CONDITION

Apnea of prematurity

Learn why premature babies may have pauses in breathing, how apnea of prematurity is diagnosed and treated, and what families can expect before and after NICU discharge.

WHAT IT IS
Breathing pauses from immature control in premature babies

BODY SYSTEM
Nervous system and lungs

MAIN SYMPTOMS
Breathing pauses, slow heart rate, low blood oxygen, pale blue or gray skin

WHAT CAUSES IT
Immature nervous system

HOW IT IS DIAGNOSED
NICU monitoring, clinical observation, exclusion of other causes

MAIN TREATMENT
Respiratory support and stimulant medicine

CAN IT BE CURED?
No, treatment supports breathing until maturation

IS IT AN EMERGENCY?
Sometimes, if the baby stops breathing or turns blue or gray

LONG-TERM OUTLOOK
Most babies recover as they mature

Overview

Apnea of prematurity is a pause in breathing caused by immature breathing control in a premature baby. It is more common in babies born at earlier stages of pregnancy.

Doctors may define apnea as breathing that stops for at least 20 seconds. A shorter pause may also count if it occurs with a slow heart rate, low blood oxygen, or skin color change. Neonatal intensive care units, or NICUs, may use slightly different monitoring definitions.

Types of apnea include:

Apnea of prematurity is different from sudden infant death syndrome, or SIDS, and has not been shown to cause it. Home heart or breathing monitors do not prevent SIDS.

Most babies outgrow apnea as the brain, lungs, and airway mature. Before discharge, the NICU

team confirms that the baby has gone a sustained period without clinically important events and is otherwise ready to go home.

- Central apnea: The brain temporarily does not send the usual signals to the breathing muscles.
- Obstructive apnea: The baby tries to breathe, but airflow is blocked by the upper airway.
- Mixed apnea: Central and obstructive features occur during the same event. This is common in premature babies.

Symptoms

Most events are detected by NICU monitors, which may sound an alarm when breathing pauses, the heart rate slows, or blood oxygen falls. Staff check the baby because movement or loose sensors can also cause alarms.

During a true event, a baby may have:

Some events resolve without help. Others require gentle touching or rubbing to prompt breathing. More serious events may require airway repositioning, oxygen, or temporary breathing support.

Premature babies may also have periodic breathing , in which several brief pauses alternate with faster breathing. This usually does not cause major heart-rate or oxygen changes and differs from clinically important apnea.

After discharge, call emergency services if a baby stops breathing, becomes blue or gray, is limp or unresponsive, or has severe difficulty breathing. Begin infant cardiopulmonary resuscitation, or CPR, if trained and instructed to do so. Contact the baby's clinician promptly about less urgent breathing or color changes, including events during feeding.

- A pause in breathing
- A slow heart rate, called bradycardia
- Low blood oxygen, called oxygen desaturation
- Pale, blue, or gray skin
- Reduced muscle tone or movement

Causes and risk factors

Apnea of prematurity mainly results from nervous system immaturity. The brain may not yet

respond consistently to changing oxygen and carbon dioxide levels. The muscles and reflexes that keep the upper airway open are also still developing.

The main risk factor is premature birth. Babies born at earlier gestational ages generally have more frequent and longer-lasting events.

Conditions that may trigger or worsen apnea include:

Feeding may affect breathing, heart rate, or oxygen while a premature baby learns to coordinate sucking, swallowing, and breathing. However, gastroesophageal reflux has not been shown to explain most apnea of prematurity. Acid-suppressing medicine does not treat apnea itself.

If apnea starts unexpectedly, becomes more frequent, or returns after improving, clinicians look for another medical cause rather than assuming prematurity is responsible.

- Infection, including sepsis
- Low body temperature, blood sugar, or red blood cell levels
- Lung disease or inadequate breathing support
- Seizures or other neurologic problems
- Abnormal electrolyte levels
- Medicines that suppress breathing
- Airway blockage or unsuitable head and neck positioning

Diagnosis

Apnea of prematurity is diagnosed in a premature baby after other causes of breathing pauses have been considered. No single test confirms it.

NICU monitors track breathing, heart rate, and blood oxygen. Clinicians review the event pattern and examine the baby, including whether an event occurred during sleep, feeding, handling, or a position change. Because monitor alarms are not always reliable, direct observation is important.

Testing depends on the baby's symptoms and may include:

A sleep study or detailed cardiorespiratory recording is not routinely required. It may be considered if events are unusual, persist beyond the expected age of resolution, or suggest airway obstruction. Clinicians also review medicines, feeding, respiratory equipment, and positioning.

- Blood tests for infection, anemia, glucose, or electrolyte problems
- A blood gas test to assess oxygen, carbon dioxide, and acid balance
- Cultures if infection is suspected
- Chest imaging for possible lung or airway problems
- Heart testing when a cardiac cause is possible
- Brain imaging or electrical monitoring for suspected seizures or neurologic disease

Treatment and management

Treatment depends on the frequency and severity of events and whether another condition is present. The goal is to support breathing while respiratory control matures.

During an event, NICU staff assess the baby and airway. Gentle stimulation or repositioning the head and neck may be enough. A more serious event may require oxygen or assisted breaths.

Caffeine citrate is the medicine most often used. It stimulates the brain's breathing center, improves breathing consistency, and may help some babies stop mechanical breathing support sooner.

Caffeine is given under neonatal supervision. Dosing depends on the baby's weight, age, response, and hospital protocol. Families should never give caffeine products or change treatment themselves.

Possible effects include a fast heart rate, jitteriness, increased urination, or feeding intolerance. Blood caffeine levels are not routinely required with standard treatment, but clinicians may check them if treatment is ineffective or side effects are suspected.

If caffeine and positioning are insufficient, noninvasive support may keep the airway open and stabilize breathing. Options include continuous positive airway pressure, or CPAP, and other positive-pressure support delivered through nasal prongs.

Clinicians also treat contributing problems, such as infection, low blood sugar, anemia, or inadequate respiratory support, and review medicines that might suppress breathing.

Caffeine is usually stopped after the baby matures and remains free of significant events for a period determined by the NICU. Because caffeine remains in a premature baby's body for a long time, observation may continue after the final dose.

Some infants go home with a cardiorespiratory monitor for a specific medical reason, but this is not routine after resolved apnea. A monitor does not replace safe sleep, medical follow-up, or caregiver CPR training.

Complications

Most babies recover as they mature. Events usually decrease near term-equivalent age, although they may persist longer in babies born extremely early.

Repeated oxygen drops are associated with concerns about growth, eye health, lung disease, and neurodevelopment in very premature infants. These babies often have several overlapping risks, so the effect of apnea alone may be difficult to determine.

Large clinical trials found that caffeine reduced the duration of positive-pressure support and the risk of bronchopulmonary dysplasia, a chronic lung condition of prematurity. Follow-up did not show an increase in major long-term disability and found some early developmental benefits, although outcomes vary.

A new or changing apnea pattern may indicate an underlying illness and requires assessment. Ongoing events can also delay discharge, particularly if they require stimulation or breathing support. Additional observation helps confirm stable breathing, temperature, feeding, and growth.

Follow up

Before discharge, families should understand what the NICU considers a significant event, how long the baby has been event-free, and whether feeding-related events have been resolved. Observation requirements vary by gestational age, event severity, caffeine use, and hospital policy.

Follow-up may involve a pediatrician, neonatal follow-up program, eye or lung specialist, and developmental services.

Follow safe-sleep guidance for every sleep:

Parents and regular caregivers should consider infant CPR training before discharge. Families using prescribed oxygen, a medical monitor, or other equipment need hands-on training and clear instructions about alarms, equipment problems, and whom to call.

Contact the baby's clinician promptly for coughing or color changes during feeding, unusual sleepiness, worsening breathing, poor feeding, fever, or events recorded by prescribed monitoring.

Call emergency services if the baby is not breathing, turns blue or gray, becomes limp or unresponsive, or struggles severely to breathe.

- Place the baby alone on the back on a firm, flat sleep surface.

- Keep pillows, loose blankets, positioners, and soft objects out of the sleep area.
- Use prescribed oxygen or other equipment exactly as instructed.
- Do not substitute a consumer breathing monitor for safe sleep or medical care.

Sources

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