

Thermoregulation and Incubator Top Down

There is no published standard of care specifying a goal time to close the incubator top after NICU admission. The literature focuses on achieving and maintaining normothermia (36.5–37.5°C) as the primary goal, rather than prescribing a specific time target for incubator closure.[\[1\]\[2\]](#)

What the evidence supports: The overarching principle is to minimize incubator openings and thermal disruptions during the admission process, particularly for very preterm infants.[\[3\]](#)

Key recommendations include:

Infants should be placed in a prewarmed, double-walled incubator with appropriate humidity (commonly 70–80% for extremely preterm infants) on NICU admission. The polyethylene wrap should remain in place until the incubator environment is stable.[\[4\]\[5\]](#) The goal is to complete admission tasks (lines, assessments, stabilization) as efficiently as possible and close the incubator.[\[3\]](#) Andersen et al. (2026) advocate reframing neonatal thermal care as "actively managing thermal and vapour gradients" and emphasize minimizing incubator openings as a key evidence-based strategy.[\[3\]](#)

Common institutional practices (not evidence-based standards) typically aim to have the incubator closed within 60–90 minutes of admission, with the understanding that sicker or more premature infants requiring extensive stabilization may take longer. Many quality improvement initiatives target admission temperature as the measurable outcome rather than incubator closure time per se.

The most actionable metric is admission temperature. The WHO and multiple neonatal societies define hypothermia as <36.5°C, and achieving admission normothermia is the quality benchmark most NICUs track.[\[2\]](#)

References

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Overview: Golden Hour QI in the NICU centers on standardizing the first 60 minutes after birth for extremely preterm infants, with thermoregulation as one of the most consistently included and most reliably improved bundle elements. A 2025 scoping review of 34 Golden Hour QI protocols in infants ≤ 32 weeks found thermoregulation in 24/34 protocols, with reported improvements in mortality, BPD, IVH, NEC, and sepsis, though protocol content and outcome definitions vary widely enough to limit cross-study comparison.^[1] Reviews since the first NICU adoption in 2009 consistently report reduced hypothermia and hypoglycemia, faster IV access and fluid/medication initiation, and lower BPD, IVH, and ROP.^[2]

Representative QI results

- **Single-center, <27 weeks** - a multidisciplinary Golden Hour protocol reduced hypothermia from 59% to 26% (Phase I) and 38% (Phase II), hypoglycemia from 18% to 7% to 4%, and median minutes to completed stabilization from 110 to 92.^[3]

- **Thermoregulation bundle ≤ 32 weeks/VLBW** - anticipation and staff preparedness, polyethylene wrap, polyethylene-lined bonnet, and servo-control mode at birth and during transport increased normothermia from 33% to 60%, raised mean admission temperature from 36.10°C to 36.52°C, and cut moderate hypothermia from 41% to 12%.^[4]

- **Golden Hour neuroprotection bundles** - extend thermoregulation into a broader IVH-prevention package (antenatal steroids and magnesium, delayed cord clamping, early CPAP, midline head positioning with head-of-bed elevation, minimal handling, caffeine, restricted sampling), where bundled adoption has repeatedly improved physiologic targets and in several initiatives reduced IVH.^[5]

- **Achieving closed (top-down) incubator care as a QI outcome** - The most directly relevant recent work is the University of Virginia improvement-science initiative (Heitkamp et al., 2026), which is notable for using time from admission to incubator closure as the primary outcome measure for infants <28 weeks:^[6]

Baseline average admission time was 117 minutes; SMART aim was ≤ 87 minutes.

PDSA 1: designated admission coordinator, structured flowsheet, visible timer for team awareness.

PDSA 2: line-placement efficiency, auditory timer, team huddle at 15 minutes, and earlier incubator closure explicitly to promote thermoregulation.

Result (n=106): average admission time fell from **117 to 59 minutes (50% reduction)**; proportion meeting the aim rose from 8% to 100%, with reduced process variability.

Process measures worth tracking alongside closure time in a local project: time to glucose check, IV dextrose, X-ray, and surfactant.^[6]

Physiologic rationale for closing the incubator early

A closed convective incubator reduces evaporative and convective losses that an open radiant warmer cannot control, and humidity is the dominant modifiable variable. Modeling work in closed incubators shows a $\pm 20\%$ change in relative humidity requires roughly a 1.5–2.0°C compensatory change in air temperature depending on weight and gestational age, which argues for setting humidity and air temperature together rather than titrating temperature alone.^[7] Delivery-room adjuncts remain the upstream foundation: ambient temperature $\geq 23^\circ\text{C}$, plastic bag/wrap with a cap, radiant warmer, and warmed humidified gases, with exothermic mattresses as an option (Class 2b) and an explicit caution that warming bundles increase hyperthermia risk.^{[8][9]}

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