CONDITION

Bronchopulmonary dysplasia

Learn how bronchopulmonary dysplasia affects premature babies, including symptoms, diagnosis, treatment, home oxygen, follow-up care, and warning signs.

WHAT IT IS
Long-term lung condition of prematurity

BODY SYSTEM
Lungs and breathing

MAIN SYMPTOMS
Ongoing oxygen need, labored breathing, wheezing, feeding difficulty

WHAT CAUSES IT
Prematurity, breathing support, oxygen, inflammation

HOW IT IS DIAGNOSED
Respiratory support assessment around 36 weeks' postmenstrual age

MAIN TREATMENT
Supportive breathing and nutritional care

CAN IT BE CURED?
No, treatment supports growing lungs

IS IT AN EMERGENCY?
Sometimes, blue or gray lips

LONG-TERM OUTLOOK
Many improve but breathing problems may persist

Overview

Bronchopulmonary dysplasia, or BPD, is a long-term lung condition that mainly affects babies born very early. It is sometimes called chronic lung disease of prematurity.

A premature baby's lungs may not be fully developed at birth. The smallest airways and air sacs are still growing, and the lungs may not make enough surfactant. Surfactant is a substance that helps keep the air sacs open.

Many premature babies need oxygen, a breathing machine, or other respiratory support to survive. These treatments are essential, but high oxygen levels and pressure inside the lungs can add stress to delicate lung tissue. Infection and inflammation can also interrupt normal lung development. BPD results from a combination of these factors rather than from one single injury.

BPD ranges from mild to severe. Some babies need extra oxygen for a short time. Others require breathing support for months and may go home with oxygen. The condition can affect feeding, growth, sleep, and the body's ability to handle respiratory infections.

The lungs continue to grow during childhood. Many children improve as they get older, although some continue to have asthma-like symptoms, reduced exercise tolerance, or other breathing problems. Care from neonatal, lung, heart, nutrition, and developmental specialists can support recovery and identify complications early.

Symptoms

BPD develops in babies who already need care for prematurity and breathing problems. It usually becomes clear over time rather than appearing suddenly.

Possible signs include:

Symptoms can change from day to day. Feeding, crying, sleep, and respiratory infections may temporarily increase the baby's oxygen needs or work of breathing.

Some children who had BPD continue to cough, wheeze, or become short of breath more easily during early childhood. These symptoms may resemble asthma, but the underlying lung changes are not always the same as those in typical childhood asthma.

- Continuing to need oxygen or breathing support near the baby's original due date
- Fast, shallow, or labored breathing
- Flaring of the nostrils or pulling in of the skin between the ribs
- Wheezing, coughing, or noisy breathing
- Difficulty coordinating sucking, swallowing, and breathing
- Tiring, sweating, or breathing faster during feeds
- Slow weight gain
- Lower oxygen levels during feeding, sleep, or illness

Causes and risk factors

BPD is most strongly linked to very premature birth. Babies born before the lungs have completed important stages of development have fewer mature air sacs and blood vessels. Their lungs may be less able to exchange oxygen without support.

Several factors can contribute:

Not every premature baby with these factors develops BPD. Some full-term or near-term babies can develop chronic lung injury after severe infection, major surgery, or prolonged ventilation, but this is less typical.

- Early gestational age: Gestational age is the number of weeks of pregnancy completed before birth. The earlier a baby is born, the less developed the lungs are likely to be.
- Very low birth weight: Smaller premature babies are more likely to need prolonged breathing support.
- Respiratory distress syndrome: This condition occurs when immature lungs do not have enough surfactant and cannot stay open easily.
- Mechanical ventilation: A ventilator can provide lifesaving breaths. Pressure and volume from ventilation can also injure fragile lungs, especially when support is needed for a long time.
- Oxygen exposure: Extra oxygen is necessary when blood oxygen is low, but prolonged exposure to more oxygen than the body needs can contribute to lung inflammation.
- Inflammation or infection: Infection before or after birth may interfere with normal lung growth. A severe bloodstream or lung infection can increase respiratory support needs.
- Patent ductus arteriosus: This is a blood vessel near the heart that normally closes after birth. If it remains open, extra blood may flow to the lungs and make breathing more difficult.
- Limited growth before or after birth: Poor growth can affect lung development and the strength needed for breathing.

Diagnosis

There is no single blood test or scan that confirms BPD. Clinicians diagnose it by reviewing when the baby was born, how long oxygen was needed, and what type of breathing support is still required at a specific age.

Many definitions assess respiratory support around 36 weeks' postmenstrual age. Postmenstrual age combines the weeks of pregnancy completed before birth with the weeks that have passed since birth. For example, a baby born at 28 weeks reaches 36 weeks' postmenstrual age eight weeks later.

Definitions differ among hospitals and research groups. Some classify BPD by the amount of oxygen a baby needs. Newer approaches place more emphasis on the type of respiratory

support, such as oxygen through a nasal tube, continuous positive airway pressure, or a ventilator. The care team can explain which definition it uses and what the assigned severity means for the baby.

Tests may help assess lung function or look for complications:

Before discharge, some babies have an oxygen study during sleep, feeding, or activity. This helps the team decide whether oxygen is needed at home. The specific testing depends on the baby's condition and local practice.

- Continuous or periodic oxygen-level monitoring
- Chest X-rays when the clinical situation requires them
- Blood tests that show oxygen, carbon dioxide, or acid levels
- An echocardiogram, which is an ultrasound of the heart, to look for pulmonary hypertension or heart problems
- Feeding and swallowing evaluation if feeds cause coughing, choking, fatigue, or oxygen changes
- Growth and nutrition assessment

Treatment and management

Treatment supports breathing while protecting the lungs and allowing them to grow. The plan changes as the baby matures.

In the neonatal intensive care unit, clinicians use the least invasive breathing support that can safely maintain oxygen and ventilation. This may include oxygen through a nasal cannula, continuous positive airway pressure, or mechanical ventilation. Oxygen levels are monitored closely so the team can adjust support.

Surfactant may be given soon after birth to treat respiratory distress syndrome. It helps keep immature air sacs open but is not a direct treatment for established BPD.

Nutrition is a major part of care. Babies with BPD use extra energy to breathe but may tire during feeds. Breast milk or formula may be fortified to provide more nutrition in a smaller volume. Some babies need temporary tube feeding. Feeding specialists can help when swallowing and breathing are difficult to coordinate.

Medicines are used selectively:

A baby may go home with oxygen when otherwise medically ready. Families receive equipment training, instructions for oxygen use, and a plan for equipment problems or power

outages. Oxygen should not be changed or stopped without guidance from the care team, even if the baby appears comfortable.

Smoke, vaping aerosols, and strong fumes can irritate the lungs. A smoke-free home and car are especially important. Good hand hygiene and avoiding close contact with people who are ill can reduce infection exposure.

Routine childhood vaccination is important. Clinicians may also assess whether the baby qualifies for an antibody product that helps prevent severe respiratory syncytial virus, or RSV, disease. Eligibility depends on the child's age, medical history, RSV season, and current public health guidance.

- Diuretics like furosemide or hydrochlorothiazide help the body remove extra fluid. They may make breathing easier in some babies, but long-term use can affect electrolytes, bones, or growth and requires monitoring.
- Bronchodilators like albuterol or salmeterol relax muscles around the airways. A clinician may consider a monitored trial when wheezing or airway narrowing is suspected.
- Corticosteroids like prednisone or hydrocortisone reduce inflammation. Because they can have important side effects, the decision to use them depends on the baby's age, respiratory needs, and overall risks.
- Medicines for pulmonary hypertension may be needed when high pressure develops in the lung's blood vessels. This requires specialist care.

Complications

Babies with BPD have different outcomes. A diagnosis does not mean that every complication will occur.

Possible complications include:

Severe BPD may require prolonged ventilation, a tracheostomy, or a feeding tube. A tracheostomy is a surgically created opening in the neck that connects to the windpipe. These treatments are reserved for babies with complex, long-term support needs.

- Pulmonary hypertension: Blood pressure becomes too high in the vessels carrying blood through the lungs. This can strain the right side of the heart.
- Respiratory infections: RSV, influenza, and other infections may cause more severe breathing problems or lead to hospital care.
- Feeding and growth problems: Increased energy needs, reflux, swallowing difficulty, and tiring during feeds can affect growth.

- Airway problems: Some babies have a soft or narrowed windpipe, persistent wheezing, or increased airway sensitivity.
- Sleep-related breathing problems: Oxygen levels may fall during sleep, particularly while the lungs are still healing.
- Ongoing respiratory symptoms: Cough, wheeze, reduced exercise tolerance, or a need for inhaled treatment may continue into childhood.
- Developmental concerns: Babies born very early are at increased risk for movement, learning, hearing, vision, and developmental difficulties. These risks are related to prematurity and serious newborn illness, not only to BPD.

Follow up

Follow-up often involves a primary care clinician and a neonatal or pulmonary clinic. Some children also see cardiology, nutrition, feeding, developmental, or ear, nose, and throat specialists.

Routine visits may review:

A clinician may gradually reduce oxygen after reviewing the child's growth, breathing, and measured oxygen levels. Families should not test longer periods without oxygen unless the care team has provided a plan.

Contact the child's healthcare team promptly for a new cough, wheezing, reduced feeding, fewer wet diapers, unusual tiredness, fever, or a mild increase in breathing effort. Follow the child's written illness or oxygen plan when one has been provided.

Seek urgent medical care if the child is breathing much harder or faster than usual, repeatedly vomiting feeds, becoming difficult to wake, or cannot maintain the oxygen level set by the care team despite following the plan.

Call emergency services for blue or gray lips or face, pauses in breathing, severe chest pulling, gasping, unresponsiveness, or a major equipment failure when the child cannot breathe safely without the equipment.

- Oxygen use and equipment
- Breathing during sleep, activity, and feeding
- Growth and nutritional intake
- Medicines and possible side effects
- Feeding and swallowing safety

- Development, hearing, and vision
- Vaccinations and infection prevention

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