

PEDIATRIC READINESS IN THE EMERGENCY DEPARTMENT

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Organizational Principles to Guide and Define the Child Health Care System and/or Improve the Health of All Children

Key words: pediatric readiness; emergency treatment

Abbreviations:

ED: emergency department; EMS: emergency medical services; EMSC: Emergency Medical Services for Children (program); IOM: Institute of Medicine; NPRP: National Pediatric Readiness Project; PECC: Pediatric Emergency Care Coordinator; PI: performance improvement; QI: quality improvement

Abstract

Note: This is a revision of the previous joint policy statement titled “Guidelines for Care of Children in the Emergency Department.” Children have unique physical and

psychosocial needs that are heightened in the setting of serious or life-threatening emergencies. The majority of ill and injured children are brought to community hospital emergency departments (EDs) by virtue of proximity. It is, therefore, imperative that all EDs have the appropriate

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resources (medications, equipment, policies, and education) and capable staff to provide effective emergency care for children. This policy statement outlines resources necessary for EDs to stand ready to care for children of all ages. These recommendations are consistent with the recommendations of the Institute of Medicine (now called the National Academy of Medicine) in its report “The Future of Emergency Care in the United States Health System.” Although resources within emergency and trauma care systems vary locally, regionally, and nationally, it is essential that ED staff, administrators, and medical directors seek to meet *or exceed* these recommendations to ensure high-quality emergency care is available for all children. These updated recommendations are intended to serve as a resource for clinical and administrative leadership of EDs as they strive to improve their readiness for children of all ages.

Introduction

This policy statement delineates the recommended resources necessary to prepare emergency departments (EDs) to care for pediatric patients. Adoption of the recommendations in this policy will facilitate the delivery of emergency care for children of all ages and, when appropriate, timely transfer to a facility with specialized pediatric services. This joint policy is an update of previously published guidelines.¹⁻⁴

These recommendations are intended to apply to all EDs that provide care for children. In the United States, most children who seek emergency care (83%) present to general EDs versus specialized pediatric EDs.⁵ Intended users of these recommendations include all EDs that are open 24 hours a day, 7 days a week, including freestanding EDs and critical access hospital EDs. This policy statement is not intended to address urgent care centers, as other recommendations are available addressing those settings.⁶

Background

The National Hospital Ambulatory Medical Care Survey reported that in 2014 there were approximately 5,000 EDs in the United States. Of the more than 141 million ED visits in the United States in 2014, approximately 20% were for children younger than 15 years.⁷ Children have unique anatomic, physiologic, developmental, and medical needs that differ from adults. These differences must be considered when developing emergency services, in training ED staff, and in stocking equipment, medication, and supplies.

IMPROVING PEDIATRIC READINESS IN US EDS

In 2006, the “Future of Emergency Care” series of the Institute of Medicine (IOM; now the National Academy of Medicine) noted ongoing deficiencies in both the prehospital and ED settings, including the availability of pediatric equipment, access to supplies and medications, training for staff, and policies incorporating the unique needs of children.⁸ Although there have been marked improvements in many areas of everyday pediatric readiness, persistent variability and need for improvement remain across the continuum of care.^{5,9-12}

One of the specific recommendations from the 2006 IOM report was that hospitals appoint coordinators for pediatric emergency care. At that time, only 18% of EDs in the United States reported having a physician coordinator and only 12% had a nursing coordinator for pediatric emergency care. A national assessment performed in 2003¹³ demonstrated that EDs that have staff in these positions tend to be more prepared, as measured by compliance with “Guidelines for the Care of Children in the Emergency Department” published by the American College of Emergency Physicians (ACEP) and American Academy of Pediatrics (AAP) in 2001.¹ In 2009 the AAP, ACEP, and the Emergency Nurses Association (ENA), with the support of the Emergency Medical Services for Children (EMSC) program, undertook a major revision of these guidelines.^{3,4} The 2009 joint policy statement is the subject for this policy revision.

The National Pediatric Readiness Project (NPRP), launched in 2013, is an ongoing quality improvement (QI) initiative among the federal EMSC and the AAP, ACEP, and ENA to ensure pediatric readiness of EDs.⁹ In phase one of the project, hospital ED leaders in all US states and territories were asked to complete a comprehensive web-based assessment of their readiness to care for children. The assessment was based on the 2009 joint policy statement.^{3,4} The response rate was 83%, representing more than 4,000 EDs.⁵ The data from this project provide a snapshot of the nation’s readiness to provide care to children in the ED. They also provide information on gaps in readiness at the state and national level, confidential site-specific needs, and recommendations to improve readiness. Key findings include:

1. The majority of children who seek emergency care (69.4%) are cared for in EDs that see fewer than 15 pediatric patients a day, highlighting the need to provide additional pediatric emergency resources to smaller and often rural EDs.

2. The overall median score for the nation was 70 (out of 100 possible points). This represents an improvement when compared with a similar survey completed in 2003 (median score of 55 points).^{5,13}
3. The median score for EDs with a high volume of pediatric patients (>27 pediatric visits per day) was greater than EDs with medium/medium-high (5-27 pediatric visits per day) or low pediatric volume (<5 pediatric visits per day).
4. Approximately half of EDs lacked a physician (52.5%) or nurse (40.7%) pediatric emergency care coordinator (PECC). The presence of a PECC is strongly correlated with improved pediatric readiness, independent of other factors.⁵ Another analysis of hospital-based EDs in the state of California also demonstrated that the presence of a PECC was associated with improved overall pediatric readiness scores.¹⁴
5. Fifty-five percent of EDs reported the absence of a QI plan addressing pediatric care and, of those that had a QI plan, 41.7% lacked specific quality indicators for children. The presence of a QI plan that included pediatric-specific indicators was independently associated with improved overall readiness scores in California.¹⁴
6. In the absence of participation in a pediatric verification program, trauma center status was not predictive of higher pediatric readiness scores.¹⁴
7. Approximately half of hospitals reported lacking disaster plans (53.2%) that include specific care needs for children.⁵
8. A process to ensure that weights are measured and recorded in kilograms only, a pediatric safety concern, was also lacking in 32.3% of EDs completing the assessment.⁵

PEDIATRIC READINESS AND PEDIATRIC FACILITY RECOGNITION

The EMSC program has long promoted improved preparedness and recognition of prepared EDs. Current EMSC performance measures address pediatric readiness for children with both traumatic and medical emergencies.¹⁰ Performance measure 04 is: "The percent of hospitals recognized through a statewide, territorial or regional standardized system that are able to stabilize and or manage pediatric medical emergencies." At this time, 11 states have developed such a system (recognizing 8% of all US hospital-based EDs),¹⁵ and all have used the 2009 joint policy statement as the basis of their recognition criteria. Some

states have published descriptions of the process they used to establish and maintain a pediatric recognition system.^{14,16}

Recognition and verification have been associated with improved readiness scores. Remick et al described an association between higher hospital readiness scores and an on-site verification program in California.¹⁴ National data indicate that states that have a recognition/verification system and have achieved EMSC performance measure 04 have readiness score that is an average of 10 points higher than those who do not have such a system.¹⁵ In addition, hospitals that have been recognized scored, on average, 22 points higher on the assessment than those that had not been recognized as pediatric ready by their state (unpublished data from National EMS for Children Data Analysis and Resource Center, 2014; www.nedarc.org).

PEDIATRIC READINESS: IMPROVING THE SAFETY AND QUALITY OF PEDIATRIC EMERGENCY CARE

Over the past 15 years, patient safety has become a key priority for health systems.¹⁷ In 2014, the AAP released the revised policy statement "Patient Safety in the Pediatric Emergency Care Setting."¹⁸ This statement and other recent work have demonstrated the value of specific structural and process measures on improved patient safety and quality of care. For example, a weight-based color-coded medication safety system can decrease dosing errors and improve timeliness of dosing,^{19,20} and order sets, reminders, and clinical practice recommendations embedded within information systems increase adherence to best practices.^{21,22}

Although previous guidelines^{1,2} were consensus based, several recent studies have demonstrated the effects of pediatric readiness on outcomes for children treated in EDs. Some investigators have examined the effect of improved pediatric readiness and/or facility recognition on the quality of pediatric emergency care. Ball et al²³ compared outcomes in children with extremity immobilization and a pain score of 5 or greater in a state with a medical facility recognition program to similar facilities in a state without a facility recognition program. The children in the state with the recognition system had improved timeliness of the management of pain for fractures and decreased exposure to radiation use. Kessler et al²⁴ demonstrated that teams of health care providers who practiced in EDs with higher pediatric readiness scores performed better in standardized simulation of the care of children with sepsis. A statewide program in Arizona to improve pediatric readiness of EDs has been associated with a decreased pediatric mortality rate after participation in a verification process based on compliance with published guidelines.²⁵ Shared

resources and coordination of care in emergency care systems is a strategy that may improve pediatric readiness locally, regionally, and nationally. Further research should be supported to evaluate the effects of each of the recommended components of the guidelines on quality of pediatric emergency care.

The information from the pediatric readiness assessment, research described earlier in this policy, and expert opinion from the coauthoring organizations informed this revised statement. These recommendations provide current information on equipment, medications, supplies, and personnel considered critical for managing pediatric emergencies in EDs. This statement also offers recommendations for the administration and coordination of pediatric care in the ED; pediatric emergency care QI, performance improvement (PI), and patient safety activities; policies, procedures, and protocols for pediatric care; and key ED support services. It is believed that all EDs in the United States can meet or exceed these recommendations and that some hospitals, such as those with pediatric critical care capabilities or children's hospitals with greater resources, will develop and implement even more comprehensive recommendations and share their expertise with their local and regional communities. These updated recommendations are intended to serve as a resource for clinical and administrative leadership of EDs as they strive to improve their readiness for children of all ages.

I. Administration and Coordination for the Care of Children In the ED

A. Pediatric Emergency Care Coordinator (PECC): A Physician Coordinator identified by the ED Medical Director and a Registered Nurse Coordinator identified by the ED Nurse Director. Identification of a physician and nurse PECC is central to the readiness of any ED that cares for children.

1. The Physician and Nurse PECCs may be concurrently assigned other roles in the ED (eg, frontline staff designated by leadership) or may oversee more than one program in the ED (ie, Medical or Nursing Director, or as coordinator for trauma, stroke, or STEMI). PECC roles may be shared through formal agreements with administrative entities, such as within hospital systems, where there is another ED capable of providing definitive pediatric care.

2. Facilitate the following qualifications for Physician and Nurse PECCs:
 - a. The Physician PECC is qualified by the facility to provide emergency care. Optimally, the Physician PECC is a board-certified/eligible specialist in emergency medicine or pediatric emergency medicine. Otherwise, the Physician PECC must meet the qualifications for credentialing by the hospital as an emergency clinician specialist with special training and experience in the evaluation and management of the critically ill child. The Physician PECC is credentialed by the facility and has verified competency in care of children, including resuscitation, per the hospital policy. For EDs with limited resources, this administrative role may be shared with a clinical nurse specialist, nurse practitioner, or physician assistant (ie, advanced practice provider) credentialed to care for patients in the ED.
 - b. The Nurse PECC is a registered nurse who possesses special interest, knowledge, and skill in the emergency nursing care of children through clinical experience and demonstrated competence in critical thinking and clinical skills. Where available, a Certified Emergency Nurse (CEN) or preferably a Certified Pediatric Emergency Nurse (CPEN) is desirable. Otherwise, the nurse coordinator has verified competency per hospital policy and may have other credentials such as Certified Pediatric Nurse (CPN) or Certified Critical Care Registered Nurse (CCRN).
3. The Physician and Nurse PECCs work collaboratively and are responsible for the following:
 - a. Promote adequate skill and knowledge of ED staff physicians, nurses, and other health care providers and staff (ie, physician assistants, advanced practice nurses, paramedics, and technicians) in the emergency care and resuscitation of infants and children. PECCs should have significant input into the methods for demonstrating competency in pediatric emergency care for their respective disciplines.
 - b. Participate in the development of the pediatric components of the QI plan and facilitate

- QI activities related to pediatric emergency care.
- c. Assist with development and periodic review of ED policies and procedures and standards for medications, equipment, and supplies to ensure adequate resources for children of all ages.
 - d. Serve as liaison/coordinator in collaboration with appropriate in-hospital and out-of-hospital pediatric care committees in the community/region and emergency medical services (EMS), trauma, and emergency preparedness coordinators (if they exist).
 - e. Serve as liaison to definitive care hospitals, such as regional pediatric referral hospitals and trauma centers, EMS agencies, primary care providers, health insurers, and any other care resources needed to integrate services along the pediatric care continuum, such as pediatric injury prevention, chronic disease management, and community education programs.
 - f. Facilitate pediatric emergency medical and nursing education for ED health care providers and staff, including but not limited to the identification of continuing pediatric emergency education resources.
 - g. Facilitate inclusion of pediatric-specific elements in physician and nursing orientation in the ED.
 - h. In coordination with the local credentialing processes, facilitate competency evaluations for staff that are pertinent to children of all ages. Where available, simulation (ie, pediatric scenario-based mock codes) has been demonstrated to improve pediatric care in resuscitation and team settings.²⁶⁻²⁸
 - i. Facilitate integration of pediatric needs in hospital disaster/emergency preparedness plans and promote inclusion of pediatric patients in disaster drills.²⁹
 - j. PECCs should collaborate with ED leadership to enable adequate staffing, medications, equipment, supplies, and other resources for children in the ED.
 - k. Communicate with ED and hospital leadership on efforts to facilitate pediatric emergency care.

II. Competencies for Physicians, Advanced Practice Providers, Nurses, and Other ED HEALTH CARE PROVIDERS

- A. Physicians, advanced practice providers, nurses, and other ED health care providers, based on their level of training and scope of practice, should have the necessary skill, knowledge, and training in the emergency evaluation and treatment of children of all ages, consistent with the services provided by the hospital.
- B. Baseline and periodic competency evaluations completed for all ED clinical staff, including physicians, advanced practice providers, nurses, and other health care providers are age specific and include neonates, infants, children, adolescents, and children with special health care needs. Competencies are determined by each institution's hospital policy and medical staff privileges as a part of the local credentialing process for all licensed ED staff.
- C. Demonstration and maintenance of pediatric clinical competencies may be achieved through continuing education, including participation in local educational programs, professional organization conferences, or national pediatric emergency care courses or through scheduled mock codes or patient simulation, team training exercises, or experiences in other clinical settings, such as the operating room (ie, airway management). Evaluation of such competencies may be achieved through direct observation, chart reviews, written knowledge tests, and/or maintenance of physician or advanced practice provider board certification or nurse certification where pediatric emergency medicine is a significant component of annual continuing education requirements.
- D. Potential areas for pediatric competency and professional performance evaluations may include but are not limited to:
 1. Assessment and treatment
 - a. Triage
 - b. Illness and injury assessment and management
 - c. Pain assessment and treatment, including nonpharmacologic pain management (eg, distraction techniques and comfort holds)

2. Medication administration and delivery
3. Device/equipment safety (eg, low-volume infusion pumps)
4. Procedures
 - a. Airway management
 - b. Vascular access
 - c. Sedation and analgesia
5. Resuscitation
 - a. Critical care monitoring
 - b. Neonatal resuscitation
 - c. Pediatric resuscitation
6. Trauma resuscitation and stabilization³⁰
 - a. Burn management
 - b. Traumatic brain injury
 - c. Fracture management
 - d. Hemorrhage control
 - e. Recognition and reporting of nonaccidental trauma
7. Disaster drills that include triage of pediatric victims, tracking and identification of unaccompanied children, family reunification, and determination of pediatric surge capacity²⁹
8. Patient- and family-centered care, including cultural competency
9. Team training and effective communication
 - a. Transitions of care/handoffs³¹
 - b. Closed-loop communication

III. Quality Improvement/Performance Improvement In the ED

Quality is best assured by evaluating each of the 6 domains addressed by the IOM^{31,32}: safe, equitable, patient-centered, timely, efficient, and effective. Performance improvement processes are essential to evaluating quality of care, and measurement is integral to PI activities. Pediatric-specific metrics should be carefully identified to assess the quality of care throughout each phase of health care delivery across the emergency care continuum. A pediatric patient care review process is integrated into the QI/PI plan of the ED according to the following recommendations:

- A. The potential framework for QI efforts may focus on the effectiveness of structural elements, processes, and clinical outcomes relative to pediatric emergency care. Minimum components of the QI/PI process should include collecting and analyzing data to discover variances, defining a plan for improvement, and evaluating the success of the QI/PI plan with

measures that are outcome based. High-level QI efforts facilitate education and training, implementation of targeted system change, and measurement of system performance over time until steady, high-level performance is achieved.

- B. The QI/PI plan of the ED shall include pediatric-specific indicators. Pediatric emergency care metrics have been identified (see Table 1) and should be strongly considered for inclusion in the overall QI plan. In addition, performance bundles may be used to assess quality of care provided for specific clinical conditions (eg, pediatric septic shock, pediatric asthma, pediatric closed head injury).
- C. Components of the process integrate out-of-hospital, ED, trauma, inpatient pediatrics, pediatric critical care, and hospital-wide QI or PI activities and may interface with regional, state, or national QI collaboratives, including injury prevention efforts.³³⁻³⁶
- D. Mechanisms are in place to monitor professional performance, credentialing, continuing education, and clinical competencies, including integration of findings from QI audits and case reviews for pediatric emergency care.

Numerous resources are available to assist ED staff with implementing QI/PI activities (see Table 2).

IV. Policies, Procedures, and Protocols for the ED

- A. Policies, procedures, and protocols for the emergency care of children are age specific and include neonates, infants, children, adolescents, and children with special health care needs. Staff are educated accordingly and monitored for compliance and periodically updated. These include, but are not limited to, the following:
 1. Illness and injury triage
 2. Pediatric patient assessment and reassessment
 3. Documentation of a full set of pediatric vital signs, including core temperature, respiratory rate, pulse oximetry, heart rate, blood pressure (including manual confirmation), pain, and mental status when indicated
 4. Identification and notification of the responsible provider of abnormal vital signs (age or weight based)
 5. Immunization assessment and management (eg, tetanus and rabies) of the underimmunized patient³⁷

TABLE 1
Sample Performance Measures for Pediatric Emergency Care*

Measures	Description
Patient triage	Measurement of weight in kilograms for pediatric patients Method to identify age-based abnormal pediatric vital signs
Infrastructure and personnel	Presence of all recommended pediatric equipment in the emergency department Presence of physician and nurse coordinators for pediatric emergency care
Patient-centered care	Patient and/or caregiver understanding of discharge instructions
Emergency department flow	Door-to-provider time Total length of stay
Pain management	Pain assessment and reassessment for children with acute fractures
Quality and safety	Number of return visits within 48 hours resulting in hospitalization Medication error rates
Disease-Specific Measures	
Trauma	Use of head computed tomography (CT) in children with minor head trauma Protocol for suspected child maltreatment
Respiratory diseases	Administration of systemic steroids for pediatric asthma exacerbations Use of an evidence-based guideline to manage bronchiolitis
Infectious diseases	Use of antibiotics in children with suspected viral illness

* Based on the work of Alessandrini E, Varadarajan K, Alpern ER, et al. Emergency department quality: an analysis of existing pediatric measures. *Acad Emerg Med.* 2011;18(5):519-526.

6. Sedation and analgesia (including nonpharmacologic interventions for comfort) for procedures, including medical imaging^{38,39}
7. Consent (including situations in which a parent or legal guardian is not immediately available)⁴⁰
8. Social and behavioral health issues, including belligerent, impaired, or violent parents and patients⁴¹⁻⁴³
9. Physical or chemical restraint of patients
10. Child maltreatment mandated reporting and assessment (physical and sexual abuse, sexual assault, human trafficking, and neglect)⁴⁴
11. Death of a child in the ED^{45,46}
12. Do-not-resuscitate orders
13. Lack of a medical home
14. Children with special health care needs, including developmental disabilities (eg, autism spectrum disorders, ventilator-dependent children)
15. Family-centered care,⁴⁷⁻⁵² including:
 - a. Involving families and guardians in patient care decision making and in medication safety processes
 - b. Family and guardian presence during all aspects of emergency care, including resuscitation
 - c. Education of the patient, family, and caregivers and guardians
 - d. Discharge planning and education
 - e. Bereavement counseling
16. Communication with patient's medical home or primary health care provider at the time of the ED visit (this can help ensure that a judicious and appropriate approach to examination, testing, imaging, and treatment is coordinated and follow-up is arranged in the most cost-effective and up-to-date manner)⁵³
17. Telehealth and telecommunications⁵⁴
18. All-hazard disaster preparedness plan that addresses the following pediatric issues⁵⁵:
 - a. Availability of medications, vaccines (eg, tetanus and rabies), equipment, supplies, and appropriately trained providers for children in disasters
 - b. Pediatric surge capacity for both injured and noninjured children
 - c. Decontamination, isolation, and quarantine of families and children of all ages
 - d. Minimization of parent-child separation and improved methods for reuniting separated children with their families

TABLE 2

Examples of Pediatric Emergency Care Performance Improvement Activities and Resources

Clinical Emergency Department Registry (CEDR)	https://www.acep.org/cedr/
Committee on Quality Transformation, Section on Emergency Medicine	https://www.aap.org/en-us/about-the-aap/Committees-Councils-Sections/Section-on-Emergency-Medicine/Pages/About-Us.aspx
EMS for Children Innovation and Improvement Center	https://emscimprovement.center
Emergency Nurses Association	https://www.ena.org/#practice-resources
Education in Quality Improvement for Pediatric Practice (EQIPP)	https://eqipp.aap.org/
The National Pediatric Readiness Assessment	https://www.pedsready.org
Pedialink, The AAP Online Learning Center	https://pedialink.aap.org/visitor
Pediatric Readiness Toolkit	http://www.pediatricreadiness.org
Pediatric Trauma Society	http://pediatrictraumasociety.org/
Interfacility Tool Kit for the Pediatric Patient	http://www.traumanurses.org/inter-facility-tool-kit-for-the-pediatric-patient
Pediatric TQIP	https://www.facs.org/quality-programs/trauma/tqip/pediatric-tqip
PECARN guidelines	http://www.pecarn.org

- e. Access to specific medical and behavioral health therapies, as well as social services, for children in the event of a disaster
 - f. Disaster drills that include a pediatric mass casualty incident at least once every 2 years and that all drills include pediatric patients
 - g. The care of children with special health care needs, including children with developmental disabilities
- B. Evidence-based clinical pathways, order sets, or decision support should be available to providers in real time. These may be systematically derived, consensus driven, or locally developed based on available evidence. Many children's hospitals and/or academic centers have developed such clinical pathways. Collaboration with regional pediatric centers and trauma centers may facilitate the use of standard, evidence-based guidelines. An updated and complete list is available on the Pediatric Readiness Web site⁵⁶⁻⁶⁰ (www.pediatricreadiness.org).
- C. Hospitals should have written pediatric interfacility transfer procedures and/or agreements that include the following pediatric components⁶¹⁻⁶³:
1. Defined process for initiation of transfer, including the roles and responsibilities of the referring facility and referral center (including responsibilities for requesting transfer, method of transport, and communication)
 2. Transport plan to deliver children safely (including the use of child passenger restraint devices) and in a timely manner to the appropriate facility capable of providing definitive care
3. Process for selecting the appropriate care facility for pediatric specialty services not available at the hospital; these specialty services may include:
 - a. Medical and surgical specialty care
 - b. Critical care
 - c. Reimplantation (replacement of severed digits or limbs)
 - d. Trauma and burn care
 - e. Psychiatric emergencies
 - f. Obstetric and perinatal emergencies
 - g. Child maltreatment (physical and sexual abuse and assault)
 - h. Rehabilitation for recovery from critical medical or traumatic conditions
 - i. Orthopedic emergencies
 - j. Neurosurgical emergencies
 4. Process for selecting the appropriately staffed transport service to match the patient's acuity level (ie, level of care required and equipment needed for transport) and appropriate for children with special health care needs
 5. Process for patient transfer (including obtaining informed consent)⁶⁴
 6. Plan for transfer of critical patient information (ie, medical record, imaging, copy of signed transport consent) as well as personal belongings and provision of directions and referral institution information to family

7. Process for return transfer of the pediatric patient to the referring facility as appropriate
8. Integration with telehealth/telecommunications processes and mobile integrated health/community paramedicine as appropriate⁵⁴

V. Pediatric Patient and Medication Safety in the ED

The delivery of pediatric care should reflect an awareness of unique pediatric patient safety concerns and should include the following policies or practices^{65,66}:

- A. Children should be weighed in kilograms, with the exception of children who require emergency stabilization, and the weight should be recorded in a prominent place on the medical record, preferably with the vital signs.
 1. For children who require resuscitation or emergency stabilization, a standard method for estimating weight in kilograms should be used.
- B. A full set of vital signs should be recorded and reassessed per hospital policy for all children.
- C. Processes for safe medication (including blood products) prescribing, delivery, and disposal should be established and should include the following^{67,68}:
 1. Use precalculated dosing guidelines for children of all ages.
 2. Consider adding a pharmacist with pediatric competency to the ED team, especially in large EDs, during times of higher volume.
 3. Identify the administration phase as a high-risk practice (eg, the simple misplacement of a decimal point can result in a 10-fold medication error).
 4. Promote distraction-free zones for medication preparation.^{69,70}
 5. Implement and utilize computerized physician order entry and clinical decision support with pediatric-specific kilogram-only dosing rules, including upper dosing limits, within Emergency Department Information Systems (EDISs).
 6. Implement and utilize computerized physician order entry to create allergy alerts for all prescribed medications.
 7. Practice vigilance for all administered or prescribed medications and consider developing

- standardized order sets, particularly for high-risk medications, such as opioids and antibiotics.
 8. Implement an independent 2-provider cross-check process for high-alert medications.
 9. Create a standard formulary for pediatric high-risk and commonly used medications.
 10. Standardize concentrations of high-risk medication.
 11. Reduce the number of available concentrations to the smallest possible number.
 12. Implement systems that bypass weight-based calculations during pediatric resuscitations and treatment to reduce potentially harmful mistakes.
 13. Establish a culture of safety surrounding pediatric medication administration that encourages reporting of near-miss or adverse medication events that can then be analyzed to feed back into the system in a continuous QI model.
 14. Ensure that caregivers are well instructed on medication administration, particularly for pain and antipyretic medications, prior to being discharged from the ED.
 15. Promote integration of health literacy concepts and skills including the use of plain language, teach-back, pictograms, and lower-literacy instructions.⁷¹⁻⁷⁵
- D. Pediatric emergency services should be culturally and linguistically appropriate,⁷⁶ and the ED should provide an environment that is safe for children and supports patient- and family-centered care.^{48,49,77}
 1. Enhance family-centered care by actively engaging patients and families in safety at all points of care and address issues of ethnic culture, language, and literacy.
 2. Direct families to appropriate resources, and review patients' rights and responsibilities from the perspective of safety.
 3. Include shared decision making.
 4. Utilize trained language interpreter services rather than bilingual relatives.
 - E. Patient-identification policies, consistent with The Joint Commission's national patient safety goals, should be implemented and monitored.⁷⁸
 - F. Policies for the timely tracking, reporting, and evaluation of patient safety events and for the disclosure of medical errors or unanticipated outcomes should be implemented and monitored, and education and

training in disclosure should be available to care providers who are assigned this responsibility.^{65,66}

VI. Support Services for the ED

- A. The radiology department should have the skills and capability to provide imaging studies of children and have the equipment necessary to do so and guidelines to reduce radiation exposure that are age and size specific.⁷⁹⁻⁸¹
 1. The radiology capability of hospitals may vary from one institution to another; however, every ED should promote on-site radiology capabilities to meet the needs of children in the community.
 2. Medical imaging protocols that address age- or weight-appropriate dose reductions for children receiving studies that impart ionizing radiation, consistent with ALARA (as low as reasonably achievable) principles.⁸²
 3. A process should be established for the referral of children to appropriate facilities for radiological procedures that exceed the capability of the hospital.
 4. A process should be in place for the timely review and interpretation reporting by a qualified radiologist for medical imaging studies in children.
 5. When a patient is transferred from one facility to another, to avoid unnecessary radiation exposure, all efforts should be made to transfer completed images. New technology (eg, cloud sharing or HIPAA protected) may facilitate image sharing between facilities.⁸³
- B. The laboratory should have the skills and capability to perform laboratory tests for children of all ages, including obtaining samples, and have available microtechnology for small or limited sample sizes.
 1. The clinical laboratory capability must meet the needs of the children in the community it serves.
 2. There should be a clear understanding of what the laboratory capability is for any given community, and definitive plans for referring children to the appropriate facility for laboratory studies should be in place.
 3. Protocols should be developed for the screening and administration of blood and blood products for ill or injured children.

VII. Equipment, Supplies, and Medications

Pediatric equipment, supplies, and medications shall be easily accessible, labeled, and logically organized (eg, kilogram weight, weight-based color coding).

- A. Medication chart, color-based coding, medical software, or other systems shall be readily available to ED staff to ensure proper sizing of resuscitation equipment and proper dosing of medications based on patient weight in kilograms.
- B. Resuscitation equipment and supplies shall be located in the ED; trays and other items may be housed in other departments (such as the newborn nursery or central supply) with a process to ensure immediate accessibility to ED staff. A mobile or portable appropriately stocked pediatric crash cart should be available in the ED at all times.
- C. ED staff shall be appropriately educated as to the location of all items (Appendix 1).
- D. Each ED shall have a daily method to verify the proper location and function of equipment and expiration of medications and supplies.
- E. Tables 3a and 3b and Appendix 1 outline medications, equipment, and supplies necessary for the care of children in the ED by qualified health care providers.⁸⁴

Summary

The 2006 IOM report, *Emergency Care for Children: Growing Pains*, uses the word “uneven” to describe the current status of pediatric emergency care in the United States.⁸ Although much progress has been made in the level of pediatric readiness across communities,⁵ there remains a significant opportunity for further progress nationwide. An important first step in ensuring readiness is the identification of a physician and nurse coordinator for pediatric emergency care.

All EDs must be continually prepared to receive, accurately assess, and, at a minimum, stabilize and safely transfer acutely ill or injured children. This is necessary even for hospitals located in communities with readily accessible pediatric tertiary care centers and regionalized systems for pediatric trauma and critical care. The vast majority of children requiring emergency services in the United States receive this care in a nonchildren’s hospital ED, with 69% of EDs providing care for fewer than 15 children per day.⁵ This relatively infrequent exposure of hospital-based emergency care professionals to seriously ill or injured children represents a substantial barrier to the maintenance of

TABLE 3A

Resuscitation Medications for Use in Pediatric Patients in EDs¹

- Adenosine
- Amiodarone
- Atropine
- Calcium chloride and/or calcium gluconate
- Epinephrine (1 mg/mL [IM] and 0.1 mg/mL [IV] solutions)²
- Lidocaine
- Procainamide
- Sodium bicarbonate (4.2%)³
- Vasopressor agents (eg, dopamine, epinephrine, norepinephrine)

TABLE 3B

Medications to Be Used in the ED for the Care of Children

- Analgesics (oral, intranasal, and parenteral)
- Anesthetics/topical (eg, EMLA [eutectic mixture of local anesthetics], lidocaine 2.5% and prilocaine 2.5%, LET [lidocaine, epinephrine, and tetracaine], LMX 4 [4% lidocaine])
- Anticonvulsants (eg, levetiracetam, valproate, carbamazepine, fosphenytoin, phenobarbital)
- Antidotes (common antidotes should be accessible to the ED)⁴
- Antiemetics (eg, ondansetron, prochlorperazine)
- Antihypertensives (eg, labetalol, nicardipine, sodium nitroprusside)
- Antimicrobials (parenteral and oral)
- Antipsychotics (eg, olanzapine, haloperidol)
- Antipyretics (eg, acetaminophen, ibuprofen)
- Benzodiazepines (eg, midazolam, lorazepam)
- Bronchodilators
- Corticosteroids (eg, dexamethasone, methylprednisolone, hydrocortisone)
- Dextrose (D₁₀W)
- Diphenhydramine
- Furosemide
- Glucagon
- Insulin
- Lidocaine
- Magnesium sulfate
- Mannitol
- Naloxone hydrochloride
- Neuromuscular blockers (eg, rocuronium, succinylcholine)
- Oral glucose or sucrose solutions for pain control in infants
- Sedation medications (eg, etomidate, ketamine)
- Vaccines
- 3% hypertonic saline

¹ For a more complete list of medications used in a pediatric ED, see reference 75.

² Formerly epinephrine 1:1,000 solution, now 1 mg/mL for IM use or inhalation; 1:10,000 solution now 0.1 mg/mL for IV use.

³ If only sodium bicarbonate 8.4% available, may dilute 1:1 with normal saline before administration in children <2 years of age.

⁴ For less frequently used antidotes, a procedure for obtaining them should be in place.

essential skills and clinical competency. Recognition of the unique needs of the ill and/or injured children served by an emergency care facility, including children with special health care needs; the commitment to better meet those needs through adoption of these recommendations; and the ongoing commitment to evaluate care quality and safety and maintain pediatric competencies should provide a strong foundation for pediatric emergency care.

Resources to assist with implementation of all aspects of this document can be found at www.pediatricreadiness.org.

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