PRIMEVIEW

# BRONCHOPULMONARY DYSPLASIA

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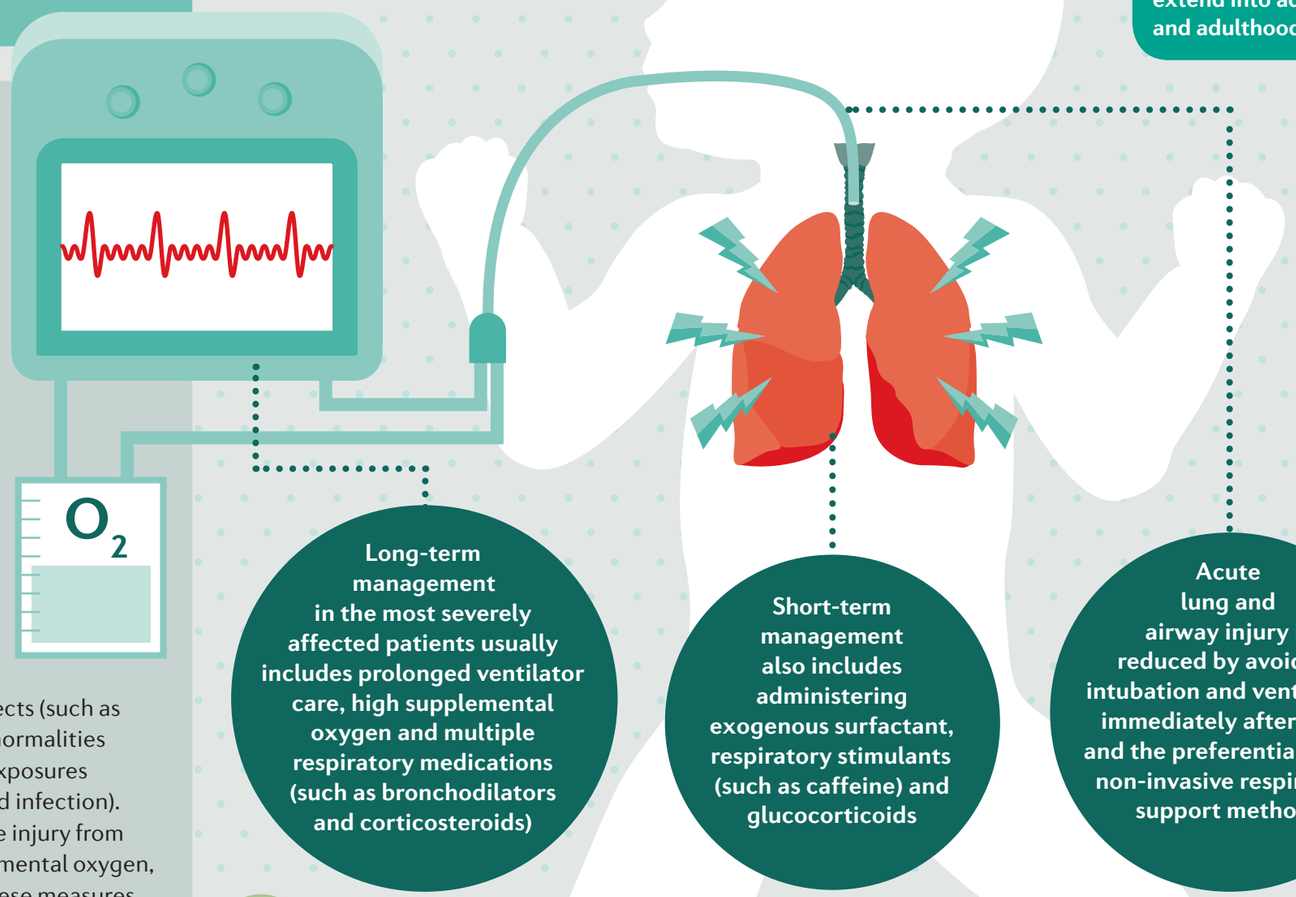
For the Primer, visit doi:10.1038/s41572-019-0127-7

**Bronchopulmonary dysplasia (BPD) is a form of chronic lung dysfunction resulting from lung and airway injury caused by respiratory support measures in (predominantly premature) newborn babies.**

## PATHOPHYSIOLOGY

The incompletely developed lungs of premature infants are structurally immature and do not produce pulmonary surfactant, because the alveolar cells that produce surfactant constituents only differentiate late in gestation. Consequently, antenatal and repeated postnatal injury hamper lung repair and development, resulting in reduced alveolarization and injury to the pulmonary microvasculature (that is, BPD). Antenatal modulators of lung development and healing include preconception effects (such as maternal nutrition), pregnancy abnormalities (such as pre-eclampsia) and fetal exposures (for example, maternal smoking and infection). Postnatal modulators include acute injury from mechanical ventilation and supplemental oxygen, and the response of the lungs to these measures, which is determined by the lung developmental programme and tissue repair and remodelling (including fibrosis). Inflammation is a major pathogenetic mechanism in BPD and underlies the injury from many of these factors. Inflammatory exposures, both prenatal, such as chorioamnionitis (inflammation of the placenta and amniotic fluid due to infection), and postnatal, such as sepsis and necrotizing enterocolitis, also contribute to lung and airway injury.




## MANAGEMENT

**Long-term management in the most severely affected patients usually includes prolonged ventilator care, high supplemental oxygen and multiple respiratory medications (such as bronchodilators and corticosteroids)**

**Short-term management also includes administering exogenous surfactant, respiratory stimulants (such as caffeine) and glucocorticoids**

**Acute lung and airway injury is reduced by avoiding intubation and ventilation immediately after birth and the preferential use of non-invasive respiratory support methods**

**Severe BPD can result in respiratory and cardiopulmonary dysfunction (such as pulmonary hypertension and exercise intolerance) that can extend into adolescence and adulthood**

## EPIDEMIOLOGY

**BPD is the most common complication of premature infants born at <28 weeks gestation and its prevalence is increasing with the improved survival of premature (<37 weeks gestation) infants. BPD prevalence varies widely in different parts of the world, which may be related to differences in diagnostic criteria. Weight and gestational age at birth are the major risk factors for BPD. For example, fourfold fewer infants born at 28 weeks gestation are diagnosed with BPD than those born at 22–24 weeks gestation. Other risk factors include male sex, genetics, ethnicity, maternal smoking and intrauterine growth restriction.**

## DIAGNOSIS

**Historically, a requirement for supplemental oxygen at 36 weeks post-menstrual age has been the basis for a BPD diagnosis. However, a consensus definition of BPD is lacking, and various definitions propose including other aspects of care (such as respiratory support) or disease pathology (such as evidence of parenchymal injury). Spatial heterogeneity in the severity of lung disease exists, and the reparative response to injury varies between individuals, suggesting the existence of distinct disease endotypes. Consequently, stratification of patients by disease severity to tailor treatment or to identify patients for inclusion in clinical trials is inaccurate using current BPD definitions.**

## OUTLOOK

Despite substantial changes in care for preterm infants in the past 15 years, including the increased use of less invasive respiratory support methods and prenatal corticosteroid treatment (to promote lung development), the reduction in BPD prevalence in the same time-frame has been minimal. The lack of a BPD definition that is based on the pathophysiology of the disease is one possible reason for this disappointing result. Mesenchymal stem cells and anti-inflammatory agents are emerging therapies that have shown promising results in preliminary studies and trials, but larger trials are needed to confirm the safety and efficacy of these treatments. Finally, an improved understanding of the cell types and signalling networks involved in lung development and repair should provide therapeutic targets for improved treatment of BPD.

doi:10.1038/s41572-019-0134-8; Article citation ID: (2019) 5:77

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