Bronchopulmonary Dysplasia (BPD)
A Dietitian’s Reference Guide

Definition:
a chronic lung disease acquired in infancy due to lung damage, typically from mechanical ventilation.1-5
Risk factors include extreme prematurity, extremely low birth weight, mechanical ventilation, and a severe respiratory or lung infection.2-6 Symptoms include cyanosis, cough, rapid breathing, and shortness of breath.5, 6

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Diagnosis
The National Institute of Child Health and Human Development/National Heart, Lung and Blood Institute came out with recommendations in 2000 for how to diagnosis BPD before 32 weeks and after 32 weeks.2-4 The chart below provides a summary of this description.

<table>
<thead>
<tr>
<th>Time of Assessment</th>
<th>Gestational Age &lt;32 weeks</th>
<th>Gestational Age ≥ 32 weeks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mild BPD</td>
<td>Breathing room air at assessment</td>
<td>Breathing room air by 56 days or discharge</td>
</tr>
<tr>
<td>Moderate BPD</td>
<td>Needs &lt;30% oxygen at assessment</td>
<td>Need for &lt;30% oxygen at 56 days or discharge</td>
</tr>
<tr>
<td>Severe BPD</td>
<td>Need for ≥30% oxygen and/or positive pressure at assessment</td>
<td>Need for ≥30% oxygen and/or positive pressure at 56 days or discharge</td>
</tr>
</tbody>
</table>

Lab Tests

<table>
<thead>
<tr>
<th>General Tests</th>
<th>Specific Tests</th>
<th>Reason for Specific Tests</th>
</tr>
</thead>
<tbody>
<tr>
<td>ABG</td>
<td>Serum Calcium &amp; Phosphorus</td>
<td>On diuretics</td>
</tr>
<tr>
<td>Pulse oximetry</td>
<td>Urine Osmolality &amp; Urine Specific Gravity</td>
<td>On diuretics &amp; fluid restriction</td>
</tr>
<tr>
<td>Hgb&amp;HCT</td>
<td>Serum Alkaline Phosphatase &amp; vitamin D</td>
<td>Metabolic bone disease</td>
</tr>
</tbody>
</table>

Medications
Common medications for BPD include:
- Diuretics2,6,7
- Corticosteroids2,5,7
- Bronchodilators5,6,7
- Supplemental Oxygen2
- Methylxanthines (caffeine)7
- Surfactant6

Client History
When interviewing the client’s family and looking over the client’s chart, some specific items to take note of are:
- Gestational age at birth1,3
- Birth weight1,3
- Feeding history1
- Oral motor skills1
- Average daily weight gain1
- Coexisting medical conditions1,3
- History of mechanical ventilation3
- Developmental assessment1
- Date of last labs1

Example of BPD lungs8

Nutrition Focused Physical Findings
While looking at overall health of the infant, there are multiple physical symptoms that may impact nutrition including:
- Increased respiration rate1
- Supplemental oxygen1
- Small for gestational age1
- Appearance of wasting1
- Poor coordination of suck, swallow, and breathing2
- Swallow disfunction2
- Oral-tactile hypersensitivity & aversion2
- Gastroesophageal reflux/delayed

PES
Commonly seen PES statements that are specific to BPD include:
- NI 1.2 Inadequate energy intake related to problems eating and long feedings required as evidenced by inadequate weight gain.
- NI 5.1: Increased nutrient needs related to increased energy needs from supplemental oxygen, lung disease, and medication as evidenced by inadequate weight gain.1
- NI 5.7.1: Inadequate protein intake related to poor suck/swallow reflex or oral aversion as evidenced by inadequate weight gain and decreased intakes.1
Possible Complications
Possible complications include RSV, developmental problems, poor growth, and pulmonary hypertension.\textsuperscript{1, 2, 5}

Goals
Goals for the patient with BPD may include:
- Normalization of growth\textsuperscript{1, 2}
- Weight gain and length equivalent to infants without BPD \textsuperscript{1}

Intake Needs/Comparative Standards
Energy & Protein
Energy expenditure is increased by up to 25%. Because of this the current recommendation for infants with BPD is 120-160 kcal/kg/d.\textsuperscript{1, 2} Protein needs for preterm infants are 3.5-4 g/kg/d.\textsuperscript{9} To help achieve these levels without increased fluid, patients may be fed using formula for low birth weight or preterm infants (for first 12 months) or human milk fortifier.\textsuperscript{1, 2} These fluids should be concentrated to be between 24-30 kcal/oz.\textsuperscript{1, 2}

Fluid
Fluids may be restricted for infants with BPD, and they may be on diuretics.\textsuperscript{2} Current recommendations for fluid needs are:\textsuperscript{1}

| First 10 kg | 10 ml/kg/d |
| Next 10 kg | 50 ml/kg/d |
| Remaining weight | 20 ml/kg/d |

Vitamins and Minerals
The following vitamins and minerals may need to be supplemented for breastfed infants: vitamin D, calcium, phosphorus, and iron.\textsuperscript{1}

Parent Support
Parents and caretakers of infants with BPD may need extra support and encouragement, especially from hospital staff who may be their only resource. Infants with BPD often require many hours in the day just for feeding. Doctors may recommend keeping the infant at home during the months of November through March to help prevent the infant from getting RSV.\textsuperscript{2} This may cause the parents to feel isolated. Make sure to give encouragement and help them with practical solutions for taking care of their infant.

Long-term Prognosis
Many infants in the past who have had BPD still have decreased exercise capacity and chronic pulmonary function impairment. However, with new treatments it is possible that these problems will begin to decrease in the future.\textsuperscript{4}

Nutrition Assessment
Include the following in your nutrition assessment:\textsuperscript{1}
- Height
- Weight
- Weight change
- Growth pattern and percentile ranks
- Intake of calories, protein, and carbohydrates
- Fluid intake
- Calcium and vitamin D intake
- Prescription medications
- Mealtime behaviors
- Pertinent labs
- Overall appearance
- Total estimated needs of energy, protein and fluids
- Desired growth pattern

Nutrition Interventions
When planning nutrition interventions, here are some things to keep in mind:
- Calorie and protein needs may be increased due to the stress on the lungs and extra effort to breath, as well as to aid in “catch-up” growth\textsuperscript{1}
- To help increase calories and protein, use human milk fortifier or adjusted formula\textsuperscript{1, 2}
- If feeding is not sufficient, many infants with BPD require tube feeding\textsuperscript{1, 2}
- Many infants with BPD have aversions to oral sensations, including feeding\textsuperscript{2}
- Pace feeding may be needed for infants with swallowing difficulties\textsuperscript{2}
- Some BPD patients may have gastroesophageal reflux, and may need change in positioning or smaller more frequent meals\textsuperscript{2}

Anthropometric
One of the best indicators of nutritional adequacy in infants with BPD is growth and increase in weight. Monitoring guidelines for infants with BPD are shown in the chart below:\textsuperscript{1, 2}

<table>
<thead>
<tr>
<th>Measurement</th>
<th>How often</th>
<th>Length of tracking</th>
</tr>
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<tbody>
<tr>
<td>Weight for height</td>
<td>Monthly for first 4 months; every 3 months thereafter</td>
<td>2 years</td>
</tr>
<tr>
<td>Length for age</td>
<td>Monthly for first 4 months; every 3 months thereafter</td>
<td>3 years</td>
</tr>
</tbody>
</table>

For more information visit the Pediatric Nutrition Care Manual and lung.org.
References:


