Late Preterm Birth: Increased Clinical Risk

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Learning Objectives

- Appreciate late preterm babies as a particularly vulnerable population of infants
- Understand the unique challenges that this population faces
- Recognize the increased risks associated with babies born in this population
- Understand the trends in Kansas and the US regarding the birth of babies in the later preterm period
- Understand some of the strategies used to promote safe care of these infants, and avoidance of delivery when possible
Late Preterm Infants

- It was recently recommended that the term “late preterm infants” replace the term “near-term infants,” as it better reflects the higher risk of complications experienced by this group of infants.

- Late preterm infants (LPTI) are defined as premature infants born between 34 and 36 6/7 weeks of gestation.

ACOG Committee Opinion No. 404, 2008
Engle WA et al Pediatrics 2007
Why Focus on Late Preterm Infants?

- The rates of prematurity in the United States continue to rise
  - In 2003, 12.3% of U.S. births were preterm, representing a 16% increase since 1990 and a 31% increase since 1981
- That means that 1 in 8 babies is born premature in the United States
- Babies born between 34-36 completed weeks account for 71-74% of these preterm births
Why Focus on Late Preterm Infants?

- Because they are mature in appearance, usually weigh between 2-2.5 kg, are often relatively stable in the delivery room, and these babies are often cared for in the well-baby nursery.

- However, recent evidence shows that the late preterm infant faces a higher rate of morbidity (both early and late) and mortality than its term counterpart.
Definitions

- **Intrauterine growth restriction (IUGR)**
  - Rate of fetal growth less than normal or less than potential for that infant. May not be SGA

- **Low birth weight (LBW)**
  - Birth weight less than 2500 grams

- **Very low birth weight (VLBW)**
  - Birth weight less than 1500 grams

- **Extremely low birth weight (ELBW)**
  - Birth weight less than 1000 grams
How Old Are You Anyway?  
Gestational Age Assessment

- Accurate assessment of a newborn’s age and size guides the caregiver in anticipation and management of the common problems related to age and growth status
- Obstetric methods
- Assessment by physical exam
LPTI Epidemiology

- Most of the recent rise in preterm birth rate in the US is attributed to the LPTI
  - Very preterm birth (PTB) rate has been fairly stable since 1990
- Late PTB accounts for over 71% of preterm births in the US
- PTB is one of the leading causes of death in the 1st month of life

Davidoff MJ et al *Semin Perinatol* 2006
NCHS final natality data 2008
Increase in C/S Rate in Relation to Gestational Age


Total Cesarean Deliveries

Late PTB, Cesarean, and Pregnancy Complications

- Yee & colleagues, *Obstet Gynecol* 2008
  - Canadian cohort
  - Elective cesarean at 36-38 4/7 weeks
  - Associated with increased neonatal
- Respiratory morbidity
Cesarean Section Delivery has Increased Risks for LPTI, Term Infants and Moms

- Elective C/S vs Vaginal birth
  - Increase in risk of NICU stay $\geq 7$ days
    - OR 2.11 (conf interval 1.75-2.55)
  - If cephalic presentation increase in mortality by 1.7 fold
  - Increased risk of respiratory disease; Oxygen need
  - Reduces mortality associated with breech presentation
- Maternal morbidities
  - Death
  - Hysterectomy
  - Blood transfusion
  - Intensive care stay
  - Abx use

Engle, Clinics in Perinatology, 2008
Villar, BMJ 2007
Madar, Act Paediatr, 1999
Rise in Labor Induction Rate: Related to Increase in LPTI?

- Left shift in delivery gestational age
- Rise in labor induction and cesarean rates – not explained by changing maternal demographics or risk factors
  - C/S on demand?
  - Decrease in post dates
    - Davidoff & colleagues, *Semin Perinatal* 2006
- Several studies show increasing rates of labor induction in general
- Several studies show increasing rates of medically indicated LPTB by induction or cesarean
Late preterm is between 34 and 36 completed weeks gestation. 
Source: National Center for Health Statistics, final natality data. 
Late Preterm Births by Race/Ethnicity

Kansas, 2004-2006 Average

US, 2004-2006 Average

All race categories exclude Hispanics. Categories do not sum to total since missing ethnicity data are not shown. Late preterm is between 34 and 36 completed weeks gestation.
Cost of Preterm

US, 2005

Infant Deaths by Cause of Death

US, 2005


Risk factors for LPT Birth

- Prior PTB
- Race
- Maternal age
- Tobacco (21% mothers in US) or drugs
- Infection
- Maternal chronic disease or pregnancy complications
- Multifetal pregnancies and ART

Iams JD *Clin Perinatol* 2003
CDC
Morbidity for the LPTI

- Respiratory distress
- Hypothermia
- Hypoglycemia
- Feeding problems
- Hyperbilirubinemia/Kernicterus
- Rehospitalization
- SIDS
- Developmental outcomes
FIGURE 7-6 Specific neonatal morbidity by birth weight and gestational age. (From Lubchenco, L.O.: The high-risk infant. Philadelphia, 1976, Saunders.)
Morbidity in the Late PTI

![Morbidity Graph]

*P < .03

LPTI Morbidities

- Late PTB newborns 4-7 times more likely to have a least 1 medical condition
  - Temperature instability (10% vs 0%)
  - Hypoglycemia (16% vs 5%)
  - RDS (29% vs 4%)
  - Apnea (6% vs <0.1%)
  - Jaundice (54% vs 38%)
  - Feeding difficulties (32% vs 7%)
  - ICN

ACOG Committee Opinion No. 404, 2008
Engle W & Kominiarek MA. Clin Perinatol 2008
Shapiro-Mendoza et al Pediatrics 2008
“Early Term” Neonates

- 37-38 gestational weeks
- Increased risk for
  - RDS
  - TTNB
  - pulmonary hypertension
  - ICN admission or prolonged admission

Engle W & Kominiarek MA. *Clin Perinatol* 2008
Escobar, *Semin Perin*, 2006
<table>
<thead>
<tr>
<th>Gestational age</th>
<th>Supplemental O$_2$ for $\geq$1 hour OR [95% CI]</th>
<th>Assisted ventilation OR [95% CI]</th>
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</thead>
<tbody>
<tr>
<td>38-40 weeks</td>
<td>Reference</td>
<td>Reference</td>
</tr>
<tr>
<td>37 weeks</td>
<td>2.04 [1.61-2.59]</td>
<td>2.35 [1.84-3.02]</td>
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<tr>
<td>36 weeks</td>
<td>4.95 [3.95-6.21]</td>
<td>5.24 [4.11-6.68]</td>
</tr>
<tr>
<td>33 weeks</td>
<td>28.8 [20.4-40.6]</td>
<td>31.9 [22.5-45.3]</td>
</tr>
</tbody>
</table>

Escobar, *Semin Perin*, 2006
Temperature Instability

  - 10% of LPTI experienced temperature instability compared to 0% of term infants
  - OR: infinite, $P < .0012$

Laptook, *Semin Perin*, 2006
Hyperbilirubinemia

  - Prospective study that compared 146 near-term infants (35-37 wks) to 219 term
  - The risk for significant hyperbili requiring phototherapy was 10.5% in term infants, 25.3% in near-term (2.4x more likely)
  - Bilirubin levels peaked in near-term infants at 5-7 days
Hyperbilirubinemia

![Graph showing the total serum bilirubin levels over age for infants at different risk levels.](image-url)
Major Risk Factors for Severe Hyperbilirubinemia

- Predischarge TSB in "high-risk" zone
- Jaundiced in first 24 hours
- Laboratory evidence of hemolytic disease
- Gestational age 35 to 36 weeks
- Significant bruising
- Exclusive breast-feeding
- Previous sibling received phototherapy
- East Asian race
- Other: IPM, male gender, maternal age >25
Hyperbilirubinemia

  - In a retrospective study of well-infants;
  - Newborns at 35-36 weeks were 13.2x more likely to develop hyperbilirubinemia requiring phototherapy,
  - Newborns at 36-37 weeks 7.7x more likely than infants born at ≥40 weeks

  - In a retrospective study of 51,387 newborn infants of >2000 g;
  - Infants born at 36-37 weeks' gestation were 5.7x more likely to develop significant hyperbilirubinemia than newborns at 39-40 weeks' gestation
Hypoglycemia

- Late preterm infants are at higher risk for hypoglycemia due to decreased glycogen and brown fat stores, decreased ketone response, inadequate intake, and increased interventions.

- Amiel-Tison et al, 2002
  - Found 9% of LPTI developed hypoglycemia

- Wang et al, 2004
  - Found 15.6% of LTPD developed hypoglycemia compared to 5.3% of term OR 3.30 [1.1-12.2]
  - Nearly 2/3 of LPTI required treatment with IVF for correction
Infection in the Near-Term Infant

- **Humoral immunity** – involves antigen antibody response that is most effective after previous exposure. Immunoglobulins G, M, A and E

- **Cellular immunity** – specific and nonspecific. Specific involves T cells, nonspecific involves response of WBC and complement
<table>
<thead>
<tr>
<th>Gest Age</th>
<th>Escobar % Rehosp</th>
<th>Oddie % Rehosp</th>
<th>Oddie Gest Age</th>
</tr>
</thead>
<tbody>
<tr>
<td>≥ 41 wks</td>
<td>3.6%</td>
<td>2.4%</td>
<td>&gt;40 wks</td>
</tr>
<tr>
<td>38-40 wks</td>
<td>4.4%</td>
<td>3.4%</td>
<td>38-40 wks</td>
</tr>
<tr>
<td>37 wks</td>
<td>5.6%</td>
<td></td>
<td>37 wks</td>
</tr>
<tr>
<td>36 wks</td>
<td>7.3%</td>
<td>6.3%</td>
<td>36 wks</td>
</tr>
<tr>
<td>35 wks</td>
<td>6.8%</td>
<td></td>
<td>35 wks</td>
</tr>
<tr>
<td>34 wks</td>
<td>9.1%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Escobar, *Semin Perin*, 2006  
Oddie, *Arch Dis Child*, 2005
Neurodevelopment

- Evaluated 7817 children up to 12 years of age for health conditions or special care need according to birth weight

<table>
<thead>
<tr>
<th>Problem</th>
<th>BW &gt;2500g</th>
<th>BW 1500-2499g</th>
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<tbody>
<tr>
<td>Learning problem</td>
<td>6.24%</td>
<td>12.46%</td>
</tr>
<tr>
<td>ADD/ADHD</td>
<td>5.37%</td>
<td>9.28%</td>
</tr>
<tr>
<td>Emotion behav prob</td>
<td>12.27%</td>
<td>17.31%</td>
</tr>
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Late PTB Neonatal Outcomes

- Long-term outcomes: developmental delay, ADHD and behavior problems, respiratory disorders

| Table 3 |
|------------------|------------------|------------------|
| School age outcome of healthy late preterm (n = 22,552) versus healthy term (n = 164,628) infants in Florida |
| Outcome | Age (years) | Relative risk (95% confidence interval) |
| Developmental delay or disability | 0–3 | 1.46 (1.42–1.50) |
| Special education | 5 | 1.13 (1.11–1.15) |
| Grade retention | 5 | 1.11 (1.08–1.14) |

SIDS

- The extent of breathing control maturation is dependent on both gestational age and chronological age.
- The relative risk for ALTE events in late preterm infants is higher than term infants (RR 5.6, $P < .008$) and remains higher until 43 weeks' PMA.
- The rate of SIDS in preterm infants born 33-36 weeks is 1.37/1000 compared to 0.69/1000 for infants 37-42 weeks.
Implicated Factors for Increased Rate of LPTB

- Increased surveillance
- Inaccurate gestational age
- Increased multifetal pregnancies
- Worsening maternal demographics
- Presumption of maturity at 34 wks
- Fear of fetal risks

- Maternal autonomy
- Physician practice patterns
  - Convenience
  - Delivery w/o indication
  - Planned delivery
  - Delivery mode
Prevention of Late LPTB

- Accurate gestational dating
  - prudent use of antenatal fetal testing
  - prudent use of labor induction and cesarean, targeting significant medical indications

- Assisted reproductive technology strategies to minimize multifetal gestations
LPTB at 34-36 Weeks: Should It Be Arrested?

- Suggest that labor should not be induced at 34-35 weeks
- Tocolysis and steroids “may be considered”


\[ P = 0.008 \text{ compared with 36-week group} \]
\[ P = 0.015 \text{ compared with the 36-week group} \]
Recommendations

- Recognize that late preterm infants are at risk for transitional problems:
  - Respiratory distress
  - Hypoglycemia
  - Hypothermia
- Monitor for them appropriately, with scheduled routine surveillance
- Establish appropriate discharge criteria, discharge screens, and discharge education
  - Bilirubin screening
  - Car seat screen (<37 weeks)
  - Back To Sleep
  - Lactation support
Recommendations

- Recognize risk factors for rehospitalization
  - 34-36 weeks, exclusively breast-fed, male, cared for in the normal newborn nursery, primiparous mother with L&D complications
- Early (48 hrs), frequent and more prolonged follow-up (which may include home health visits or f/u phone calls) to assess breast-feeding adequacy, hydration status, and bilirubin
- Support and research in this ever-growing population to assess their needs and optimize care
General Guidelines for Managing the LPTI

- Remember the risks
- Manage in least restrictive environment but with high degree of suspicion and prompt intervention for problems.
  - It’s better to back off from overtreatment than to chase a baby who gets sick rapidly.
- Avoid early discharge
General Guidelines for Management of the LPTI

- Educate the family about what to expect – before, during, and after delivery
  - The fewer surprises the better
  - Families who understand the issues are usually more supportive and involved with care
- Advocate and educate regarding the risks of the LPTI
Bottom Line for LPTI

- Premature births are becoming increasingly more common in America
  - Rising more than 30 percent in the last 25 years
- Nearly 71 percent of those births being LPT babies
- Increase may be attributed to more early inductions
  - For medical or personal reasons
- There are many medical reasons for early induction
  - However, it’s becoming more common for women to request early inductions for personal reasons
- Much of early labor is unavoidable
  - Need to prepare parents who may be at risk or about to give birth to a late preterm infant about the needs of these early babies
- With preventative care and early intervention, outcomes can be improved
THE END

THANK YOU!
References

- *Seminars in Perinatology* (2006) Feb; 30(1)
- *Seminars in Perinatology* (2006) Apr; 30(2)
References