

Free Executive Summary

Emergency Care for Children: Growing Pains



Committee on the Future of Emergency Care in the United States Health System

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Children represent a special challenge for emergency care providers, because they have unique medical needs in comparison to adults. For decades, policy makers and providers have recognized the special needs of children, but the system has been slow to develop an adequate response to their needs. This is in part due to inadequacies within the broader emergency care system. Emergency Care for Children examines the challenges associated with the provision of emergency services to children and families and evaluates progress since the publication of the Institute of Medicine report Emergency Medical Services for Children (1993), the first comprehensive look at pediatric emergency care in the United States. This new book offers an analysis of: • The role of pediatric emergency services as an integrated component of the overall health system. • System-wide pediatric emergency care planning, preparedness, coordination, and funding. • Pediatric training in professional education. • Research in pediatric emergency care. Emergency Care for Children is one of three books in the Future of Emergency Care series. This book will be of particular interest to emergency health care providers, professional organizations, and policy makers looking to address the pediatric deficiencies within their emergency care systems.

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Summary

Children represent a special challenge for emergency and trauma care providers, in large part because they have unique medical needs in comparison with adults. Respiratory rates, heart rates, and blood pressure levels all change as children grow, so vital signs that would be normal for an adult patient may signal distress in a child. Special care is necessary when providers intubate a child to accommodate a shorter trachea and higher larynx. Medication doses must be carefully calculated specifically for each pediatric patient based on his or her weight. Providers must also know how to handle children's emotional reactions to illness and injury, which vary by age. Children may not be old enough to communicate what is wrong with them or how they became injured, making triage more difficult. It is not surprising, then, that many emergency providers feel stress and anxiety when caring for pediatric patients.

For decades, policy makers and providers have recognized the special needs of children, but the emergency and trauma care system has been slow to develop an adequate response to those needs. This shortcoming is due in part to inadequacies of the broader system. The emergency and trauma care system is highly fragmented, with little coordination among prehospital emergency medical services (EMS), hospital services, and public health. Use of emergency departments (EDs) has grown considerably even as many EDs have closed, contributing to crowded conditions in those that remain open. Ambulance diversion has become a daily occurrence in many cities around the country. Key specialists needed to treat emergency and trauma patients are increasingly difficult to find, resulting in longer waits and more distant prehospital transport for critically injured patients. Emergency care providers on the front lines of safety net care encounter patients with intractable

social problems. Much of the service provided to these difficult patients is compensated poorly or not at all. This situation places tremendous financial pressure on safety net hospitals, some of which have closed or are in danger of closing as a result.

The problems faced by children in the current emergency care system are even more daunting. Although children represent 27 percent of all ED visits, many hospitals are not well prepared to handle pediatric patients. For example:

- Only about 6 percent of EDs in the United States have all of the supplies deemed essential for managing pediatric emergencies; only half of hospitals have at least 85 percent of those supplies.
- Of the hospitals that lack the capabilities to care for pediatric trauma patients, only half have written transfer agreements with other hospitals.
- Although pediatric skills deteriorate quickly without practice, continuing education in pediatric care is not required or is extremely limited for many prehospital emergency medical technicians (EMTs).
- Many medications prescribed for children are “off label,” meaning they have not been adequately tested or approved by the U.S. Food and Drug Administration (FDA) for use in pediatric populations.
- Disaster preparedness plans often overlook the needs of children, even though their needs during a disaster differ from those of adults.
- Evidence indicates that pediatric treatment patterns vary widely among emergency care providers, that many of these providers do not properly stabilize seriously injured or ill children, that many undertreat children in comparison with adults, and that many fail to recognize cases of child abuse.
- These shortcomings are often exacerbated in rural areas, where dedicated, well-intentioned prehospital and ED providers often make do without the specialized pediatric training and resources that most of us would expect to be in place.

As a result of the above problems, many children with an emergency medical condition do not receive appropriate care under the current system. Many urban areas have children’s hospitals or hospitals with pediatric EDs staffed by pediatric emergency medicine specialists and equipped with the latest technologies for the care and treatment of children. However, the vast majority of ED visits made by children are not to children’s hospitals or those with a pediatric ED, but to general hospitals, which are less likely to have pediatric expertise, equipment, and policies in place.

The Institute of Medicine’s (IOM) Committee on the Future of Emergency Care in the United States Health System was formed in September 2003 to examine the emergency care system in the United States; explore its strengths, limitations, and future challenges; describe a desired vision of

the system; and recommend strategies for achieving that vision. The committee was also tasked with taking a focused look at the state of pediatric emergency care, prehospital emergency care, and hospital-based emergency and trauma care. This report is one in a series of three that presents the committee's findings and recommendations in these areas. Summarized below are the committee's findings and recommendations for improving pediatric emergency and trauma care. In addition, this report serves as a follow-up to the 1993 IOM report *Emergency Medical Services for Children*, which represented the first comprehensive look at pediatric emergency care in the United States. That report, which documented shortcomings in a number of areas, received considerable attention from emergency care providers, professional organizations, policy makers, and the public. Over the past 13 years, the federal Emergency Medical Services for Children (EMS-C) program, a grant program that assists states in dealing with pediatric deficiencies within their emergency care systems, has been actively addressing the shortcomings identified in that report. The committee's findings and recommendation regarding the EMS-C program are summarized below as well.

ACHIEVING THE VISION OF A 21ST-CENTURY EMERGENCY CARE SYSTEM

As noted above, emergency care for children cannot be improved until some of the long-standing problems within the overall emergency care system are addressed. To that end, the committee developed a vision for the future of emergency care that centers around three goals: coordination, regionalization, and accountability. Many elements of this vision have been advocated previously; however, progress toward achieving these elements has been derailed by deeply entrenched political interests and cultural attitudes, as well as funding cutbacks and practical impediments to change. Concerted, cooperative efforts at all levels of government—federal, state, regional, local—and the private sector are necessary to finally break through and achieve optimum emergency care.

Coordination

One of the most long-standing problems with the emergency care system is that services are fragmented. EMS, hospitals, trauma centers, and public health have traditionally worked in silos. For example, public safety and EMS agencies often lack common radio frequencies and protocols for communicating with each other during emergencies. Similarly, emergency care providers lack access to patient medical histories that could be useful in decision making. Only about half of hospitals have pediatric interfacility transfer agreements. Moreover, planning is fragmented; often pediatric

concerns are overlooked entirely, or planning for adult and pediatric care occurs independently.

The committee envisions a system in which patients of all ages and in all communities receive well-planned and coordinated emergency care services. Dispatch, EMS, ED providers, public safety, and public health should be fully interconnected and united in an effort to ensure that each patient receives the most appropriate care, at the optimal location, with the minimum delay. From the standpoint of the patient and parents, delivery of emergency care services should be seamless. Inclusion of pediatric concerns during planning can help the system meet the needs of children to the best of its ability.

Regionalization

Because not all hospitals within a community have the personnel and resources to support the delivery of high-level emergency care, critically ill and injured patients should be directed specifically to those facilities with such capabilities. That is the goal of regionalization. There is substantial evidence that the use of regionalization of services to direct such patients to designated hospitals with greater experience and resources improves outcomes and reduces costs across a range of high-risk conditions and procedures. A few states have taken steps to regionalize pediatric emergency care, allowing advanced life support ambulances to bring such patients only to hospitals designated as having pediatric capabilities. However, a state-by-state analysis shows that many states still have not formally regionalized pediatric intensive or trauma care.

Thus the committee supports further regionalization of emergency care services. However, use of this approach requires that EMTs, as well as parents and caregivers, be clear on which facilities have the necessary resources. Just as trauma centers are categorized according to their capabilities (i.e., level I–level IV/V), a standard national approach to the categorization of EDs that reflects both their adult and pediatric capabilities is needed so that the categories will be clearly understood by providers and the public across all states and regions of the country. To that end, the committee recommends that **the Department of Health and Human Services and the National Highway Traffic Safety Administration, in partnership with professional organizations, convene a panel of individuals with multidisciplinary expertise to develop evidence-based categorization systems for emergency medical services, emergency departments, and trauma centers based on adult and pediatric service capabilities (3.1).**¹

¹The committee's recommendations are numbered according to the chapter of the main report in which they appear. Thus, for example, recommendation 3.1 is the first recommendation in Chapter 3.

This information, in turn, could be used to develop protocols that would guide EMTs in the transport of patients. However, more research and discussion are needed to determine under what circumstances patients should be brought to the closest hospital for stabilization and transfer instead of being transported directly to the facility with the highest level of care if that facility is farther away. Debate also continues over what procedures are effective for the care of children in the field. Therefore, the committee also recommends that **the National Highway Traffic Safety Administration, in partnership with professional organizations, convene a panel of individuals with multidisciplinary expertise to develop evidence-based model prehospital care protocols for the treatment, triage, and transport of patients, including children (3.2).**

Accountability

Without accountability, participants in the emergency care system need not accept responsibility for failures and can avoid making changes to improve the delivery of care. Accountability has failed to take hold in emergency care to date because responsibility is dispersed across many different components of the system, so it is difficult even for policy makers to determine where system breakdowns occur and how they can subsequently be addressed. When hospitals lack pediatric transfer agreements, when providers receive no continuing pediatric education, and when pediatric specialists and on-call specialists are not available, no one party is to blame—it is a system failure.

To build accountability into the system, the committee recommends that **the Department of Health and Human Services convene a panel of individuals with emergency and trauma care expertise to develop evidence-based indicators of emergency and trauma care system performance, including the performance of pediatric emergency care (3.3).** Because of the need for an independent, national process with the broad participation of every component of emergency care, the federal government should play a lead role in promoting and funding the development of these performance indicators. The indicators developed should include structure and process measures, but evolve toward outcome measures over time. These performance measures should be nationally standardized so that statewide and national comparisons can be made. Measures should evaluate the performance of individual providers within the system, as well as that of the system as a whole. Measures should also be sensitive to the interdependence among the components of the system; for example, EMS response times may be related to EDs going on diversion.

Using the measures developed through such a national, evidence-based, multidisciplinary effort, performance data should be collected at regular

intervals from all hospitals and EMS agencies in a community. Public dissemination of performance data is crucial to driving the needed changes in the delivery of emergency care services. Dissemination can take various forms, including public report cards, annual reports, and state public health reports. Because of the potential sensitivity of performance data, they should initially be reported in the aggregate rather than at the level of the individual provider organization. However, individual provider organizations should have full access to their own data so they can understand and improve their performance, as well as their contribution to the overall system. Over time, performance information on individual provider organizations should become an important part of the public information on the system.

Achieving the Vision

States and regions face a variety of different situations with respect to emergency and trauma care, including the level of development of adult and pediatric trauma systems; the effectiveness of state EMS offices and regional EMS councils; and the degree of coordination among fire departments, EMS, hospitals, trauma centers, and emergency management. Thus no single approach to enhancing emergency care systems will accomplish the three goals outlined above, and it will be necessary to explore and evaluate a number of different avenues for achieving the committee's vision. The committee therefore recommends that **Congress establish a demonstration program, administered by the Health Resources and Services Administration, to promote coordinated, regionalized, and accountable emergency care systems throughout the country, and appropriate \$88 million over 5 years to this program (3.4).** Grants should be targeted at states, which could develop projects at the state, regional, or local level; cross-state collaborative proposals would also be encouraged. Over time and over a number of controlled initiatives, such a process should lead to important insights about what strategies work under different conditions. These insights would provide best-practice models that could be widely adopted to advance the nation toward the committee's vision for efficient, high-quality emergency and trauma care. It will be essential for the federal granting agency and grant recipients to consider explicitly the implications of proposed projects for both adult and pediatric patients.

Furthermore, the fragmented responsibility for emergency care at the federal level must be reduced. Responsibility is widely dispersed among multiple federal agencies within the Department of Health and Human Services (DHHS), the Department of Transportation (DOT), and the Department of Homeland Security (DHS). The scattered nature of federal responsibility for emergency care makes it difficult for the public to identify a clear point of contact, limits the visibility necessary to secure and maintain funding, and

creates overlaps and gaps in program funding. The committee recommends that Congress establish a lead agency for emergency and trauma care within 2 years of the release of this report. The lead agency should be housed in the Department of Health and Human Services, and should have primary programmatic responsibility for the full continuum of emergency medical services and emergency and trauma care for adults and children, including medical 9-1-1 and emergency medical dispatch, prehospital emergency medical services (both ground and air), hospital-based emergency and trauma care, and medical-related disaster preparedness. Congress should establish a working group to make recommendations regarding the structure, funding, and responsibilities of the new agency, and develop and monitor the transition. The working group should have representation from federal and state agencies and professional disciplines involved in emergency and trauma care (3.6).

ADDRESSING SPECIFIC PEDIATRIC CONCERNS

In addition to the above reforms to the broader emergency care system, the delivery of optimum pediatric emergency care will require addressing a number of concerns specific to pediatric populations. It will be necessary to strengthen the capabilities of the emergency care workforce to treat pediatric patients, improve patient safety, exploit advances in medical and information technology, foster family-centered care, enhance disaster preparedness, and improve the evidence base.

Strengthening the Workforce

Ideally, because of the unique way in which pediatric patients should be triaged and treated, all children should be served by emergency care providers with formal training and experience in pediatric emergency care. In reality, providers' levels of pediatric emergency care training vary considerably. Residency programs, medical schools, nursing schools, states, EMS agencies, and hospitals have varying requirements for initial and continuing pediatric emergency care education and training. In some cases, the training is intensive; however, emergency medicine or pediatrics training often represents only a small part of a provider's total training time. Of particular concern are emergency care providers who rarely encounter pediatric patients, making it difficult for them to maintain pediatric skills. This is a long-standing problem that has improved somewhat over time, but naturally has led to continued concern about the ability of the emergency care workforce to care properly for pediatric patients. To reduce the consequences of illness and injury, the workforce must have the knowledge and skills necessary to provide appropriate pediatric emergency care. The committee believes all

emergency care providers should possess a certain level of competency to deliver emergency care to children. Therefore, the committee recommends that every pediatric- and emergency care–related health professional credentialing and certification body define pediatric emergency care competencies and require practitioners to receive the level of initial and continuing education necessary to achieve and maintain those competencies (4.1).

Treatment patterns of providers in emergency care for pediatric patients differ not only because of differences in training, but also because of the lack of evidence-based clinical practice guidelines for many different types of conditions. This is troubling since the use of such guidelines has been shown to improve the quality of care. The committee recommends that the Department of Health and Human Services collaborate with professional organizations to convene a panel of individuals with multidisciplinary expertise to develop, evaluate, and update clinical practice guidelines and standards of care for pediatric emergency care (4.2). The committee believes these guidelines should be evidence-based, developed through an evidence evaluation process. That process should include individuals from different disciplines and different types of emergency care organizations to promote consensus and uniformity.

Simply recommending more training and the development of guidelines is not enough, however. Someone must be responsible at the provider level for ensuring that continuing education opportunities are available and exploited. Similarly, the development of clinical guidelines is useless without widespread adoption by providers. Thus the committee believes that pediatric leadership is needed in each provider organization. The committee recommends that emergency medical services agencies appoint a pediatric emergency coordinator, and that hospitals appoint two pediatric emergency coordinators—one a physician—to provide pediatric leadership for the organization (4.3). The pediatric coordinator position would not be a full-time position, but a shared role. Still, the coordinators would have a number of responsibilities, including ensuring adequate skill and knowledge among fellow ED or EMS providers, overseeing pediatric care quality improvement initiatives, and ensuring the availability of pediatric medications, equipment, and supplies.

Improving Patient Safety

Emergency care services are delivered in an environment where the need for haste, the distraction of frequent interruptions, and clinical uncertainty abound, thus posing a number of potential threats to patient safety. Children are, of course, at great risk under these circumstances because of their physical and developmental vulnerabilities, as well as their need for care that may be atypical for providers used to treating adult patients.

The committee recommends that **hospitals and emergency medical services agencies implement evidence-based approaches to reducing errors in emergency and trauma care for children (5.3)**. There is, however, a paucity of high-quality data on the epidemiology of medical errors among children, particularly within the emergency care system. Instead, there have been only a few, typically small studies demonstrating that care delivered to children is compromised at several points during prehospital EMS care or an ED visit. Thus continued research is needed to determine the best strategies for improving patient safety in prehospital and ED pediatric care. At the same time, however, various hospitals and EMS agencies have had some success with several promising strategies that could be replicated by other organizations.

One category of medical errors well documented to be common in both the EMS and ED environments is those that occur during the prescribing, dispensing, and administration of medications. To address this problem for pediatric patients, the committee recommends that **the Department of Health and Human Services and the National Highway Traffic Safety Administration fund the development of medication dosage guidelines, formulations, labeling guidelines, and administration techniques for the emergency care setting to maximize effectiveness and safety for infants, children, and adolescents. Emergency medical services agencies and hospitals should incorporate these guidelines, formulations, and techniques into practice (5.2)**.

Perhaps the foremost problem associated with pediatric medication in the emergency care setting is the above-noted prescribing of medications for children off label. Medications designed for adults may not be suitable for children, yet once a drug has been approved by the FDA, further studies to determine its safety and efficacy in infants and children are rarely conducted. Moreover, emergency care professionals have few evidence-based guidelines and little information to assist them in the prescribing of medications for pediatric patients. As a result, emergency providers must prescribe medications for children without a full understanding of their risks, benefits, or implications for these patients. Therefore, the committee recommends that **the Department of Health and Human Services fund studies of the efficacy, safety, and health outcomes of medications used for infants, children, and adolescents in emergency care settings in order to improve patient safety (5.1)**.

Exploiting Advances in Medical and Information Technology

Technology is likely to advance the way care is delivered in the prehospital and ED settings. New technologies designed to accelerate diagnosis and workflow—advanced imaging modalities, rapid diagnostic tests, laboratory

automation, EMS technologies, patient tracking tools, and new triage models—are likely to be adopted. As these new technologies are introduced, it is critical to consider how they can help (and whether they may bring harm to) pediatric patients. While this may appear to be an obvious consideration, there have been many examples of medical technologies originally developed for adults but used on children with unintended consequences.

A market for products designed specifically for pediatric patients has not been well developed. To this end, the committee recommends that **federal agencies and private industry fund research on pediatric-specific technologies and equipment for use by emergency and trauma care personnel (5.4)**. To stimulate demand for pediatric-appropriate technologies, emergency providers should be made aware of the potential shortcomings of products designed for adults and adapted for children. Federal agencies and private industry also need to take a close look at technologies already in place and available for use on pediatric patients that have not been adequately tested for potentially harmful effects on these patients.

A similar issue exists in the development of information technologies. Hospitals, EMS systems, and government entities are beginning to make substantial investments in information technologies that may improve the quality and efficiency of emergency care delivery. Yet the safety, impact, and risks of these systems for pediatric patients have received little attention. Specific consideration of pediatric needs during the design of such systems is critical to ensure that they are appropriate for the pediatric patient. For example, electronic health records must be designed so that providers can record measurements with a granularity appropriate for newborns and infants, and computerized physician order entry tools must incorporate pediatric-specific dosing tables.

Fostering Family-Centered Care

One of the six aims for health care quality improvement proposed by the IOM in its 2001 landmark report *Crossing the Quality Chasm: A New Health System for the 21st Century* was patient-centeredness, meaning that care should encompass the qualities of compassion; empathy; and responsiveness to the needs, values, and preferences of the individual patient. Parents are recognized as a pediatric patient's primary source of strength and support and play an integral role in the child's health and well-being. Increasing recognition of both the importance of meeting the psychosocial and developmental needs of children and the role of families in promoting the health and well-being of their children has led to the concept of family-centered care.

There are several definitions of family-centered care, but they all essentially recognize that providers should acknowledge and make use of

the family's presence, skills, and knowledge of their child's condition when caring for the child. Indeed, a growing body of research demonstrates the importance of ensuring the involvement of patients and families in their own health care decisions, better informing families of treatment options, and improving patients' and families' access to information. A number of studies have found some evidence that family-centered care is associated with improved health outcomes, patient and family satisfaction, and provider satisfaction. Unfortunately, few EMS agencies and EDs have written policies or guidelines for family-centered care in place, and few providers are trained in family-centered approaches. Because such approaches to care can mutually benefit the patient, family, and provider, the committee recommends that **emergency medical services agencies and hospitals integrate family-centered care into emergency care practice (5.5).**

Enhancing Disaster Preparedness

As noted earlier, because of their anatomical, physiological, developmental, and emotional differences, children are generally more vulnerable than adults in the event of a disaster. They also require specialized equipment and different approaches to treatment during such an event. For example, adult decontamination units cannot be used because rescuers need to be able to adjust water temperature and pressure to suit the needs of children (e.g., provide high-volume, low-pressure, heated water). Children also require different antibiotics and different dosages to counter many chemical and biological agents. As with the development of the emergency care system, however, the needs of children have traditionally been overlooked in disaster planning. A 1997 Federal Emergency Management Agency (FEMA) survey found that none of the states had incorporated pediatric components into their disaster plans.

Hurricane Katrina, which struck as this report was being written, highlighted the shortcomings of the nation's disaster planning at many levels. Katrina was extreme in its scope and impact, but even small disasters can present enormous challenges to a system that struggles to meet day-to-day patient needs. Though it is still too early to compile all of the lessons learned from Hurricane Katrina, we have learned enough from this and other disasters to recognize that improved planning for disasters is necessary, and that children must be a particular focus of such efforts. The committee recommends that **federal agencies (the Department of Health and Human Services, the National Highway Traffic Safety Administration, and the Department of Homeland Security), in partnership with state and regional planning bodies and emergency care providers, convene a panel with multidisciplinary expertise to develop strategies for addressing pediatric needs in the event of a disaster. This effort should encompass the following:**

- Development of strategies to minimize parent–child separation and improved methods for reuniting separated children with their families.
- Development of strategies to improve the level of pediatric expertise on Disaster Medical Assistance Teams and other organized disaster response teams.
- Development of disaster plans that address pediatric surge capacity for both injured and noninjured children.
- Development of and improved access to specific medical and mental health therapies, as well as social services, for children in the event of a disaster.
- Development of policies to ensure that disaster drills include a pediatric mass casualty incident at least once every 2 years (6.1).

Improving the Evidence Base

Pediatric emergency care is a young field; even in the late 1970s, there were no pediatric emergency medicine textbooks or journals. Although the amount of research conducted in pediatric emergency care has increased considerably over the past 25 years, a significant information gap remains. Indeed, basic questions about the structure of the pediatric emergency care system and patient outcomes remain unanswered. Many of the treatments and management strategies that are widely practiced today are not supported by scientific evidence. A national commitment to emergency care research for children is needed.

Lack of adequate data and limited research funding are among the most important barriers to the advancement of research in pediatric emergency care. No single hospital or EMS agency is likely to have access to sample sizes large enough to answer important questions about critically ill or injured children. The use of research networks, in which researchers from different institutions pool data, has proven to be successful in addressing such challenges. The large number of patients included in the networks allows researchers to carry out trials designed to evaluate rare conditions or complications. If these networks receive the funding needed for sustainability, they not only generate important findings, but also help train and support the development of young investigators.

Since emergency care research is often not based on a single disease entity, a key characteristic of much of this research is its tendency to cut across multiple specialty domains. This has made it difficult for researchers in the field to obtain training grants from the siloed funding structure of the National Institutes of Health, the largest single source of support for biomedical research in the world. The committee recommends that **the Secretary of Health and Human Services conduct a study to examine the gaps and opportunities in emergency care research, including pediatric emergency**

care, and recommend a strategy for the optimal organization and funding of the research effort. This study should include consideration of the training of new investigators, development of multicenter research networks, involvement of emergency and trauma care researchers in the grant review and research advisory processes, and improved research coordination through a dedicated center or institute. Congress and federal agencies involved in emergency and trauma care research (including the Department of Transportation, the Department of Health and Human Services, the Department of Homeland Security, and the Department of Defense) should implement the study's recommendations (7.1).

Focused research attention is needed on pediatric injury, the leading cause of death and disability in children beyond the first year of life. National and state trauma registries, which are used to collect, store, and retrieve data on trauma patients, allow researchers to study the etiologic factors, demographic characteristics, diagnoses, treatments, and clinical outcomes of pediatric trauma patients. However, no single trauma registry currently provides accurate estimates of the scope and characteristics of pediatric trauma. The American College of Surgeons' National Trauma Data Bank constitutes the world's largest repository of pediatric trauma data, but continued steps are needed to expand its pediatric capacity. The committee recommends that **administrators of state and national trauma registries include standard pediatric-specific data elements and provide the data to the National Trauma Data Bank. Additionally, the American College of Surgeons should establish a multidisciplinary pediatric specialty committee to continuously evaluate pediatric-specific data elements for the National Trauma Data Bank and identify areas for pediatric research (7.2).**

THE EMERGENCY MEDICAL SERVICES FOR CHILDREN PROGRAM

Despite its modest annual appropriation, the EMS-C program boasts many accomplishments. It has initiated hundreds of injury prevention programs; provided thousands of hours of training to EMTs, paramedics, and other emergency medical care providers; developed educational materials covering every aspect of pediatric emergency care; and established a pediatric research network. Still, as discussed earlier, certain segments of the emergency care system continue to be poorly prepared to care for children, and the work of the program continues to be relevant and vital.

Addressing some of the long-standing problems in pediatric emergency care, as well as the new concerns raised in this report, will require the leadership of a well-recognized, well-respected entity not just within pediatrics, but within the broader emergency care system. The EMS-C program, with its long history of working with federal partners, state policy makers, re-

searchers, providers, and professional organizations across the spectrum of emergency care, is well positioned to assume this leadership role. But additional resources are necessary so the program will have the capacity to rapidly address the deficiencies in the pediatric emergency care system for children. The committee recommends that **Congress appropriate \$37.5 million per year for the next 5 years to the Emergency Medical Services for Children program (3.7).**

The proposed 5-year period is not intended as a limit on federal funding dedicated to improving pediatric emergency care; indeed, there will always be a need to monitor and study pediatric emergency care. However, the hope is that the various components of leadership in emergency care at the federal level will be better integrated in the future. Pediatric emergency care will always remain an important piece of that federal leadership, but may not require a separate, stand-alone program. After 5 years, it will be necessary to reevaluate how best to identify and fund pediatric emergency care objectives at the federal level. Future funding levels for the EMS-C program must also be reevaluated.

CONCLUDING REMARKS

The quality of the U.S. emergency care system is of critical importance to all Americans. Regardless of income, insurance status, race, ethnicity, geography, or age, everyone relies on the emergency care system to provide needed care in the event of a critical illness or injury. Although the current system operates poorly in many respects, a more reliable system is achievable. Change must be stimulated quickly, however, as millions of Americans continue to access this flawed system each week.

As reforms to the broader emergency care system are accomplished, policy makers at the federal, state, and local levels must not repeat mistakes made in previous decades by neglecting the special needs of pediatric patients. Consideration of those needs must be fully integrated into all aspects of emergency care planning. Individual providers (physicians, nurses, EMTs, and others), as well as provider organizations, also have an important role to play in stimulating improvements in pediatric emergency care. Indeed, they have a responsibility to ensure that care delivered to children meets the highest possible standards of quality.

FUTURE OF EMERGENCY CARE

EMERGENCY CARE FOR CHILDREN GROWING PAINS

Committee on the Future of Emergency Care
in the United States Health System

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The serpent has been a symbol of long life, healing, and knowledge among almost all cultures and religions since the beginning of recorded history. The serpent adopted as a logotype by the Institute of Medicine is a relief carving from ancient Greece, now held by the Staatliche Museen in Berlin.

*“Knowing is not enough; we must apply.
Willing is not enough; we must do.”*

—Goethe



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This report has been reviewed in draft form by individuals chosen for their diverse perspectives and technical expertise, in accordance with procedures approved by the National Research Council's Report Review Committee. The purpose of this independent review is to provide candid and critical comments that will assist the institution in making its published report as sound as possible and to ensure that the report meets institutional standards for objectivity, evidence, and responsiveness to the study charge. The review comments and draft manuscript remain confidential to protect the integrity of the deliberative process. We wish to thank the following individuals for their review of this report:

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Although the reviewers listed above have provided many constructive comments and suggestions, they were not asked to endorse the conclusions or recommendations nor did they see the final draft of the report before its release. The review of this report was overseen by **Enriqueta C. Bond**, Burroughs Wellcome Fund, and **Thomas F. Boat**, Children's Hospital Research Foundation and Department of Pediatrics, University of Cincinnati. Appointed by the National Research Council and Institute of Medicine, they were responsible for making certain that an independent examination of this report was carried out in accordance with institutional procedures and that all review comments were carefully considered. Responsibility for the final content of this report rests entirely with the authoring committee and the institution.

Foreword

The state of emergency care affects every American. When illness or injury strikes, Americans count on the system to respond with timely and high-quality care. Yet today, the emergency and trauma care that Americans receive can fall short of what they expect and deserve.

Emergency care is a window on health care, revealing both what is right and what is wrong with our delivery system. Americans rely on hospital emergency departments in growing numbers because of the skilled specialists and advanced technologies they offer. At the same time, the increasing use of the emergency care system also represents failures of the larger health care system—the growing numbers of uninsured Americans, the limited alternatives available in many communities, and the inadequate preventive care and chronic care management received by many. These demands can degrade the quality of emergency care and hinder its ability to provide urgent and lifesaving care to seriously ill and injured patients wherever and whenever they need it.

The Committee on the Future of Emergency Care in the United States Health System, ably chaired by Gail Warden, set out to examine the emergency care system in the United States; explore its strengths, limitations, and future challenges; describe a desired vision of the emergency care system; and recommend strategies required to achieve that vision. Their efforts build on past contributions of the National Academies, including the landmark National Research Council report *Accidental Death and Disability: The Neglected Disease of Modern Society* in 1966, *Injury in America: A Continuing Health Problem* in 1985, and *Emergency Medical Services for Children* in 1993.

The committee's task in the present study was to examine the full scope of emergency care, from 9-1-1 and medical dispatch to hospital-based emergency and trauma care. The three reports produced by the committee—*Hospital-Based Emergency Care: At the Breaking Point*, *Emergency Medical Services at the Crossroads*, and *Emergency Care for Children: Growing Pains*—provide three different perspectives on the emergency care system. The series as a whole unites the often fragmented prehospital and hospital-based systems under a common vision for the future of emergency care.

As the committee prepared its reports, federal and state policy makers were turning their attention to the possibility of an avian influenza pandemic. Americans are asking whether we as a nation are prepared for such an event. The emergency care system is on the front lines of surveillance and treatment. The more secure and stable our emergency care system is, the better prepared we will be to handle any possible outbreak. In this light, the recommendations presented in these reports take on increased urgency. The guidance they offer can assist all of the stakeholders in emergency care—the public, policy makers, providers, and educators—to chart the future of emergency care in the United States.

Harvey V. Fineberg, M.D., Ph.D.
President, Institute of Medicine
June 2006

Preface

Emergency care has made important advances in recent decades: emergency 9-1-1 service now links virtually all ill and injured Americans to immediate medical response; organized trauma systems transport patients to advanced, lifesaving care within minutes; and advances in resuscitation and lifesaving procedures yield outcomes unheard of just two decades ago. Yet just under the surface, a growing national crisis in emergency care is brewing. Emergency departments (EDs) are frequently overloaded, with patients sometimes lining hallways and waiting hours and even days to be admitted to inpatient beds. Ambulance diversion, in which overcrowded EDs close their doors to incoming ambulances, has become a common, even daily problem in many cities. Patients with severe trauma or illness are often brought to the ED only to find that the specialists needed to treat them are unavailable. The transport of patients to available emergency care facilities is often fragmented and disorganized, and the quality of emergency medical services (EMS) is highly inconsistent from one town, city, or region to the next. In some areas, the system's task of caring for emergencies is compounded by an additional task: providing nonemergent care for many of the 45 million uninsured Americans. Furthermore, the system is ill prepared to handle large-scale emergencies, whether a natural disaster, an influenza pandemic, or an act of terrorism.

This crisis is multifaceted and impacts every aspect of emergency care—from prehospital EMS to hospital-based emergency and trauma care. The American public places its faith in the ability of the emergency care system to respond appropriately whenever and wherever a serious illness

or injury occurs. But while the public is largely unaware of the crisis, it is real and growing.

The Institute of Medicine's Committee on the Future of Emergency Care in the United States Health System was convened in September 2003 to examine the emergency care system in the United States, to create a vision for the future of the system, and to make recommendations for helping the nation achieve that vision. The committee's findings and recommendations are presented in the three reports in the *Future of Emergency Care* series:

- *Hospital-Based Emergency Care: At the Breaking Point* explores the changing role of the hospital ED and describes the national epidemic of overcrowded EDs and trauma centers. The range of issues addressed includes uncompensated emergency and trauma care, the availability of specialists, medical liability exposure, management of patient flow, hospital disaster preparedness, and support for emergency and trauma research.

- *Emergency Medical Services at the Crossroads* describes the development of EMS over the last four decades and the fragmented system that exists today. It explores a range of issues that affect the delivery of prehospital EMS, including communications systems; coordination of the regional flow of patients to hospitals and trauma centers; reimbursement of EMS services; national training and credentialing standards; innovations in triage, treatment, and transport; integration of all components of EMS into disaster preparedness, planning, and response actions; and the lack of clinical evidence to support much of the care that is delivered.

- *Emergency Care for Children: Growing Pains* describes the special challenges of emergency care for children and considers the progress that has been made in this area in the 20 years since the establishment of the federal Emergency Medical Services for Children (EMS-C) program. It addresses how issues affecting the emergency care system generally have an even greater impact on the outcomes of critically ill and injured children. The topics addressed include the state of pediatric readiness, pediatric training and standards of care in emergency care, pediatric medication issues, disaster preparedness for children, and pediatric research and data collection.

THE IMPORTANCE AND SCOPE OF EMERGENCY CARE

Each year in the United States approximately 114 million visits to EDs occur, and 16 million of these patients arrive by ambulance. In 2002, 43 percent of all hospital admissions in the United States entered through the ED. The emergency care system deals with an extraordinary range of patients, from febrile infants, to business executives with chest pain, to elderly patients who have fallen.

EDs are an impressive public health success story in terms of access to

care. Americans of all walks of life know where the nearest ED is and understand that it is available 24 hours a day, 7 days a week. Trauma systems also represent an impressive achievement. They are a critical component of the emergency care system since approximately 35 percent of ED visits are injury-related, and injuries are the number one killer of people between the ages of 1 and 44. Yet the development of trauma systems has been inconsistent across states and regions.

In addition to its traditional role of providing urgent and lifesaving care, the emergency care system has become the “safety net of the safety net,” providing primary care services to millions of Americans who are uninsured or otherwise lack access to other community services. Hospital EDs and trauma centers are the only providers required by federal law to accept, evaluate, and stabilize all who present for care, regardless of their ability to pay. An unintended but predictable consequence of this legal duty is a system that is overloaded and underfunded to carry out its mission. This situation can hinder access to emergency care for insured and uninsured alike, and compromise the quality of care provided to all. Further, EDs have become the preferred setting for many patients and an important adjunct to community physicians’ practices. Indeed, the recent growth in ED use has been driven by patients with private health insurance. In addition to these responsibilities, emergency care providers have been tasked with the enormous challenge of preparing for a wide range of emergencies, from bioterrorism to natural disasters and pandemic disease. While balancing all of these tasks is difficult for every organization providing emergency care, it is an even greater challenge for small, rural providers with limited resources.

Improved Emergency Medical Services: A Public Health Imperative

Since the Institute of Medicine (IOM) embarked on this study, concern about a possible avian influenza pandemic has led to worldwide assessment of preparedness for such an event. Reflecting this concern, a national summit on pandemic influenza preparedness was convened by Department of Health and Human Services Secretary Michael O. Leavitt on December 5, 2005, in Washington D.C., and has been followed by statewide summits throughout the country. At these meetings, many of the deficiencies noted by the IOM’s Committee on the Future of Emergency Care in the United States Health System have been identified as weaknesses in the nation’s ability to respond to large-scale emergency situations, whether disease outbreaks, naturally occurring disasters, or

continued

acts of terrorism. During any such event, local hospitals and emergency departments will be on the front lines. Yet of the millions of dollars going into preparedness efforts, a tiny fraction has made its way to medical preparedness, and much of that has focused on one of the least likely threats—bioterrorism. The result is that few hospital and EMS professionals have had even minimal disaster preparedness training; even fewer have access to personal protective equipment; hospitals, many already stretched to the limit, lack the ability to absorb any significant surge in casualties; and supplies of critical hospital equipment, such as decontamination showers, negative pressure rooms, ventilators, and intensive care unit beds, are wholly inadequate. A system struggling to meet the day-to-day needs of the public will not have the capacity to deal with a sustained surge of patients.

FRAMEWORK FOR THIS STUDY

This year marks the fortieth anniversary of the publication of the landmark National Academy of Sciences/National Research Council report *Accidental Death and Disability: The Neglected Disease of Modern Society*. That report described an epidemic of automobile-related and other injuries, and harshly criticized the deplorable state of trauma care nationwide. The report prompted a public outcry, and stimulated a flood of public and private initiatives to enhance highway safety and improve the medical response to injuries. Efforts included the development of trauma and prehospital EMS systems, creation of the specialty in emergency medicine, and establishment of federal programs to enhance the emergency care infrastructure and build a research base. To many, the 1966 report marked the birth of the modern emergency care system.

Since then, the National Academies and the Institute of Medicine (IOM) have produced a variety of reports examining various aspects of the emergency care system. The 1985 report *Injury in America* called for expanded research into the epidemiology and treatment of injury, and led to the development of the National Center for Injury Prevention and Control within the Centers for Disease Control and Prevention. The 1993 report *Emergency Medical Services for Children* exposed the limited capacity of the emergency care system to address the needs of children and contributed to the expansion of the EMS-C program within the Department of Health and Human Services. It has been 10 years, however, since the IOM examined any aspect of emergency care in depth. Furthermore, no National Academies report has ever examined the full range of issues surrounding emergency care in the United States.

That is what this committee set out to do. The objectives of the study were to (1) examine the emergency care system in the United States; (2) explore its strengths, limitations, and future challenges; (3) describe a desired vision for the system; and (4) recommend strategies for achieving this vision.

STUDY DESIGN

The IOM Committee on the Future of Emergency Care in the United States Health System was formed in September 2003. In May 2004, the committee was expanded to comprise a main committee of 25 members and three subcommittees. A total of 40 main and subcommittee members, representing a broad range of expertise in health care and public policy, participated in the study. Between 2003 and 2006, the main committee and subcommittees met 19 times; heard public testimony from nearly 60 speakers; commissioned 11 research papers; conducted site visits; and gathered information from hundreds of experts, stakeholder groups, and interested individuals.

The magnitude of the effort reflects the scope and complexity of emergency care itself, which encompasses a broad continuum of services that includes prevention and bystander care; emergency calls to 9-1-1; dispatch of emergency personnel to the scene of injury or illness; triage, treatment, and transport of patients by ambulance and air medical services; hospital-based emergency and trauma care; subspecialty care by on-call specialists; and subsequent inpatient care. Emergency care's complexity can be also be traced to the multiple locations, diverse professionals, and cultural differences that span this continuum of services. EMS, for example, is unlike any other field of medicine—over one-third of its professional workforce consists of volunteers. Further, EMS has one foot in the public safety realm and one foot in medical care, with nearly half of all such services being housed within fire departments. Hospital-based emergency care is also delivered by an extraordinarily diverse staff—emergency physicians, trauma surgeons, critical care specialists, and the many surgical and medical subspecialists who provide services on an on-call basis, as well as specially trained nurses, pharmacists, physician assistants, nurse practitioners, and others.

The division into a main committee and three subcommittees made it possible to break down this enormous effort into several discrete components. At the same time, the committee sought to examine emergency care as a comprehensive system, recognizing the interdependency of its component parts. To this end, the study process was highly integrated. The main committee and three subcommittees were designed to provide for substantial overlap, interaction, and cross-fertilization of expertise. The committee concluded that nothing will change without cooperative and visionary lead-

ership at many levels and a concerted national effort among the principal stakeholders—federal, state, and local officials; hospital leadership; physicians, nurses, and other clinicians; and the public.

The committee hopes that the reports in the *Future of Emergency Care* series will stimulate increased attention to and reform of the emergency care system in the United States. I wish to express my appreciation to the members of the committee and subcommittees and the many panelists who provided input at the meetings held for this study, and to the IOM staff for their time, effort, and commitment to the development of these important reports.

Gail L. Warden
Chair

Acknowledgments

The *Future of Emergency Care* series benefited from the contributions of many individuals and organizations. The Committee and Institute of Medicine (IOM) staff take this opportunity to recognize and thank those who helped in the development of the reports in the series.

A large number of individuals assembled materials that helped the committee develop the evidence base for its analyses. The committee appreciates the contributions of experts from a variety of organizations and disciplines who gave presentations during committee meetings or authored papers that provided information incorporated into the series of reports. The full list of presenters is provided in Appendix C. Authors of commissioned papers are listed in Appendix D.

Committee members and IOM staff conducted a number of site visits throughout the course of the study to gain a better understanding of certain aspects of the emergency care system. We appreciate the willingness of staff from the following organizations to meet with us and respond to questions: Beth Israel Deaconess Medical Center, Boston Medical Center, Children's National Medical Center, Grady Memorial Hospital, Johns Hopkins Hospital, Maryland Institute for EMS Services Systems, Maryland State Police Aviation Division, Richmond Ambulance Association, and Washington Hospital Center.

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