

Priorities for research in Emergency Medical Services for Children: Results of a consensus conference

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Objective: To arrive at a consensus on the priorities for future research in emergency medical services for children.

Methods: A consensus group was convened using the Rand-UCLA Consensus Process. The group took part in a 3-phase process. Round I involved reviewing a compendium of relevant research articles and answering a mailed questionnaire. Panel members were asked to prioritize topics on the basis of the 1993 Institute of Medicine Report on Emergency Medical Services for Children. Participants were asked to rate each topic based on the significance of the research, and whether the topic would (1) improve general knowledge (2), change behavior (3), improve health (4), decrease the cost of care, or (5) change public policy. A 4-point Likert scale was used. Participants were also asked if the research would require a multicenter study and if the research were feasible. Round II of the study involved a meeting of the panel, where the results of Round I were discussed and the topics were reprioritized. The topics were given a rank order and a final ranking was done in Round III.

Results: The panel considered a list of 32 topics; these were combined and reworded to give them more precise meaning. Several new topics were also added. Fifteen topics were given a rank order and placed within the 7 broad categories of the Institute of Medicine report. Clinical aspects of emergency care, systems organization, configuration, and operation and injury prevention were given high priority rankings. The first 5 topics were very close in point-rank order.

Conclusion: The panel was able to develop a list of important topics for future research in emergency medical services for

children that can be used by foundations, governmental agencies, and others in setting a research agenda for such services.

INTRODUCTION

Improving the care of ill and injured pediatric patients has been a major goal of the Emergency Medical Services for Children (EMSC) Program since its inception. This program has now been funded for 12 years, administered by the US Department of Health and Human Services, Health Resources and Services Administration, Maternal and Child Health Bureau in collaboration with the Department of Transportation, National Highway Traffic Safety Administration. Almost every state has received EMSC funding, and many methods for improving pediatric emergency care have been implemented, including system development, integration of pediatric components into EMS systems, and legislative initiatives. How effective EMSC activities and projects have been in improving outcomes, however, has not yet been evaluated. Because there is wide variability in the structure of EMS systems from state to state—different levels of EMS providers, distances to community hospitals and tertiary care centers, and differences in the availability and consistency of data—there is little information available on how effective these projects have been in achieving the goals of EMSC.

The first EMSC funding was provided for “demonstration” grants designed to encourage the development of statewide projects to improve the emergency care of children through system development, education of emergency providers, and data collection and analysis (1). As the program has matured, funding has shifted to support projects targeting specific issues in pediatric emergency care, such as violence and injury prevention, pain reduction, diagnostic procedures, curriculum development, improving the care of children with special health care needs, and so on. Although research has not been a priority in this program, much descriptive data on EMSC in the professional literature have been generated from the EMSC grant program (2–5). These data were collected, however, to provide a framework for system development and not specifically to evaluate the effects of EMSC implementation. Because the EMSC program was originally developed to improve direct services, no research agenda was developed.

The Institute of Medicine (IOM) Report on Emergency Medical Services for Children, a carefully researched document published in 1993, included many recommendations for improving pediatric emergency care nationally (6). Included in the report was a list of areas for research in pediatric emergency care; however, this list was very general and was not prioritized. The report suggested that

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attention be given to the expansion of research in 7 areas (Fig. 1). MacKenzie (7) also suggested a set of topics, primarily related to trauma care for further investigation, proposing that the key elements for this research base include population-based data collection, projects that clearly document what works best in the delivery of care, and longitudinal research that focuses on outcomes.

To build on the IOM recommendations, a consensus conference was held in June 1996, sponsored by the Maternal and Child Health Bureau with staff from the National EMSC Resource Alliance, to

describe priorities for future EMSC research. The following summary of the conference describes the consensus process and the recommendations of the participants.

MATERIALS AND METHODS

The Rand-UCLA consensus process was used to ensure validity of the results of this consensus conference (8, 9). To develop the list of invitees for the conference, a letter was sent to all present and

Clinical aspects of emergencies and emergency care

- Posttraumatic shock, septic shock, hemodynamic instability, and hypotension
- Pediatric resuscitation
- Appropriate uses of and techniques for intubation, bag-valve-mask ventilation, vascular access and intraosseous infusion; and pneumatic antishock garments in children
- Physiological responses of injured or sick children to certain interventions and when parents are present or absent
- Operative versus nonoperative management of blunt hepatic, splenic, and pancreatic injuries
- Evaluation of minor head trauma including indications for computed tomographic (CT) scans, observation, and admission
- Management of injured children using blood products and synthetic blood products
- Treatment of acute asthma attacks, including initial assessment and management and determining whether inpatient or outpatient follow-up care is needed
- Psychosocial support for families of injured or sick children
- Appropriate techniques for prehospital management of ill or injured children, including decisions about on-scene stabilization or immediate transport

Severity and acuity measures for injury and illness

- Development and validation of injury and illness scoring scales for children, with special attention to applications in the field (for triage) and for research purposes
- Ways of discriminating between life-threatening and non-life-threatening illness and injury
- Survivability by level of severity of injury or illness
- Scales for severity of abdominal and chest trauma injuries
- Methodologies for triage of patients more accurately in the field and in emergency departments, with particular attention to young children with possible serious illness

Patient outcomes and outcome measures

- Development and validation of practical functional and other outcome measures
- Disability assessment and scoring systems for children
- Innovative approaches to longitudinal follow-up

Costs

- Determination of true direct and indirect costs associated with EMSC for all major types and settings of emergency care
- Assessment of the marginal (ie, incremental) costs of improving EMS systems sufficiently to be able to handle the pediatric age group adequately
- Economic consequences of pediatric trauma or severe illness to families and to taxpayers
- Evaluation of the cost-effectiveness of different EMSC program configurations, with particular attention to a broad set of program benefits (ie, outcomes)

System organization, configuration, and operation

- Effective and practical ways to upgrade EMS system components
- Effectiveness, efficiency, and other outcomes of various EMS/EMSC arrangements for different populations and settings
- Extent to which children who need emergency medical services receive them, with particular attention to care received (or not received) in hospital EDs
- Population-based estimates of need for ED and pediatric ICU beds for assessment of emergency care resources appropriate for local and regional areas
- Pediatric emergency care in special circumstances and locales
- Effective ways to measure and improve the quality of EMS care, for different types of EMS providers, systems, and settings

Education and training

- Effective ways to provide professional education and training and retraining to maximize skill acquisition and retention and to improve practice patterns and patient outcomes
- Public education in prevention, basic emergency care skills, use of the EMS system, and similar topics, with attention to level of resulting behavior change

Prevention

- Effective strategies for injury prevention, including comparative effectiveness of laws, regulations, and educational programs
- Outcomes, costs, and cost-effectiveness of prevention programs

FIG 1. IOM Report. Summary of high-priority topics for a research agenda in emergency medical services for children.

former EMSC grantees, all state EMS directors, and selected pediatric emergency medicine program directors asking them to identify persons who they considered experts in research in emergency medical services for children. The 10 persons receiving the most votes were invited to participate in the conference. Of the 10 selected, 2 persons declined the invitations, so alternates were selected in their place.

Round 1. Selected research articles on EMSC topics, and representing several research methods (case study, multicenter, qualitative, quantitative, descriptive) were sent to each participant to read before the conference. In addition, participants were sent a questionnaire listing the areas of research as delineated in the IOM Report (Fig. 1). Participants were asked to rate each topic on the basis of the significance of the research, and whether research in the topic area would (1) improve general knowledge, (2) change behavior, (3) improve health, (4) decrease cost of care, or (5) change public policy. A 4-point Likert scale was used for participants' responses to the questions. In addition, each participant was asked to consider whether the feasibility and cost of conducting research on the topic was reasonable or prohibitive, and whether the study would require multicenter collaboration to obtain useful results. The ratings for this preliminary work were then tallied, and the results were presented and discussed in the next round.

Round 2. For the second round of this consensus process, the panel met face-to-face and discussed the methodology and the results generated in Round 1. A rank-order serial voting method was used to reprioritize the research topics, and the 32 topics generated during Round 1 were reprioritized on a new rank-order list. A "parking lot" list was recreated for topics that panel members wished to revisit and reconsider over the course of the conference.

Several rounds of voting resulted in considerable refining and prioritizing of the list. After each round of voting on topics, the sum rank order was determined for overall topic priorities. Tables showing the results were developed and presented to the panelists after each voting point in the process. As a result of discussion among the participants, some topic areas were combined and reworded during this process of reconsideration and consolidation. Additional material was incorporated into the list, which resulted in the development of a new list of 15 topics. This list included all of the 7 broad areas listed in the IOM report.

Round 3. The final list of 15 topics was discussed and another round of rank-order voting took place. The wording of several topics was changed, and there was a discussion about shortening the topic list; the group decided, however, that all 15 topics would be retained for the final vote. The issue of whether specific topics required multicenter studies was entertained in this round of discussion. The positive and negative attributes of multicenter research were also discussed (Table 1). Finally, a plan was discussed for dissemination and use of the information.

RESULTS

From the initial 32 topics considered by the panel in Round 1, the topics were combined and reworded for more precise meaning; several new topics were also added. A final list of 15 topics was developed and prioritized by the participants in rank order. The final consensus results of research topics in priority order are listed in Figure 2. This list represents topics in all of the 7 broad categories listed in the IOM report.

Clinical aspects of emergency care, systems organization, con-

Research topics

1. Management of major clinical entities such as:
 - Shock
 - Respiratory distress
 - Asthma
 - Brain injury
 - Multiple organ trauma
 - Seizures
 - Poisoning
 - Behavioral disorders
 - Burns
 - Fever
2. Development and validation of practical, functional, and other outcomes measures
3. Injury prevention: strategies, outcome and cost-effectiveness
4. Fundamental issues in the development of medical informatics for EMS
5. Effective ways to measure, improve, and upgrade the quality of EMS care and systems
6. Prevention and relief of physical and emotional pain and suffering of patients
7. Evaluation of the effect and cost of out-of-hospital EMS interventions
8. Pediatric resuscitation
9. Costs of emergency medical services for children
10. Extent to which pediatric patients who need emergency services receive them
11. Development and validation of injury and illness scoring scales for children
12. Effective ways to provide professional education, training and retraining to maximize skill acquisition and retention and to improve practice patterns and patient outcomes
13. Public education methods of effecting behavioral changes in the areas of injury prevention, basic emergency care skills, and the use of EMS systems
14. Triage methods: out-of-hospital and in the ED
15. Children with special health care needs

FIG 2. EMSC research topics ranked by priority.

TABLE 1*Positive and negative aspects of multicenter research*

Positive	Negative
High external validity	Can be difficult to control quality of data
Large sample size possible	Cost may be high
Results are more widely accepted	Centers may be reluctant to participate
Is feasible with careful planning	Feasibility becomes more difficult with larger studies
Can obtain uniform data on same issue from many sources	Can be difficult to organize

figuration and operation, as well as injury prevention remained high priority categories in all rounds of voting. The 5 highest priority topics were very close in total point count. In the initial rounds, outcome measures, severity scores, cost of care, and education and training were ranked as low-priority topics, but these topics were given a higher priority as the discussion progressed.

The panel carefully considered the need for large, multicenter research studies and the positive and negative aspects of these studies. Participants agreed on the importance of this methodology in answering many critical issues in pediatric emergency care. The panel believed that the work of this research conference should be widely disseminated through journal articles and other media to encourage researchers to address these topic areas.

In summary, a panel was selected through a validated consensus methodology. Participants in the consensus process met and developed a research agenda for EMSC. The panel hopes that these prioritized topics will be used by foundations and by federal and state agencies in considering the funding of future projects related to pediatric emergency care. As a final step for implementation of this research agenda, an EMSC action plan could be developed to address specifically how this research can be fostered and funded. The panel believed that the work of this research consensus conference should be widely disseminated through journal reports such as this one, newsletters, workshops at national meetings, and symposia. The initial cost of conducting this research may seem high, but the research findings may ultimately result in significant savings. There is also great potential to reduce the pain and suffering of children and their families. The overall goal of improving outcomes for ill and injured children can only be accomplished through activities and interventions based on sound and valid research.

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APPENDIX

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