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Chapter 15. Pediatric Safety and Quality

Susan Lacey, Janis B. Smith, Karen Cox

Background

Pediatric inpatient safety and quality of care are dynamic and complex phenomena. Our intent is to inform the reader about efforts underway by pediatric stakeholders and specialty groups and to understand where credible information can be accessed pertaining to patient safety and quality in the provision of care for the hospitalized child. Over the past several years, pediatric groups have partnered to improve general understanding, reporting, process improvement methodologies, and quality of pediatric inpatient care. These collaborations have created a robust program of projects, benchmarking efforts, and research.

This chapter discusses general findings about safety and quality; major initiatives by agencies, groups, and collaborations; a guide to synthesis documents surrounding quality care and evidence-based practice for specific areas of pediatric care; and recommendations about how we can move pediatric safety and quality forward in practice and in the policy arena.

Patient safety literature and associated findings on adverse events for pediatric patients have been widely disseminated.¹⁻⁹ Much of the focus has centered on medication errors—the most frequently reported adverse event for both adult and pediatric patients. Indeed, the Institute of Medicine (IOM) reported that medication errors are the most common, yet preventable, type of harm that can occur within the pediatric population,¹⁰ and Bates¹¹ reported that when pediatric medication errors occur, these patients have a higher rate of death associated with the error than adult patients.

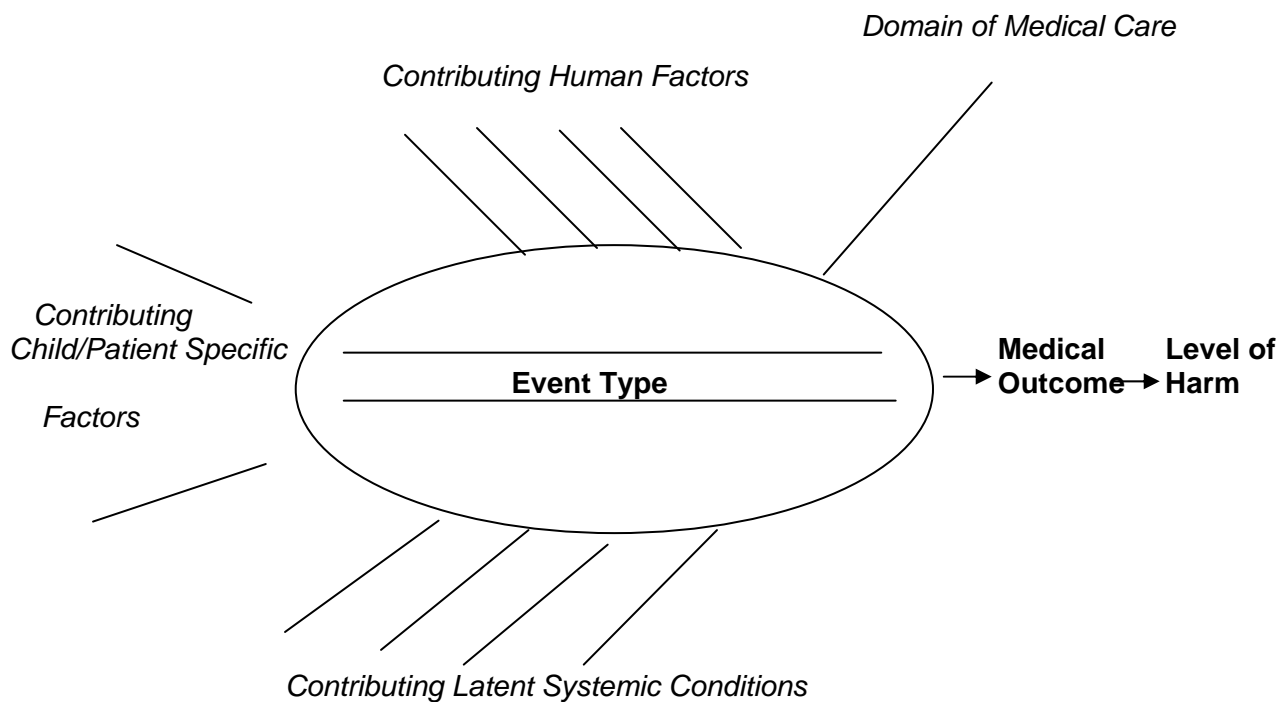
Medication errors, however, are only one potential adverse event for hospitalized children. Slonim and colleagues⁴ found 1.86–2.96 medical errors per 100 discharges of hospitalized children. Four distinct challenges confront those conducting research and caring for children.¹² These four related issues are each problematic, but in concert they create a high-risk environment for hospitalized children. Following are the four issues for pediatric patients, summarized from Beal and colleagues:¹²

- **Development:** As children mature both cognitively and physically, their needs as consumers of health care goods and services change. Therefore, planning a unified approach to pediatric safety and quality is affected by the fluid nature of childhood development.
- **Dependency:** Hospitalized children, especially those who are very young and/or nonverbal, are dependent on caregivers, parents, or other surrogates to convey key information associated with patient encounters. Even when children can accurately express their needs, they are unlikely to receive the same acknowledgment accorded adult patients. In addition, because children are dependent on their caregivers, their care must be approved by parents or surrogates during all encounters.
- **Different epidemiology:** Most hospitalized children require acute episodic care, not care for chronic conditions as with adult patients. Planning safety and quality initiatives within a framework of “wellness, interrupted by acute conditions or exacerbations,” presents distinct challenges and requires a new way of thinking.

- **Demographics:** Children are more likely than other groups to live in poverty and experience racial and ethnic disparities in health care. Children are more dependent on public insurance, such as State Children’s Health Insurance Program (SCHIP) and Medicaid.

All quality research is challenged to standardize frameworks and language under which all care providers operate. Each population has unique language and focused areas with no current common language across all specialty areas. Pediatric safety and quality efforts are further challenged as most of the work on patient safety to date has focused on adult patients. There is no standard nomenclature for pediatric patient safety that is widely used. However, a standard framework for classifying pediatric adverse events that offers flexibility has been introduced.¹³ The model, seen in Figure 1, allows for analysis and depicts the relationships and interactions of the elements of an event.

Figure 1. Conceptual Model of a Patient Safety Taxonomy



Standardization provides consistency between interdisciplinary teams and can facilitate multisite studies. If these large-scale studies are conducted, the findings could generate large-scale intervention studies conducted with a faster life cycle. More rapid acceptance of efficacious improvement strategies should result.

Leaders in Pediatric Safety and Quality

Agency for Healthcare Research and Quality

The Agency for Healthcare Research and Quality (AHRQ) is the Federal authority for patient safety and quality of care. AHRQ has been a leader in funding safety and quality improvement efforts, synthesizing and disseminating findings to clinicians and the public for more than two decades to stimulate both scientific and policy dialogue. AHRQ has been a leader in pediatric quality and safety. Within the agency, the Children's Health Advisory Group is a resource for AHRQ's senior leaders that helps focus work in key topic areas as the state of the science changes. A focus of AHRQ funding is translational research, which moves scientific findings to health care settings across the care continuum. Projects funded by AHRQ help determine where gaps in safety and quality exist.¹⁴

AHRQ also sponsors the Health Cost and Utilization Project (HCUP), a family of databases supported by a Federal-State-industry partnership. One of the databases is the Kids Inpatient Database (KID). HCUP is the largest information source of patient encounters in both inpatient and outpatient settings. All HCUP databases contain more than 100 variables linked to patient care, including both clinical and charge data. All patient identifiers are removed to protect patients' confidentiality. The HCUP databases are used by clinicians and health services researchers to investigate care delivery and discover trends in outcomes and costs. They are also used internally at AHRQ for special projects, such as the development of pediatric indicators outlined in the next section.

The initial AHRQ work on pediatric patient safety was conducted by investigators from Johns Hopkins, using the KID database for the year 1997.⁴ However, Miller, Elixhauser, and Zhan⁵ conducted a more recent review of potential pediatric safety issues by using the previously defined adult indicators. They found that hospitalized children who experienced a patient safety incident, compared with those who did not, had

- Length of stay 2- to 6-fold longer
- Hospital mortality 2- to 18-fold greater
- Hospital charges 2- to 20-fold higher

Another key finding in this initial work demonstrated that severity of illness and type of hospital are directly associated with patient safety incidents, except for birth trauma. Birth trauma was directly associated with African American and Hispanic race, but not type of hospital.

Subsequently, AHRQ sought to develop pediatric quality indicators with the goal to "highlight areas of quality concern and to target areas for further analysis."¹⁵ Nominated peer reviewers from 44 professional clinical organizations joined this effort. Each had to spend the majority of his or her time in direct clinical practice. Development of the PedQIs is the result of Phase I of this work. The complete report, *Measures of Patient Safety Based on Administrative Data: The Patient Safety Indicators*, was published in February 2006.

After rigorous review, 18 pediatric quality indicators were recommended for inclusion in the AHRQ quality measure modules, based on expert input, risk adjustment, and other considerations. Thirteen inpatient indicators are recommended for use at the hospital level, and five are designated area indicators. Inpatient indicators are treatments or conditions with the greatest potential of an adverse event for hospitalized children. Area-level indicators are intended

to measure access to care and have the potential to reduce hospitalization and subsequent untoward events. Table 1 presents the AHRQ pediatric quality indicators.

Table 1. Pediatric and Area-Level Indicators

Pediatric Quality Indicators Provider-Level Indicators	Area-Level Indicators
Accidental puncture or laceration	Asthma admission rate
Decubitus ulcer	Diabetes short-term complication rate
Foreign body left during procedure	Gastroenteritis admission rate
Iatrogenic pneumothorax in neonates at risk	Perforated appendix admission rate
Iatrogenic pneumothorax in nonneonates	Urinary tract admission rate
Pediatric heart surgery mortality	
Pediatric heart surgery volume	
Postoperative hemorrhage or hematoma	
Postoperative respiratory failure	
Postoperative sepsis	
Postoperative wound dehiscence	
Selected infections due to medical care	

Source: Agency for Healthcare Research and Quality—www.qualityindicators.ahrq.gov.

Phase II of this project will extend the work to include indicators of neonatal care quality. In addition, methodological issues associated with risk adjustment require refinement to reduce variation in coding patient care for future comparison studies. Possible additions to the dataset will address the patient’s condition on admission and increase the understanding of how laboratory and pharmacy utilization impact patient outcomes. AHRQ will continue to work with health care providers to refine the area-level indicators to improve outcomes for children receiving outpatient care and reduce the incidence of hospitalization for those defined conditions.

The findings of AHRQ-funded research provide Congress with critical information about patient safety and quality of care for the American people. This work will influence Federal funding for projects related to improving health care safety and quality for children. (See AHRQs’ Web site, www.ahrq.gov, for more information.)

National Guideline Clearinghouse and National Quality Measures Clearinghouse

The National Guideline Clearinghouse is a public resource for evidence-based clinical practice guidelines, while the National Quality Measures Clearinghouse is a repository of evidence-based practice measures and measure sets. These entities, both initiatives of AHRQ, offer consumers and clinicians the most recent information about the continuum of care and best practices for all health care recipients. Those which involve the provision of care to children are relevant to this chapter. Although both sources offer comprehensive guides for numerous diseases and disorders for children, there are also specific reports and documents pertinent to pediatric inpatient care. In addition, users are able to search both sites with a high level of specificity; the search for articles can be narrowed to those that are peer reviewed, by authors, by dates, etc.^{16, 17}

Collaborations for Pediatric Safety and Quality

Numerous groups are actively engaged in improving pediatric care, quality and safety. Each of these groups has a unique mission and membership. Several recent efforts have these groups

working on joint projects to move things forward within their respective spheres of influence. Table 2 details these groups' missions and how to access their Web sites.

Table 2. Key Web Sites

Organization	Mission	Web Site
The National Association of Children's Hospitals & Related Institutions	Clinical care, research, training, and advocacy	www.childrenshospitals.net
Child Health Corporation of America	Business strategies, safety & quality	www.chca.com
National Initiative for Children's Healthcare Quality	Education and research	www.nichq.org
Neonatal Intensive Care/Quality & Vermont Oxford Network	Quality improvement, safety & cost effectiveness for newborns & families	www.nicq.org
Children's Oncology Group	Cures for childhood cancers, family support	www.childrensoncologygroup.org
Initiative for Pediatric Palliative Care	Education, research & quality improvement	www.ippcweb.org
End-of-Life Nursing Education Consortium	End-of-life education & support	www.aacn.nche.edu/elnec

The National Association of Children's Hospitals and Related Institutions

The National Association of Children's Hospitals and Related Institutions (NACHRI) is a not-for-profit organization of 160 member institutions in the United States, Australia, Canada, Italy, Mexico, and Puerto Rico. It supports and promotes children's health issues through clinical care, research, training, and advocacy. NACHRI works through collaborative efforts to help build measures for inpatient pediatric outcomes and is a key stakeholder in these efforts. In addition, NACHRI staff have led national focus groups to facilitate the understanding of barriers to pediatric patient safety and quality of care. The Web site can be searched for information on improvement efforts either completed or underway.¹⁸

Child Health Corporation of America

Child Health Corporation of America (CHCA) is a for-profit organization with membership of free-standing pediatric hospitals across the United States. Its mission is to support its membership through improved business strategies, and also through improved safety and quality of care. In fact, CHCA was the lead on the development and adoption of the pediatric core asthma measures, described below, included in the National Quality Forum work.¹⁹

The National Initiative for Children's Healthcare Quality

As a not-for-profit organization, the National Initiative for Children's Healthcare Quality focuses on education and research and is dedicated solely to improving the quality of health care provided to children. Founded in 1999, the National Initiative's mission is to eliminate the gap between what is and what can be in health care for all children.²⁰

The Neonatal Intensive Care/Quality and Vermont Oxford Network

The Neonatal Intensive Care/Quality is a multicenter collaborative working with members of the Vermont Oxford Network, a not-for-profit organization that has as its mission to improve the quality and safety of care for newborn infants and their families through a coordinated program

of research, education, and quality improvement projects.²¹ Currently, the Neonatal Intensive Care/Quality collaborative has three primary goals:

1. Achieve measurable improvements in the quality, safety, and efficiency of neonatal intensive care.
2. Develop new resources, tools, and knowledge for quality improvement in neonatal intensive care units.
3. Disseminate this improvement knowledge to the neonatal community.

Children's Oncology Group

The Children's Oncology Group is an international research organization supported in large part by the National Cancer Institute.²² The National Cancer Institute founded the pediatric cooperative group in 1955. Since then, cure rates for children and adolescents with cancer have risen dramatically, from 10 percent to 70 percent. The Children's Oncology Group includes 500 pediatric cancer specialists from 240 pediatric institutions in the United States, Canada, and Australia. Currently more than 40,000 children, adolescents, and young adults in the United States are treated according to research protocols. A multidisciplinary approach is used, and both curative and supportive care are constantly under investigation. The way in which the Children's Oncology Group collaborates is considered the gold standard for cooperative clinical research because of its ability to pool scientific ideas, research skills, and data. Member institutions can obtain rapid answers to clinical questions of interest and pursue optimal care for pediatric patients diagnosed with cancer.

100,000 Lives Campaign

CHCA, NACHRI, and the National Initiative for Children's Healthcare Quality are partnering to bring resources to the children's health care community as part of the Institute for Healthcare Improvement 100,000 Lives Campaign. The Pediatric Node of the 100,000 Lives Campaign was launched in December 2004.²³ The objective of the campaign was to save 100,000 pediatric lives within 18 months by improving strategies in key areas of care: preventing surgical site and central line infections, preventing ventilator-associated pneumonia, deploying rapid response teams for inpatient settings, and medication reconciliation. A target of 1,600 participating institutions was set, and as of April 2006 there were more than 2,200 organizations engaged in this work.

Pediatric Intensive Care Measures

The Pediatric Intensive Care Measures collaborative is a joint effort of NACHRI; Medical Management Planning, a benchmarking service; and CHCA to develop pediatric core measures.²⁴ In February 2004, the Pediatric Intensive Care Measures collaborative issued a national call for measures from hospitals and received 51 measures from a variety of sources. An expert panel was created representing a variety of expertise and care models, with panelists from all parts of the Nation. The panel's charge was to rigorously review the measures submitted and determine which should move forward for consideration as standard measures for generalized use.

A key issue that arose immediately was the need for a standardized risk-adjustment methodology that would meet the Joint Commission (formerly the Joint Commission on Accreditation of Healthcare Organizations or JCAHO) requirement to be in the public domain, but that also had been validated in the United States pediatric population. The panel did not identify any single tool to meet these criteria, but noted that risk adjustment was a critical component of any core measure set for pediatric intensive care units (PICUs).

After several months of work by the expert panel, by additional experts who worked in subgroups, and after voting by the children's hospitals, the following potential PICU core measures were identified:

- PICU standardized mortality ratio
- PICU severity-adjusted length of stay
- PICU unplanned readmission rate and review of unplanned readmissions
- PICU pain assessment on admission and PICU periodic pain assessment
- PICU medication safety practice adoption
- PICU central line infection prevention practice adoption

Next steps are continued discussions with all stakeholders to pilot test these measures in a respectable number of PICU settings followed by modification of these measures, if necessary. Because the Joint Commission uses only measures endorsed by the National Quality Forum, discussed in other chapters and below, advocates will seek this endorsement. Ultimately, PICUs would embed these measures in their overall quality improvement programs with institutional improvement strategies.

The National Quality Forum

The mission of the National Quality Forum is to improve the lives of patients by building consensus for quality measurement and reporting. The majority of this work has been done with adult patients. A vigorous collaboration with NACHRI and CHCA was launched to create pediatric measures. This partnership has identified the Children's Asthma Core, which is made up of the following core measures for asthma patients:²⁵

1. Return to hospital (i.e., emergency department, observation status, or inpatient admission) with same asthma diagnosis within 7 days following inpatient discharge
2. Return to hospital with same asthma diagnosis within 30 days following inpatient discharge
3. Return to hospital with same asthma diagnosis within 7 days following emergency department or observation stay
4. Use of relievers (drugs used to control exacerbations) for inpatient asthma
5. Use of systemic corticosteroids for inpatient asthma
6. Risk-adjusted length of stay
7. Home management plan of care discussed with patient/caregiver

Development and national pilot testing of these children's asthma core measures was conducted and, as of October 2007, three were selected for inclusion as performance measures for accreditation by the Joint Commission: use of relievers, use of systemic corticosteroids, and home management plan of care.

Resources and dedication are needed to conduct and sustain this level of inquiry. Hospitals are committed to this level of disease-specific investigation and reporting. However, the Joint

Commission's involvement adds an additional level of organizational commitment to provide the necessary resources to collect and report this information consistently over time.

This work is aligned with the National Heart, Lung, and Blood Institute's and the American Academy of Pediatrics's most recent recommendations for pediatric asthma guidelines, which are now under revision. These guidelines include information on best practices with asthma medications as related to symptoms, prevention, and monitoring and controlling asthma.²⁶ All of this work is an iterative process, and organizations and regulatory bodies continue to modify and revise this work.

Palliative Care

Over the last few decades, a significant body of research has contributed to the science of palliative care. Two key groups have developed best practices and guidelines for individuals and institutions that provide care to dying children: the Initiative for Pediatric Palliative Care (IPPC) and the End-of-Life Nursing Education Consortium.^{27, 28}

IPPC is both an education and a quality improvement effort, aimed at enhancing family-centered care for children living with life-threatening conditions. IPPC's comprehensive, interdisciplinary curriculum addresses knowledge, attitudes, and skills that health care professionals need to better serve children and families.

IPPC is a project of the Center for Applied Ethics and Professional Practice, a division of Education Development Center, Inc. The Education Development Center is a nonprofit organization with more than 600 professional staff, working on 300 educational projects throughout the United States and in 27 other countries. Education Development Center is the lead organization in this initiative, working in close collaboration with NACHRI, the Society of Pediatric Nurses (SPN), the Association of Medical Schools Pediatric Department Chairs, and the New York Academy of Medicine.

The IPPC team is composed of nationally renowned educators and clinicians with expertise in pediatric palliative care. IPPC is a broad-based collaborative effort that includes children's hospitals, pediatric units in general hospitals, and hospice or home care programs that serve children living with life-threatening conditions and their families.

The End-of-Life Nursing Education Consortium project is a national education initiative to improve end-of-life care in the United States. The project provides undergraduate and graduate nursing faculty, continuing education providers, staff development educators, pediatric and oncology specialty nurses, and other nurses with training in end-of-life care so they can teach this essential information to nursing students and practicing nurses.

Nurse Staffing and Pediatric Outcomes

An established body of literature links nurse staffing and hours worked with patient outcomes. While the number of nurses providing patient care is recognized as an inadequate measure of nursing care quality, there is hard evidence that nurse staffing is directly related to patient outcomes. Patient death, nosocomial infections, cardiac arrest, and pressure ulcers are linked to inadequate nurse-to-patient ratios.^{29, 30} Heavy workloads, nurses' perception that they are unable to carry out their professional role, conflict and other difficult relationships, and unsupportive leadership are identified by the IOM as related to increased risk of errors and accidents, as well as to substance abuse, conflict, increased use of sick time, and workplace

violence.³¹ However, most of the research linking nursing workload and outcomes for either patients or nurses has been conducted with adult patients and the nurses who care for them. The following section covers only pediatric patients and nurses.

National Database of Nursing Quality Indicators

The American Nurses Association's National Center for Nursing Quality collects data about nursing care quality reported by nursing units to the National Database of Nursing Quality Indicators.³² The database provides a data repository for hospitals participating in a national effort to address nursing care safety and quality. The National Database of Nursing Quality Indicators has collected data about nursing care quality for adult patients since 1998. Indicators of pediatric nursing care quality were developed and pilot tested in 2004. Since the fourth quarter of 2004, data about the pain assessment, intervention, and reassessment cycle and peripheral intravenous infiltration have been collected from a national sample of pediatric units and children's hospitals.

These two indicators of pediatric nursing care quality are *sensitive* measures of nursing care. That is, the presence or absence of registered nurses (RNs) impacts the outcome for pediatric patients requiring pain management and/or peripheral administration of intravenous fluids and/or medications. Professional nurses play a key role in successful pain management, especially among pediatric patients unable to verbally describe pain. Astute assessment skills are required to intervene successfully and relieve discomfort.³³ Maintenance of a patient's intravenous access is a clear nursing responsibility. Pediatric patients are at increased risk for intravenous infiltration and for significant complications of infiltration, should it occur.^{34, 35}

The characteristics of effective indicators of pediatric nursing care quality include the following:

- Scalable. The indicators are applicable to pediatric patients across a broad range of units and hospitals, in both intensive care and general care settings.
- Feasible. Data collection does not pose undue burden on staff of participating units as the data is available from existing sources, such as the medical record or a quality improvement database, and can be collected in real time.
- Valid and reliable. Indicator measurement within and across participating sites is accurate and consistent over time.

In 2003, Stratton³⁶ studied the link between pediatric outcomes of interest and nurse staffing. She used administrative data from seven academic, not-for-profit children's hospitals, which included 17 medical/surgical, 5 oncology, and 12 intensive care units, to analyze the correlation between staffing and 5 indicators of quality care identified in the literature as nurse sensitive. Stratton controlled for unit type and patient characteristics. The five indicators were medication administration errors, central line infections, bloodstream infections, intravenous infiltrates, and parent/family complaints. Key findings supported a strong inverse relationship between the proportion of hours of pediatric nursing care delivered on patient care units by RNs and the rate of occurrence of central line and bloodstream infections. Other significant findings included the following:

- A higher percentage of nursing overtime hours was associated with lower parent/family complaint rates.
- A higher percentage of nursing overtime hours and a lower percentage of hours of care from float/agency/traveler RNs were associated with lower bloodstream infection rates.

This work applies nurse staffing to outcomes among pediatric patients and also expands the context of nurse staffing to include “float/travel/agency” nurses and the complex issue of overtime into the research questions. Since maximizing the capability of the nursing workforce is a strategy employed in high-reliability organizations, this work makes an important contribution to pediatric nursing.

The California Nursing Outcomes Coalition Database Project

The California Nursing Outcomes Coalition Database Project, the statewide database that links patient outcomes and nurse staffing, is actively conducting data collection and unit-based benchmarking for pediatric units across the State (N. Donaldson, co-principal investigator, Carolyn Aydin, co-investigator, California Nursing Outcomes Coalition Pediatric Pilot Project, personal communication, July 2006). To date, 66 diverse pediatric units have joined this database. No formal reports have been generated, as this work is in process.

Evidence-Based Pediatric Practice

Evidence-based practice is defined as a systematic approach to clinical decisionmaking to provide the most consistent and best possible care to patients.³⁷ Evidence-based practices can also be applied to organizational structure and processes. As individuals and organizations seek to provide safe, high-quality care for hospitalized children, tactics to reduce hospital errors are an important beginning point. McFadden, Towell, and Stock³⁸ systematically reviewed the literature on patient safety and derived a list of seven “critical strategies” for dealing with the challenges of reducing errors and improving patient safety, as well as both internal and external barriers to error-reduction strategies. Following are the evidence-based recommendations for improvement:

1. Create a partnership for safety with all stakeholders—doctors, nurses, administrators, trustees, and patients. Care of children in hospitals necessitates the inclusion of parents or other surrogates among the safety stakeholders.
2. Develop a system for reporting errors that is free of blame. An effective reporting system encourages reporting by being confidential and impartial, and assuring that no retribution for reporting occurs.
3. Foster open discussion of errors and near misses at all levels of the organization to identify risks, define goals, and measure progress in an environment where individuals feel comfortable discussing problems and sharing information and knowledge.
4. Create an organizational culture where patient safety is the top priority and there is an ongoing commitment to address patient safety issues.
5. Provide staff education and training in error-reduction strategies.
6. Systematically analyze the data collected on errors to understand the complex relationships and interactions that are often related to health care errors.
7. Redesign hospital systems and processes (the workplace and the work) to mitigate error so that it is difficult or impossible to make a mistake.

Barriers to the adoption of evidence-based strategies to reduce errors were also identified from the literature. Examples of organizational factors that may function as barriers include lack of support from top administrators, lack of knowledge or understanding of errors, and lack of resources. External barriers to reporting errors include threat of malpractice suits and media

attention to errors. Cost-containment efforts resulting from managed care may reduce staffing to dangerous levels, divert resources from error prevention, or both.³⁸

Hospitals are making progress toward adopting strategies that improve patient safety, McFadden, Stock, and Gowen report.³⁹ Though continued progress is needed, most U.S. hospitals have begun to implement some of the evidence-based practices that research has demonstrated are efficacious in reducing hospital errors.

Challenges in Pediatric Evidence-Based Practice

Nurses caring for hospitalized children face similar challenges as nurses in all hospital settings. There is a substantial gap between evidence and practice, as many nurses do not understand or value research and have had little training that helps them find evidence on which to base their practice.^{36, 40} Most nurses practice based on what they learned in nursing school and from their subsequent experiences with patient care.⁴¹ When practice questions arise, nurses are most likely to ask peers for information and advice.³⁷

Common challenges to nurses learning about and putting into practice guidelines based on the systematic identification and synthesis of the best available scientific evidence persist in all settings. For example, nurses' knowledge and competence with the recommended technique for endotracheal suctioning is inadequate, especially with regard to the instillation of normal saline.^{42, 43} Bridging the gap between scientific evidence for practice and the application of the evidence in the clinical care of patients continues to challenge practicing nurses, nursing educators, nurse experts, and nursing administrators.

The following personal and organizational barriers to the use of research and the implementation of evidence-based practices among nurses have been identified:^{37, 40, 41, 44-46}

- Perceived low usefulness of research in clinical decisionmaking
- Lack of time to access, read, and evaluate research
- Lack of access to the tools needed to search for evidence
- Inadequate skills to conduct information searches
- Real or perceived lack of assistance with information seeking
- Difficulty understanding research articles
- Belief that change will produce minimal benefits
- Perceived lack of authority
- Low management and staff support
- Lack of physician collaboration and buy-in
- Costs of resourcing the development of evidence-based practices

Unique challenges in nursing care for children. Some authors suggest that pediatric nursing, rooted deeply in tradition and ritual, is particularly resistant to evidence-based practice changes.^{47, 48} Pain management in infants and children is an example of the influence of tradition, personal bias, the persistence of myths, and resistance to change.⁴⁸ However, it is important to note that SPN has recognized that evidence-based practice represents a shift in clinical decisionmaking and provides a more complete and comprehensive understanding of “best” clinical practice. Its position and recommendations are as follows:⁴⁹

1. SPN endorses clinical practice based on “best evidence” from evidence-based practice sources and patient and family preferences.

2. SPN supports clinically based nurses who use an evidence-based practice approach to maximize clinical outcomes for pediatric patients and their families.
3. SPN supports advanced practice nurses in the roles of evidence-based practice mentors for clinically based nurses.
4. SPN supports nursing research that generates new knowledge of best practice based on measurable, improved patient outcomes.
5. The SPN Listserv provides an opportunity for best practice discussions among its members.
6. SPN supports nursing higher education that trains all levels of nurses in the application and dissemination of evidence-based practice.
7. SPN supports institutions' efforts to create a culture and resource infrastructure that incorporates evidence-based practice in all aspects of patient care delivery, including collaboration and sharing of ideas and information among other nursing institutions and agencies.

The *Journal of Pediatric Nursing* includes an evidence-based practice section in each issue, focusing on the search for and critique of the best evidence to answer challenging clinical questions so that the highest quality, up-to-date care can be provided children and their families. The American Academy of Pediatrics Steering Committee on Quality Improvement and Management develops and classifies clinical practice guidelines “intended to improve clinical care by reducing inappropriate variations, producing optimal outcomes for patients, minimizing harm, and promoting cost-effective practices”⁵⁰ (p. 874). The committee uses a three-step process in developing clinical practice guidelines:

1. Determination of the quality of the evidence in support of a proposed practice recommendation
2. Evaluation of the anticipated balance between benefits and harm when the recommendation is carried out
3. Designation of the recommendation's strength (*strong recommendation, recommendation, option, or no recommendation*).

Clearly, leadership exists for overcoming barriers to implementing evidence-based pediatric practice.

The challenges of family-centered care. Family-centered nursing of children places the concerns, needs, strengths, and capabilities of the family at the center of a hospitalized child's care. Rush and Harr⁴⁸ suggest family-centered care and evidence-based practices might be at odds at the bedside and recommend a “marriage” of the two to assure that the best care is achieved. More recent definitions of evidence-based practice include patient preference, but pediatric nurses will have an opportunity to lead efforts to include existing evidence-based strategies for family-centered care, as well as lead the further development of practice guidelines that include the perspective of the family in care. Several examples of evidence-based, family-centered care follow.

Nearly two decades ago, Martha Curley demonstrated that the nursing mutual-participation model of care diminished distress for parents of children in the pediatric intensive care unit.^{51, 52} When nurses assisted parents of critically ill children to continue specific parenting activities with their children in the intensive care unit, parents reported less stress.

Bernadette Melnyk and colleagues⁵³⁻⁵⁵ tested the effects of the Creating Opportunities for Parent Empowerment program with mothers of young children in the pediatric intensive care unit. Study participants were provided written and audiotaped information describing young

children's typical responses to critical illness and intensive care and parental-role information, which suggested strategies the parents could use to facilitate their children's adjustment. These parents, compared to the control group, reported less negative mood and parental stress, provided more support to their children during intrusive procedures, participated more in their children's care, and reported fewer posttraumatic stress symptoms after discharge.

A strategy to prepare parents for their child's transfer from the pediatric intensive care unit was tested for its impact on parental anxiety.⁵⁶ Study parents received written information explaining the transfer procedure and the level of care on the general pediatric unit, reinforcing the positive aspects of their child's transfer. The information was provided 24 to 48 hours prior to the transfer. Findings indicated that experimental group parents had lower levels of anxiety following transfer.

In 2004, Melnyk, Small, and Carno⁵⁷ critically appraised these five studies of parent-focused interventions aimed at improving coping and mental health outcomes for children and their parents. Despite what is known about the potential adverse effects of critical illness and intensive care for children and their families, interventions with proven effectiveness are not in place in pediatric critical care units across the United States. Clinical practice guidelines that incorporate evidence-based interventions are needed if they are to become the standard of care.

IPPC²⁷ is a consortium of seven academic children's hospitals, Education Development Center, NACHRI, the New York Academy of Medicine, SPN, and the Association of Medical School Pediatric Department Chairs. The group has both education and quality improvement objectives that address the growing empirical evidence that U.S. health care systems fail to meet the needs of children with life-threatening conditions and their families.

A commitment to culturally respectful, family-centered care of children with life-threatening conditions is evidenced as support of the family unit and involvement of the child and family in communication. Decisionmaking and care planning are two of six quality domains in the program. Evidence-based practice guides discovering what matters to families and incorporating the perspectives of children and families in care planning and implementation.⁵⁸

The American Heart Association issued guidelines in 2000 that recommended, for the first time, that family members be given the option to be with their loved ones during resuscitation efforts, whenever possible.⁵⁹ Pediatric Advanced Life Support guidelines also endorse family presence during resuscitation of children.⁶⁰ However, clinicians in many settings have resisted following the guidelines, citing the belief that the family will suffer undue trauma and may not understand what is happening to their loved one, and concern that family presence may lead to litigation.⁶¹ A literature review for evidence-based practice guideline development at the Children's Hospital, Denver, found that families want to have a choice about being present during resuscitation efforts, refuting previous beliefs that family presence is detrimental to family members or institutions. The review led to development of an evidence-based practice policy that may guide others to provide compassionate, family-centered care that respects family choice and supports their presence during resuscitation efforts.⁶²

Evidence-Based Clinical Practice Guidelines: Exemplars

The development of guidelines for practice is vital to the implementation of evidence-based practices and the quality outcomes anticipated as a consequence of reducing unnecessary variation, enhancing benefit, minimizing harm, and promoting cost effectiveness. The gap between establishing evidence for practice and implementing evidence-based practice, however,

is significant. In fact, the IOM identifies it as a “quality chasm.”⁶³ In July 2003, the National Quality Forum released 30 safe practices for better health care, calling it a road map for safety. The practices identified are supported by “evidence so clear that if they were universally implemented, they would significantly improve the situation with regards to medical errors and patient safety”⁶⁴ (p. 12). More than two-thirds of the 30 safe practices are related to Joint Commission national patient safety goals or other Joint Commission initiatives, and they are applicable to the care of hospitalized children. In addition, pediatric quality indicators proposed by AHRQ and those proposed by the IOM inform and direct efforts to improve the safety and quality of care for hospitalized children. The section that follows presents progress toward evidence-based clinical practice guidelines for pediatric care addressing national patient safety and quality objectives.

Pressure Ulcer Prevention

Pressure ulcers do occur in acutely ill children. However, there are differences among pediatric patients, such as between premature neonates and older infants or children; between all pediatric patients and those in at-risk groups, such as those with spina bifida and those who are critically ill; and in the distribution of pressure ulcers between infants, children, and adults.

Risk factors for pressure ulcer development are not different among pediatric patients or between children and adults. The factors include (1) decreased mobility, activity, and sensory perception; (2) increased moisture, friction, and shear forces; and (3) intrinsic factors that influence tissue tolerance associated with age, nutrition, and tissue perfusion.

The incidence of pressure ulcers among hospitalized children is consistent across studies. There is a 17 percent incidence in children in the intensive care unit following cardiac surgery,⁶⁵ 19 percent among infants in a neonatal intensive care unit,⁶⁶ 26 percent among children in a multidisciplinary pediatric intensive care unit,⁶⁷ 27 percent in a prospective, multicenter study of pediatric intensive care unit patients,^{68, 69} and 23 percent in a recently reported study that included pediatric intensive care and general pediatric care patients.⁷⁰

Prevention of skin breakdown begins with accurate prediction of pressure ulcer risk. The Braden Skin Risk Scale score, the gold standard for predicting pressure ulcer risk in adult patients, has been adapted for use with pediatric patients to reflect the unique needs of children.⁷¹ A multicenter study of the Braden Q Scale demonstrated that its performance is similar in a pediatric intensive care population and in adult patients. The modified Braden Q, which is shorter, is comparable.⁶⁸ The Starkid Skin Scale used the Braden Q as the basis for developing a shorter, simpler tool to measure risk of skin breakdown. While it has high interrater reliability and high specificity, the initial study of its use found its sensitivity low.⁷⁰ It is, however, the only tool evaluated in general pediatric patient care.

Risk factors for the development of pressure ulcers include white race; younger age; diarrhea; use of medical devices, especially mechanical ventilation; and higher severity of illness, hallmarked by hypotension and prescription of vasoactive medication infusions. Lower Braden Q or Starkid Scale scores were predictive of risk for skin breakdown.

The location of pressure ulcers in pediatric patients is different than it is in adults. The most common location in pediatric intensive care patients was the head (occiput and ears). Acutely ill pediatric patients in the intensive care unit also developed lower-body pressure ulcers, with their heels most frequently affected.⁶⁸ In general care pediatrics, skin breakdown on the buttocks or perineum is most commonly related to diaper dermatitis.⁷⁰

Most children in all studies had Stage I pressure ulcers and developed them early in hospitalization—likely when they were most ill. Prevention and treatment strategies have not been studied in children, but those recommended in the AHRQ evidence-based review of practices known to prevent pressure-related injury are logically applicable in pediatric patients. Evidence supports the use of pressure-reducing devices to distribute weight over a larger surface area, head-of-bed elevation to the lowest degree consistent with the patient's condition to minimize sheer-related injuries, elevation of the heels off the bed, and a turning schedule to provide pressure relief.⁷² In addition, injuries from medical devices such as oximeter probes, endotracheal and tracheostomy tubes, BiPAP masks, catheters, and splints—which were not included in pressure ulcer data in the studies—warrant efforts at prevention from vigilant pediatric care providers. “Excellent skin care is a hallmark of quality nursing care.”⁷⁰

Catheter-Related Bloodstream Infection Prevention

Catheter-related bloodstream infection (CRBSI) is associated with increased morbidity, mortality, and health care costs.⁷³ While securing and maintaining reliable venous access is essential in acute care of hospitalized infants and children, use of central venous catheters carries a number of risks. Included are local infection, CRBSI, septic thrombophlebitis, endocarditis, metastatic infections (brain abscess, lung abscess, osteomyelitis), and mechanical complications during insertion.⁷⁴ Children are at greater risk than some adults for CRBSI. In pooled pediatric intensive care unit data reported by the Centers for Disease Control and Prevention (CDC) National Nosocomial Infection Surveillance System in 2003, the rate of CRBSI was 7.3 per 1,000 catheter days.⁷⁵ Bloodstream infection is the most common nosocomial infection in pediatric critical care units, followed by ventilator-associated pneumonia.^{75, 76} Length of stay increases dramatically in the face of bloodstream infection, as do associated hospital costs.⁷⁷

Strategies to reduce risk of CRBSI. Measures to minimize the risk for infection related to intravenous therapy have important implications for nursing care of acutely ill pediatric patients. Evaluation of the risk-reduction measures has, most often, been undertaken in studies with adult patients. Most, however, apply to the care of hospitalized infants and children.^{74, 78} Important differences are noted. Factors over which nurses have direct influence are discussed.

Site selection. The presence of phlebitis and the density of skin flora at the catheter insertion site are risk factors for infection. For adults, lower-extremity insertion sites, including those in the femoral vein, are associated with a higher risk of deep vein thrombosis⁷⁹ and have been demonstrated to have relatively high bacterial colonization rates.⁸⁰ In children, femoral catheters have a low incidence of mechanical complication and may have an infection rate equivalent to catheters in alternative locations.^{81–83}

Hand hygiene and aseptic technique. Hand hygiene with an antibacterial soap and water or with waterless alcohol-based gels or foams contributes significantly to reducing risk of CRBSI.^{74, 84} Hand hygiene is recommended before and after palpating potential catheter insertion sites, and before and after inserting, replacing, accessing, repairing, or dressing an intravascular catheter.⁷⁴ During central venous cannulation, the CDC recommends maximal barrier protection (cap, mask, sterile gown, gloves, and drape). Skin asepsis with 2 percent aqueous chlorhexidine is recommended. Providone iodine, which has been the most widely used antiseptic for cleansing intravascular insertion sites, is acceptable if it is allowed to remain on the skin for at least 2 minutes, or until dry, prior to catheter insertion.⁷⁵

Catheter site dressing changes. Recommendations for catheter site dressing changes are extrapolated to pediatrics from adult studies.⁷⁸ Central catheter dressings should be either sterile gauze or sterile, transparent, semipermeable dressing that covers the insertion site. The choice of dressing is a matter of preference, as no differences for CRBSI have been found between the two.⁸⁵ Gauze may be preferred in patients who are diaphoretic or who have oozing or bleeding at the insertion site. Dressings should be changed using aseptic technique at least weekly or if the dressing becomes damp, loosened, or visibly soiled.⁷⁵

The longstanding practice of intermittent application of topical antibiotic ointment to the catheter insertion site is no longer endorsed by the CDC.⁷⁵ Application of antibiotic ointment increases the rate of catheter colonization with *Candida* species, promotes emergence of resistant bacteria, may compromise the integrity of the catheter, and has not consistently been shown to decrease the rate of CRBSI.

Replacement of intravenous administration sets. The optimal interval for routine replacement of administration sets has been well studied. Data reveal that replacing administration sets no more frequently than every 72 hours is safe and cost effective.^{86, 87} Data from a more recent study demonstrated that phlebitis rates were no different when administration sets were left in place for 96 hours compared with 72 hours.⁸⁸ Data from an additional recent study with adults support delaying replacement of administration sets up to 7 days if the patient is not receiving total parenteral nutrition, blood transfusion, or interleukin-2 via the intravenous tubing.⁸⁹

Implementing the recommendations. Multifaceted interventions are necessary to assure that evidence-based infection control guidelines to prevent CRBSI are followed. In a recent study in an adult surgical intensive care unit, CRBSI was nearly eliminated when five interventions were put in place to improve adherence with infection control guidelines during central venous catheter insertion.⁹⁰ The interventions were as follows:

1. An educational intervention to increase provider awareness of evidence-based infection control practices
2. Creation of a central catheter insertion cart to assure that needed equipment and supplies to provide asepsis during central venous catheter insertion or exchange were accessible in one location
3. Asking providers daily in interdisciplinary rounds about removal of central catheters to reduce risk from prolonged, but unnecessary exposure
4. Implementation of a checklist of items that assure compliance with evidence-based infection control guidelines, completed by the bedside nurse during central venous catheter insertion or exchange
5. Nurse empowerment to stop procedures if guidelines are not followed

The study authors report sustained improvement years following the initial implementation of the five interventions. Between January 2003 and April 2004, there were two CRBSIs in this surgical intensive care unit or 0.54/1,000 catheter days. No infections had occurred in more than 9 months. By their estimate, 43 CRBSIs and eight deaths may be prevented per year, saving nearly \$2 million in additional costs annually.

The authors report the following important lessons learned from this initiative: (1) relatively simple and inexpensive interventions produced significant improvement; (2) processes that reduce steps in workflow are more likely to succeed than those that require more steps; (3) creating redundancy through the use of a checklist, as in aviation, is an effective technique to improve patient care safety; and (4) a culture of safety requires teamwork and collaboration.

Improving Communication and Collaboration

Health care errors and poor quality of care are consequences of a variety of workplace systems and processes. Care of hospitalized patients across the lifespan is provided in complex environments where limited time, parallel tasking, interdependence, and the need for decisionmaking despite uncertainty create unique demands. The importance of effective communication with patients and their families as well as between interdisciplinary teams is recognized as key to reducing errors and improving quality in a number of industries. Analysis of 2,455 sentinel events reported to the Joint Commission revealed that the primary root cause in more than 70 percent was communication failure. The seriousness of these failures is evident: approximately 75 percent of these patients died.⁹¹

Relational coordination. The concept of relational coordination was developed and validated in the commercial aviation business.⁹² When team members and team relationships are well coordinated, there is frequent, timely, accurate communication, as well as problem-solving, shared goals, shared knowledge, and mutual respect. The impact of team relationships on outcomes for patients has been demonstrated in a number of studies.

The impact of relational coordination in health care was tested in a study of orthopedic surgery patients undergoing total joint replacement at nine hospitals in three U.S. cities.⁹³ Quality of care, postoperative pain and functioning, and length of stay were the outcome measures for this study. Patients evaluated the quality of care by completing a questionnaire that measured the patients' reported confidence and trust in their physicians, nurses, physical therapists, or case managers; knowledge of the identity of the physician, nurse, physical therapist, or case manager in charge of their care; belief that providers were aware of their medical history; belief that providers were aware of their condition and needs; belief that their providers supplied consistent information; belief that their providers worked well together; belief that they were treated with respect and dignity; satisfaction with their overall care; and finally, intent to recommend the hospital to others. Providers, including physicians, nurses, physical therapists, social workers, and case managers, assessed four communication dimensions (frequent, timely, accurate, and problem-solving communication) and relationship dimensions (shared goals, shared knowledge, and mutual respect) between each respondent and each of the five core disciplines involved in the care of joint replacement patients.

The study found that relational coordination varied significantly between the hospital sites. Quality of care was significantly improved by relational coordination and each of its dimensions. Postoperative pain was significantly reduced by relational coordination, whereas postoperative functioning was significantly improved by several dimensions of relational coordination, including the frequency of communication, the strength of shared goals, and the degree of mutual respect among care providers. Length of stay was significantly shortened by relational coordination and each of its dimensions.

Improving communication and teamwork. The Kaiser Permanente health care system has adopted standardized tools and behaviors from commercial aviation and has demonstrated their effectiveness in enhancing teamwork and reducing risk of patient harm.⁹⁴ Crew resource management training was provided to team members from a variety of clinical domains, including the operating room, the intensive care unit, obstetrics and perinatal care, and a cardiac treadmill unit. The teams each worked on a clinical project in which crew resource management techniques could be applied to improve the quality and safety of patient care, supported with site visits and educational sessions. The tools and behaviors to improve communication effectiveness

in this study were briefings using the SBAR (situation, background, assessment, recommendation) format, appropriate assertion, clear language, situational awareness, and debriefing. This work is explicated in the section on communication of this book.

Briefings. Brief, concise communication of critically important information transmitted in a predictable format has been adopted in the perinatal unit by nurses, midwives, and physicians to improve the team response to fetal distress. A common language is used to optimize problem recognition. Simple and effective rules are activated when a problem is recognized: the identifying person has 1 minute to look at it independently, 2 minutes to look at it with a colleague, and by minute 3 should be physically correcting the problem.

Perioperative briefings by surgical teams have virtually eliminated wrong-site surgeries and improved nursing turnover in the operating room by 16 percent. Employee satisfaction has risen; perception of safety in the operating room is judged “outstanding”; and significant improvements in teamwork, communication, responsibility for patient safety, and handling errors have been measured.⁹⁴

Appropriate assertion and critical language. Creating environments where people will express their concerns and speak up is a key factor in safety. The hierarchy of caregivers in hospitals and differences in communication styles between nurses, physicians, and others often interfere with adequate communication. The common practice of indirect communication between nurses and physicians is risky. In assertive communication there is a series of steps to clearly communicate what is needed and reach a decision:

1. Get the person’s attention.
2. Express concern.
3. State the problem.
4. Propose action.
5. Reach a decision.

Nurses have license to say “I need you to come now and see this patient.” They need not provide an objective argument to convince a physician to see a patient. It is acceptable for nurses to say “Something is wrong, I’m not sure what it is, but I need you here now.” Recently, emergency medical teams from Australia demonstrated that in-hospital cardiac arrests were reduced 65 percent by early intervention.⁹⁵ The number one criterion to call for help was a staff member who “was worried” about a patient.

Sharing goals. Patients in the intensive care unit at Johns Hopkins University Medical Center are cared for by intensivist-led teams, which include the intensive care unit attending physician, critical care fellows, anesthesia and surgery residents, nurse practitioners, nurses, respiratory therapists, and a pharmacist. During daily rounds, the intensive care unit team develops a plan of care for the day, spending 20 to 25 minutes at each patient’s bedside. One attending physician questioned that rounds failed to clarify explicit patient care goals, prompting the team to measure their impact on team communication.⁹⁶

When measured, less than 10 percent of residents and nurses understood the goals of care for the day. To improve communication among providers, the team developed and implemented a daily goals form, based on crew resource management principles, which outlines the tasks to be completed, the plan of care, and the plan for communication with the patient and family members. The following are discussed in rounds and noted:

1. What needs to be done for the patient to be discharged from the intensive care unit?
2. What is this patient’s greatest safety risk? How can we reduce that risk?
3. Pain and sedation management

4. Cardiac/volume status
5. Pulmonary/ventilator management
6. Mobilization
7. Infection, cultures, drug levels
8. GI/nutrition status
9. Medication changes (Can any be discontinued?)
10. Tests and procedures
11. Scheduled labs, morning labs, chest x-ray
12. Consultations
13. Communication with primary service
14. Family communication
15. Can lines/catheters/tubes be removed?
16. Is this patient receiving DVT/peptic ulcer disease prophylaxis?

The daily goals form is completed for each patient during rounds, signed by the fellow or attending physician, and handed to each patient's nurse. The goals are reviewed at least three times each day by all providers, who initial the form to indicate their review. The form is updated if the goals of care change.

To evaluate the impact of the daily goals form on patient outcomes, intensive care unit length of stay was measured for 1 year following pilot testing, revision, and implementation. After implementing the goals form, the percentage of residents and nurses who understood their patient's daily goals increased to more than 95 percent. Intensive care unit length of stay decreased significantly from a mean of 2.2 days to 1.1 days. With a decrease in length of stay, the intensive care unit was able to admit 670 additional patients in the study year. In addition, the use of the goals form may have prevented complications such as CRBSI (by prompting removal of central venous catheters when no longer needed for therapy) and ventilator-associated pneumonia (by assuring head-of-bed elevation, peptic ulcer disease prophylaxis, and assuring patients were assessed for readiness for extubation).

The team learned that using an interdisciplinary communication tool is more important than the specific statements on the form. As its use has spread to other intensive care units in the Johns Hopkins system and to other hospitals, the structure and content of the form have changed. Other hospitals are invited to modify the form to meet their needs and are cautioned to expect frequent revisions in the beginning.

Interdisciplinary collaboration. Nurse-physician relationships have been characterized negatively for more than a century. The "doctor-nurse game," first described in 1967, is a stereotypical pattern of interaction in which nurses learn to show initiative and offer advice, while appearing to passively defer to physicians' authority.⁹⁷ The game has been replayed and revisited in the decades since, though a recent literature review suggests that this pattern of interaction is decreasing in frequency in contemporary health care settings.⁹⁸ The importance of managing the doctor-nurse game is illustrated in an analysis of nurse-physician collaboration in pain management practices and underscores the need to draw on nursing practice and knowledge to effectively challenge issues of power and status.⁹⁹

Patient outcomes are linked to healthy professional relationships. A descriptive study with nurses at 14 hospitals that had achieved Magnet status (see section on the Magnet Recognition Program below) suggests that collaborative relationships between nurses and physicians contributes to lower mortality at magnet hospitals, compared with mortality at hospitals without the designation.¹⁰⁰ Nurses participating in the study described relationships with physicians along

a scale of collegial, collaborative, student-teacher, neutral, or negative. Collegial and collaborative relationships were differentiated based on the power base characterizing interactions. In collegial relationships, the power base is equal, although it may be different. Nurses respect physicians for their education, while physicians respect nurses for their knowledge and extended contact with patients. In collaborative relationships power is mutual, but not equal. In both, mutual dependence and willing cooperation are characteristic.

Subsequently, direct care nurses, nurse managers, and physicians at 44 clinical units in 5 hospitals where extensive collegial and collaborative relationships were identified have participated in interviews to identify structures that enable their positive relationships.^{101, 102} Goals of the multisite initiative are to identify evidence-based management practices and suggestions for attaining high-level, productive, and beneficial nurse-physician relationships.

Improving team structure and heightening communication have been tested in a 5-year study with nurses and physicians caring for general surgery patients at a tertiary care hospital.¹⁰³ Well-defined patient care teams (physicians, case managers, and charge nurses) with clear role responsibilities were developed, and a formal, regular schedule of daily team meetings was initiated. Following the intervention, mean length of stay for surgical patients was decreased and patient volume increased, while a high level of patient satisfaction was maintained.

Differences in education and socialization may make collaboration difficult. Interdisciplinary learning opportunities have been effective in developing collaborative skills among those new to their professions.^{104, 105} The registered nurse-resident physician preceptor program at the University of Kentucky pairs new residents with a registered nurse for an 8-hour orientation shift.¹⁰⁶ Physicians directly encounter the nurse's unique functions, perspectives, knowledge, and contributions.

A recent systematic review of evidence for the effectiveness of interdisciplinary education as a strategy to build collaborative relationships found no definitive outcomes, as studies had wide inclusion criteria, methodology, and outcomes.¹⁰⁷ The absence of evidence does not mean that interdisciplinary education is ineffective; it may simply mean that it has not yet been rigorously evaluated.

The same review examined evidence of the effectiveness of interdisciplinary collaboration interventions. Although the review found a heterogeneous sample of intervention studies, which prevented meta-analysis, clinical improvements in patient care were related to interventions that target improving interdisciplinary collaboration.¹⁰⁷ The authors have a funded randomized controlled trial to evaluate the impact of both an interdisciplinary education intervention and an interdisciplinary collaboration intervention with 20 general medicine units in four Toronto hospitals. Evaluation lasting 12 months of some 30,000 patient admissions is anticipated. Information about patient outcomes; patient and family satisfaction; readmission rates; evidence-based discharge prescriptions; length of stay; staff turnover; and interdisciplinary satisfaction and trust among nurses, physicians, and allied professionals will be collected. It is anticipated that the study will add rigor to the body of evidence for interdisciplinary collaboration.

Culture change is at the heart of improving communication, teamwork, and collaboration. Care complexity in today's hospital systems demands care coordination that is unparalleled. Individual provider excellence alone is insufficient; the team and its coordinated efforts must be excellent. Improving communication is evidence-based care that benefits patient safety and care quality.

Infant Position in Neonates Receiving Mechanical Ventilation

Mechanical ventilation is often required when treating critically ill newborns, especially those who are preterm. A systematic review of randomized controlled trials that compared the impact of several body positions during mechanical ventilation of sick newborns was conducted by the Cochrane Collaboration and reported in 2003.¹⁰⁸ Ten trials involving 164 infants were included in the review. The trials compared several positions: prone versus supine, prone versus lateral right, lateral right versus supine, lateral left versus supine, lateral right versus lateral left, and good lung dependent versus good lung uppermost. In all the trials, stable infants were selected for the intervention.

Only the prone position was more efficacious than supine positioning. Placing infants prone for short periods of time improved oxygenation. However, evidence that prone positioning produces sustained improvements in oxygenation was not reported.

None of the trials reported complications of repositioning infants who were receiving mechanical ventilation. However, accidents such as inadvertent extubation or umbilical catheter dislodgement are easily imagined. Infants who require prolonged mechanical ventilation may be at risk for the development of pressure ulcers if maintained in one position and would benefit from repositioning.

The review suggests that large controlled clinical trials are needed to determine the various benefits or problems from different positions. Studies that look at medium and long-term outcomes—duration of mechanical ventilation, skin integrity, hospital length of stay, and mortality—are necessary. In addition, reexamination of positioning interventions with infants who are less stable may help to clarify whether there are subgroups of infants with different disease severity who may benefit. Finally, questions about the effects of lateral positioning, especially in infants with asymmetrical pulmonary pathology, still need answers.

Smoking Cessation

Smoking and other tobacco-product use by adolescents is a major public health problem recognized by the World Health Organization (WHO). Data from 1999–2005 found that nearly 20 percent of adolescents report current tobacco use.¹⁰⁹ Tobacco cessation programs must address this significant public health problem. In addition, both adolescents and younger children may be exposed to second-hand smoke. Nurses who care for pediatric patients have an opportunity to address the health risks of smoking with both pediatric patients and their families. The Joint Commission recommends that smoking cessation advice be given to pediatric patients who are hospitalized with community-acquired pneumonia or asthma and their families. Indeed, Turner-Henson and colleagues¹¹⁰ have urged nurses to consider assessment of smoking status as part of taking vital signs for all pediatric admissions and in outpatient settings.

A recent meta-analysis of the effects of nursing-delivered smoking cessation interventions with adults found nursing efforts to modestly increase the odds of quitting.¹¹¹ There was evidence that interventions were most effective for patients hospitalized with cardiovascular disease, and interventions with nonhospitalized adults were also beneficial. Studies of smoking cessation efforts with adolescents and during pregnancy were not included in the meta-analysis. However, it is not unreasonable to generalize from the findings that smoking cessation interventions with hospitalized patients were most effective. Patients in the hospital may be more

amenable to the intervention. Certainly, the opportunity to offer cessation advice and resources to pediatric or family tobacco users should not be missed.

A study of adolescent smokers' attitudes toward quitting and their beliefs about their parents' opinion about smoking included more than 4,500 U.S. high school students who had smoked within the previous 30 days.¹¹¹ All adolescent smokers were asked, "Have you ever seriously thought about quitting smoking?" Those who had seriously considered quitting were questioned about past attempts and how recent their last attempt was. Those who had not seriously thought about quitting were asked if they thought they would ever want to quit. Regardless of whether their parents smoked, adolescents who placed value on their parents' opinions were more likely to think seriously about quitting and to have tried to quit in the past 6 months. Recalling a parent's expressed desire that their child not smoke was associated with significant increases in the likelihood of seriously thinking about quitting, even among those adolescents whose parents smoked. Agreeing with the statement, "When I'm older, my parents won't mind that I smoke," was significantly associated with decreased odds of seriously thinking about quitting and recently attempting to quit. This study demonstrates that parents, both those who smoke and those who do not, may have a significant role in influencing young smokers' desire to quit smoking. Nurses need to exploit this information with families of adolescent patients.

A recent randomized clinical trial compared an Internet-based smoking cessation intervention (Stomp Out Smokes—SOS) developed at the University of Wisconsin with brief individual counseling sessions for adolescent smokers.¹¹³ The smoking abstinence rate for teens who received individual counseling was twice that of those who accessed the Internet-based intervention at 30 days, 24 weeks, and 36 weeks. In fact, the SOS intervention participants accessed the site an average of only 7 days and 11 total logins. Likely, they did not have an adequate "dose" of treatment. More structured, personal, and proactive patient education delivered in person or by telephone or e-mail is recommended for intervention with adolescent smokers.

This section has presented a sample of the evidence-based practices that have implications for national safety and quality aims and the care of infants and children in hospitals. Nurses who care for pediatric patients must be actively involved in the development, testing, implementation, and evaluation of evidence-guided best practices.

Other Issues for Pediatric Care

Although this chapter has focused on pediatric inpatient care, most care for children takes place in outpatient settings. There are critical issues for children requiring outpatient care that impact their health and well-being and, therefore, the illnesses seen in hospitalized children and their potential to experience an adverse event. We must address these issues with the same vigor as the movement toward inpatient evidence-based practices. Otherwise, the overall health of children will deteriorate with lifelong consequences that will impact their quality of life and the cost of health care, as well as limit their opportunities to contribute to society in positive ways.

Poverty and Disparity

Poverty and disparities in health care, two overarching issues for children in this country, impact their care within the community and the inpatient setting. In most cases they are inextricably intertwined. In 2003, an estimated 35.9 million Americans (12.9 percent) lived in

poverty, 4.3 million newly poor since 2000. Approximately 733,000 American children lived in poverty.¹¹⁴ This is a fluid statistic as third-party payers for children's health care are often public programs, which fill the gaps created by reductions in employer-based health plans. These State and Federal programs are subject to review and reduction at any time, when other financial issues or crises take priority.

Childhood Obesity

Childhood obesity is at epidemic proportions. One in every six children in the United States is obese or overweight.¹¹⁵ Obesity is not only an adverse social stigma and a threat to quality of life; significant health issues are associated with it. Obese individuals are at greater risk for diabetes, cardiovascular diseases, and poor mental health than persons who are not obese. Children are not an exception. These chronic conditions increase the cost of care over a lifetime and can lead to serious disability.¹¹⁴

Poverty, disparities in health care, and childhood obesity present unique challenges for the health care system at large. Long-range planning must address these issues and tangential issues for our children to live healthy, productive lives.

Unique Issues in Adolescent Health

Adolescents (children ages 13–20 years) have unique health care needs, distinct from those of younger children and nonelderly adults. Their physiologic and social characteristics differ from those of younger children and adults. Adolescents require reproductive health care; care for sexually transmitted diseases; mental health care for depression, substance abuse, and other disorders; trauma care; and care for chronic diseases—asthma being the most common.¹¹⁶

Recent data reveal unique patient safety problems when adolescents are hospitalized. The incidence of adverse events in the Colorado and Utah Medical Practice Study found 2.74 percent more adverse events among adolescents than younger children.¹¹⁷ In this study, more than three-quarters of adverse events for hospitalized adolescents occurred with diagnostic, medication, and pregnancy and delivery-related services.

There are racial disparities in the incidence of asthma, a leading cause of chronic illness in children and adolescents. African Americans have a higher prevalence of asthma and are four times more likely to be hospitalized and five times more likely to die of asthma than non-African Americans.^{118, 119} Despite much attention on improving asthma care and asthma disparities, a 2003 IOM report still identified the quality of asthma treatment as one of 20 priority areas for national action.¹²⁰ Priorities in research to reduce asthma disparities were published by the National Heart, Lung, and Blood Institute in 2002.¹²¹

The Role of Nurse Scientists

Pediatric nurse scientists have actively engaged in scientific inquiry from the bench to the bedside for many decades. There have been rich contributions associated with nurse-patient interactions that focus on the patient in a holistic manner. Recommendations from Sue Thomas Hegyvary, editor of the *Journal for Nursing Scholarship*, might frame the future of pediatric nursing research. She proposed research that will

1. Attend to morbidity, mortality, and contributing factors at the micro and macro levels of society.
2. Support programs of study that are longitudinal, sequential, and comparative and that continue to examine phenomena from small to larger contexts.
3. Move from reviews of the literature, concept analyses, and proposals for investigation toward new knowledge in the field.
4. Focus on the interventions and outcomes of a study, rather than debate superior or inferior methodologies.
5. Synthesize the aforementioned recommendations to generate research beyond the theoretical and small-scale application.
6. Draw evidence-based conclusions based on scientific findings. In other words, only conclusions based on empirical findings should be promulgated as nursing science.¹²²

Benchmarking, Funding, and Federal Data

Participation in national benchmarking and quality work can pose a significant expense for involved institutions. It is difficult, therefore, for some organizations to participate in this valuable work. Institutions should not face economic barriers to participation. Perhaps organizations that demonstrate need could be federally funded to join these efforts.

Funding for scientific work in pediatrics must be increased. However, appropriation discussions for Federal funding are highly competitive. Children are disadvantaged as they are not voting members of society. Although there are strong advocates for funding children's research, their voices can be muted by other specialty groups with voting power. It is critical that nurses, health care providers, and other pediatric stakeholders continue their efforts to speak for children in the halls of Congress.

A well-funded national strategy for organizing, analyzing, and reporting patient safety and quality data would accelerate progress in pediatric safety and quality improvement. The KID HCUP, the Kids Inpatient Database developed as part of the Healthcare Cost and Utilization Project, forms a sound basis for this work; however, not all States report these data, as participation is voluntary. No mandate for participation appears likely. Currently, 36 States report discharge data to AHRQ for inclusion in the KID HCUP database. Even when States do report, missing data can be a significant problem. For instance, reporting race is still optional. Lack of consistency in reporting makes it difficult to control for confounding variables when analyzing the data to answer research questions.

Despite its imperfections, the KID HCUP database is a rich source for health services researchers and practitioners to mine. It would be an even stronger tool if all States reported data and if uniformity and consistency were assured.

National Institute of Nursing Research. The National Institute of Nursing Research (www.ninr.nih.gov), established in 1993, began as the National Center for Nursing Research in 1985. It has been a leader in funding for nursing research in key areas (see Table 3). Part of the National Institute of Nursing Research mission is to identify and fund research in areas of science unique to nursing and vulnerable patients, including children. A full complement of funding is available, from intramural awards that support onsite education and training to develop young investigators, to extramural funding for investigator-initiated research and for centers that conduct and disseminate research for special populations.

Table 3. National Institute of Nursing Research—Extramural Areas of Science

Chronic illness & long-term care	Health promotion & risk reduction in adults	Cardiopulmonary health & critical care
Neurofunction & sensory conditions	Immune responses & oncology	Reproductive health & child health promotion
End-of-life & environmental contexts		

Other funding sources. The American Nurses Foundation (www.nursingworld.org/anf) and Sigma Theta Tau (www.nursingsociety.org) are two additional organizations that support nursing research. In addition, many specialty organizations have grant funds available on a competitive basis. A search on each organization's Web site can yield information about the availability of grants and their application process. All typically support both quantitative and qualitative research that can help launch an investigator's pilot work, in advance of funding for more comprehensive studies.

Positive Momentum for Nursing Practice: The Magnet Recognition Program

In the past decade, the Magnet Recognition Program, the seal of approval for professional nursing practice environments, has gained considerable momentum across the country. One of the hallmarks of this prestigious certification is that direct care nurses have clinical experts who help create an environment of scientific inquiry. Practice based on evidence is critical to both a culture that contributes to nursing satisfaction and to quality care for patients. Magnet momentum (www.nursingworld.org/ancc/magnet) continues to grow each year and can only advance the use of evidence-based nursing practices. Children and their families will reap the benefits of professional nursing practice driven by science, not tradition—valuable and worthy goals for us all.

Conclusions

Pediatric care is complex due to developmental and dependency issues associated with children. How these factors impact the specific processes of care is an area of science in which little is known. We are only beginning to understand the relationship between nurse staffing and adverse events in hospitalized children; effects that may be compounded by inadequate numbers of pediatric nurses. Throughout health care providing safe and high quality patient care continues to provide significant challenges. Efforts to improve the safety and quality of care are resource intensive and take continued commitment not only by those who deliver care, but by agencies and foundations that fund this work. Advocates for children's health care must be at the table when key policy and regulatory issues are discussed. Only then will the voice of our most vulnerable groups of health care consumers be heard.

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