

Optimizing Safety, Communication, and Teamwork in and Around the Pediatric Operating Room

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“Everyone has two jobs: to do their work and to improve their work.”

—Paul Batalden, M.D.

Abstract

The future of perioperative healthcare delivery, and anesthesiology services in particular, is bright. At the same time, the fundamental components of human interaction are being challenged in both predictable and unpredictable ways. Significant variations in quality of care provided to pediatric patients have been documented and lead to substandard care that contributes to diagnostic and medication errors. The quality of pediatric perioperative healthcare delivery is dependent on meaningful integration of past essential components of compassion, communication, caring, and curing into the future. This foundation of safety and reliability through prevention is essential by improving processes with a focus on customer service, evolving communication, enhanced teamwork, and through leveraging as well as understanding and respecting the human factors impositions of the culture, organization, and the limitations of technology.

All health care professionals caring for children should consider incorporating quality measurement and a focus on enhancing their team performance and safety into their practice. However, we need to focus on what is the right approach to take and the best questions to ask and address the challenges of aggregating scientifically imperfect tests of change. Effective teams use specific, structured techniques and behaviors that help communicate the appropriate messages in an efficient manner. These techniques and behaviors include: Checklists, Briefings, Debriefing, huddles, SBAR, I-PASS and tools to minimize distractions, critical language, and how to enable safe culture for psychological safety in the OR.

The future evolution of patient-centered care will need to focus on the best outcomes for the patient and address barriers to changes in the culture moving from the “be all” system where the patient adapts to the care model to one where the system is open to collaborating and redesigning the system with consideration of the patient and family’s needs. We define continuous quality improvement (CQI) as the daily use of QI methods to improve outcomes while engaging all practice staff. Quality improvement (QI) should become a central part of the work of pediatric clinicians where the patient is the central focus of the service, and all members of the team are focused on optimal and safe care of the patient moving through the perioperative arena. Performance improvement can help pediatric anesthesiologists to ask the right questions when seeking to drive improvement, prevent child harm, and improve the value of care.

Introduction

Health care services have evolved from primitive forms where harm was pervasive, with advances in technology, understanding, economic policy, and outcomes. At the same time potential for harm continues to exist including anesthesia-related causes of preventable injuries and errors, such as from medication errors, that continue to occur even after 30 years of applied research. (1) Ineffective communication and teamwork are flagged by The Joint Commission and the Closed Claims Project as critical elements in causing harm to patients. Increasingly, colleagues, patients, payers and certifying agencies expect such measurement to achieve the Triple Aim of better health, better care and lower cost. In addition, new payment models increasingly pay providers for demonstrated value rather than volume, and they expect participation in continuous improvement. Perioperative care continues to improve with waves of change and innovation that include less invasive procedures, more rapid recovery and shorter hospital stays. Quality and safety have been thrust to the forefront stimulated by novel revelations and renewed attention to limitations of processes and services despite the technologic and therapeutic advances. The care of children is especially dependent on a continued focus and innovation as caring for children of different sizes and communication capabilities carries a unique set of risks and challenges, particularly in the fast paced procedural environment.

The Clinical Microsystem: The Building Blocks of Safety

The building blocks for safe pediatric anesthesia care are the clinical microsystem. (2) The fundamental differences in quality of service to children are centered around the differences in provider interactions with the family unit and caregivers being of greater importance with respect to communication, engagement and satisfaction. Within this clinical microsystem is leaving a loved one, who may be incapable of effective communication, in the arms of a person who was met shortly before this transition. The microsystem is an organizing design construct in which social systems cut across traditional discipline boundaries. Because of its interdisciplinary focus, the clinical microsystem provides a conceptual and practical framework for simplifying complex organizations that deliver care that provides an important opportunity for organizational learning. Two separate and unique vulnerabilities meet when a child has surgery: The first is total reliance on a provider to care for and keep the patient safe during surgery and the second is the parent/caregiver trusting and completely relinquishing control/care of the patient. These together change the perspective and vision of quality and safety and put a premium on the importance of gaining swift trust and communicating with the family and the patient. Co-production of child perioperative care thus means inviting parents/caregivers into a meaningful decision-making collaboration while ceding control in order in an authentic family centered-care. (3) Younger children in particular have a limited ability to protect themselves and participate in care due to their inability to effectively communicate, but also due to a steep lack of knowledge and lack of understanding of the complex issues and environments in which we conduct pediatric anesthesia care. Most adults on the other hand can ask questions, express anxiety, answer questions and remind providers of allergies and report issues such as a leaking or a painful intravenous line, the need to urinate, or even the signs of a drug reaction such as shortness of breath and pruritis.

The complexity of healthcare production makes improvement in pediatric safety and quality virtually impossible using the same routines and approaches. In particular dealing with children and their families has long been recognized as an essential component of pediatric care. Effective and well designed communication is essential to convey important medical information from providers to providers through the system when the patient is unable to participate. The parent/family must be coopted as active team-members to help facilitate care, instructed what to look for and keep well informed to help keep the patient safe from ever present dangers including in successful activation of rapid response teams for improved outcomes. (4)

Advances in parental presence in the operating room and the importance of child life services have contributed to family and patient centered perioperative care and sense of security. At the same time the integration of the parent or caregiver into the procedural team can be leveraged to further the experience and quality of the perioperative interactions. While in manufacturing co-production has enhanced user satisfaction and integration, consumer ideas and input are highly sought for product enhancement, while the production of a service such as healthcare is dependent on the co-production between the provider and the patient and/or family to maximize the product/service. (3) In the perioperative period, improving integration of family centered care and communication can benefit from novel approaches to optimizing this relationship. Human factors and ergonomics, essentially engineering or redesigning the nature and quality of the interaction of people, technology and equipment, and tasks can create synergy using design as a stepping stone to foster greater team involvement of the family/caregiver in patient care delivery. (5) In the perioperative environment, elements of human factors can be used to redesign approaches to enhance communication and integration of teamwork to enhance satisfaction and improve care delivery.

The Role of Communication in Improving Safety and Quality

Communication in the workplace is the basis of effective, trusting and productive relationships. In the healthcare delivery arena, in particular, it is a critical component of all aspects of patient care and a fundamental tool for safeguarding and advancing the six domains of health care quality according to the Institute of Medicine: safe, effective, efficient, patient and family centered, equitable, and timely. (6) Communication is also the foundation for the triad of optimizing delivery of complex services such as healthcare: communication, teamwork, and customer satisfaction. However, barriers to effective communication can occur at any time, but broad categories of issues arise frequently. These include the impact of the digital domain and changes and challenges of education and learning from the generational divide. Understanding and addressing these human factors issues may enhance safety, help develop more meaningful processes that mimic the real work of anesthesia versus the imagined work, thus addressing real work and safety constraints, and enhancing the quality of the teamwork. (7)

Communication manifests in four major ways to improve both safety and quality of pediatric perioperative care: a) family centered communication and teamwork, b) facilitating and enhancing communication through a climate to foster and enable family and health care providers to speak up, c) enhancing reporting or communication of issues, problems and events after they occur, and d) patient and family quality and assessment postoperatively (patient reported outcomes (PROM)).(8) The first focus of family centered communication begins in including the family and the patient in the team. Including the family in rounds in the ICU improves satisfaction through connecting and generating comfort and confidence. (9) For the OR, the ideal place to involve the family could be in the pre-op area and during the surgical timeout. Since the timeout occurs in the operating room just prior to the procedure, this is not possible as we are not at the point of parent presence during operations, at least yet. One approach is to bring the OR to the family by using a “check-in” process immediately prior to going into the operating room in the pre-op area. This is effectively a redesign of the OR transition workflow to include the family and the patient in the a focused deliberate process. The OR nurse, holding room nurse, anesthesia providers, the patient and the family go over to the patient and discuss the issues, consents, sites, equipment needs and availability, allergies and all other issues in a team format and with a checklist. The patient and parents are directly engaged to verify correct procedure, identity and patient related issues and encourages their role in the peri- and post-operative care. This occasionally results in modification of the procedure, adding things such as blood draws or follow-up imaging studies, or even adding additional involvement of other providers. Inviting the family into this process directly engages the care team more meaningfully and facilitates the integration of equipment, procedures, and concerns prior to induction and when the family or caregivers are still present. This is likely most advantageous when the family is engaged through open-ended questions instead of statements about intent. (10) This directly impacts care through enhanced communication at the organizational wide level, addresses patient expectations and preparedness and engages with the family and care team members by improving family trust and confidence in the team. (11)

Creating a Culture of Trust: The Cornerstone of Safety

The second major way that quality and safety can be improved is by creating an environment where people feel empowered and safe to speak—the psychological safety. (12) This involves reducing or eliminating barriers to honest communication and building loyalty and trust versus the psychological danger of speaking up. A climate where asking questions is encouraged and fostered even if at times uncomfortable is essential to relieving the emotional burden of providers and meaningful communication where team members can honestly raise safety concerns and solutions. (13) This includes the family as well as all health care providers involved in the child’s care. Mapping of the patient/family interactions can help or hinder the effective and respectful utilization of the family as part of the team. Bringing the “OR to the patient and family” changes the balance of the team from “we know what we are doing” and “we know best” to the concept that “we want you to be part of the team to help assure the patient gets the best and safest care.” This acknowledgment by the surgical team of the primacy of the family in the surgical process can facilitate more attentive and respectful care and encourage team members to working more closely together at the outset. (14)

The Learning Organization: Capturing Process and Outcomes Failures

Outcomes in complex work depend on the integration of individual, team, technical, and organizational factors. A continuum of cascade effects exists from apparently trivial incidents to near misses and full-blown adverse events. Consequently, the same patterns of failure and their relationships precede both adverse events and near misses. Getting clinicians to report these events requires an environment that fosters a rich reporting culture to capture accurate and detailed data about nuances of care. (15) This requires efficient and effective communication through multiple modalities to capture events or concerns of quality and safety that can lead to awareness and measurement of opportunities for process improvement. Information about quality and safety comes in many different forms. Data can come from the electronic medical record: this includes adverse event data that can be tracked, chart reviews with the use of an electronic QI template, and the MPOG and ASPIRE databases (currently working on pediatric specific outcome metrics). Data may also come from electronic event reporting systems and in unrelated verbal daily safety check-ins. Lastly quality and safety data can come from the patient experience assessment from postoperative telephone calls made to every outpatient from a PACU nurse (16), and data can come from the patient experience team in the form of Press-Ganey survey or free text comments both electronically or hand written. The issues that are reported on address all facets of care ranging from simple dirty floors to drug errors, sedation gone awry and inadvertent extubation and include changes in care acuity, readmission, and

unexpected admissions. Patients and families have been shown to correctly assess the need for alerting rapid response teams. (4)

Any reported event or concern should be reviewed by at least 3 people to get a diverse assessment and evaluation of the reported data. In our hospital we use all of the previously mentioned methods for capture of events and concerns which are later reviewed by a nurse coordinator (for pediatric process improvement and patient safety), a surgeon and an anesthesiologist. A determination is made regarding what intervention is needed including but not limited to, initiating a multidisciplinary review with suggested process redesign and revised training in relation to process improvement, operational problems or personnel issues. Lack of retaliation, fear and ease to report are important to maximize reporting. (17) From the standpoint of quality, deficiencies in patient and family experience and satisfaction should be addressed through a team dedicated to this outcome measure. The follow up is also critical to prevent people from getting discouraged and to encourage future reporting. The use of family stories and their incorporation into team feedback, advisory committee and incorporating families into hospital committees and Board is valuable for their perspective. (18) We believe that many reporting channels are needed to ensure the system is aware of the safety and quality concerns that could pose harm to patients. Honest and timely communication of irregular events and concerns drives front-line ongoing engagement and improvement.

Tools to Measure Reliability, Teamwork and Effective Communication

The science of continuous quality improvement offers a powerful way of thinking about how to transform clinical operations and healthcare teams and how to measure reliability, teamwork and communication. There are five main quality improvement tools that we recommend every anesthesiologist should master— process maps, checklists, Ishikawa diagrams, run charts, and control charts—to improve the process, flow and outcomes of surgical care. (19) The tools help visualize, analyze, and track process and outcome data for both individual and groups of patients and should be used routinely by clinicians and healthcare systems to evaluate and improve care as well in the design of the built environment. (20) The tools can be used to achieve measurable improvements in the efficiency, effectiveness, performance, accountability, and outcomes of quality in services or processes of care. We know there is a tightly coupled relationship between non-routine events, teamwork and patient outcomes. (21)

We are going to focus here on the process map which is, in our minds, the most important quality improvement tool. The other tools can be seen here (22). A process map or a flowchart as in figure 1 is a visual representation of the care process that is created with information provided by team members. The process mapping exercise can help clinicians clarify through visualization what they know about their environment and determine what they want to improve about it. The process maps use common flow chart symbols and can describe the current state or baseline; the improved state in transition, and the optimal state. This exercise helps clinicians make assumptions and expectations explicit and can provide transparent insights on reflecting on their current state and importantly, into how to improve the process of care or to overcome barriers they perceive to its improvement. (2) Working with clinicians to understand their clinical sense-making is essential to sustain their interest and engagement in long-term continuous improvement. (23)

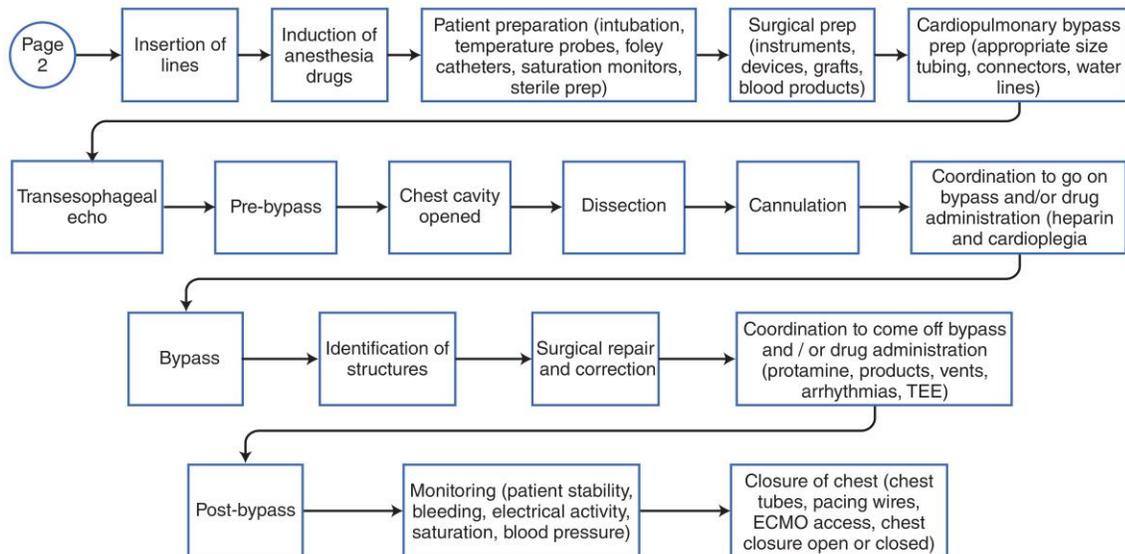


Figure 1. A process map of a pediatric cardiac surgical care operative processes (part of a larger perioperative process map that starts at the prehospital phase and continues through discharge). (22)

A high degree of process awareness often drives the design changes needed to sustain improvement at the individual and team levels. (24) Process mapping describes precisely what an individual provider is required to do and when, in terms of cognitive processes, actions, or both, to achieve the system’s goal. Data are collected from observations or interviews that carefully break down complex clinical processes into discrete, measurable, and clear tasks. Team members can gain insights into how they and their colleagues perceive the same tasks and hopefully come to a shared understanding of the process.

Ultimately, improving patient outcomes requires appreciating the inherent links between process and results. Process maps help focus improvement efforts, not for the individual, but for the entire clinical microsystem. Visualizing the process can also help identify inefficiencies (e.g., parallel or redundant processes that have emerged for whatever reason), clarify roles, and reduce ambiguity among team members, all of which can help coordinate patient care across services and microsystems. This process is particularly useful in improving surgical patient transitions of care and avoiding readmissions and bounce back to the intensive care and high-dependency units. (25)

Process maps show how interactions occur, uncover variations, and make the invisible perioperative processes visible. Process maps can be created at different levels of detail to illustrate the major phases or detailed activities in that process. It is important to map the current process, not the desired process, to identify opportunities for improvement. We have used process mapping in multiple surgical and non-surgical settings to better understand the processes of care, including pediatric cardiac surgery and to summarize the data on near misses and adverse events. (26)

Tools and Approaches to Overcome Unseen Barriers to Change

Most serious pediatric adverse patient events or industrial and banking disasters (i.e., NASA Challenger space shuttle disaster, the Italian Cruise Costa Concordia ship wreck, the Wall Street 2008 meltdown, etc), do not arise from single point errors, but from many people committing multiple seemingly innocuous errors over time that breach reasonable practice standards. Vaughan describes allowing such unseen process and decision errors to go unattended as ‘normalized deviance’. (27) By deviance, we mean organizational behaviors that deviate from normative standards or professional expectations. Outside people see the situation as deviant, whereas inside people get accustomed to it, seeing it as ‘routine, rational, and entirely acceptable’. Low hand-washing compliance before patient contact, minimal attending oversight of OR care at nights or on weekends, suppressing information about poor care, and the poor handoff communication between OR and ICUs and wards are examples of normalized deviance. (28)

Discussion of this sensitive matter using terms such as ‘normalized deviance’ frequently leads to defensive reactions that halt conversation and require deeper reflection and examination. Ashforth and Anand have described organizational normalized deviance as arising from three mutually reinforcing processes: institutionalization, Refresher Course Lectures Anesthesiology 2018 © American Society of Anesthesiologists. All rights reserved. Note: This publication contains material copyrighted by others. Individual refresher course lectures are reprinted by ASA with permission. Reprinting or using individual refresher course lectures contained herein is strictly prohibited without permission from the authors/copyright holders.

rationalization, and socialization. (29) During the institutionalization phase, repetitive practices are enacted without significant thought about the nature of the behavior. The cause of the behavior is often external to any one person; instead it emerges from group interaction and socialization.

A few of these barriers and potential solutions are listed in Table 1, which is based on input gathered from healthcare practitioners. Any of these factors may hold back an organization, but strong leadership cannot be overemphasized as one of the critical elements for effectively driving change initiatives in intensive care. To increase efficiency and close the chasm between optimal patient care and that which actually exists, leaders must abandon adherence to obsolete management models.

Table 1 Barriers to Perioperative Change and Potential Solutions*

Factors Inhibiting Change	Potential solutions
Lack of leadership support	Facilitate contact with peers successful in deploying the methodologies
Resistance or scepticism from staff	Develop stakeholder analysis and use a team-based problem-solving approach.
Hesitancy to invest time and money	Create a business case supported by sound data (i.e. if the project is to focus on reducing infections, document the costs associated with such occurrences including length of stay, supplies, and added labour).
Shortage of internal resources to lead change initiatives	Enlist outside help to drive initial projects or receive training and mentoring in conjunction with projects that produce immediate results
Waning commitment or flavour of-the-month syndrome	Implement a solid communication plan that reaches all levels of the organisation, and build momentum through early, visible wins
Uncertain roles and/or lack of accountability	Adopt management systems and structures that clearly link projects and performance with overall strategies.
This is how we do things here	Addressing actions or care practices that deviates from guidelines, standards or professional society (i.e. ASA) in non-punitive manner

* Adapted from Barach P. Addressing barriers for change in clinical practice. In: Guidet B, Valentin A, Flaatten H, editors. Quality management in intensive care: a practical guide. Cambridge: Cambridge University Press; 2016. ISBN 978-1-107-50386-1. (30)

Successful change in operating room practices will be a function of a willingness to adopt new changes, and challenge dogma and the widespread normalized deviance. Dissatisfaction with the present, a shared vision of the future, and mastery of a core set of process improvement tools are needed. Each of these elements is key and needs to be fully leveraged to bring about change. Change leadership is about tirelessly working on each of these elements. Change leadership is also about ensuring all the people in and around the operating room and those that oversee the surgical pathways in the organization understand the changes, believe in the personal and organizational impact, and have the capabilities and confidence to flourish in the necessarily changing environment.

There are, however, a number of barriers to successful change – both in terms of implementation and equally, if not more importantly, in sustaining it. Why are both kinds of change not more successful? Often, the failures can be traced to a few missing ingredients:

- a) A fundamental acceptance or realignment in thinking.
- b) Appropriate guidance or knowledge.
- c) Clear strategies and tactics for maintaining long-term results.

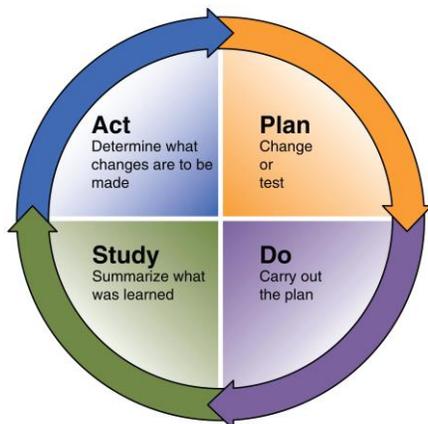
The upside to past improvement project failures is that they usually provide some valuable lessons for the future. For instance, organizations currently contemplating ERAS programs, introducing Surgical Site Infection prevention initiatives, as one aspect of transformation can learn from the experiences of other units, both inside and outside their hospital or healthcare system. While avoiding a ‘cookie cutter’ approach to change initiatives, such examination can provide useful insights into what worked well, and what gaps may have been overlooked.

The Science of Continuous Quality Improvement

Recognizing the barriers to change of clinical practices requires appreciating the heterogeneity and complexity of interventions implicit in improvement science, including rapid-cycle improvement methods, such as Plan–Do–Study–Act (PDSA) cycles that involve iterative cycles of planning, design, evaluation, and refinement of improvement strategies. (31) The Avedis Donabedian structure–process–outcome model provides the fundamental conceptual framework for delivery improvement evaluating the culture, service innovation in the delivery, and organisation of healthcare, and is encapsulated in the well-described PDSA cycle of quality improvement. (32) It is widely understood today that the first step towards improving the safety and quality of care is addressing the varying

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mental models held by care providers and managers. (33) Because mental models “limit us to familiar ways of thinking and acting,” every planning procedure must, at some point, expose and challenge the organization’s mental models. This does not mean that all mental models will be changed by a planning procedure and some of our mental models will have to change before we can improve our patient’s outcomes.



The implementation and evaluation of changes in structure and process are bound together in a recursive learning cycle of continuous quality improvement, at the heart of highly reliable organizational systems. (34) These HRO inspired systems are considered to be the most reliable and safe social technical systems in the world. Figure 2 shows a PDSA model builds on the Donabedian framework and provides clinicians with a structured theory–praxis methodology for routinely evaluating performance and answering the following questions:

- What are we trying to accomplish?
- Are we achieving what we claim and how effective and efficient are we?
- From where we are now, what changes can we make that will result in improvement?
- How will we know that we have achieved the change and that it is an improvement?

Figure 2. The plan-do-study-act cycle (22)

The PDSA continuous quality improvement cycle is founded on a thorough understanding of the process being evaluated, gained by detailed mapping of the process of interest, selection of appropriate measurement tools, and identification of an acceptable range of variance including in the physical design of the pediatric operating room and equipment and the reduction of hospital and ICU readmissions. (20, 35) The PDSA consists of a four-stage implementation process:

- Plan:** What is to be changed, in what way, and how is subsequent performance to be measured and recorded?
- Do:** Implement the plan and collect measurement data on process and outcome.
- Study:** Analyse the data and amend the plan to address the results of the analysis. Rework the process map to identify new nodes, connections, and issues.
- Act:** Implement the amended plan and collect the measurements again in an iterative recursive manner.

Summary

The most progressive view to define quality is that it is defined entirely by the customer, in our case the child and their parents/caregivers, and it is based upon evaluation of their entire perceived customer experience. (36) Improving teamwork is an important factor in the professional education of physicians in effort to produce insight, provide feedback, engage the team members, and track patient progress. Further integration of human factors and ergonomic redesign with the intent of better approaches to maximize the utility and effect improve patient outcomes. (37) In fact, it is a requirement for using CQI tools effectively. Indeed, ongoing quality improvement efforts are not about which tools are used but about how these tools can of the tools is essential, and this includes communication.

Teams that do not communicate well cannot deliver effective care but are merely groups of individuals working side by side. Effective teamwork and communication are critical to functioning safely in health care. They help groups navigate competing priorities, overcome issues associated with human factors, and reduce the risk of error. Anesthesia training must focus more intently on providing clinicians with the core competencies—the knowledge, skills and attitudes to more effectively communicate with the family and other providers and function as high reliable teams. (38) Anesthesiologists have been and will continue to be leaders in ensuring safe and reliable pediatric care. However, continued vigilance with regard to human factors and a deep and robust focus on systematic rather than personnel issues are vital to ensuring safe pediatric anesthesia. Continued research on how to improve the safety and quality of pediatric perioperative care will be driven by honest and respectful dialogue with providers. This will eventually lead to a deeper understanding of the systemic causes and mechanisms that cause harm and how best to develop resilience to help mitigate this harm and develop more reliable systems of care.

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