

## CASE STUDY

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# Not Too Hot, Not Too Cold

Sustained Improvements in Normothermia Rates through participation in CPQCC's Delivery Room Management QI Collaborative

### SUMMARY

Through participation in the CPQCC Delivery Room Management Quality Improvement Collaborative, Kaiser Permanente Fontana Medical Center was able to improve normothermia rates from 40% to 67% at the end of the 12-month intervention period. The team went on to reach and maintain its goal normothermia rate of above 90% for all infants from 2014-2016. Kaiser Fontana Medical Center's success demonstrates the importance of the collaborative QI model in helping centers achieve and sustain improvements in neonatal care.

## Background

In 2011, CPQCC developed a Delivery Room Management Toolkit<sup>i</sup> and implemented a Delivery Room Management Quality Improvement Collaborative. According to the Perinatal Quality Improvement Panel (PQIP) Program Manager Courtney Nisbet, "PQIP voted and chose delivery room management based on the trends in CPQCC data, evidence of changing/emerging practice in this area, and the importance to disseminate this information to members throughout the state." The toolkit provides updated, evidence-based guidelines for infant resuscitation and served as the basis for the Collaborative which aimed to reduce risk and improve outcomes at delivery. While all babies require delivery room management, the smallest infants often have immature organs, need extra care, and benefit most from interventions. Without appropriate care, these infants may experience hypothermia and respiratory problems, thus increasing their likelihood of morbidity and mortality.<sup>ii</sup>

The Delivery Room Management Collaborative involved implementation of a change package, developed by an expert panel, described in Table 1.<sup>iii</sup> The package focused on items such as maintaining a normal temperature and utilizing a checklist for high-risk neonatal resuscitation. The 12-month collaborative utilized CPQCC's standard approach to quality improvement, which is based on a model developed by the Institute for Healthcare Improvement.<sup>iv</sup> Participating members regularly reviewed their data and collaborated with other sites during monthly webcasts. Site representatives met with members of the expert panel to discuss their data and design action plans. Collaborative participants were able to decrease hypothermia from 39% to 21% in the 12-month period, whereas the decrease in hypothermia in hospitals conducting independent quality improvement projects and those not participating in any QI efforts in delivery room management decreased from 38% to 33% and 42% to 34% respectively in the same time period, pointing to the success of the collaborative QI model. Furthermore, participants in the collaborative model were also able to decrease delivery room intubation from 53% to 40%, and the use of surfactant in the delivery room from 37% to 20%.<sup>v</sup> Compliance with the readiness bundle described in the change package (i.e. items 1 and 2 from Table 1) among the Collaborative sites, increased from a baseline of zero to a median of 71%.

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**Table 1. CPQCC Delivery Room Management Quality Improvement Collaborative Change Package**

1. Use a checklist to prepare for all high-risk neonatal resuscitations.
2. Improve teamwork and communication in the delivery room using briefings, debriefings, and other methods. At minimum, each resuscitation requires a briefing and debriefing.
3. Obtain a pulse oximetry reading by 2 minutes of life and continuously monitor the heart rate and oxygen saturation in the following situations at minimum: <ul style="list-style-type: none"><li>○ VLBW infant</li><li>○ Whenever positive pressure ventilation is required</li></ul>
4. Maintain normal temperature.
5. Optimize initial respiratory support: <ul style="list-style-type: none"><li>○ Early use of CPAP (within 60 seconds of life)</li><li>○ Avoid intubation (if possible)</li><li>○ Avoid surfactant use in the delivery room</li></ul>
<b>Best practices 1 and 2 above were combined to form the “Readiness Bundle.” VLBW, very low birthweight; CPAP, continuous positive airway pressure. This table was adapted from Bennett et al. 2016.</b>

## Normothermia

An important aspect of the Delivery Room Management change package is maintaining a normal infant core temperature (normothermia). Infants quickly lose heat after birth and preterm infants are at a greater risk for hypothermia because their ability to regulate body temperature has not fully developed due to lower brown fat stores and immature skin. CPQCC’s Delivery Room Management Toolkit suggests the following normothermia techniques:

- **Ensure proper use of the radiant warmer in the delivery room by:**
  - Placing VLBW babies on an exothermic mattress
  - Ensuring timely placement of the sensor
  - Selecting “servo” control
  - Setting the appropriate “target” temperature for the servo control (often starting the skin temperature at 37°C)
- **Assign one person the task of monitoring and noting down the infant’s temperature every 5 minutes while in the delivery resuscitation area.**
- **For extremely low birth weight infants (e.g. < 28 weeks GA):**
  - Wrap the infant without drying by using a polyethylene occlusive dressing, or by placing the infant in a standard one-gallon food quality polyethylene bag
  - Place a cap on the infant’s head
  - Utilize chemically activated heat packs specifically designed for neonatal use below the pre-warmed blankets on which the infant is placed
  - Ensure minimum delivery/resuscitation room ambient temperature of 26° C (77° F)

## One hospital’s story

Kaiser Permanente Fontana Medical Center, a participant in the Delivery Room Management Collaborative, was able to successfully increase normothermia rates for their infants to 90%. Their experience demonstrates how normothermia improvement was sustained, and even further improved, after the Collaborative concluded and highlights lessons that may be useful for other Neonatal Intensive Care Units.

The Kaiser Fontana Medical Center NICU had been working on improving normothermia for several years, having increased rates from 14% in 2006 to between 40-60% prior to the start of the Delivery Room Management Collaborative. In 2011, the center decided to join the Collaborative in an attempt to further their improvements.

## A bundle approach to improving normothermia

Kaiser Fontana Medical Center began working on normothermia by implementing a bundle of interventions that included:

- **Staff education regarding the importance of normothermia and optimal practices**
- **Maintaining the labor and delivery room and operating room (LDR/OR) temperature at 23°C (74°F)**
- **Use of exothermic mattresses, pre-heated radiant warmers, saran wrap, head caps, and warm towels to maintain infant temperature**
- **Transport from LDR/OR to NICU in a servo-controlled unit**
- **Recording axillary temperature every 5 minutes in the LDR/OR**
- **Taking the axillary temperature within 15 minutes of admission to the NICU**

The normothermia bundle was adapted from the techniques suggested in the Delivery Room Management Toolkit and made to work within the context of Kaiser Fontana Medical Center's NICU. Dr. Dilip Bhatt, a Neonatologist and one of the leaders of the normothermia improvements at Kaiser Fontana Medical Center emphasized the importance of customizing best practice bundles to ensure they are "acceptable to you and what is feasible in your hospital." He further stressed that a "bundle is not a static thing, it has to be variable. If the temperature is not successful, you need to change your bundle," and noted that it is important to debrief after every case in order to identify what can be done better next time.

A neonatal nurse practitioner (NNP) who participated in the QI effort said implementing the bundle approach helped the team to become more vigilant about maintaining temperatures within the target range. She explained that prior to joining the Collaborative, the team had a tendency to "overcook," whereas now "we are actually more careful of checking temperature." Another NNP shared that they now do not move the baby until the baby's temperature is within the optimal range.

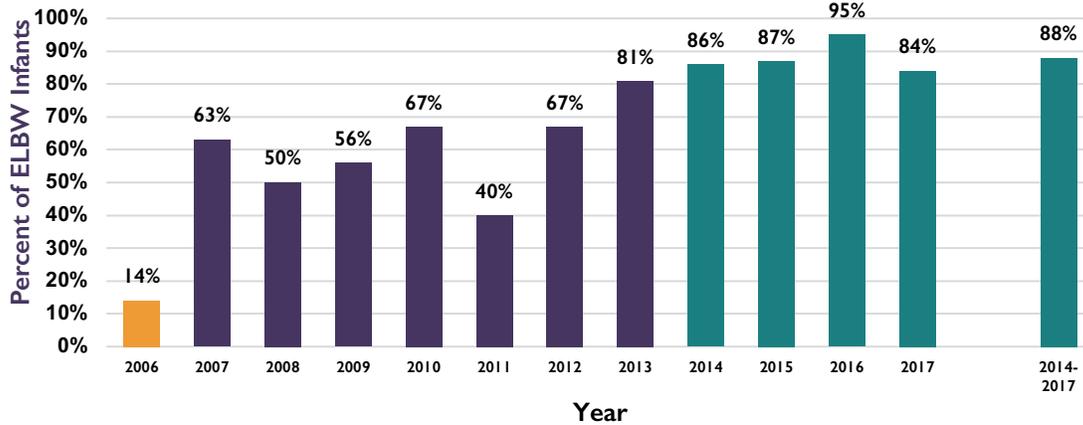
## Ensuring collaboration and engagement at all levels

Engaging all levels of care and providing education to staff is critical to the success of a quality improvement effort. Dr. Nirupa Reddy, a NICU Hospitalist and normothermia leader at Kaiser Fontana Medical Center, explained that they engaged with staff at "all of the levels of meetings that we have so that everyone who is providing care, from the bedside nurses to administrative staff, were on the same page." In addition, it is helpful to initiate efforts with key individuals, such as leaders from obstetrics and neonatology, so that they may help champion the interventions within their own teams.

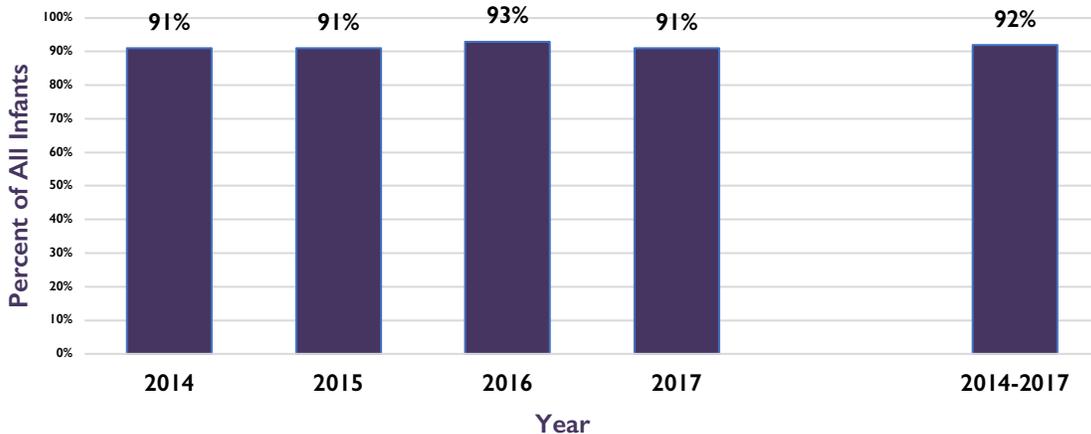
## Results

Through the course of the Delivery Room Management Collaborative, Kaiser Permanente Kaiser Fontana Medical Center was able to increase its normothermia (36.5-37.5 degrees Celsius) rate for ELBW infants from 40% to 67% at the end of the 12-month period. The team went on to reach and maintain its goal normothermia rate of above 90% for all infants from 2014-2016. Normothermia rates for extremely low birth weight infants (ELBW) are shown in Figure 1 and for all infants in Figure 2<sup>v</sup>.

**FIGURE I. Normothermia for ELBW Infants (36.5-37.5 °C)**



**FIGURE 2. Normothermia for All Infants Admitted from Labor and Delivery to the NICU (36.5-37.5 °C)**



Since 2014, the Kaiser Fontana Medical Center NICU has maintained a moderate hypothermia (<36 °C) rate of 0% and hyperthermia (>37.5 °C) of 8.3%. In this same time period, the lowest ELBW temperature was 36.0°C and highest ELBW temperature was 38.8 °C. Of the 12 ELBW preterms that were hyperthermic in the last four years, 100% (12/12) had negative blood cultures, 42% (5/12) had mothers with placenta pathology positive for chorioamnionitis, and 100% (12/12) were discharged home with no mortalities.

### Sustaining quality improvement

Monthly reporting, root cause analysis, and interdisciplinary efforts were reported as key factors for sustained improvement. Dr. Reddy emphasized the importance of monthly reporting for sustained improvement stating, “I feel that accountability to other members of the team really helped [us] to stay on task. On a monthly basis we review all the data on our admissions and our normothermia rates and that gets reported in multiple different ways. ... We report [monthly] to the whole group, and then in our quality improvement meetings in perinatal QI and NICU QI, it’s reported on a monthly basis, too.” For Dr. Bhatt, real time data and making sure that all hospital groups are on the same page were vitally important to sustaining quality improvement.

## Conclusion

Providers at Kaiser Fontana Medical Center emphasized the importance of CPQCC toolkits in helping with local implementation of regional objectives. They also emphasized that monthly reporting and monthly webcasts were critically important to their success; these allowed each NICU team to share with other sites their successes and failures to date. Collaboration allowed them to learn from other teams and bring those lessons back to their own NICU.

Kaiser Permanente Fontana Medical Center's experience in the Delivery Room Management Collaborative demonstrates the success of the collaborative quality improvement model in facilitating sustained improvement in clinical outcomes, in this case in rates of normothermia. Key factors to sustaining improvement after the collaborative concludes include monthly reporting, in-depth case review, and interdisciplinary efforts.

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<sup>i</sup> Bell, Richard, et al. "Delivery Room Management Quality Improvement Toolkit." California Perinatal Quality Care Collaborative, [www.cpqcc.org/sites/default/files/DRToolkitUpdateFinal5-18-11.pdf](http://www.cpqcc.org/sites/default/files/DRToolkitUpdateFinal5-18-11.pdf).

<sup>ii</sup> "Delivery Room Management of the VLBW Infant." California Perinatal Quality Care Collaborative, [www.cpqcc.org/qi-tool-kits/delivery-room-management-vlbw-infant](http://www.cpqcc.org/qi-tool-kits/delivery-room-management-vlbw-infant).

<sup>iii</sup> Bennett, Stacie C., et al. "Implementing Delivery Room Checklists and Communication Standards in a Multi-Neonatal ICU Quality Improvement Collaborative." *The Joint Commission Journal on Quality and Patient Safety*, vol. 42, no. 8, 2016, pp. 369–376., doi:10.1016/s1553-7250(16)42052-0.

<sup>iv</sup> Institute for Healthcare Improvement (IHI). *The Breakthrough Series: IHIs Collaborative Model for Achieving Breakthrough Improvement* IHI Innovation Series white paper, IHI, Cambridge, MA, 2003.

<sup>v</sup> Bhatt, Dilip, et al. "Delivery Room Temperature at 74 Degrees F Can Achieve Normothermia in Extremely Low Birth Weight Infants: A Single Unit Multidisciplinary Team Efforts and Quality Improvement." *Pediatric Academic Societies Conference*, 2017.

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