Duration/Weaning of CPAP

There is **no fixed recommended duration** for CPAP therapy in preterm infants; rather, CPAP is continued until the infant meets clinical stability criteria and then weaned using either a gradual pressure reduction or sudden discontinuation approach. The duration is highly dependent on gestational age, with the median postmenstrual age (PMA) at successful weaning approximately 36 weeks across gestational ages, though more immature infants tend to wean at later PMAs.[1]

Typical Duration of CPAP by Gestational Age
The duration of CPAP therapy is inversely related to gestational age at birth. In a large retrospective cohort of 449 infants born <32 weeks, the median PMA at successful weaning from all non-invasive respiratory support (including CPAP) was **36.0 weeks**, with earlier GA infants achieving weaning at later PMAs.[1] In an RCT of 226 infants ≤32 weeks, the median total CPAP days was 14–16 days for the overall cohort, but this varied substantially by GA subgroup. Infants born at 23-27 weeks required significantly longer CPAP than those born at 28–32 weeks.[2] A retrospective study of infants <30 weeks demonstrated a negative linear relationship between GA and PMA at successful trial off, with systematic reviews reporting mean PMA of **32–35 weeks** and mean weight of **1,600–1,900 g** at successful discontinuation across mixed GA populations.[3]

Readiness Criteria for CPAP Discontinuation: While no universal guideline exists, the following criteria are consistently used across major clinical trials and institutional protocols:

Parameter	Readiness Criterion	References
CPAP pressure	≤5–6 cmH_2O	[1], [2], [3]
FiO_2	0.21 (room air), or <0.25	[2], [3], [4]
Respiratory rate	<60 breaths/min (no persistent tachypnea)	[2], [3]
Work of breathing	No significant retractions	[2], [3]
Apnea/bradycardia	No significant apnea; ≤2 episodes in 12 h or ≤3 in 24 h (none requiring bag-mask ventilation)	[2], [3]
Oxygen saturation	SpO_2 >90% most of the time; <5% of time with SpO_2 <80%	[3]
Active comorbidities	Not currently being treated for hemodynamically significant PDA or sepsis	[3]
Tolerance off CPAP	Tolerates ≥15 min off CPAP during nursing cluster care	[3]

Failure Criteria (Indicating Need to Resume CPAP)
The Jensen et al. RCT (JAMA Pediatrics, 2018) defined failure criteria that are widely referenced:[8]

Persistent tachypnea (RR ≥70 breaths/min)
Increased work of breathing (intercostal retractions)
Increased oxygen requirement >10% above baseline to maintain SpO_2 >90%
>3 episodes of bradycardia (<70 bpm) or desaturation (<70%) in 24 hours
Major apnea/bradycardia requiring positive pressure ventilation
Transcutaneous CO_2 increase >2.0 kPa from baseline
If failure criteria are met, CPAP should be resumed and a new weaning attempt delayed at least 24 hours.[10]

Weaning Strategy: Gradual Pressure Wean vs. Sudden Discontinuation
Two major RCTs have compared these approaches:

Jensen et al. (2018): 372 infants <32 weeks, found **no significant difference** in total CPAP days between sudden

discontinuation (from 5 cmH_2O) and gradual pressure wean (1 cmH_2O/day down to 4 cmH_2O). However, the pressure wean group had a shorter time to successful wean (3 vs. 4 days, p = 0.003).[8]

Kakkilaya et al. (2021): 226 infants ≤32 weeks, similarly found **no difference in total CPAP days** (median 16 vs. 14 days). However, gradual weaning to 3 cmH_2O significantly reduced failed first attempts (27% vs. 43%, p < 0.01), particularly in infants **23–27 weeks GA**, who were 2.4 times more likely to succeed on the first attempt with gradual weaning.[2]

A quality improvement study implementing standardized gradual pressure weaning guidelines improved successful first-attempt weaning from **9.5% to 54%** (p < 0.001) and reduced time to full oral feeds by 7 days.[9]

Emerging Evidence: Extended CPAP
Recent data suggest that **extending CPAP beyond the point of clinical stability** may confer lung growth benefits. A randomized trial (100 infants ≤32 weeks) found that 14 days of extended CPAP (eCPAP) in stable infants breathing room air, compared with immediate discontinuation, resulted in:[10][11]

Significantly greater increase in FRC through discharge (27.2 vs. 17.1 mL, p = 0.01)
Significantly higher alveolar volume at 6 months corrected age (500 vs. 418 mL, p = 0.033)
Improved DLCO and forced expiratory flows at 6 months

A secondary analysis of the same trial showed eCPAP reduced intermittent hypoxemia episodes by **~94 episodes per 24 hours** (p < 0.0001), with 66% of this effect mediated through increased mean SpO_2.[12] These findings suggest that extending CPAP for an additional 2 weeks in stable preterm infants may promote lung growth and reduce intermittent hypoxemia during a critical developmental window, though larger multicenter trials are needed before this becomes standard practice.

Practical Summary
CPAP duration should be individualized based on clinical stability rather than a predetermined timeline. Most infants are ready for a weaning trial when on ≤5 cmH_2O in room air with stable respiratory effort and minimal apnea/bradycardia. Gradual pressure weaning (1 cmH_2O/day) reduces failed first attempts, especially in the most immature infants. The emerging eCPAP data raises the possibility that continuing CPAP beyond traditional stability criteria may benefit lung development, but this remains investigational.

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Criteria to Wean CPAP Pressure

The recommended approach is **gradual pressure weaning, reducing CPAP by 1 cmH_2O at defined intervals** which significantly improves first-attempt weaning success, particularly in the most immature infants (<28 weeks), without prolonging total CPAP duration.[1][2][3] Three main weaning methods have been studied; graded time-off cycling is now generally disfavored, while gradual pressure wean and sudden discontinuation produce equivalent total CPAP days but differ in first-attempt success rates.[1]

Step 1: Readiness Criteria to Initiate Pressure Weaning - Before beginning any pressure reduction, the infant must demonstrate clinical stability. The criteria used across the major RCTs and QI studies are consistent:

Parameter	Criterion to Initiate Weaning	References
CPAP pressure	Currently on ≤5–6 cmH_2O	[1], [2], [3]
FiO_2	0.21 (room air)	[1], [2], [3]
Respiratory rate	<60 breaths/min	[3]
Work of breathing	No significant retractions	[1], [3]
Apnea/bradycardia	No clinically significant episodes (≤2 in 12 h or ≤3 in 24 h)	[3], [4]
SpO_2	≥90% sustained	[3]
Active comorbidities	No hemodynamically significant PDA or active sepsis	[3]
Tolerance off CPAP	Tolerates ≥15 min off CPAP during cluster care	[3]

Step 2: Gradual Pressure Weaning Protocol - Three evidence-based protocols have been studied, differing primarily in the rate of pressure reduction and the final pressure before discontinuation:

Protocol A — Jensen et al. (JAMA Pediatrics, 2018; 372 infants, <32 weeks)
- Reduce CPAP by **1 cmH_2O every 24 hours** from the starting pressure (typically 5 cmH_2O) down to **4 cmH_2O**
- At 4 cmH_2O, discontinue CPAP entirely
- If failure criteria are met during the wean, increase pressure back up by 1 cmH_2O
- If failure occurs after discontinuation, recommence CPAP and reattempt after ≥24 hours[1]

Protocol B — Kakkilaya et al. (J Pediatr, 2021; 226 infants, ≤32 weeks)
- Reduce CPAP by **1 cmH_2O stepwise** from 5 cmH_2O down to **3 cmH_2O**
- At 3 cmH_2O, discontinue CPAP
- This protocol produced significantly fewer failed first attempts (27% vs. 43%, $p < 0.01$) and fewer infants needing ≥2 attempts (5% vs. 20%, $p < 0.01$) compared with sudden discontinuation from 5 cmH_2O
- Infants 23–27 weeks GA were **2.4 times more likely** to succeed on the first attempt with this approach[2]

Protocol C — Amatya et al. (J Perinatol, 2017; 70 infants, 26–32 weeks)
- Reduce CPAP by **1 cmH_2O every 8 hours** from 5 cmH_2O down to **3 cmH_2O**
- At 3 cmH_2O, discontinue CPAP
- First-attempt success: 67% (gradual) vs. 40% (sudden), $p = 0.03$[3]

Step 3: Criteria to Proceed With Each Pressure Reduction Step - At each pressure level, the infant must remain stable for the defined interval (8–24 hours depending on protocol) without any failure criteria, which also serve as criteria to halt the wean and increase pressure, are consistent across major trials:[1][2][8]

- Persistent tachypnea (RR ≥60–70 breaths/min for >2 hours)
- Increased work of breathing (intercostal retractions)
- Increased FiO_2 requirement >0.10 above baseline to maintain SpO_2 >90%
- >3 episodes of bradycardia (<70 bpm) or desaturation (<70%) in 24 hours
- Any apnea/bradycardia requiring positive pressure ventilation
- Transcutaneous CO_2 increase >2.0 kPa from baseline (if monitored)
- Respiratory acidosis (pH <7.2, $PaCO_2$ >65 mmHg)

If any failure criterion is met during pressure reduction, the pressure should be **increased back by 1 cmH_2O** and the infant reassessed. A new weaning attempt should not be made for at least **24 hours** after the readiness criteria are again met.[1]

Step 4: Post-Discontinuation Monitoring - After CPAP is fully discontinued, the infant should be monitored for **5–7 days** for signs of weaning failure.[8][10] Successful weaning is typically defined as remaining off CPAP for 5-6 consecutive days without meeting failure criteria.[8][10]

Quality Improvement Evidence
A 2025 QI study implementing a standardized gradual pressure weaning guideline (similar to Protocol B) revealed that successful first-attempt CPAP weaning improved from **9.5% to 54%** ($p < 0.001$), and time to full oral feeds decreased by 7 days (29 → 22 days, $p < 0.001$), with no increase in BPD or total respiratory support days.[11]

Weaning Methods to Avoid

Graded time-off cycling (progressively increasing hours off CPAP per day) has been shown to prolong CPAP and oxygen duration and increase the risk of BPD and length of hospital stay compared with either sudden wean or pressure wean, and is generally not recommended.[1][9]

"More infants born before 28 weeks of gestation were successfully weaned from nCPAP during the first attempt in the pressure wean group compared with the sudden wean group (risk difference, 31%; 95% CI, 13%-50%), but there was no difference in the duration of nCPAP and oxygen supplementation."[1]

Practical Summary
The best-supported protocol for most NICUs is to initiate weaning when the infant is stable on ≤5 cmH_2O in room air with no significant apnea, then **reduce by 1 cmH_2O every 8–24 hours down to 3–4 cmH_2O** before discontinuation. This approach is particularly important for infants <28 weeks GA, where it roughly doubles the likelihood of first-attempt success. Standardizing this protocol through unit guidelines has been shown to dramatically improve weaning outcomes.[11]

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