SUPPLEMENTAL LESSON

14

Bringing Quality Improvement to Your Resuscitation Team

What you will learn

- The rationale for introducing quality improvement (QI) methods into the delivery room
- Basic QI principles
- Potential QI projects for neonatal resuscitation teams

Key Points

1. In health care, multifaceted tasks such as neonatal resuscitation benefit from the application of quality improvement principles.
2. Quality improvement can address multiple aspects of neonatal resuscitation practice and outcomes.
3. A multidisciplinary team is a key component of effective quality improvement.
4. Project aims should be specific, measurable, achievable, realistic, and timely.
5. A balancing measure seeks to ensure that the quality improvement project is not leading to unintended adverse consequences.
6. Data collection and reporting can identify gaps and allow tracking of neonatal resuscitation performance.
7. As the team tracks data and develops ideas for changes to motivate improvement, a common method of testing change is the 4-phase Plan-Do-Check-Adjust (PDCA) cycle.

Case: A quality improvement project to reduce hypothermia in preterm newborns

A staff member who collects data for your hospital's participation in a statewide collaborative notices that several recent preterm newborns had hypothermia when they were admitted to your neonatal intensive care unit (NICU). The staff member brings this to the attention of the nurse manager and medical director. The team reviews data from the past 12 months and finds that the average temperature among the 20 babies born before 32 weeks' gestational age was 35.9°C. As admission hypothermia is associated with adverse outcomes for preterm newborns, a small, multidisciplinary quality improvement (QI) team is formed to address this problem. The team includes a neonatologist, neonatal nurse practitioner, NICU nurse, pediatric hospitalist, and respiratory therapist. The team also invites the hospital's quality improvement specialist to participate.

Upon further review of the data, the team found that 40% of the preterm newborns had an admission temperature below 36.5°C, meeting its definition of hypothermia. The team develops the following aim statement: We will decrease the rate of admission hypothermia in preterm newborns less than 32 weeks' gestational age from 40% to 20% during the next 12 months. A data collection form is created to track the implemented changes and their impact on the frequency of hypothermia. While reviewing its unit's practices, the QI team finds that thermoregulation practices vary according to the provider attending each delivery. The team reviews the literature and decides to standardize care by implementing a combination of interventions, including using polyethylene plastic wrap, a chemical warming mattress, and a cotton hat. In their hospital, 2 nurses attend each preterm delivery. The team decides that one of these nurses will be designated to be in charge of thermoregulation. This nurse will prepare the supplies, turn on the radiant warmer, place the temperature sensor, and monitor the steps of thermoregulation during resuscitation to ensure that the baby remains covered with plastic wrap.

The QI team meets monthly and reviews its data. The team posts a chart showing admission temperatures for all preterm newborns in a location where NICU staff can see it daily. After 3 months, the team finds that the average admission temperature has increased and there appears to be a trend toward a reduced rate of admission hypothermia. Looking more closely, they find that the improvement is noticeable for vaginal births but not cesarean births. Two representatives from the labor and delivery staff are invited to join the QI team. Over the next month, the QI team hosts educational huddles where the risk of admission hypothermia is discussed with the operating room staff. The

team implements a process to increase the operating room temperature before preterm cesarean births. There is a steady improvement in admission temperatures, the team's aim is achieved, and the team focuses on strategies to sustain the improvement.

The role of quality improvement in neonatal resuscitation

A newborn who requires resuscitation or stabilization after birth relies on well-trained health care providers. This textbook reviews the cognitive and technical skills necessary to become proficient in neonatal resuscitation. Participating in simulation and debriefing enhances the communication, leadership, and behavioral skills that are necessary for effective teamwork. Ultimately, the performance of health care providers and the outcomes of patients also depend on the system in which the patients receive their care. This includes the physical environment, policies, and culture of the health care setting. Quality improvement in health care aims to address these underlying aspects of care.

In health care, multifaceted tasks benefit from the application of QI principles. Several aspects of neonatal resuscitation make it a particularly good area on which teams can focus their QI efforts.

- Neonatal resuscitation is a complex process that may require infrequently used supplies and equipment.
- Teams with varying composition often assemble to work together with little advance notice.
- Practice is guided by an algorithm.
- There are measurable data that are relevant for processes in care and important patient outcomes.

This lesson gives an overview of basic QI principles as they relate to training and practice in neonatal resuscitation.

Identifying and describing the problem

Begin your neonatal resuscitation quality improvement project by identifying a problem and describing the process that needs to be improved. You can identify problems in your neonatal resuscitation process by surveying parents in your nursery or NICU, asking your staff about things that cause them dissatisfaction, reviewing patient safety reports or patient complaints, or auditing charts and comparing your patient outcomes with those from published reports or established collaborations. Observe a series of neonatal resuscitations from a parent's point of view. Are there processes or activities that you would find confusing, upsetting, or frustrating? Next, observe

resuscitations from a staff member's point of view. Are there processes or activities that are inefficient or distract staff members from important tasks?

Once you identify a potential problem, ask yourself a series of questions to further describe the problem. Following are some examples:

- What is the problem that we need to improve?
- Who are all of the people affected by this problem?
- During patient care, when does this problem happen?

Now that you have created a list of potential problems that could be improved, you need to prioritize them. Additional questions will help you judge the importance of potential QI projects.

- Is the problem an urgent patient safety issue?
- Do you have the experience and resources to solve a complex problem or do you need to start with a small project to improve the likelihood of success?
- Do you have access to the data needed to measure whether your project is successful?

Assembling a team to improve the problem

A multidisciplinary team is a key component of health care quality improvement, and this is particularly true for problems identified in delivery room care. While a specific process that needs improvement may be the target of a project that directly involves only 1 or 2 roles, other members of the delivery room team may have perspectives that provide helpful insights. A core QI team may include a physician/advanced practice provider, nurse, respiratory therapist, labor and delivery nurse, and patient advocate. Administrators, educators, lactation consultants, parents, and hospital-based QI experts can also be important members of a team. Specific projects may benefit from recruitment of other roles to the team. For example, a project aiming to improve management of the operating room environment or delayed umbilical cord clamping would benefit from other members of the obstetric team. A project that aims to ensure that the correct neonatal care providers are called to a delivery would benefit from involving unit clerks.

There are formal training programs and a broad literature base on the science and practice of quality improvement. Many hospitals will have clinicians and/or administrators with a substantial background in quality improvement who can provide valuable expertise even if they are not clinically involved in the delivery room.

Developing a specific aim

Next, develop a clearly stated and specific aim. The Institute of Medicine (IOM) has outlined 6 broad aims for health care improvement that can be used to help teams identify their own specific aims.[1] The IOM suggests that care should be

- **Safe:** Patients should not be injured by the care that is intended to help them.
- **Effective:** The care provided should be guided by scientific evidence.
- **Patient-Centered:** Decisions should be focused on the patient's best interest and goals.
- **Timely:** Care should be provided when it is needed and without delay.
- **Efficient:** Avoid wasting patient and staff time. Avoid wasting limited resources.
- **Equitable:** All patients deserve high-quality care, and we should work to eliminate disparities between racial, ethnic, and gender groups.

Your goal is to describe exactly what you hope to accomplish with this project. An acronym that has been used as a guide for developing a good aim is SMART. This acronym stands for Specific, Measurable, Achievable, Realistic, and Timely. It is based on principles outlined by the Model for Improvement from the Institute for Healthcare Improvement (Table 14-1).

Table 14-1. Steps for Developing SMART Aims

Step	Description
Specific	Have a precise goal. Example: *We will reduce the number of preterm newborns <32 weeks' gestational age who have hypothermia upon admission to the NICU by 20%.*
Measurable	Have a clear, understandable measurement that will make it possible to recognize an improvement. Example: *...defined as admission temperature <36.5°C.*
Achievable	Have actionable items that can be used to achieve the goal, such as evidence-based practices that have been shown to be effective. Example: *...using a bundle of preventive measures, including plastic wrap, chemical warming mattresses, cotton hats, and increasing ambient temperature.*
Realistic	Have appropriate resources, such as staff involvement, training, and equipment. Example: *...with plans for simulation training for all staff to implement strategies.*
Timely	Have a timeline that is realistic, yet creates a sense of urgency for the project. Example: *...within a time frame of 1 year.*
Final SMART Aim	*We will reduce the number of preterm newborns <32 weeks' gestational age with hypothermia upon admission to the NICU by 20%, defined as admission temperature <36.5°C, using a bundle of preventive measures, including plastic wrap, chemical warming mattresses, cotton hats, and increasing ambient temperature, with plans for simulation training for all staff to implement strategies, within a time frame of 1 year.*

Prioritizing your potential changes

Once your target for quality improvement has been identified and a specific aim has been described, the team can identify potential practice changes using evidence from published literature, interventions from similar QI projects at your own institution, practices in other local hospitals, and guidelines or toolkits developed by multicenter collaborative QI organizations. The team also can brainstorm about the specific circumstances in the local setting that have made it difficult to achieve the best outcomes for the targeted problem. This planning will help to inform the strategies in initiating and sustaining the project.

Data for quality improvement in neonatal resuscitation

Being able to track data efficiently and accurately is an important aspect of quality improvement. Depending on the targets of a project, some data may already be collected as part of clinical care, while other elements may be collected specifically for a project. In many situations, measures that describe a particular process in patient care, rather than the outcome of care, require additional data collection.

- For example, in a project to improve thermoregulation for preterm newborns, admission temperature may be routinely collected, but whether a thermal mattress was used in the delivery room may not be systematically collected.
- Another key process measure may be the actual ambient temperature of the operating room during a cesarean birth.

An important feature of data for quality improvement is the use of balancing measures. A balancing measure seeks to ensure that the QI project is not leading to unintended adverse consequences. For a project to reduce hypothermia, a balancing measure could be newborns who have hyperthermia upon admission to the NICU.

Tracking the improvement process

It is important to systematically follow the data collected through the improvement process. *Run charts and control charts* are common ways to track QI data.

A run chart is a simple method of visualizing change over time. It can help you identify trends and determine if the changes you made are leading to improvements. On the chart, the horizontal (x) axis represents time periods or cases in order, and the process or outcome being measured is plotted on the vertical (y) axis. The individual values are connected by a line.

- A run chart can be constructed relatively easily using a spreadsheet program, online tools, or even by hand.
- Two horizontal lines may be added to the chart. One line shows the mean (average) or median (middle) value of the process or outcome you are measuring during the monitoring period. The other line shows the goal or target chosen by your team for your SMART aim.
- For example, in a project tracking thermal management for preterm newborns, admission hypothermia would be the primary measurement being tracked (Figure 14.1). Baseline data prior to starting the QI project are necessary to have a sense of the goal, direction, and scale of change. Annotations can be made on the chart to show key time points when new processes were implemented.

Figure 14.1. A sample run chart illustrating admission hypothermia over time. The plotted values represent the percentage of preterm babies admitted with hypothermia each month. The project goal and the median (middle) value during the entire monitoring period are shown with horizontal lines. Important process changes are annotated on the chart.

Rules have been published to help you determine if the trends visualized on the run chart represent chance (random) variation or can be attributed to the practice changes you made. If you are interested in learning more about these rules, see the Additional Resources section at the end of this lesson.

A limitation of a run chart is that it may not be able to give assurance whether the observed trend is stable ("in control") or changing. To get a better sense of whether the process being measured is in control, QI teams use *control charts* (also called statistical process control charts or SPC charts).

- A control chart is a version of the run chart that includes additional horizontal lines called *upper and lower control limits*. These control limits are determined from historical data.
- If the variation in the outcome being measured is contained within the 2 control limits, it is stable and not changing more than what can be explained by chance variation.
- The upper and lower control limits are calculated by spreadsheet programs or QI software.
- Calculating control limits requires the collection of some baseline data. Frequently, at least 15 to 20 points are recommended.
- Once the process has changed and your measured outcome shows a sustained improvement beyond what can be explained by chance variation, the QI team may choose to recalculate the control limits.

An example of a control chart for the data collected during the thermal management project is shown in Figure 14.2.

Plotting data over time and employing control charts will prevent the QI team from overreacting to outliers. These are situations where an unusual outcome occurred for reasons not directly related to the QI project. Reacting too quickly to an undesirable outcome may lead to a lack of ability to discern the true result of a QI intervention. It may be helpful to recruit a colleague to the team who has experience with software for quality improvement. This person does not necessarily have to be directly involved with the perinatal/neonatal setting to provide their expertise to complement the clinical expertise of the other team members.

Figure 14.2. A sample control chart illustrating upper control limits (UCL) and lower control limits (LCL). After period 15, the team may choose to recalculate the control limits.

Cycles of improvement

As the team tracks data and develops ideas for changes to motivate improvement, a common method of testing change is the 4-phase Plan-Do-Check-Adjust (PDCA) cycle.[2] The *Plan* phase involves the team's efforts to review the relevant best practices in the context of the local setting and develop an initial set of changes designed to improve the problem. The *Do* phase involves the implementation of selected changes in processes, systems, or education. The *Check* phase includes tracking and reviewing data after the practice changes are implemented to determine if the goal has been achieved. In addition to reviewing the process or outcome in question, explore what you have learned from implementing the changes. Ask why improvement was observed or not observed. The *Adjust* phase involves taking action on what you have learned from this cycle, informing others of the results, implementing the tested changes widely and sustaining them if successful, or incorporating what you learned from this cycle into new changes that will inform the *Plan* phase of the next improvement cycle.

What is the difference between a research project and a quality improvement project?

A research project seeks to answer a question of whether a specific intervention leads to a better outcome. This may often involve randomizing a patient to the study intervention or a control intervention. In contrast, QI projects use existing evidence or best practices and seek to implement them for the appropriate patients more frequently, systematically, and efficiently. Usually, there is no randomization and no informed consent, as the interventions are already presumed to be beneficial to the patient. Quality improvement projects can be written into reports for the purpose of informing others to learn how to implement change in their setting.

Potential projects for quality improvement in neonatal resuscitation

The previous lessons have ended with lists of potential quality improvement opportunities. These and other potential projects are listed in Table 14-2.

Table 14-2. Potential Quality Improvement Opportunities in the Delivery Room
Having the appropriate team members at the time of delivery
Increasing the proportion of newborns with cord clamping delayed for 30-60 seconds
Having all of the ventilation corrective steps performed prior to alternative airway insertion
Decreasing delivery room intubation for preterm newborns by improving continuous positive airway pressure (CPAP) and positive-pressure ventilation (PPV) by mask
Having the target oxygen saturation in range at 5 minutes of age for preterm newborns
Providing 100% oxygen when initiating chest compressions

References

[1] Institute of Medicine Committee on Quality of Health Care in America. *Crossing the Quality Chasm: A New Health System for the 21st* Century. National Academies Press; 2001

[2] Institute for Healthcare Improvement Resources: How to Improve. Institute for Healthcare Improvement. 2018. Accessed December 10, 2020. http://www.ihi.org/resources/Pages/HowtoImprove/default.aspx

Additional Resources

Brady PW, Tchou MJ, Ambroggio L, Schondelmeyer AC, Shaughnessy EE. Quality Improvement Feature Series Article 2: Displaying and Analyzing Quality Improvement Data. *J Pediatric Infect Dis Soc.* 2018;7(2):100-103

Kakkilaya V, Jubran I, Mashruwala V, et al. Quality Improvement Project to Decrease Delivery Room Intubations in Preterm Infants. *Pediatrics.* 2019;143(2):e20180201

Lapcharoensap W, Lee HC. Tackling Quality Improvement in the Delivery Room. *Clin Perinatol.* 2017;44(3):663-681

Institute for Healthcare Improvement. Accessed December 10, 2020. http://www.ihi.org

Agency for Healthcare Research and Quality. Accessed December 10, 2020. http://www.ahrq.gov