Measure: Thermal Condition of Low Birth Weight Neonates Admitted to Level 2 or Higher Nurseries in the First 24 Hours of Life

Measure Developer: Collaboration for Advancing Pediatric Quality Measures (CAPQuaM)

Numerator	Denominator	Exclusions	Data Source(s)
Number of children whose first temperature after arrival to the level 2 or higher nursery falls within the following criteria: cold (< or =34.5), very cool (34.51-35.50), cool (35.51- 36.50), euthermic or about normal (36.51-37.50), and overly warm (> 37.5).	All infants born in a medical facility with birth weights less than 2,500 grams and admitted to a level 2 or higher nursery within 24 hours of birth.	Numerator Exclusions: None. Denominator Exclusions: Neonates with comfort care, neonates with anencephaly; and/or optional: Neonates managed with hypothermia for therapeutic reasons and for whom the decision to initiate hypothermia preceded the first temperature in the special or intensive care nursery. Described further in technical specifications.	Hybrid of administrative claims data and medical records (paper or electronic) data.

Measure Importance

Hypothermia is associated with the death of the infant prior to discharge from the hospital and with bleeding in the areas around the infant's brain, which can cause significant disabilities and developmental delays for these infants.[1]

Evidence Base for Focus of the Measure

Improvement in hospital outcomes for temperature has been demonstrated in the literature, and many approaches to improving infant outcomes have been described.[2]

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Advantages of the Measure

- This measure addresses a key safety and quality gap in inpatient care for low birthweight infants, many of whom are premature.

- This intermediate outcomes measure is closely associated with important long-term outcomes.

- This measure is highly feasible and based on data that are readily available and easy to abstract or to collect in real time.

- The measure treats temperature as over a range of the variable, making clinically appropriate differentiation along the range, rather than forcing it into a dichotomy, which is not consistent with clinical data and which invites controversy regarding where to define such a "good/bad" threshold. The measure avoids artificially defining where "hypothermia" begins.

- For ease of description, the use of five categories makes the measure easier to understand: cold, very cool, cool, about right, and too warm. These are all linked explicitly to defined temperature ranges and are consistent with our expert panel recommendations.

Levels of Aggregation Applicable to the Measure[3]

The measure was developed at the level of the hospital and is appropriate for comparison when a sufficient sample size is available at the hospital, State, regional, and national levels, as well as by payer and provider organizations.

Reliability and Validity of the Measure

- The reliability of methods for assessing temperature is very high using various types of thermometers.

- The measure is designed to identify births using administrative and/or claims data. Time values, temperature values, and clinical covariates are to be abstracted from the medical record. Demographic variables may come from either source. An electronic medical record or electronic data capture form could be used to collect temperature data and timing contemporaneously.

- The measure was derived from ratings that received very high face validity using the modified University of California Los Angeles (UCLA)/RAND Delphi process.

- The measure is more robust than historical approaches to measuring hypothermia. By using five categories, the impact of small measurement error is reduced compared with the commonly used dichotomous measures. In other words, a one category change is less consequential than the difference between normal and abnormal.

Measure Development and Testing

The measure developer tested the reliability of the measure using the New York State neonatal database. The database included reports from 20 level 2 nurseries, 27 level 3 nurseries, and 14 regional perinatal centers. The measure testing included all newborn infants from these facilities with a birth weight of 400-2499 grams whose admission temperature was 29^0 C or higher (thus, reducing the potential for including potential data errors).

Selected Results from Tests of the Measure

- Pretesting by CAPQUAM prior to measure development in three different New York City hospitals showed that cold stress was common, and that it puts low birth weight infants at risk for devastating outcomes before discharge, including death and hemorrhage into the brain.

- Increasing the temperature from 34.0 to 35.0⁰ C increases the relative chance of survival by 24 percent, from 35.0 to 36.0⁰ C by 26 percent, and from 36.0 to 37.0⁰ C by 27 percent, resulting in absolute risk reductions of 2.8 percent, 2.4 percent, and 2.0 percent, respectively.

- A core body temperature increase from 34.0 to 37.0⁰ C is associated with a relative decrease in mortality of 98 percent and an absolute decrease in mortality of 7.2 percent.

- As part of measure testing, thermal performance was assessed in all 7,553 babies admitted to level 2 or higher nurseries in New York State and included in the New York State department of health data base for 1 year. Using the measure specifications, 1.9 percent of infants were cold; 9.6 percent were very cool; and 48.0 percent were cool. These results are shown in Figure 1.

Figure 1. Categorical distribution of temperatures among infants admitted to level 2 or higher nurseries in New York State

2.6% 1.9%
9.6%
37.9%
48.0%

Cold Very Cool Cool About Right Too Warm
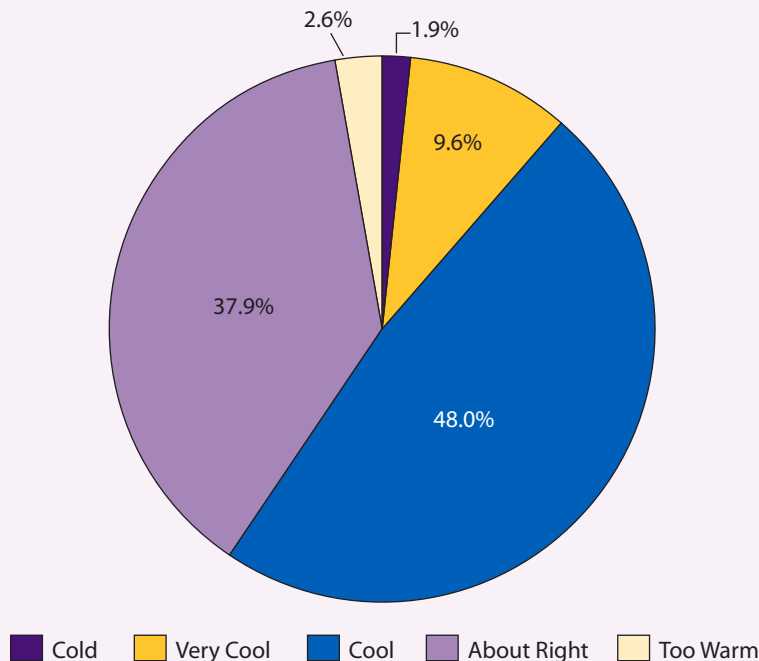
Caveat

Small sample sizes reduce precision of the measure. However, entities that pool data over multiple years when sample sizes are too small will be able to analyze results by subgroups if desired.

More Information

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- CAPQuaM: Lawrence C. Kleinman, MD, MPH, FAAP; drlarrykleinman@gmail.com.

- Coming soon: Link to measure details on the AHRQ Web site.

For more information about the PQMP, visit www.ahrq.gov/CHIPRA.

Notes

[1]Miller SS, Lee HC, Gould JB. Hypothermia in very low birth weight infants: distribution, risk factors, and outcomes. J Perinatol 2011; 31(Suppl 1):S49-56.

[2]Billimoria Z, Chawla S, Bajaj M, et al. Improving admission temperature in extremely low birth weight infants: a hospital-based multi-intervention quality improvement project. J Perinat Med. 2013 Jul;41(4):455-60. doi: 10.1515/jpm-2012-0259.

[3]The Children's Health Insurance Program Reauthorization Act (CHIPRA) required measures developed under this program to "permit comparison of quality and data at a State, plan, and provider level." The measure developer identified the intended levels of aggregation and comparison as reported here.