

The Pediatric Emergency Care Applied Research Network: Progress and Update

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The Pediatric Emergency Care Applied Research Network

The Pediatric Emergency Care Applied Research Network (PECARN), established in 2001, is the first federally funded national network of emergency departments focusing on research in emergency medical services for children (EMSC). With more than 800 000 annual pediatric visits among its 21 participating emergency departments, the network has been able to study important conditions with infrequent or rare outcomes in diverse populations. In this report, we present the accomplishments from the first 4 years of the PECARN, providing details of completed and ongoing studies, major challenges faced and overcome, methods used to measure network progress and success, and future directions. Clin Ped Emerg Med 7:128-135 © 2006 Elsevier Inc. All rights reserved.

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In June 2001, the Emergency Medical Services for Children (EMSC) Program of the Health Resources and Service Administration's Maternal and Child Health Bureau (HRSA/MCHB) invited proposals to participate in cooperative agreements to establish a collaborative research network dedicated to EMSC. This was based on the observed need for EMSC research in general [1,2] and, more specifically, a multicenter research structure [2], as had been clearly identified via recommendations from EMSC stakeholders, national organizations, as well as prominent researchers and experts in the private and public sectors. The 4 cooperative agreements funded through the EMSC Network Development Demonstration Project formed the Pediatric Emergency Care Applied Research Network (PECARN), the first federally funded national network of emergency departments (EDs) focusing on research in EMSC [3-5]. The PECARN consists of 4 research nodes comprising 21 EDs in 9 states and the District of Columbia. These EDs evaluate a diverse population of more than 800 000 children annually. With experienced scientific leadership, committed investigators, and a robust infrastructure, the PECARN has been able to overcome several barriers that previously limited the ability to conduct high-quality, useful, and generalizable studies

on EMSC. The most significant barrier is the difficulty of studying illnesses and injuries with infrequent or rare but serious adverse outcomes. The PECARN hospitals care for

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diverse populations of children, making their research studies more generalizable than those conducted at single institutions. In this report, the accomplishments from the first 4 years of the PECARN are presented, including studies completed and ongoing, major challenges faced and overcome, methods used to measure network progress and success, and future directions.

PECARN Accomplishments From 2001 to 2005

Development of Infrastructure and Policies

In the first 4 years of the PECARN, a fully operational infrastructure has been developed and strengthened. As described in detail in PECARN history articles, this included the establishment of 4 nodal centers that administer and support the 5 to 6 hospitals within their node, formation of research partnerships among academic and community-based hospitals with diverse patient populations and research infrastructures, and the creation of a steering committee that serves as the primary governing body of the PECARN [3-5]. In addition, 4 subcommittees have been created that inform the steering committee, provide essential input into research organization and activities, and assist with the development of network policies and the implementation and publication of PECARN research studies. Of critical importance in the first 4 years, the PECARN Central Data Management and Coordinating Center (CDMCC) at the University of Utah has been integrated into all aspects of PECARN study design, implementation, and analysis.

The PECARN has also created governing policies. Bylaws that govern the development and approval of network policies have been established, and policies and procedures that outline the roles and responsibilities of the steering committee and its subcommittees have been subsequently created. These policies and procedures cover several important aspects of the PECARN workflow, including the intake procedure for reviewing and approving new research proposals, steps for the oversight involved in the development and implementation of research studies, rules for publishing findings, and standard operating procedures that address specific topics such as site monitoring and adverse event reporting. These policies also clarify network function and provide a "corporate memory," providing necessary continuity as clinical centers, investigators, and research coordinators inevitably change in the academic setting.

Development of a PECARN Research Agenda

An important objective identified by the PECARN was to develop a consensus-derived and well-informed research agenda for the network. Using the nominal group process and the Hanlon method of prioritization, the existing

EMS and EMSC research agendas were reexamined to develop a PECARN-specific multicenter research agendas [6-8]. The prioritization process resulted in a ranked list of 16 topics focused on EMSC multicenter research in both the hospital and prehospital settings. The top 10 items on this agenda in order of priority are respiratory illness/asthma, prediction rules for high-stakes/low-likelihood diseases, medication error reduction, injury prevention, urgency and acuity scaling, race/ethnic/class disparities in health, mental health, treatment of infectious diseases, best practices in patient care, and pain and anxiety management.

Research and Development Process

During its first 4 years, the PECARN instituted a rigorous process to introduce and develop research projects. New research concepts must undergo comprehensive development and review before submission to the Protocol Concept Review and Development Subcommittee. Proposals are typically developed within an individual node, through collaboration among nodes, or within a PECARN working group (which is typically created as a multinodal collaborative effort to address specific research areas). Recognizing the wealth of EMSC research expertise outside of the PECARN, the network strongly encourages external investigators to develop and submit research proposals to the PECARN through a node or working group, which can be facilitated by the chairperson of the PECARN Steering Committee. External investigators with specific expertise have also been invited to participate in PECARN activities and to submit research proposals. If the research study is endorsed, then the external investigator becomes the principal investigator (PI) of the PECARN study and leads the study with the close collaboration of PECARN PIs and committees. Two of the endorsed PECARN research proposals have come from external investigators.

Once a preliminary proposal is submitted to the PECARN, the Protocol Concept Review and Development Subcommittee members, consisting of 10 experienced investigators, epidemiologists, and statisticians, provide detailed reviews and critiques of the preliminary proposal. A summary of this subcommittee's recommendations is presented to the steering committee members, who then vote on proposal endorsement. The steering committee has endorsed only a subset of the preliminary proposals submitted, typically after many required revisions, reflecting the PECARN's careful deliberation and reflection on the importance, scientific rigor, and feasibility of each proposal.

After a preliminary proposal is endorsed by the steering committee, the investigator then develops a detailed protocol. Input from the Safety and Regulatory Subcommittee, the Quality Assurance Subcommittee, the Grants and Publication Subcommittee, and the Feasibility and Budget Subcommittee ensures that high-quality, feasibly sound, and ethical proposals will be developed and

submitted for extramural funding. The Feasibility and Budget Subcommittee was created after the other subcommittees were established, upon recognition of the need to assist investigators in developing feasible protocols within the confines of an appropriate budget and to assess the financial requirements of projects early in the grant-writing process. Selected smaller PECARN research protocols may be conducted with internal infrastructure funding alone. Most PECARN research projects, however, are of larger scope and require extramural funding to augment the PECARN infrastructure for successful completion. Table 1 details the substantial success of the PECARN during the first 4 years to develop scientifically rigorous protocols of high priority, obtain federal funding, and enroll large numbers of patients from diverse populations. Of 8 proposals submitted for extramural funding, 6 have been successfully funded.

Completed and Ongoing PECARN Research

The first study completed by the PECARN was a descriptive study on the epidemiology of ED visits in the network as a whole [9]. This essential study, termed the PECARN Core Data Project, collected and analyzed annual information gathered from existing electronic sources and medical records at all sites in the network. The collection of such information has served 2 important purposes: it (1) demonstrated the PECARN's capacity to collect and synthesize large quantities of basic epidemiologic information and to submit these informa-

tion in a standard format to the PECARN CDMCC and (2) provided data on the frequency of diagnoses seen at each ED within the PECARN, as well as other critical information for the purposes of hypothesis generation and study design development. Two articles have been published from these data [9,10], and several others are in development [11-15]. This project has been extended to subsequent years because the data are invaluable for projecting accrual of patients in new PECARN studies.

Analyses of diagnostic data in the PECARN Core Data Project were complicated by the limitations of the *International Classification of Diseases, Ninth Revision* system, which include redundancy and poor categorization of pediatric emergency diagnoses. As a result, PECARN investigators developed a study entitled "Creating a Diagnosis Grouping System for Child ED Visits" and were awarded an EMSC Targeted Issues Grant to fund the project. The investigators subsequently created a parsimonious diagnosis taxonomy system for pediatric emergencies through use of PECARN Core Data Project data, expert panels, and consensus techniques [16]. The taxonomy system established was then applied to other national data sets in which it was found to be consistent and comprehensive. As the last component of the study, the investigators are currently creating a severity classification system to complement the diagnosis taxonomy.

The "Childhood Head Trauma: A Neuroimaging Decision Rule" study represents the first prospective

Table 1 Completed and ongoing PECARN research.

Project title	Funding and duration	Enrollment
PECARN Core Data Project	EMSC Program Network Development Demonstration Project Cooperative Agreement; 2001-2005 and 2005-2008	Data for approximately 800 000 patient visits per yr; 2002 to present (study ongoing)
Creating a Diagnosis Grouping System for Child ED Visits	EMSC Targeted Issues Grant; 2004-2007	
Childhood Head Trauma: A Neuroimaging Decision Rule	MCHB Research Program and EMSC Program; 2004-2006	More than 30 000 patients enrolled through February 2006; enrollment ongoing through August 2006
The Effectiveness of Oral Dexamethasone for Acute Bronchiolitis: A Multicenter Randomized Clinical Trial	MCHB Research Program and EMSC Program; 2005-2006	561 patients enrolled as of February 2006; enrollment ongoing through April 2006
Hypothermia for Pediatric Cardiac Arrest Planning Grant	National Institutes of Health/NICHHD; 2003-2004	489 patients enrolled
The Use of Lorazepam for the Treatment of Pediatric Status Epilepticus	National Institutes of Health/NICHHD Contract; 2004-2006	48 patients enrolled as of February 2006
Predicting Cervical Spine Injury in Children: A Multi-Centered Case-Control Analysis	EMSC Targeted Issues Grant; 2005-2008	Ongoing
Biosurveillance Using the PECARN	EMSC Program Network Development Demonstration Project Cooperative Agreement; 2001-2005 and 2005-2008	Ongoing
PECARN Psychiatry/Mental Health Working Group Pilot Study	EMSC Program Network Development Demonstration Project Cooperative Agreement; 2001-2005 and 2005-2008	600 patients enrolled

study performed by the PECARN. Traumatic brain injury is the leading cause of death in children older than 1 year and a leading cause of disability. Some traumatic brain injuries after blunt head trauma are initially unrecognized, leading to preventable morbidity [17,18]. At the same time, clinicians appear to use computed tomography imaging excessively after minor blunt head trauma, exposing many children to radiation unnecessarily, because of a lack of reliable and evidence-based acute imaging criteria. Funded by the HRSA/MCHB Research Program and the EMSC Program through an intra-agency partnership, this observational study aims to derive and validate a clinical decision rule that accurately and reliably identifies children at high risk and near-zero risk for significant traumatic brain injuries needing acute intervention after blunt head trauma. This follows a pilot study on approximately 2000 children with blunt head trauma successfully conducted by PECARN investigators at a single site [19]. Because clinically important traumatic brain injury is uncommon in children with minor head trauma, approximately 30 000 patients needed to be enrolled across the PECARN to derive a definitive decision rule with sufficient precision and generalizability. As of March 2006, 30 000 patients have been successfully enrolled, making the study the largest of its kind, with nearly an 80% capture rate of eligible patients. Another 10 000 children are presently being enrolled to validate the decision rule that will be derived based on the first 30 000. Derivation, validation, and subsequent dissemination of the rule will result in more efficient and evidence-based evaluation of children with blunt head trauma. This will lead to more appropriate use of computed tomography scanning, lessen inappropriate exposure of children to ionizing radiation and, as a result, lower costs.

The PECARN has a clear mandate to perform definitive clinical trials to answer questions regarding the effectiveness of potentially important therapies. The study entitled "The Effectiveness of Oral Dexamethasone for Acute Bronchiolitis: A Multicenter Randomized Clinical Trial" is the PECARN's first randomized double-blinded clinical trial. A 2003 report solicited and published by the Agency for Health Care Research and Quality found "no evidence that any single agent can be recommended for treatment of bronchiolitis" and concluded that, "at present, evidence is insufficient to recommend any of the treatments studied." This report called for multicenter, placebo-controlled, randomized trials of medications typically used for this condition [20]. The PECARN bronchiolitis trial, funded by the HRSA/MCHB Research Program and the EMSC Program, addresses this mandate. The principal aim of this study is to assess the effectiveness of a promising treatment, oral dexamethasone, for acute moderate-to-severe bronchiolitis. One prior study suggested benefit but was limited by its small sample size and single-institution setting [21]. If the current study's

findings support the use of dexamethasone, this would be the first evidence-based treatment identified for bronchiolitis. Presently, data collection is in its third and final year, with more than 500 patients enrolled, which also makes this study the largest of its kind on the topic.

The network is currently performing 2 preliminary studies concerning therapies for acutely ill or injured children, 1 pertaining to therapeutic hypothermia for pediatric cardiac arrest and another regarding status epilepticus. These are studies that will lead to definitive randomized clinical trials.

The PECARN provides a unique opportunity to evaluate potential therapies for cardiac arrest. Cardiac arrest with apnea and loss of palpable pulse in childhood is a tragic and fortunately uncommon event that often results in death or poor-quality neurologic survival [22,23]. Unfortunately, no present therapy has been proven to be effective in children, although mild hypothermia has shown promise in adults who have undergone cardiac arrest [24,25]. The "Hypothermia for Pediatric Cardiac Arrest Planning Grant," supported by the National Institute of Child Health and Human Development (NICHD) of the National Institutes of Health, is a feasibility study conducted at 15 PECARN intensive care units that will describe the patients and the event characteristics of pediatric patients who had a cardiac arrest and delineate factors associated with outcome. The data will be used to plan a future randomized clinical trial of the efficacy of mild hypothermia as a means to improve survival and neurologic outcomes of children after cardiac arrest. Data collection is complete, with analysis ongoing, for 489 patients.

Benzodiazepines, including lorazepam, are generally considered the most effective agents for the initial treatment of status epilepticus; however, pediatric studies on the safety and efficacy of such treatment in an emergency setting are limited [26,27]. The objective of the PECARN study "Use of Lorazepam for the Treatment of Pediatric Status Epilepticus" is to determine the pharmacokinetics and optimal dosing of lorazepam for pediatric use. This study, funded by the NICHD, addresses the need for pediatric drug labeling legislated by the Best Pharmaceuticals for Children Act. This Act was implemented to lead to new pediatric labeling of medications in accordance with the rules and regulations of the US Food and Drug Administration and will enhance the number of medications for which dose, efficacy, and harm data are available to guide use in children [28]. The PECARN lorazepam project is the first study of the 12 off-patent medications identified by the Best Pharmaceuticals for Children Act for investigation. With this pharmacokinetic phase of the study nearing close, investigators are working closely with partners at the NICHD to plan for a randomized controlled trial comparing lorazepam with diazepam for the treatment of pediatric status epilepticus.

An excellent example of how the PECARN is able to address serious but rare outcomes is the project entitled “Predicting Cervical Spine Injury in Children: A Multi-Centered Case-Control Analysis,” supported by an EMSC Targeted Issues Grant. Immobilization of children with cervical spine injuries in the out-of-hospital setting may be beneficial but is poorly studied. In contrast, immobilization for transport of pediatric patients without cervical spine injury is common and known to be associated with adverse events [29,30]. In fact, more than 99% of immobilized children have no cervical spine injury and are therefore exposed to harm with no demonstrable benefit. The purpose of the PECARN cervical spine study is to identify a set of variables that separate injured children with negligible risk of cervical spine injuries from those with non-negligible risk. This will be the largest case-control study on pediatric cervical spine injuries ever reported. The results of this ongoing study, once disseminated to the EMS community, will help develop new field management strategies that will limit spinal immobilization of children to those at nonnegligible risk of cervical spine injuries.

The PECARN is acutely aware that children with psychiatric complaints presenting to EDs have reached epidemic proportions over the past decade. It is not clear whether EDs provide, or are prepared to provide, optimal care for these patients, especially given the often-extensive and complex social evaluations involved. The objective of the “PECARN Psychiatry/Mental Health Working Group Pilot Study” is to ascertain the sources of ED referral for children with psychiatric complaints and determine the organization and use of resources used for these patients. The data will be used to inform more definitive prospective studies in this high-priority area.

In addition to improving individual patient care through ED- and prehospital-based research, the PECARN has a responsibility to strengthen public health surveillance at both the regional and national levels. The overall objective of the study “Biosurveillance Using the PECARN” is to create a pediatric health information network as part of the national health information infrastructure. Although symptom and diagnostic data are stored in administrative health care databases, there is currently no real-time pediatric-focused automated system for integrating these data so that abnormal patterns of disease will be detected in a timely manner [31,32]. The current PECARN study will determine whether hospital administrative information and information routinely collected in the course of clinical care can effectively be used to detect abnormal patterns of disease in a region. These data can be used for bioterrorism surveillance as well as general-purpose public health surveillance and clinical research. The study is ongoing in the PECARN and continues to enroll

centers and develop the technology and statistical methods for detecting unusual clusters of disease in time and in space.

Major Challenges Faced in the PECARN and Lessons Learned

Although the PECARN has progressed rapidly and continues to grow and develop new projects at an increasing pace, it has done so despite numerous challenges. Some of these include the variability in institutional review board (IRB) practices among institutions, the difficulties inherent in implementation of complex and multiple protocols at numerous sites in geographically distinct areas, the need to monitor performance across sites, and the need to obtain an appropriate level of funding for individual studies.

Variability of decision making and policies at local IRBs was anticipated; nevertheless, this remains somewhat problematic. Because IRBs are unequally funded and staffed, the time needed to review and obtain approval for protocols and modifications can be excessive at some sites, delaying study implementation. However, on a positive note, IRBs are often willing to discuss and debate the interpretations of federal regulations and are willing to work with PECARN sites to get studies done within IRB and federal guidelines. For the observational, noninterventive, and minimal-risk PECARN head trauma study, for example, a few IRBs were wary of granting a waiver of written informed consent, likely because of different interpretations of the federal regulations. Investigators were able, however, to impress upon IRBs the minimal-risk nature of the study, the impracticability of this study without this waiver, and the need for uniform implementation of study procedures across sites to ensure scientific rigor. This resulted in an approval for waiver of written informed consent at all but 2 sites. Nevertheless, in this study, the patients' guardians are informed of the ongoing study at the time of the ED visit and verbal consent is then obtained at the time of telephone follow-up. The PECARN investigators will continue to engage IRBs on difficult issues such as waivers and exemptions from informed consent.

The PECARN investigators understood that uniform implementation of multiple and often-complex protocols across numerous sites posed a substantial challenge, particularly in the ED setting. The PECARN study PIs have used several methods to increase the likelihood of uniform implementation, including the development of detailed manuals of operation; in-person full-day training sessions for investigators and research assistants; detailed onsite training for staff in each ED; and frequent communication between the study PI and all sites through e-mail, monthly conference calls, and a virtual online communication interface. Site monitoring visits by the nodal administrators and a dedicated site monitor

Table 2 Elements of the nodal report cards.

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- Participation in PECARN meetings
 - Participation in PECARN voting
 - PECARN subcommittee contribution
 - PECARN grant submissions
 - Research proposals submitted to the PECARN for consideration and approval rating of the proposals
 - Study enrollment success
 - Good clinical practices compliance
 - Author participation and timely manuscript completion
 - Leadership and participation by node for each PECARN research project
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from the PECARN CDMCC have been critical as well. The importance of a committed and vigilant investigator at each site to work closely with the local research assistant and to provide oversight and feedback to all those involved in data collection and transmission cannot be overemphasized. Sites with more researchers who are available and enthusiastic to take ownership of individual studies are more likely to successfully implement multiple studies. The substantial time commitment involved in being a site investigator for an individual study highlights the need for appropriate funding to protect investigator time and the personal dedication needed for, and voluntary nature of, many PECARN activities when funding is not sufficient.

The PECARN has experienced variability in the performance of studies across sites, as expected, particularly with regard to the ability to enroll a high percentage of eligible patients and perform appropriate follow-up. To minimize and respond to this variability, the PECARN performs intensive site monitoring for all studies, irrespective of whether the study is a double-blind randomized trial, observational study, or retrospective chart review. The type and frequency of monitoring depend on the nature of the study, with interventional trials receiving the most frequent visits. We believe site monitoring is so important to maintaining scientific rigor that it must be considered as part of proposed study budgets.

The PECARN is attractive to funding agencies because the network can offer substantial savings and economies of scale owing to its preexisting infrastructure, which includes a full-time research assistant at all sites and an independently funded data center. For example, the PECARN can supply a portion of the research assistant's time as part of a grant budget (eg, 20% of a full-time equivalent at each site for any particular study) to decrease the funds requested in an extramural grant application. However, because of their large scope and size, PECARN research studies are inevitably expensive even for large funding agencies. The PECARN study PIs have frequently had little choice but to offer less-than-optimal financial support to study site investigators, research assistants, and institutions to obtain extramural

grants and remain within budget restrictions. Time commitment that exceeds financial support is particularly problematic for study investigators as academic institutions closely follow cost-sharing issues and local investigators have competing local research interests, clinical responsibilities, and administrative commitments. The PECARN also needs its leaders to focus their grant-writing efforts on PECARN initiatives, yet this is only realistic if sufficient funds will be available to compensate for their time. The PECARN leaders must actively work with and educate funders to make the financial needs of network studies and investigators more clearly understood.

Methods Used to Measure the PECARN's Progress and Success

The PECARN is charged with not only conducting high-priority EMSC research but also assessing the performance of the network. To achieve this objective, the PECARN Quality Assurance Subcommittee developed report cards on the performance of each of the 4 nodes as a whole, the individual PECARN sites, and the CDMCC. Standardized operating procedures to determine report card scores have been developed. Elements of the nodal and site report cards are shown in [Tables 2 and 3](#).

The PECARN's success over time will be measured by the ability to successfully perform high-priority EMSC research in a definitive as well as generalizable fashion and then translate the evidence to the EMSC practitioner community to improve health outcomes of acutely ill and injured children. Successes in the first 4 years of the network include funding and implementation of multiple complex and high-priority research protocols, publication of several articles [3-5,9,10], and presentation of 14 abstracts at national conferences [9-16,33-38]. In the next 1 to 2 years, many more PECARN publications are anticipated as the initial group of funded PECARN research projects is completed. In fact, the research momentum in the PECARN continues to steadily increase. The areas explored in these articles and abstracts address high-priority clinical topics in EMSC and include issues related to health services, epidemiology, practice variation, research techniques, and health care disparities.

Table 3 Elements of individual PECARN site report cards.

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- Timeliness of IRB submissions and approval
 - Completeness of essential documents binder
 - Participation in PECARN research studies
 - Study enrollment success
 - Timeliness and accuracy of study data entry
 - Responsiveness to site monitoring reports
 - Team contribution of the site to PECARN research and other activities
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Future Directions

After the successful first 4 years of the PECARN, its goals for the upcoming years include the following:

1. To continue performing high-priority, rigorous, and definitive hospital-based EMSC research studies;
2. To generate, develop, and conduct high-priority and rigorous prehospital-based EMSC research studies; and
3. To study and promote the transfer and translation of scientific-based evidence to EMSC health care leaders, policymakers, and practitioners in all settings to ultimately enhance the health outcomes of acutely ill and injured children.

Although the PECARN will continue to perform ED-based research, a strong emphasis has been placed on prehospital research in the future. The out-of-hospital environment provides unique barriers to conducting research, including a setting that is difficult to control, with little national standardization of prehospital care practices or data collection [39]. Prehospital research also requires investigators to navigate numerous bureaucratic layers at the state, regional, and local levels [40]. Fortunately, the PECARN includes experienced investigators who have forged strong relationships with prehospital agencies, and a PECARN Prehospital Working Group has been formed to coordinate efforts in this area. These relationships will be crucial to successfully moving prehospital research forward.

Ultimately, the research performed within the PECARN will be most significant if it translates into better patient outcomes through improved clinical practices. The Agency for Health Care Research and Quality has set objective measurement standards defining the significance of research: level I, the study is published and impacts on further research; level II, a policy or program results from the research; level III, the research results in a change in clinical practice; and level IV, the research results affect health outcomes [41]. The PECARN is charged to not only improve the evidence base but also foster the translation of research findings into evidence-based policy and practice with improved health outcomes (level IV). For instance, the PECARN will not only validate the decision rule generated in the study entitled "Childhood Head Trauma: A Neuroimaging Decision Rule" but also subsequently perform studies to implement the rule and measure how it changes clinical practice, benefits patient health, and results in cost-effective care. In addition, results from the bronchiolitis dexamethasone trial will likely influence guideline recommendations and practice among health care providers. In the near future, PECARN investigators will submit a grant proposal for a randomized clinical trial whose aim is to compare 3 practical ED methods to improve compliance with the National Asthma Education and Prevention Program

guidelines for the use of chronic inhaled corticosteroids in children seen in the ED with persistent asthma.

Lastly, but of critical importance, the PECARN recognizes the great need to improve the safety of children who receive care in EDs in accordance with the Institute of Medicine report entitled "To Err is Human: Building a Safer Health System" [42]. Research is lacking on pediatric safety issues in the ED setting. The PECARN intends to add to what is known and directly study issues that will improve patient safety in this setting. Two recently endorsed PECARN studies address patient safety issues. In one of these studies, investigators plan to assess the risk and predictors of adverse events in approximately 20 000 procedural sedations performed in the ED. In a separate study, the PECARN Safety Workgroup will establish a networkwide incident reporting system to quantify medical errors in the ED; these data will inform subsequent interventional studies on error-reduction strategies.

Summary

In its first 4 years, the PECARN has become a well-established, well-organized, and highly successful conduit for EMSC research. As long as the Congress chooses to fund the EMSC Program, the PECARN will continue to conduct high-priority research in EMSC to provide the base of evidence on which to guide clinical practice and to ultimately improve the outcomes of acutely ill and injured children.

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