Emergency Department Readiness For Pediatric Illness And Injury

Abstract

There are approximately 25 million emergency department visits by children each year in the United States. It can be challenging for healthcare providers to maintain the readiness of emergency departments in terms of equipment availability, policies and procedures for the care of children, and quality improvement for pediatric patients. Nearly 90% of children are seen in general emergency departments, and 50% of emergency departments see fewer than 10 pediatric patients per day, resulting in somewhat limited experience with critically ill and injured children for most emergency care clinicians. In the framework of the current healthcare system that is wrought with overcrowding, underfunding, and highly variable pediatric capabilities, children are arguably at the greatest risk for medical error. This issue reviews the current state of pediatric readiness in emergency departments, the necessary steps to ensure day-to-day readiness, the published guidelines for pediatric readiness, and systems-based innovations in pediatric readiness.
Case Presentation

A 14-month-old boy in respiratory distress is carried into your ED by his parents after choking on a piece of meat. Upon presentation, he is noted by the nurse to have audible stridor and severe retractions. His initial vital signs are: heart rate, 190 beats/min; respiratory rate, 10 breaths/min; oxygen saturation, 78% on room air; temperature, 37.4°C; and blood pressure, 90/54 mm Hg. The patient is rapidly triaged using the Emergency Severity Index, and on arrival at the patient’s bedside, you are immediately notified by the staff of abnormal vital signs. You initiate bag-mask ventilation for hypoventilation and hypoxia. There is poor chest rise, and you feel resistance to ventilation. You recognize that this child is in respiratory failure with an upper airway obstruction, and you begin the process of relieving the obstruction. The scenario calls to mind a meeting you had earlier that morning regarding treatment of pediatric patients in your ED and equipment you might need. You think about some of the questions that were brought up and how they might apply to care for this child, such as:

1. Was the triage tool that was used adequate for this child, and did the staff notify you in an appropriate time frame of abnormal vital signs?
2. Are the critical pediatric resuscitation equipment and supplies stored in a location that makes them readily available for use?
3. Which staff members should be identified to ensure that necessary equipment is immediately available, including pediatric Magill forceps and a difficult airway kit?
4. How will our ED staff ensure that medications given to this child to facilitate intubation are dosed accurately?
5. How will the family be updated on the child’s management?
6. Once stabilized, will this child be admitted for definitive care, or will the child require transfer to another facility for pediatric intensive care services?

Introduction

Because parents are most likely to take sick children to the closest emergency department (ED), 90% of children are seen in general EDs. On the emergency clinician’s side, however, opportunity to care for critically ill or injured children is relatively uncommon, and anxiety can be high when such children present. Discovering that the necessary equipment and personnel are not available to respond efficiently should never occur at the moment they are needed. Just as hospitals anticipate and prepare for the care of trauma, stroke, and cardiac patients, preparation for the care of children should also be in place. Guidelines for pediatric readiness are well defined and readily available from many sources. Developing the expertise within hospitals to ensure pediatric readiness of EDs can be a challenge, but it can be accomplished with dedicated staff assigned to the role of ensuring readiness.

Pediatric Patient Safety In The United States Healthcare System

Healthcare providers and patient have long been aware of patient safety issues in the United States healthcare system. Over the last decade, such issues have come under increasing public scrutiny, due in large part to publication of the 2000 Institute of Medicine (IOM) report, To Err is Human, in which a reported 44,000 to 98,000 deaths were estimated to occur each year from preventable medical error. These results prompted a call to action. In 2001, the National Quality Forum identified a number of environmental factors associated with increased risk for medical error, including high patient volumes, high-acuity illnesses, and the need to make rapid healthcare decisions while under severe time constraints. In addition, overcrowding and boarding have been cited repeatedly as barriers to safe, high-quality care in the ED setting.

In such a healthcare environment, it is reasonable to assume that certain populations with special needs (such as children or the elderly) may be at even greater risk for medical error. The elderly population is expanding as the baby boomer generation ages, and many healthcare providers will have additional experience caring for this population; however, few healthcare providers have enough ongoing experience with critically ill or injured children to maintain their knowledge and skills. This, in turn, may lead to failures in an emergency clinician’s ability to recognize severity of illness and may cause subsequent errors in decision-making. In fact, one-half of all United States EDs see fewer than 10 pediatric patients per day. Children require a unique set of competencies, policies, equipment, and patient safety initiatives to meet their needs.

In response to growing concerns that the needs of children were not being met, in 1985 the United States Congress developed the Emergency Medical Services for Children (EMS for Children) program with the stated goal of reducing childhood death and disability due to injury or illness. The EMS for Children program has been extremely active and highly successful through the development of clinical protocols and guidelines for pediatric equipment, medications, and staffing; the establishment of resource centers to facilitate state and national research in pediatric emergency care; and education and training programs for emergency clinicians. Since its inception, the EMS for Children program has remained the largest single source of support for research and education initiatives in pediatric emergency care in the United States.
Despite the EMS for Children program’s numerous early accomplishments, based on a growing awareness that the needs of children were not being met, the IOM commissioned 2 key reports on the state of emergency care. In the first report, published in 1993, the IOM provided recommendations in 5 specific areas: (1) provider education and training, (2) essential tools needed for pediatric care, (3) communications, (4) system evaluation and research, and (5) leadership by federal and state agencies. More specifically, the IOM advised that “children needed to be more widely recognized and made a genuine priority,” and that regulatory agencies should “…require hospital emergency departments and emergency response and transport vehicles to have available and maintain equipment and supplies appropriate for the emergency care of children.” While the call to action was echoed by the EMS for Children program and numerous medical and nursing professional organizations, its impact was lessened by the increasing strain on resources in the emergency care systems.

Over the following decade, the number of emergency care visits steadily increased while hundreds of hospitals and EDs closed, leading to increasing overcrowding in facilities that remained open. In response, the IOM commissioned and published in 2006 a second analysis and a subsequent 3-part report entitled, The Future of Emergency Care in the United States Health System. Here, the IOM cited not only the rising number of ED visits and overcrowding, but also the critical shortages of healthcare providers and increasing ambulance diversions. Such strains in the system were recognized as contributing to poor overall quality of care and unnecessary medical errors. In addition, the IOM noted that, while children account for approximately one-quarter of all ED visits, most EDs and emergency medical services (EMS) agencies do not routinely require specialized pediatric training for clinical staff, and some lack the full scope of recommended pediatric equipment, medications, and supplies. The IOM cautioned that such an environment has created a clear “unevenness” in the ability of emergency care systems to treat children.

**Pediatric-Specific Safety Risks**

In the setting of the current healthcare system, factors affecting pediatric patient safety include limited emergency clinician training and/or limited experience in pediatric emergency care and uncertain availability of pediatric-sized equipment and supplies. In addition, children have unique characteristics and needs that require a higher level of attention. Such needs include the use of weight-based or length-based dosing rather than standardized dosing. The simple misplacement of a decimal point may result in a 10-fold medication error. In addition, young children are at increased risk of medical error due to their inability to communicate effectively and localize key symptoms such as pain or the site of injury. This becomes even more challenging when children are unaccompanied by a parent or guardian. Finally, children with complex medical histories and special healthcare needs often exhibit less obvious signs of underlying illness, which can result in failure to recognize the critical nature of their presentation.

**Guidelines Development For Pediatric Readiness**

While various organizations had worked individually to define “pediatric readiness” in EDs, it was not until 2001 that the American Academy of Pediatrics (AAP) and the American College of Emergency Physicians (ACEP) joined forces to create a comprehensive set of guidelines. Through collaboration with the Emergency Nurses Association (ENA), these guidelines were further revised and expanded in 2009 to include family-centered care and patient safety recommendations as well as recommendations for the care of children in disasters. The guidelines target 7 areas of focus:

1. Administration and coordination
2. Physicians, nurses, and other healthcare clinicians
3. Quality improvement
4. Patient safety
5. Policies, procedures, and protocols
6. Support services
7. Equipment, supplies, and medications

Furthermore, these guidelines are intended for all EDs that provide emergency care 24 hours a day, including those with limited resources.

**Literature On Pediatric Readiness**

Several studies have attempted to assess pediatric readiness in EDs. In 2001, a survey of 737 hospital EDs in Canada revealed significant gaps in the availability of pediatric equipment. The gaps were linked to a low percentage of pediatric visits (< 10%), the lack of the presence of an emergency clinician trained in Pediatric Advanced Life Support (PALS), and the lack of an on-call pediatrician. The United States Consumer Product Safety Commission conducted a 2001 survey of 101 hospital EDs that participated in the National Electronic Injury Surveillance System, and they extrapolated the results to all hospitals in the United States. They found that nearly 60% of EDs see fewer than 50 patients per day (adult and pediatric) and designate themselves as “standby” (physician on call to the ED) or “basic” EDs. Pediatric-sized equipment was less often available, and the great majority of hospitals lacked pediatric-specific inpatient services despite the fact...
that three-quarters of the hospitals admitted pediatric patients to their facilities. Additionally, less than half of hospitals without a pediatric intensive care unit (PICU) had written transfer agreements with other facilities.

In 2002, the United States Centers for Disease Control and Prevention (CDC) supported a survey of 839 nonfederal hospitals with 24-hour EDs that participated in the National Hospital Ambulatory Medical Care Survey to assess the availability of pediatric services, expertise, and supplies.16 In this report, Middleton and Burt found that only 5.5% of hospitals had all of the recommended equipment (per the 2001 guidelines), and approximately 50% of hospitals without a PICU lacked written transfer agreements.

In a 2003 study of United States EDs, Gausche-Hill et al found that nearly 90% of children are seen in nonchildren’s hospitals, 25% of children are seen in rural or remote areas, and 50% of all EDs see fewer than 10 pediatric patients per day.1 Similar to the findings of Middleton and Burt, they also found that 6% of EDs had all of the recommended pediatric equipment; however, 90% of responding hospitals had at least 81% of the recommended equipment. A large majority of the responding EDs also had all of the recommended medications. Of note, < 60% of hospitals reported awareness of the 2001 guidelines. Finally—and perhaps most importantly—they showed that the presence of a physician or nurse coordinator for pediatric emergency care resulted in an approximately 60% improvement in pediatric readiness over hospitals lacking such coordinators. Unfortunately, of the responding hospitals, only 18% had physician pediatric coordinators and only 12% had nurse pediatric coordinators available.

In 2006, 4 years after the Middleton and Burt study, the CDC conducted a follow-up survey of pediatric services and equipment in United States EDs.17 Unfortunately, little change was noted from the previous study, as only 7% of hospitals had 100% of the recommended pediatric supplies, and 45% of hospitals had 85% of the recommended pediatric supplies.

Finally, following publication of the 2009 guidelines, Sullivan et al conducted a telephone survey of 279 United States EDs on the presence of pediatric services.18 Only 17% reported the presence of a nurse and/or physician coordinator for pediatric emergency care. Furthermore, the majority of hospitals reported a lack of inpatient resources to manage severe illness and injury in children.

**Barriers To Pediatric Readiness**

Reasons often cited for the lack of pediatric readiness in the ED include the multitude of barriers perceived by hospital and nurse leaders. The lack of pediatric quality improvement plans and the lack of a comprehensive disaster plan that incorporates the needs of children represent common barriers to pediatric readiness.

Cost is often one of the greatest concerns voiced by administrators; however, the cost of pediatric readiness is far less than many assume. One study indicates that the cost to the average ED for pediatric supplies is < $1000.1,15 A potential strategy to reduce the cost of replacing infrequently used pediatric emergency supplies is to purchase supplies in bulk and distribute them to different areas of the hospital or to exchange the supplies with hospitals with higher pediatric volume or with EMS provider agencies, to allow for cost sharing.

**Recommendations For Preparing The Emergency Department For Treatment Of Pediatric Patients**

Despite the enormous effort employed to promote pediatric readiness, previous studies confirm that there is still much work to be done. Focusing on a few specific areas of pediatric readiness could make a significant difference in the ability of EDs to care for children. With few hospitals being aware of the national guidelines for pediatric readiness, this is a clear first step. As the healthcare system struggles to find a balance between overcrowding and underfunding, quality improvement plans that target pediatric-specific needs must be in place. A number of resources are available to assist in pediatric readiness.

**Resources For Emergency Department Assessment And Management**

**Pediatric Readiness Checklist**


This checklist can be used by ED managers to evaluate their ED’s pediatric readiness as defined in national guidelines and to identify gaps in care.
Assessment Toolkit
The National Pediatric Readiness Project (supported by the EMS for Children program, AAP, ACEP, and ENA) has completed a nationwide assessment of pediatric readiness. Participating hospitals were able to benchmark their pediatric readiness with aggregated data from similar hospitals as well as with overall national averages. Each participating hospital also received a gap analysis to assist hospital staff in closing the pediatric readiness gap. With gaps identified, hospitals were then able to access the online national pediatric readiness toolkit, which can be found at www.pediatricreadiness.org. The toolkit was developed based on the 7 areas targeted in the 2009 guidelines and provides links to essential resources to help hospital-based clinicians begin the necessary changes, whether it be policy development or quality improvement processes. Regardless of participation in the National Pediatric Readiness Project, the toolkit is free and readily available.

Pediatric Coordinator
The responsibilities of physician and nurse coordinators for pediatric emergency care vary based on the specific needs of each facility. Ensuring that all pediatric patients receive high-quality care according to standards of practice requires a more in-depth approach. The identification of a pediatric coordinator allows pediatric needs to be made known and addressed at hospital, community, and regional levels. Pediatric-specific indicators should be integrated into the ED quality improvement plan and a process should be implemented to verify that emergency clinicians maintain pediatric competencies. Other responsibilities might include periodic review of ED policies, procedures, and supplies; ensuring pediatric needs are addressed in hospital disaster plans; and promoting pediatric emergency education for emergency clinicians. See page 9, Special Considerations, for further discussion.

Triage Tools
Virtually all EDs use a triage system to assess patients on arrival. Numerous triage scales, both 3- and 5-level, are currently available. Department-wide adoption of a validated pediatric triage tool is essential to identify children in need of rapid assessment and treatment. The ENA advocates the use of validated 5-level triage scales. Three such tools have been validated in the pediatric population and include the Emergency Severity Index, the Canadian Triage and Acuity Scale, and the Manchester Triage System. These pediatric triage scales address resource utilization and the need for hospital admission. Such triage systems can be used concomitantly with procedures to identify and communicate to physicians and midlevel practitioners any vital signs that are abnormal for the patient’s age. Implementation of such processes is likely to heighten provider awareness and expedite patient assessment and management.

Pediatric Surge Capacity Planning
While no one wants to believe that a disaster will strike their community, every hospital is likely to be involved in a surge plan should such an event occur, and, therefore, all hospitals need to be prepared to care for patients of any age. Although children are disproportionately affected in the wake of a disaster, few comprehensive disaster plans at state and local levels have incorporated the needs of children within their plans. Mass casualty and surge events will bring children and their families to any hospital, regardless of whether plans have been established or not. Given that natural disasters and terrorist attacks can strike in small towns and large cities alike, hospitals must know their pediatric surge capacity, and it is essential that they have a disaster plan in place that targets the specific needs of children.

Safety
Pediatric patient safety should remain a core focus for ED leaders. In the setting of a busy ED with significant time constraints, overcrowding, and infrequent encounters with critically ill children, an event such as a pediatric resuscitation may be a source of high anxiety that can increase the likelihood of medical error. Rapid drug administration and immediate access to appropriately sized equipment can be life-saving. In such situations, the presence of length-based tapes with precalculated drug dosing and equipment sizing (such as Broselow tape) is crucial. The suggested drug dosing by weight on the Broselow tape is based on average body weight or length. While a patient’s body habitus should be taken into consideration, as obesity can affect dosing, the American Heart Association (AHA), in their 2010 Pediatric Advanced Life Support guidelines, states, “Regardless of the patient’s habitus, use the actual body weight for calculating initial resuscitation drug doses or use a body-length tape with precalculated doses.” These guidelines suggest that if actual weight is used to calculate medication doses in obese children, overdosing may occur, and if lean body mass is used to calculate doses, underdosing may occur. Furthermore, because standardized pediatric dosing is based on weight measured in kilograms, all children aged < 18 years should have their weight measured and recorded solely in kilograms. Failure to do so creates another opportunity for medical error and decreases patient safety.
Prehospital And Hospital Clinician Training
Pediatric patients account for approximately 10% of all EMS patients, yet only 1% of these may be medical or traumatic cardiopulmonary arrests. The amount of didactic and skills training in pediatrics can be highly variable across professional training programs; however, regardless of baseline knowledge and hands-on training, pediatric skills will undoubtedly wane over time, given limited exposure. Therefore, it becomes critical that EMS systems ensure adequate ongoing skills training for clinicians.

The majority of EDs are staffed by emergency medicine-trained and family medicine-trained physicians, and the quantity and quality of pediatric training varies among residency programs. According to a survey of board-certified emergency medicine physicians, 84% felt they were at least “adequately” prepared to manage pediatric cardiopulmonary arrests and 92% felt they were at least “adequately” prepared to manage acutely ill children. These results were lower than the percentage of board-certified emergency medicine physicians who felt adequately prepared to manage adult patients (96% for treatment of adult cardiopulmonary arrests and 97% for acute illness). The availability of an inhouse or on-call pediatrician may be an important resource, yet as many as 38% of EDs lack around-the-clock access to a board-certified pediatrician. This highlights the importance of ongoing maintenance of pediatric knowledge and skills through continuing medical education, pediatric life-support courses (such as PALS through the AHA), and annual competency evaluations.

Regionalization Of Pediatric Care
Statewide designation programs are often seen as a first step toward regionalization of pediatric care. Effective management of the critically ill or injured child involves numerous steps, including a rapid EMS response, transport to a nearby facility with the ability to stabilize pediatric medical emergencies, the possible transfer to a regional center with pediatric critical care services for high-risk illnesses, and eventual transition back to the community-based medical home. Each of these steps must be fully functioning in order to prevent unnecessary death or disability. Given that pediatric critical care centers are few in number and often located some distance from the child’s home, the benefit of such services must outweigh the cost of transferring the child and the subsequent strain on the child’s family due to travel.

The development of a regionalized system of pediatric care, although controversial, may assist in ensuring that children receive “the right care, in the right place, at the right time.” Such a system would invariably require the back-and-forth exchange of information and resources between receiving facilities. Regional transfer agreements and coordination by the receiving centers must be in place to facilitate the timely transfer of critical cases. The establishment of outreach programs in which regional pediatric critical care centers provide community-based hospitals with pediatric emergency care education and protocols would facilitate a team-based approach to meeting the needs of children in the community. In addition, consultations via telemedicine may serve to decrease the disparity between rural and urban pediatric emergency care access. Both critical care and rural emergency clinicians report improvement in patient management as a result of such consultations. Furthermore, telemedicine may reduce transfers and facilitate ongoing management at rural, community-based facilities.

Such a hub-spoke model requires significant cooperation among facilities, but also provides tremendous benefits. This regionalized approach has the potential to facilitate limitation of unnecessary transfers that might otherwise overwhelm pediatric regional centers; expedite the care of critically ill children, resulting in improved outcomes; and support the management of less critically ill children at community-based facilities near the patient’s/family’s home in a generally more cost-effective manner. State EMS for Children programs can assist with the development of regionalized systems of pediatric care through the development of state regulations, an assessment of the optimal distribution of pediatric regional centers, and the continual monitoring of regionalized services.

Support In Pediatric Readiness

Federal EMS For Children Program
Since its inception in 1985, the federal EMS for Children program has provided support to all 50 states, the District of Columbia, and 8 United States territories to further integrate the treatment of children into EMS systems. Specific contributions to pediatric emergency care have included the development of the following:

1. Training programs for prehospital and hospital-based emergency care clinicians.
2. Education programs for school nurses.
4. State partnership grants to support integration of pediatric needs into the larger EMS system.
5. Resource centers (such as the National EMS for Children Data Analysis Resource Center [NEDARC]; the EMS for Children National Resource Center; and a multicenter research network, the Pediatric Emergency Care Applied Research Network [PECARN]) to promote advances in pediatric emergency care.
6. Guidelines for pediatric equipment, medications, and staffing.

(See pages 8-9 for links to these resources.)
Many of the EMS for Children initiatives focus on systems-based performance improvement efforts. Through the support of the State Partnership Grant Program, the EMS for Children program facilitates the integration of pediatric needs into state EMS systems. Grantees are, in turn, asked to ensure the program’s success by focusing their efforts and reporting back on 10 core performance measures identified by the EMS for Children program. (See Table 1.) The measures include developing a standardized system within the state, region, or territory to recognize hospitals that are able to stabilize and/or manage pediatric medical emergencies. Through these efforts, the EMS for Children program has been able to change the way children are addressed and cared for within the larger healthcare system.

Performance improvement at the local level is also critical to ensuring that healthcare services are meeting the needs of the pediatric patient population. The responsibility for such efforts generally falls on the shoulders of hospitals and their healthcare providers who often have limited time and funding available to support such efforts. Children are often overlooked in the development of such quality improvement processes. This may be due, in part, to the lack of well-defined pediatric-specific measures of quality of care. Fortunately, through the work of Alessandrini et al and the support of the EMS for Children program, 60 pediatric-specific measures have been identified through the consensus of an expert panel. These were further refined by the EMS for Children program to highlight the top 15 hospital-based pediatric emergency care performance measures. (See Table 2, page 8.) Such a framework allows even small hospitals with limited resources the opportunity to identify and address weaknesses in pediatric emergency care.

### Emergency Medical Services Role In Ensuring Pediatric Readiness

Ensuring pediatric readiness within the larger EMS system can be challenging. It cannot be overemphasized that simply stocking pediatric equipment and supplies is not sufficient to ensure pediatric readiness. Rather, readiness implies preparation at all levels, from the creation of pediatric-specific indicators to the identification of pediatric champions of ongoing quality improvement processes that address the care of children.

Setting baseline expectations and providing educational initiatives can be starting points. Similar to readiness initiatives within the hospital setting, the EMS system must include pediatric-specific indicators in quality improvement efforts, incorporation of pediatric-specific needs in state disaster plans and drills, and identification of facilities throughout the state that are ready and best able to care for children. Throughout the country, state governments are appointing pediatric emergency and trauma care specialists to state advisory committees. These experts can aid in identifying pediatric needs within the system and can target solutions. State regulations that specifically address children within the EMS system can set baseline standards for statewide quality improvement, categorization of facilities, and overall regionalization of care. Finally, state EMS agencies may also provide educational forums covering pediatric emergency care topics geared toward the prehospital professional.

Similar actions can be initiated at the local level as well. Some EMS systems have pediatric advisory councils and/or pediatric medical directors to address regional pediatric needs. Continuing education and training programs can reinforce provider skills. Other regional systems have developed verification programs to ensure that critically ill and injured children are transferred to pediatric-ready facilities. One example is Los Angeles County, Cali-

**Table 1. EMS For Children State/Territory Partnership Performance Measures**

<table>
<thead>
<tr>
<th>Performance Measure #</th>
<th>Description of Measure</th>
</tr>
</thead>
<tbody>
<tr>
<td>71</td>
<td>Percent of EMS provider agencies with online pediatric medical direction</td>
</tr>
<tr>
<td>72</td>
<td>Percent of EMS provider agencies with offline pediatric medical direction</td>
</tr>
<tr>
<td>73</td>
<td>Percent of patient care units (ambulances) with essential pediatric equipment and supplies</td>
</tr>
<tr>
<td>74</td>
<td>Standardized system to identify EDs that are able to stabilize and/or manage pediatric medical emergencies</td>
</tr>
<tr>
<td>75</td>
<td>Standardized system to identify EDs that are able to stabilize and/or manage pediatric traumatic emergencies</td>
</tr>
<tr>
<td>76</td>
<td>Percent of EDs with written interfacility transfer guidelines that include pediatric patients</td>
</tr>
<tr>
<td>77</td>
<td>Percent of EDs with written interfacility transfer agreements that include pediatric patients</td>
</tr>
<tr>
<td>78</td>
<td>Requirements for pediatric emergency education for the license/certification renewal of ALS and BLS providers</td>
</tr>
<tr>
<td>79</td>
<td>Incorporation of EMS for Children into the state/territory EMS system through establishment of an EMS for Children advisory committee, pediatric representation on EMS board, and full-time EMS for Children program manager</td>
</tr>
<tr>
<td>80</td>
<td>Integration of EMS for Children priorities into state/territory statutes and regulations</td>
</tr>
</tbody>
</table>

Abbreviations: ALS, advanced life support; BLS, basic life support; ED, emergency department; EMS, emergency medical services; EMS for Children, Emergency Medical Services for Children program.

Adapted with permission, Health Resources and Services Administration, Maternal and Child Health Bureau, Emergency Medical Services for Children Program.
Tools To Assist In Pediatric Readiness Of Emergency Departments

Fortunately, tools to assist with pediatric readiness are numerous and readily available. The ENA Institute for Quality, Safety, and Injury Prevention is rich with resources in pediatric emergency care. Additionally, the 2009 Pediatric Preparedness Checklist (developed by the AAP, ACEP, ENA, and the EMS for Children program) facilitates regular ED assessments by nurse coordinators. Finally, the United States National Research Council (NRC) has online toolkits that are easily searchable and contain specific tools that can be implemented with very little alteration. These can be found at http://www.childrensnational.org/emsc/pubres/emsc_toolbox.aspx. The following topics are included:

- Cultural Competency
- Emergency Department Pediatric Performance Measures
- Exception from Informed Consent
- Facility Categorization
- Interfacility Transfer
- Medical Direction
- Patient- and Family-Centered Care
- Pediatric Disaster Preparedness
- Pediatric Equipment Guidelines

One toolkit (developed by the ENA, the NRC, and the Society of Trauma Nurses) provides resources for EDs to improve the interfacility transfer of children, and can be found at www.pediatricreadiness.org. Sample policies and procedures are also available to address those items necessary to comply with the 2009 Joint Policy Statement: Guidelines for Care of Children in the Emergency Department. Listed below are some of the tools available to assist in preparing the ED for treatment of pediatric patients:

c. Disaster readiness site: http://cpem.med.nyu.edu/teaching-materials/pediatric-disaster-preparedness
d. National Pediatric Readiness Project site: www.pedsready.org
e. Pediatric Readiness website and toolkit: www.pediatricreadiness.org
f. EMS for Children State Partnership Performance

<table>
<thead>
<tr>
<th>Table 2. Top 15 Performance Measures In Pediatric Emergency Care</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>System-Based Measures</strong></td>
</tr>
<tr>
<td>Patient triage</td>
</tr>
<tr>
<td>Infrastructure and personnel</td>
</tr>
<tr>
<td>Patient-centered care</td>
</tr>
<tr>
<td>Emergency department flow</td>
</tr>
<tr>
<td>Pain management</td>
</tr>
<tr>
<td>Quality and safety</td>
</tr>
<tr>
<td>7. Total length of stay</td>
</tr>
<tr>
<td>8. Pain assessment and reassessment for children with acute fractures</td>
</tr>
<tr>
<td><strong>Disease-Specific Measures</strong></td>
</tr>
<tr>
<td>Trauma</td>
</tr>
<tr>
<td>10. Medication error rates</td>
</tr>
<tr>
<td>Respiratory diseases</td>
</tr>
<tr>
<td>Infectious diseases</td>
</tr>
<tr>
<td>13. Administration of systemic steroids for pediatric asthma exacerbations</td>
</tr>
<tr>
<td>14. Use of an evidence-based guideline to manage bronchiolitis</td>
</tr>
<tr>
<td>15. Use of antibiotics in children with suspected viral illness</td>
</tr>
</tbody>
</table>


Adapted with permission, Health Resources and Services Administration, Maternal and Child Health Bureau, Emergency Medical Services for Children Program. Available at: http://www.childrensnational.org/files/PDF/EMSC/PubRes/Hospital-based_Performance_Measures/Website_toolkit_document_aggregate_10.6.10_top_15.pdf
Special Considerations: The Nursing Perspective

Nurses who are in leadership roles in EDs are administratively responsible for implementation of policies and procedures that establish the actions to be taken for both common and infrequent events. Because emergency nurses are resourceful and knowledgeable about common barriers, opportunities for sharing policies and procedures are often plentiful. Nurse leaders are responsible for establishing standards for documentation of skills and competencies for the nursing and ancillary staff across the patient age continuum. They must advocate for education of the staff that will provide didactic and psychomotor skills training based on identified needs. This includes supporting advanced certification in pediatric emergency nursing for staff members who demonstrate interest, knowledge, and/or expertise in the care of children.

As previously noted, the most critical aspect of pediatric readiness that ED nurse leaders must recognize is the importance of appointing a “champion,” or coordinator for pediatric preparedness. This may be a nurse who simply has a passion for pediatric emergency care; someone who is willing to participate in the establishment of staff education programs, who demonstrates competencies in treatment of pediatric patients, and ensures that needed equipment is available. The ENA Emergency Nursing Pediatric Course (ENPC) is a comprehensive course that includes didactic and psychomotor skills education to prepare nurses to treat children in emergency care settings. This course can help support the nurse coordinator in his or her role and can serve as additional training for other nurses involved in pediatric emergency care. The Certified Pediatric Emergency Nurse (CPEN) credential demonstrates knowledge and expertise in the care of children in emergency settings.

Partnerships with regional and state EMS for Children activities may also provide opportunities for involvement in community and EMS education as well as sharing of resources. In high-volume EDs, the role of the pediatric nurse coordinator for pediatric emergency care may require a full-time position, while in others, this responsibility may only be part of a nurse’s regularly assigned duties. For some hospitals, a sample job description might include quality improvement, disaster preparedness, clinical responsibilities, and ensuring pediatric readiness initiatives are implemented.

A commitment to pediatric readiness (as evidenced by the appointment of a champion for pediatrics) ensures that pediatric emergency care is a priority. Armed with the Guidelines for Care of Children in the Emergency Department, the preparedness checklist, and knowledge of the resources available from the ENA, AAP, ACEP, and the EMS for Children program, all hospitals and ED nurse leaders can be ready when the need arises.

Controversies And Cutting Edge

The outcomes of patients with traumatic injuries have improved significantly over the last several decades due, in part, to verification programs that allow for categorization of centers according to their resources and abilities. Critically ill children would also likely benefit from the categorization of EDs based on their pediatric resources, but there is not yet a national organization or credentialing body to facilitate this. However, several state and regional EMS systems have realized the importance of developing a pediatric designation process for their medical centers. Beginning in 1998, the Illinois EMS for Children program developed a voluntary facility recognition program to identify hospitals that are ready and able to meet the needs of critically ill children. Through this process, hospitals apply for 1 of 3 possible designations: Pediatric Critical Care Center, Emergency Department Approved for Pediatrics, or Standby Department Approved for Pediatrics, or Standby.

Time- And Cost-Effective Strategies

1. Identify pediatric champions or coordinators (nurse and physician).
2. Develop a pediatric-specific quality improvement plan.
3. Include pediatric issues in disaster planning.
4. Ensure written transfer agreements are in place.
5. Utilize telemedicine to minimize the need to transfer patients.
6. Ensure that the ED is stocked with equipment that is sized appropriately for pediatric patients.
Emergency Department for Pediatrics. The Illinois EMS for Children program staff is responsible for verifying resources via scheduled onsite visits. To date, more than 100 hospitals throughout the state have participated in this program.

Similarly, Tennessee developed mandatory legislative rules establishing Standards for Pediatric Emergency Care Facilities through the Department of Health. Facilities are categorized into 1 of 4 levels of care: Comprehensive Regional Pediatric Care (CRPC) Facility, General Pediatric Care Facility, Primary Pediatric Care Facility, and Basic Pediatric Care Facility. Every hospital in the state is required to self-designate based on set criteria that are then verified through annual inspections. Tennessee has 4 CRPC centers across the state. Each has a region with associated hospitals tied through transfer agreements. The CRPCs have staff members who provide training and feedback on the treatment of pediatric patients. A statewide database developed by Vanderbilt University (REDCap) also tracks trends in problematic pediatric transports and provides feedback. Other states are also developing similar programs.

While California does not yet have a formal statewide categorization process, in 2012 all acute care hospitals in the state were given the opportunity to verify their pediatric resources and capabilities through a statewide assessment. Through the California Pediatric Readiness Project, 300 out of 335 EDs received immediate feedback along with an individualized gap analysis to facilitate improvement in pediatric readiness. While the results are forthcoming, such a program has allowed the California EMS for Children program to determine the distribution of pediatric emergency care resources throughout the state and assist hospitals to better meet the needs of critically ill and injured children.

**Summary**

Children account for nearly 25% of ED patients, and the great majority are seen in hospitals that are not children’s hospitals. While as many as 50% of

**Risk Management Pitfalls For Pediatric Readiness** (Continued on page 11)

1. **“We do not see many pediatric patients, so we do not have a physician or nurse coordinator for pediatric emergency care.”**
   All EDs have the responsibility to care for patients of any age who present for care and treatment. Designating someone to serve as a champion for pediatric emergency care issues ensures that the needs of children are being met, resulting in enhanced pediatric readiness. While high-volume facilities may choose to assign this role to a full-time position, smaller hospitals may choose a part-time or shared role.

2. **“Our quality improvement plan does not address pediatric-specific metrics.”**
   In order to ensure that the care received is as intended, quality improvement plans must be in place to identify and correct systems-based errors. While quality improvement plans may be broad, such plans must target all populations, including children.

3. **“Our patients’ vital signs are easily visible on the chart. Therefore, there is no need to notify the physician specifically.”**
   Prompt physician notification of the presence of abnormal vital signs leads to more rapid assessment and intervention. Failure to institute policies to notify physicians of abnormal vital signs may lead to significant delays in care and increase the potential for adverse outcomes.

4. **“We do not need a pediatric transfer plan or agreement since we rarely transfer pediatric patients.”**
   While pediatric transfers may be rare occurrences for some facilities, it is important to have a transfer plan and agreement in place in order to expedite access to a higher level of care. Transfer plans may include mode of transport, communication elements, and other requirements. It is important to ensure all necessary communication and documentation is completed, as lack of agreements with outlying facilities may result in significant delays in care and a struggle to identify an appropriate receiving facility.

5. **“Our healthcare providers choose what CME they complete. We do not have any specific pediatric CME requirements.”**
   Pediatric patients account for approximately 25% of ED visits. When a pediatric patient presents in extremis, it is critical that providers are prepared to manage the child effectively and efficiently. Given the relatively infrequent encounters with critically ill pediatric patients, pediatric-specific CME becomes even more important in order to maintain the skills needed to treat the pediatric population. All providers caring for children should be encouraged to complete pediatric-specific CME annually.
hospitals see fewer than 10 pediatric patients per day, all hospitals can and should be pediatric-ready. Critically ill and injured children are often transported by private car to the most geographically accessible facility. Healthcare clinicians must, therefore, be ready before the child arrives in order to provide basic stabilization and timely transfer to a pediatric critical care center, if necessary. Fortunately, national guidelines and numerous resources are available to aid in understanding the components of pediatric readiness. Furthermore, the National Pediatric Readiness Project provides a unique opportunity for ED leaders to assess their current state of readiness and identify gaps through the use of multiple web-based resources. While numerous regional and state EMS systems are making children a priority, there is still much work to be done. Nurse and physician leaders should take this opportunity to become pediatric champions at their facilities.

---

**Risk Management Pitfalls For Pediatric Readiness** (Continued from page 10)

6. "Our scale only weighs children in pounds.”
   Standard pediatric dosing is based on weight in kilograms. Weighing children in pounds requires the added step of converting weight into kilograms, which can create additional room for error. Also, utilizing both pounds and kilograms may lead to errors in documentation. All children should be weighed only in kilograms, and weight should be recorded only in kilograms to avoid miscalculations.

7. “We do not require annual competency evaluations of our providers, as this is included in the certification process.”
   While recertification may test the current knowledge base, it is important that providers maintain pediatric-specific skills. This is particularly important when these skills are not practiced regularly. Annual competency evaluations provide a means for ensuring skills maintenance.

8. “We do not use a validated pediatric triage tool.”
   The use of a validated pediatric triage tool is important to help predict resource utilization. Triage tools used for adults may under- or over-triage pediatric patients, leading to a mismatch in prioritization. A higher triage category alerts physicians to the need for rapid assessment or intervention. Particularly in the setting of overcrowding, failure to utilize a validated pediatric triage tool may result in delays in care and poor patient management.

9. "We have a hospital-wide disaster preparedness plan, but no separate plan or inclusive guidelines for children.”
   Children are disproportionately affected during disasters. In addition, children have special needs that are often not considered when managing adult patients in the setting of a disaster. Specific needs include pediatric triage, a pediatric approach to decontamination, surge capacity, reunification services, medications, and supplies. Pediatric-specific elements must be included in a hospital-wide disaster plan.

10. “We have a calculator set up in the resuscitation bay for children.”
    When a child presents in extremis, the use of a calculator or other real-time dose calculation tools creates multiple opportunities for error. The likelihood of error may be increased during stressful situations such as resuscitations. While slight underdosing and overdosing may occur based on body habitus, the AHA recommends the use of a length-based tape or actual weight to eliminate unnecessary steps in calculation that may lead to significant dosing errors.

---

**Case Conclusions**

The 14-month-old boy was moved to a medical resuscitation room and placed on a monitor. Physicians and nurses who had undergone annual continuing medical education in pediatric airway management immediately recognized that he was in extremis and responded accordingly. Nurses used a Broselow tape to quickly estimate the child’s weight for medication dosing while you provided bag-mask ventilation. You made sure that a difficult airway kit and pediatric Magill forceps were readily available and were brought to the bedside. The parents were allowed to be present, and the medical staff members that were not involved in the resuscitation provided support to the family during the resuscitation. The foreign body was removed using pediatric Magill forceps, and bag-mask ventilation was continued. The child’s oxygen saturation improved, but he required endotracheal intubation. You gave him etomidate and succinylcholine through an intraosseous needle, and intubated with a 4-mm cuffed.
endotracheal tube. The boy’s vital signs stabilized, you started continuous sedation, and updated the parents on the child’s management plan.

The nearest PICU was contacted and the transfer agreement was activated so that the child could be transferred in a timely fashion to a pediatric critical care center. Within 30 minutes, an advanced life support transport team arrived, and he was successfully transferred to a pediatric critical care facility for ongoing treatment.

References

Evidence-based medicine requires a critical appraisal of the literature based upon study methodology and number of subjects. Not all references are equally robust. The findings of a large, prospective, randomized, and blinded trial should carry more weight than a case report.

To help the reader judge the strength of each reference, pertinent information about the study, such as the type of study and the number of patients in the study will be included in bold type following the references, where available. The most informative references cited in this paper, as determined by the author, will be noted by an asterisk (*) next to the number of the reference.


CME Questions

1. What percentage of pediatric ED patients are seen in general EDs?
   a. 10%
   b. 25%
   c. 50%
   d. 90%

2. Which of the following factors is most likely to be considered by parents when determining where to take a child with an emergent condition?
   a. The ED that is closest
   b. The ED with pediatric emergency physicians on staff
   c. The hospital with an academic program
   d. The hospital with a PICU

3. The EMS for Children program was funded by Congress with the stated goal to:
   a. Enforce prehospital protocols for children
   b. Maintain a research network for pediatric emergency care
   c. Reduce childhood death and disability due to injury or illness
   d. Reduce ED overcrowding

4. According to national statistics, children account for what percentage of ED visits?
   a. 10%
   b. 25%
   c. 40%
   d. 50%

5. Which of the following is NOT one of the 7 areas of focus in the AAP Guidelines for Care of Children in the Emergency Department?
   a. Equipment, supplies, and medications
   b. Support services
   c. Care provided in urgent care and primary care settings
   d. Administration and coordination

6. What percentage of EDs lack written transfer agreements for the transfer of pediatric patients to pediatric critical care centers and other higher levels of care?
   a. ≤ 50%
   b. 60%
   c. 75%
   d. 90%

7. Pediatric surge capacity planning is:
   a. Necessary only in large urban hospitals
   b. An essential part of a hospital disaster plan
   c. Necessary only in community hospitals
   d. The responsibility of the federal government

8. The EMS for Children program state partnership grants were designed for:
   a. Purchasing pediatric ED equipment
   b. Facilitating the integration of pediatric needs into state EMS systems
   c. Parent education programs
   d. Developing triage tools

9. Which of the following provides resources to assist with pediatric readiness?
   a. EMS for Children National Resource Center
   b. Emergency Nurses Association Institute for Quality, Safety, and Injury Prevention
   c. National Pediatric Readiness Toolkit
   d. All of the above

10. Which of the following interventions would most significantly improve the pediatric readiness of an ED?
    a. Assigning the role of physician and/or nursing coordinator for pediatric emergency care
    b. Developing a family-centered care plan
    c. Developing and training staff in the use of pediatric difficult airway kits
    d. Purchasing a cricothyrotomy kit appropriate for children
In 2006, at only 9 days old, Rebecca Ava Rabinowitz passed away from an enteroviral infection that was not recognized during an emergency department visit the day before. To help prevent other families from facing this tragedy, R Baby Foundation was born. It is the first and only not-for-profit foundation uniquely focused on saving babies’ lives through improving pediatric emergency care. R Baby focuses on ensuring that babies (including those in the first months of life) suffering from viral infections and other infectious disease receive the highest quality of care and service through supporting life-saving pediatric training, education, research, treatment, and equipment.

R Baby has developed a wide breadth of programs to address many of the challenges in pediatric emergency care, including:

1. Pediatric simulation training through programs that include the INSPIRE network led by Yale School of Medicine and Columbia University and the Yale-led Sim-Mobile training program
2. Rapid viral detection technology at the University of Maryland Children’s Hospital
3. An annual symposium led by Mount Sinai Hospital in New York for top pediatric speakers nationwide to share the most current and ground-breaking information with pediatric specialists across the nation
4. R Baby’s online fever and respiratory guidelines established by Columbia University Morgan Stanley Children’s Hospital for training thousands of doctors with statistically proven improvements
5. Parent education programs to improve communication

Please visit www.rbabyfoundation.org for more information and to access valuable resources.
Pediatric Emergency Medicine Practice Has Gone Mobile!

You can now view all Pediatric Emergency Medicine Practice content on your iPhone or Android smartphone. Simply visit www.ebmedicine.net from your mobile device, and you’ll automatically be directed to our mobile site.

On our mobile site, you can:

• View all issues of Pediatric Emergency Medicine Practice since inception
• Take CME tests for all Pediatric Emergency Medicine Practice issues published within the last 3 years – that’s over 100 AMA Category 1 Credits™!
• View your CME records, including scores, dates of completion, and certificates
• And more!

Check out our mobile site, and give us your feedback! Simply click the link at the bottom of the mobile site to complete a short survey to tell us what features you’d like us to add or change.

Physician CME Information

Date of Original Release: December 1, 2013. Date of most recent review: November 15, 2013. Termination date: December 1, 2016.

Accreditation: EB Medicine is accredited by the Accreditation Council for Continuing Medical Education (ACCMCE) to provide continuing medical education for physicians. This activity has been planned and implemented in accordance with the Essential Areas and Policies of the ACCME.

Credit Designation: EB Medicine designates this enduring material for a maximum of 48 AMA PRA Category 1 Credits™. Physicians should claim only the credit commensurate with the extent of their participation in the activity.

ACEP Accreditation: Pediatric Emergency Medicine Practice is also approved by the American College of Emergency Physicians for 48 hours of ACEP Category 1 credit per annual subscription.

AAP Accreditation: This continuing medical education activity has been reviewed by the American Academy of Pediatrics and is acceptable for a maximum of 48 AAP credits per year. These credits can be applied toward the AAP CME/CPD Award available to Fellows and Candidate Fellows of the American Academy of Pediatrics.

AOA Accreditation: Pediatric Emergency Medicine Practice is eligible for up to 48 American Osteopathic Association Category 2A or 2B credit hours per year.

Needs Assessment: The need for this educational activity was determined by a survey of medical staff, including the editorial board of this publication; review of morbidity and mortality data from the CDC, AHA, NCHS, and ACEP; and evaluation of prior activities for emergency physicians.

Target Audience: This enduring material is designed for emergency medicine physicians, physician assistants, nurse practitioners, and residents.

Goals: Upon completion of this activity, you should be able to: (1) demonstrate medical decision-making based on the strongest clinical evidence; (2) cost-effectively diagnose and treat the most critical ED presentations; and (3) describe the most common medicolegal pitfalls for each topic covered.

Discussion of Investigational Information: As part of the newsletter, faculty may be presenting investigational information about pharmaceutical products that are outside Food and Drug Administration approved labeling. Information presented as part of this activity is intended solely as continuing medical education and is not intended to promote off-label use of any pharmaceutical product.

Faculty Disclosure: It is the policy of EB Medicine to ensure objectivity, balance, independence, transparency, and scientific rigor in all CME-sponsored educational activities. All faculty participating in the planning or implementation of a sponsored activity are expected to disclose to the audience any relevant financial relationships and to assist in resolving any conflict of interest that may arise from the relationship. Presenters must also make a meaningful disclosure to the audience of their discussions of unlabeled or unapproved drugs or devices. In compliance with all ACCME Essentials, Standards, and Guidelines, all faculty for this CME activity were asked to complete a full disclosure statement. The information received is as follows: Dr. Remick, Ms. Snow, Dr. Gausche-Hill, Dr. Bradin, Dr. Gilmore, Dr. Vella, Dr. Wang, Dr. Damilini, and their related parties report no significant financial interest or other relationship with the manufacturer(s) of any commercial product(s) discussed in this educational presentation.

Commercial Support: This issue of Pediatric Emergency Medicine Practice did not receive any commercial support.

Method of Participation:

• Print Semester Program: Paid subscribers who read all CME articles during each Pediatric Emergency Medicine Practice 6-month testing period, complete the CME Answer And Evaluation Form distributed with the June and December issues, and return it according to the published instructions are eligible for up to 4 hours of CME credit for each issue.

• Online Single-Issue Program: Current, paid subscribers who read this Pediatric Emergency Medicine Practice CME article and complete the test and evaluation at www.ebmedicine.net/CME are eligible for up to 4 hours of CME credit for each issue. Hints will be provided for each missed question, and participants must score 100% to receive credit.

Hardware/Software Requirements: You will need a Macintosh or PC with internet capabilities to access the website.

Additional Policies: For additional policies, including our statement of conflict of interest, source of funding, statement of informed consent, and statement of human and animal rights, visit http://www.ebmedicine.net/policies.

Direct all questions to:

EB Medicine
Phone: 1-800-249-5770 or 678-366-7933
Fax: 1-770-500-1316
5550 Triangle Parkway, Suite 150
Norcross, GA 30092
E-mail: eml@ebmedicine.net
Website: EBMedicine.net
To write a letter to the editor, email: yellasadam@gmail.com

Subscription Information:

1 year (12 issues) including evidence-based print issues;
48 AMA PRA Category 1 Credits™, 48 ACEP Category 1 Credits, 48 AAP Prescribed credits, and 48 AOA Category 2A or 2B credit; and full online access to searchable archives and additional free CME: $299
(Call 1-800-249-5770 or go to www.ebmedicine.net/subscribe to order)
Single issues with CME may be purchased at www.ebmedicine.net/PEMIssues

Pediatric Emergency Medicine Practice © 2013 www.ebmedicine.net • December 2013