisted reproductive technology (eg, IVF)
- Multiple gestation
- Fetal disorder (eg, chromosome anomaly, structural abnormality, growth restriction, death, etc)
- Vaginal bleeding (eg, 1st and 2nd trimester, placenta previa, abruption)
- Poly- or oligohydramnios
- Maternal medical conditions (eg, hypertension, diabetes, thyroid disease, asthma, etc)
- Maternal abdominal surgery during pregnancy
- Psychological issues (eg, stress, depression, unplanned pregnancy)
- Substance use:
  - Smoking (eg, tobacco)
  - Heavy alcohol consumption
  - Cocaine
  - Heroin
- Infection:
  - Bacterial vaginosis
  - Trichomoniasis
  - Chlamydia
  - Gonorrhea
  - Syphilis
  - Urinary tract (eg, asymptomatic bacteriuria, pyelonephritis)
  - Severe viral infection
  - Intrauterine infection
- Short cervical length between 14 and 28 weeks
- Positive fFN between 22 and 34 weeks

- Uterine contractions

OB/GYN: obstetrics and gynecology; PTB: preterm birth; LEEP: loop electrosurgical excision procedure; D&E: dilation and evacuation; BMI: body mass index; IVF: in vitro fertilization; fFN: fetal fibronectin.

Graphic 68992 Version 14.0

Proportion of preterm birth by etiology

Etiology	Frequency (percent)
Spontaneous preterm labor	30 to 50
PPROM	5 to 40
Multiple gestation	10 to 30
Preeclampsia/eclampsia	12
Antepartum bleeding	6 to 9
Fetal growth restriction	2 to 4
Other	8 to 9

PPROM: preterm premature rupture of membranes.

Adapted from: Slattery MM, Morrison JJ. Lancet 2002; 360:1489.

Graphic 74561 Version 3.0

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