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**A Research Agenda to Advance Pediatric Emergency Care Through Enhanced
Collaboration Across Emergency Departments**

Author List:

- Isabel Barata, MS, MD, MBA¹
- Marc Auerbach, MD²
- Oluwakemi Badaki-Makun, MD³
- Lee Benjamin, MD⁴
- Madeline M. Joseph, MD⁵
- Moon O. Lee, MD, MPH⁶
- Kim Mears⁷
- Emory Petrack, MD⁸
- Dina Wallin, MD⁹
- Paul Ishimine, MD¹⁰ & Kurt R. Denninghoff, MD¹¹ (BOTH LAST AUTHORS)

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23 **Author Affiliations:**

24 ¹Pediatric Emergency Medicine Service Line Quality Director, Northwell Health System;
25 Associate Professor of Pediatrics and Emergency Medicine, Donald and Barbara Zucker School
26 of Medicine at Hofstra/Northwell.

27 ²Associate Professor of Pediatrics and Emergency Medicine, Yale University School of
28 Medicine, New Haven CT

29
30 ³Assistant Professor of Pediatrics, Johns Hopkins University School of Medicine, Baltimore MD

31
32 ⁴Director of Clinical Operations Pediatric Emergency Center Saint Joseph Mercy Health System,
33 Ann Arbor, MI; Adjunct Clinical Instructor University of Michigan Department of Emergency
34 Medicine

35 ⁵Assistant Chair of Pediatric Emergency Medicine Quality Improvement; Professor of
36 Emergency Medicine and Pediatrics, Department of Emergency Medicine, University of Florida
37 College of Medicine-Jacksonville

38
39 ⁶Assistant Professor, Department of Emergency Medicine, Stanford University School of
40 Medicine, Stanford, CA

41 ⁸Clinical Associate Professor of Emergency Medicine and Pediatrics, Tufts University School of
42 Medicine, Boston, MA

43 ⁹Assistant Clinical Professor, Division of Pediatric Emergency Medicine, Department of
44 Emergency Medicine, University of California, San Francisco, San Francisco, CA

45
46 ¹⁰ Clinical Professor of Emergency Medicine and Pediatrics, University of California, San Diego,
47 San Diego CA

48
49 ¹¹Distinguished Professor and Associate Head of Emergency Medicine, the University of
50 Arizona College of Medicine, Tucson, Arizona

51

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52 **Corresponding Author:**

53 Isabel A. Barata, MS, MD, MBA

54

55 ibarata@aol.com (preferred email for correspondence)

56 ibarata@northwell.edu (preferred email for publication)

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90 **Abstract**

91 In 2018, the Society for Academic Emergency Medicine (SAEM) and the journal *Academic*
92 *Emergency Medicine* (AEM) convened a consensus conference entitled, “*Academic Emergency*
93 *Medicine* Consensus Conference: Aligning the Pediatric Emergency Medicine Research Agenda
94 to Reduce Health Outcome Gaps.” This article is the product of the breakout session: Enhancing
95 collaboration in pediatric emergency care (PEM practice in non-children’s hospitals).

96 This subcommittee consisting of emergency medicine, pediatric emergency medicine, and
97 quality improvement experts, as well as a patient advocate identified main outcome gaps in the
98 care of children in the EDs in the following areas: variations in pediatric care and outcomes,
99 pediatric readiness, and gaps in knowledge translation. The goal for this session was to create a
100 research agenda that facilitates collaboration and partnering of diverse stakeholders to develop a
101 system of care across all ED settings with the aim of improving quality and increasing safe
102 medical care for children. The following recommended research strategies emerged: explore the
103 use of technology as well as collaborative networks for education, research, and advocacy to
104 develop and implement patient care guidelines, pediatric knowledge generation and
105 dissemination, pediatric quality improvement; and prepare all EDs to care for the acutely ill and
106 injured pediatric patients. In conclusion, collaboration between general EDs and academic
107 pediatric centers on research, dissemination, and implementation of evidence into clinical
108 practice is a solution to improving the quality of pediatric care across the continuum.

109

110 **1) Introduction**

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111 According to a 2014 Centers for Disease Control and Prevention report, there are approximately
112 141 million Emergency Department (ED) visits per year in the United States. Of those, an
113 estimated 27 million visits were for children under 15 years of age (20% of all ED visits).¹ The
114 approximately 5,000 EDs in the U.S. vary in their pediatric patient volume, and the
115 overwhelming majority of EDs are general EDs, which provide care to both adults and children;
116 in contrast to pediatric EDs, which provide care primarily to children. Overall, 85% of pediatric
117 visits to EDs are to general EDs with varying pediatric volumes.²

118 General EDs face many challenges in caring for pediatric patients (e.g. conflicting demands on
119 time and limited resources), which may lead to variations in pediatric care and patient outcomes
120 between general and pediatric-specific EDs. For example, with respect to practice variation, the
121 use of plain radiographs for respiratory diseases (asthma, bronchiolitis and croup) is significantly
122 lower in pediatric-specific EDs than in general EDs.^{3,4} Similarly, a recent study evaluating
123 imaging radiation exposure in patients with non-trauma related abdominal complaints, revealed
124 lower computed tomography (CT) use in pediatric-specific EDs than in general EDs (OR=0.34;
125 95% CI= 0.17-0.69), and higher ultrasound use in pediatric-specific EDs (OR=2.14; 95% CI=
126 1.29-3.55).⁵ In terms of patient outcomes, mortality is the ultimate outcome that differs by type
127 of ED. Children with atraumatic out of hospital cardiac arrest have higher survival in pediatric
128 EDs than general EDs (33.8% vs. 18.9%, $P < .001$) with an adjusted odds ratio of survival in
129 pediatric ED as compared to general EDs of 2.2 (95% CI=1.7-2.8).⁶ Other studies have shown
130 similar findings, with halved mortality rates in very high pediatric volume EDs ($\geq 50,000$ annual
131 pediatric visits per year) compared with low pediatric volume EDs.⁷

132
133 Limited resources in EDs negatively impact pediatric readiness. The Emergency Medical
134 Services for Children (EMSC) program has developed an ongoing quality improvement project
135 to improve ED pediatric readiness in the U.S., starting with the development of a survey that
136 assigns an ED a pediatric readiness score out of 100. A national survey in 2013 showed that
137 86.3% of EDs see fewer than 28 children per day (<10,000 per year) and that pediatric readiness
138 correlates with pediatric visit ED volume. For EDs with low pediatric visit volume (fewer than
139 1,800 pediatric visits per year, or fewer than 5 children per day), the median pediatric readiness
140 score was 68.9; in contrast, EDs with high pediatric visit volume (>10,000 visits per year) had a
141 score of 89.8.²

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142

143 In addition to conflicting demands and limited resources multiple other factors may contribute to
144 the variability in pediatric care across practice settings. The lag in translation of scientific
145 evidence to clinical practice for instance, a well-recognized problem in healthcare, may be more
146 pronounced in general EDs than in pediatric-specific EDs when it comes to advances in the care
147 of pediatric emergency patients. Many general EDs commit resources to meeting publicly
148 reported indicators that address adult measures and may have limited resources to address
149 pediatric quality measures. In addition, the availability of specific pediatric skills and resources
150 in general EDs may limit the application of new knowledge for treatment of pediatric patients.
151 Similarly, pediatric medical events such as cardiac and/or respiratory arrests occur infrequently
152 in lower pediatric volume EDs, creating challenges in preparation for such rare events. Finally,
153 the majority of pediatric emergency medicine research and knowledge generation occurs in EDs
154 associated with academic centers or children's hospitals.

155

156 The studies outlined above illustrate the gaps in the care of children in the ED. The lack of
157 collaboration has negatively impacted resources, pediatric readiness and knowledge
158 dissemination to achieve the optimal care of children in the ED. This consensus conference
159 offered a unique opportunity to create a research agenda that facilitates partnering of diverse
160 stakeholders to develop a system of care across all ED settings with higher quality and
161 increasingly safe care for children.

162

163 **Methods**

164 *General approach and methods used for consensus generation*

165 Over a 2-year period, the ED Collaboration Sub-committee, composed of a patient advocate,
166 experts in emergency medicine practicing in EDs with different pediatric volumes, pediatric
167 emergency medicine, simulation, and practitioners with expertise in PEM quality, worked to
168 identify for the AEM consensus conference key areas of potential research in advancing
169 collaboration in pediatric emergency medicine (PEM). These areas of research address the goal
170 of “understanding the complex interactions and the need for collaboration among the different
171 types of emergency departments and providers caring for acutely sick and injured pediatric
172 patients.”

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173 Following an extensive review of the literature to identify the current state of pediatric
174 emergency care in general EDs, the subcommittee developed topics for future research,
175 identifying clinically relevant research topics with the greatest potential impact. This resulted in
176 the development of a list of four themes with associated questions (described in section 5) for
177 discussion at the consensus conference. These themes and questions were further refined by
178 soliciting the input of stakeholders outside of the subcommittee prior to the conference using a
179 Qualtrics® survey. These stakeholders included conference registrants and, members of the
180 American Academy of Pediatrics (AAP) Section on Emergency Medicine (SOEM), Emergency
181 Medical Services for Children (EMSC), American College of Emergency Physicians (ACEP)
182 Pediatric Emergency Medicine Committee, and Pediatric Emergency Care Applied Research
183 Network (PECARN)). There were a total of 178 responses.

184 At the AEMCC, committee members and approximately 115 participants assembled for the final
185 phase of the consensus process. The breakout session took place over a period of 105 minutes
186 with approximately 55 participants. The group was divided into four smaller subgroups, each one
187 moderated in a similar format, involving brainstorming and prioritization of solutions using the
188 K-J Method.⁸ This process resulted in consensus recommendations and suggested strategies for
189 future investigators.

190

191 **2) Statement of Outcome Gaps**

192 The main outcome gaps identified include variations in pediatric care and outcomes across EDs,
193 gaps in knowledge translation and limitations in pediatric readiness. For example, over the past
194 few decades general EDs have made improvements in having pediatric specific supplies and
195 equipment, however they may still have limited pediatric-centered staff and equipment, and lack
196 policies, procedures, and training specific to pediatrics.^{2,9} Higher total pediatric volume and the
197 presence of a physician and/or nurse pediatric emergency care coordinator (PECC) are associated
198 with an ED's readiness to care for children.² The lack of collaboration negatively impacts the
199 readiness of all EDs to care for children.

200

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201 Similarly, although there has been a trend toward regionalization in pediatric care, with pediatric
202 patients often being transferred from general EDs to pediatric centers, the question remains of
203 the actual need to transfer non-critical pediatric patients. In one study of children who were
204 transferred to a pediatric center from a general ED, 25% of non-critically ill children were
205 discharged directly from the receiving ED, and 17% were admitted for less than 24 hours after
206 transfer.¹⁰ This study illustrates how the lack of collaboration between the transferring general
207 EDs and the accepting institution negatively impacts the care of children. Additional thought
208 must be provided to engaging general EDs in contributing to and translating pediatric-specific
209 evidence generated primarily in academic pediatric centers to the bedside to improve pediatric
210 outcomes across EDs.

211

212 3) Conceptual Framework and Creation of the Research Agenda

213 The conceptual framework for the research agenda should distinguish between three distinct but
214 interrelated types of outcomes: implementation, quality, and patient outcomes. It is essential that
215 all stakeholders recognize the importance of general EDs in providing pediatric emergency care,
216 and the need for collaboration as a solution to improve care across all EDs.

217 Implementation

218 It is important to not only collect information regarding the care of pediatric patients in general
219 EDs but also to provide feedback on outcomes and benchmarking to strive for best practices. A
220 multitude of ongoing initiatives (Appendix 1) is making progress through the development of
221 resources, measurement tools, standards, and requirements. In addition, collaboration has been
222 evident in some pediatric-specific hospitals creating programs over the past decade involving
223 innovative models in the ED (e.g., partnership in staffing general EDs and sharing
224 policies/procedures, health-system based networks of pediatric emergency care), educational
225 outreach, telemedicine and use of simulation.¹¹⁻¹⁷

226 For example, a Canadian network, TRanslating Emergency Knowledge for Kids (TREKK), has
227 completed a series of projects to improve emergency care across all EDs by developing pediatric
228 resources available to all settings. The group has identified the preferred topics and methods of
229 delivery for content by general ED providers and have created online resources in collaboration
230 with these frontline providers.¹²

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231 Another specific example of a collaborative quality improvement project designed to promote
232 the optimal care of children in EDs in the U.S. and all U.S. territories is the National Pediatric
233 Readiness Project (NPRP) “Peds Ready”.¹⁸⁻²⁰ The implementation of Peds Ready in low to
234 medium volume EDs has been challenging. The most common barriers identified to
235 implementing national guidelines are cost of training and lack of educational resources.²
236 Therefore, the research agenda should focus on how collaboration between general EDs and their
237 associated pediatric centers may support the training and engagement of PECCs, help overcome
238 barriers to the adoption of “Peds Ready”, engage all EDs in process improvement and establish
239 a benchmark that measures ED improvement over time. Currently, the EIIC has started the
240 Pediatric Readiness Quality Collaborative involving more than 140 hospitals EDs that could
241 answer some of these research questions.

242

243 There are a variety of ongoing initiatives as well through AAP, ACEP, Emergency Nurse
244 Association (ENA), American Academy of Family Physicians (AAFP), the American Academy
245 of Physician Assistants (AAPA), the National Organization of Nurse Practitioner Faculties
246 (NONPF), EMSC, EMSC Innovation and Improvement Center (EIIC), National Priorities
247 Research Program (NPRP), PECARN and grass roots organization such as CALS
248 (Comprehensive Advanced Life Support) to create pediatric resources. These groups must work
249 with frontline stakeholders to develop and test systems of care that allow for optimization of
250 quality across the continuum.

251

252 Additionally, investigators must always consider the generalizability of work that is conducted in
253 larger academic centers to the broader community of practice in general EDs that care for most
254 children. The PECARN head injury rule is an excellent example of effective knowledge
255 translation/dissemination using decision support in the electronic medical record (EMR), apps as
256 cognitive aids, and social media campaigns including the “Think-A-Head” movement from the
257 Image Gently Alliance.^{21,22}

258

259 Quality Measures

260 Pediatric specific measures and implementation processes must be developed to ensure
261 continuous quality improvement (QI) to reduce errors, improve safety, and reduce variations in

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262 care, with the ultimate purpose of improving systems' ability to optimize patient outcomes. It is
263 important to integrate these initiatives within the broader scope of emergency medicine care. The
264 PECARN network has developed and validated instruments to evaluate the quality of care
265 delivery in pediatric care by using implicit review methods that can be used for diverse groups of
266 patients.^{23,24} A recent study used this implicit review methods tool to look at patient-level factors
267 and the quality of care in 12 PECARN EDs and found that some chief complaint categories were
268 associated with significantly lower than average quality of care, including fever (-0.65 points in
269 quality, 95% CI= -1.24 to -0.06) and upper respiratory symptoms (-0.68 points in quality, 95%
270 CI = -1.30 to -0.07).²⁵ The concern with current measures related to pediatric emergency care is
271 the lack of a systematic and comprehensive approach. The quality agenda cannot be separated
272 from implementation of these quality measures and should address the following outcomes
273 suggested by "Peds Ready": Acceptability, Adoption, Appropriateness, Feasibility, Fidelity,
274 Cost, Penetration, and Sustainability.²⁶

275

276 Patient Outcomes

277 The ultimate goal of the research agenda is to improve patient outcomes and provide high-quality
278 care across all ED settings, which in turn is dependent on provider training, collaboration
279 amongst the different stakeholders, developing and disseminating evidence-based knowledge to
280 care for children that is sustainable in any ED setting,²⁷ development of QI initiatives, and the
281 measurement of quality of the care provided.

282 **4) Research Priority/Agenda Items**

283 **Goals:** To include all EDs in creating a research agenda to advance the quality and safety of
284 pediatric emergency care across all EDs, understand the challenges, and enhance collaboration
285 among EDs to achieve optimal health outcomes.

286 **Objectives:**

- 287 ● Create best practices for developing a system of care for general EDs and those in
288 pediatric EDs to collaborate and focus on solutions to close the gap on safety, quality,
289 and evidence-based practice in a patient/family-centered setting. This system should meet
290 the needs of both groups to provide the best clinical care for pediatric patients.

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- 291 • Develop pediatric specific outcome measures and implementation processes to ensure
292 continuous quality improvement.
- 293 • Evaluate ED preparedness and readiness to provide emergency care for children and its
294 effect on patient outcomes.

295

296 These objectives lead to four themes with questions associated with each theme. The questions
297 were prioritized prior to the consensus conference via a Qualtrics® survey and are listed under
298 each theme in **Table 1** from highest to lowest priority.

299

300 **Themes:**

- 301 I. Identify solutions to the challenges and barriers in developing a system of care in general
302 EDs to provide safe and quality care for children.
- 303 II. Enhance collaboration between general EDs and pediatric-specific EDs when developing
304 national guidelines and standardizing care.
- 305 III. Study the quality of care provided to children in emergency departments in the United States.
- 306 IV. Evaluate national pediatric readiness and its effects on patient outcomes.

307

308 During the breakout session, the subgroups for each theme addressed the first 2-3 questions that
309 the pre-meeting survey had identified as top priorities. Using the K-J method, the group
310 collaboratively brainstormed, categorized, and prioritized ideas for future investigations into
311 those topics.⁸ This process resulted in consensus recommendations and suggested strategies for
312 future investigators, which are listed in detail in **Table 2**.

313

314 **5) Challenges to Creating a Research Agenda on Improving Pediatric Care in General EDs**

315 To create a research agenda to improve care in general EDs, it is essential to appreciate the
316 challenges and barriers to establishing and implementing such an agenda. These challenges are
317 significant, and to proceed with the formation of a research agenda without addressing the
318 difficulties in moving forward puts successful implementation of this agenda at risk.

319 The PEM community is at the core of establishing this research agenda, articulating both the
320 content and the methodology for implementation. It is clear that the vast majority of U.S.

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321 children are seen in general EDs, which have a wide variation in pediatric visit volumes. Because
322 pediatric visits comprise only 20% of a general ED's patient volume, more resources may be
323 directed towards the care of adults.

324 At its core, understanding how to help smaller pediatric volume EDs improve pediatric care will
325 require the PEM community to create a research agenda that establishes potential value for all
326 EDs, and will clearly involve partnering with the leadership of general EDs. Equally important is
327 the need to share data across regions and provide benchmarking to improve care in all EDs as
328 well as to then establish research priorities and interventions that improve pediatric outcomes.

329 A necessary starting point may be research aimed at understanding more about these challenges.
330 Some preliminary questions might be:

- 331 ● How do EDs with a low volume of pediatric patients view pediatric care? Is there interest
332 in focusing on such care? If not, why not?
- 333 ● What are their perceived barriers to focusing on pediatric care?
- 334 ● What are their perceived incentives to focusing on pediatric care?
- 335 ● What kinds of resources/ training would they find of most benefit?

336
337 In summary, a traditional "top down" approach, in which a research agenda is created by the
338 pediatric academic community to improve care at general EDs, is unlikely to succeed. A more
339 successful starting point would be an emphasis on understanding some of the basic challenges of
340 pediatric emergency care in general EDs, where adult patients command the majority of
341 leadership's attention and understand the need for active collaboration and partnership amongst
342 the different stakeholders.

343 **6) Conclusion**

344 In conclusion, since the majority of acutely ill and injured pediatric visits in the U.S. are to
345 general EDs, but most research is conducted in pediatric hospitals, providers in both settings
346 must collaborate in their research efforts to improve care of children nationwide. Four key
347 themes emerged from the 2018 SAEM Clinical Consensus Conference breakout session:
348 Enhancing collaboration in pediatric emergency care (PEM practice in non-children's hospitals):

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- 349 I. Identify solutions to the challenges and barriers in developing a system of care in general
350 EDs to provide safe and quality care for children.
- 351 • Future research should explore use of technology to enhance real-time clinical
352 care between EDs, as well as collaborative networks for education, research, and
353 advocacy.
- 354 II. Enhance collaboration between general EDs and pediatric-specific EDs when developing
355 national guidelines and standardizing care.
- 356 • Future research should explore development and implementation of patient care
357 guidelines in general EDs, as well as examine pediatric knowledge generation and
358 dissemination in general EDs.
- 359 III. Study the quality of care provided to children in emergency departments in the United States.
- 360 • Future research should study resources and capabilities of general EDs with
361 regards to pediatric patients, as well as the feasibility of extending pediatric
362 quality improvement to all EDs.
- 363 IV. Evaluate national pediatric readiness and its effects on patient outcomes.
- 364 • Future research should evaluate the best way to prepare general EDs for the care
365 of the acutely ill and injured pediatric patients, including the role of a Pediatric
366 Emergency Care Coordinator in advancing the quality of emergent care for
367 children.

368
369 The results of the work in preparation for the consensus conference breakout session and the
370 discussions during the session unmistakably iterated collaboration between general EDs and
371 academic pediatric centers on research, dissemination, and implementation of evidence into
372 clinical practice as a solution to improving the quality of pediatric care across the continuum.

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Table 1. Main themes identified and associated questions.

Theme	I. Identify solutions to the challenges and barriers to developing a system of care in general EDs to provide safe and quality care for children.	II. Enhance collaboration between general EDs and pediatric-specific EDs when developing national guidelines and standardizing care.	III. Study the quality of care provided to children in emergency departments in the United States.	IV. Evaluate national pediatric readiness and its effects on patient outcomes.
Associated Questions	<ol style="list-style-type: none"> 1. How can we leverage technology, e.g. telehealth and “Virtual EDs”, to disseminate ideas, improve communication, and facilitate teamwork to provide patient centered care? 2. How can we establish collaborative networks to advance education, research, and advocacy for pediatric patients taken care of in all EDs? 3. Should we create financial incentives for general EDs to prioritize resources on pediatric care? How do we link outcomes and payment to care received by pediatric patients in general EDs (incentives to not transfer)? How do we change the transfer culture to view as partnership between hospitals? 4. How can pediatric subspecialty consultation be improved in general EDs? 5. How can the challenges that prevent 	<ol style="list-style-type: none"> 1. How can guidelines developed in pediatric hospitals be translated to EDs without pediatric inpatient units/pediatric intensive care units? 2. How can providers in general EDs be engaged in developing clinical guidelines so that they are more relevant and applicable to the care of children in any ED? 3. What is the feasibility of creating an online database for management algorithms (short, intervention-based and universally applicable)? 4. Use of simulation for low volume/high acuity conditions, and teamwork: How would simulation be implemented, and how would the impact of just-in-time training of low frequency procedures in low pediatric visit volume EDs be studied? 5. What type of pediatric emergency care research needs to be conducted in general EDs? 	<ol style="list-style-type: none"> 1. How can pediatric-specific quality measures be implemented in all EDs? 2. How can the creation and maintenance of a QI program in low volume EDs with limited resources be facilitated? 3. How can a process for data collection be established on quality indicators across the spectrum of ED settings that provide care for children? 4. How can general EDs get involved in the process of developing pediatric specific measures and contribute to work being done by ACEP through the Clinical Emergency Department Registry (CEDR) and the AAP Section on Emergency Medicine Quality Transformation? 5. Additional suggestion by survey participants: How can QI collaboratives be used to support identification of quality measures, data collection, and impact on 	<ol style="list-style-type: none"> 1. What is the best way to prepare general EDs to care for pediatric patients? 2. What is the role of a Pediatric Emergency Care Coordinator (PECC) for EDs and what is the effect of PECC on patient care, quality markers and patient outcomes? 3. Does identifying providers to serve as “pediatric champions” introduce best pediatric practices into the general EDs? 4. How can information on “Pediatric Readiness” be disseminated and key stakeholders educated about its implementation?

	<p>PEM physicians in larger healthcare systems to decentralize their efforts between the children's hospitals and general EDs be evaluated?</p> <p>6. What is the feasibility of a national poison control model for PEM consults? How would these be organized and funded?</p>	<p>6. Additional suggestion by survey participants: Use of integrated EMR to implement standard of care guidelines for common pediatric emergency presentations.</p>	<p>outcomes across a wide variety of EDs?</p>	
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AAP denotes American Academy of Pediatrics, ACEP American College of Emergency Physicians, CEDR Clinical Emergency Department Registry, EDs Emergency Departments, EMR Electronic Medical Record, PECC Pediatric Emergency Care Coordinator, PEM Pediatric Emergency Medicine and QI Quality Improvement.

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Table 2. Consensus recommendations and suggested strategies for future investigators.

Theme	Questions Addressed	Consensus Recommendations	Strategies for Future Investigators
I	<p>1. How can we leverage technology, for example telehealth, and “Virtual EDs” to spread ideas, improve communication, and facilitate team-work to provide patient centered care, where “the right care is provided to the right patient at the right time and at the right place?”</p>	<ul style="list-style-type: none"> • “Virtual EDs” and telemedicine could facilitate collaboration between pediatric emergency medicine content experts and general EDs using “Just in Time” capability for challenging diagnoses and management of acutely ill and injured children. 	<ul style="list-style-type: none"> • Perform needs assessment of target stakeholders. • Transition to system that provides mentorship and partnership in knowledge exchange, potentially utilizing technology (“virtual ED,” telemedicine, EMR-based clinical decision tools). <ul style="list-style-type: none"> ○ Evaluate best model for operational implementation. ○ Explore concerns related to reimbursement and liability. ○ Address outcomes whenever possible (e.g. inappropriate transfers to pediatric-specific facilities, patient/family experience, provider satisfaction).
	<p>2. How should we establish collaborative networks to advance education, research, and advocacy for pediatric patients in all EDs? ²⁸</p>	<ul style="list-style-type: none"> • Leverage existing networks such as PECARN, EMSC, and professional organizations (e.g. ACEP, AAP, AAFP, etc.) at both state-chapter and national levels. • Work with regional health-systems to advance implementation and translation of knowledge to facilities providing pediatric emergency or urgent care services. • Form state-based Pediatric Emergency Care Coordinator (PECC) networks. 	<ul style="list-style-type: none"> • Define key stakeholders and perform a needs assessment of general EDs. • Explore collaboration with existing networks to advance research in implementation of evidence-based care guidelines. • Evaluate state-based PECC networks’ effect on adherence to existing quality measures and role in development of novel evidence-based quality measures. • Expand the concept of Emergency Departments Approved for Pediatrics (EDAP) to all EDs, requiring all EDs to meet minimum requirements for pediatric readiness, rather than being given the option to opt out. <ul style="list-style-type: none"> ○ Record and evaluate outcomes. ○ Develop a system similar to CMS measures for adults to link achievement of certain pediatric care targets, quality measures, and outcomes to reimbursement.

			<ul style="list-style-type: none"> ○ Establish a national database of pediatric outcomes to assess readiness and quality of care, considering funding through a Federal-State-Industry partnership, similar to the Kids' Inpatient Database (KID), a set of pediatric hospital inpatient databases included in the Healthcare Cost and Utilization Project (HCUP) family.
II	1. How do we translate guidelines typically developed in pediatric hospitals to hospitals without pediatric inpatient units or PICUs?	<ul style="list-style-type: none"> • PEM content experts should collaborate with local pediatric champions in general EDs in their region to reach consensus on best practices to implement specific diagnostic and management strategies for children. 	<ul style="list-style-type: none"> • Perform a needs assessment to determine which components of treatment and diagnosis in general EDs are amenable to guidelines (such as over- or under treatment and diagnostic error). • Examine barriers to implementation of guidelines in general EDs and pursue strategies to inspire interest in PEM and collaboration with PEM experts. • Explore strategies to facilitate development or adaptation of guidelines within general EDs that will lead to eventual adoption and sustained utilization, studying: <ul style="list-style-type: none"> ○ Whether it is higher yield for the PEM expert and local champion to create, implement, and evaluate guidelines together, or rather to involve the local champion in tailoring, implementing, and evaluating previously existing guidelines; ○ How to get buy in from leadership, and how a top down strategy for eliciting support compares with one from the ground up; ○ Whether or not receiving feedback from receiving pediatric EDs leads to a change in clinical practice; ○ And what the effect of implementing guidelines within an EMR has on ease of guideline use and overall job satisfaction.
	2. What is the optimal path for PEM knowledge generation and dissemination in	<ul style="list-style-type: none"> • PEM research related to knowledge generation and dissemination should involve general EDs in addition to pediatric EDs. 	<ul style="list-style-type: none"> • Perform a needs assessment to determine general EDs' interest in, and capacity for, participation in research, asking: <ul style="list-style-type: none"> ○ What is the optimal research role for general EDs (e.g. study design and implementation, sharing data, analyzing data)?

	general EDs?		<ul style="list-style-type: none"> ○ How can existing PEM research infrastructure best support general EDs? ○ What are feasible methods for performing research in a general ED setting? <ul style="list-style-type: none"> ● Explore whether research involving general EDs should focus on knowledge generation, dissemination, or both. ● Investigate how engagement in existing local and national quality initiatives can be leveraged as research. ● Examine how bidirectional research partnerships between general EDs and existing drivers of PEM research (e.g. university researchers, legislators, insurance companies) can best be established and sustained.
III	1. What is the best way to understand the resources and capabilities of community EDs compared to their patient needs?	<ul style="list-style-type: none"> ● PEM QI networks should further study general EDs, including the resources and capabilities available to support pediatric QI efforts and patient needs within these communities. 	<ul style="list-style-type: none"> ● Leverage National Pediatric Readiness Project (NPRP) data to identify PECC presence and investigate existing linkages to local and regional quality networks. ● Explore barriers to data acquisition and evaluation, as well as implementation, including: <ul style="list-style-type: none"> ○ Lack of pediatric champions or PECCs ○ Varying degrees of hospital support for pediatric QI ○ Misaligned financial incentives and support for developing pediatric QI programs
	2. How can pediatric QI measurement be implemented in all EDs?	<ul style="list-style-type: none"> ● Reporting of quality metrics in EDs should be automated through the Electronic Medical Record (EMR) and other data collection mechanisms to decrease the burden of manual chart review. ● Quality metrics should be developed only if broadly applicable and achievable across the spectrum of emergency care. ● Metric development should include general ED stakeholders, recognizing barriers to implementation. 	<ul style="list-style-type: none"> ● Identify simple achievable patient measures with broad consensus. ● Form linkages for general EDs with more pediatric resource rich institutions. ● Provide bi-directional feedback for success and larger cohort effectiveness of the program. ● Explore regulatory mandates and support for developing pediatric QI initiatives specific to EDs.

	<p>3. What is the best way to facilitate creation and maintenance of QI programs in low volume EDs with limited resources?</p>	<ul style="list-style-type: none"> • Creating universal metrics applicable to all EDs and aligning financial incentives will support institutions in developing PEM QI programs. 	<ul style="list-style-type: none"> • Create infrastructure to support measurement and data collection, including investigation into: <ul style="list-style-type: none"> ○ How to create patient level outcomes reporting; ○ How to create collaborative QI networks; ○ And how to best use EMRs and clinical decision support to assist data collection and reporting • Utilize information exchanges to increase learning. • Report outcomes and opportunities with EDs within these networks in a collaborative manner.
<p>IV</p>	<p>1. What is the best way to prepare general EDs to be Pediatric Ready?</p>	<ul style="list-style-type: none"> • Increase knowledge related to pediatric care. • Improve communication among all EDs caring for children. • Establish standard work and procedures to improve pediatric care. • Consider financial incentives to increase pediatric readiness of EDs. • Consider the use of technology in pediatric preparedness, which could impact knowledge, skill acquisition, cost, communication among different EDs, and patient-centered care delivery. 	<ul style="list-style-type: none"> • Conduct needs assessment of different types of general EDs, varying in geographic area and pediatric volume. • Education: <ul style="list-style-type: none"> ○ Identify a PECC. ○ Develop easily accessible reference materials and educational tools specific to PEM. ○ Create standardized management guidelines for common illnesses, sharing practice pathways and toolkits. ○ Utilize technology to enhance education. ○ Strengthen technical skills through simulation-based workshops. • Communication: <ul style="list-style-type: none"> ○ Create collaborative network between general EDs and pediatric specific EDs either through PECC or pediatric champions ○ Use telemedicine to enhance real time communication ○ Provide a feedback system between general and pediatric EDs • Standardizing work and procedures: <ul style="list-style-type: none"> ○ Develop an established list of equipment, procedures, and guidelines, including: <ul style="list-style-type: none"> ▪ Pediatric medication dosing ▪ Standard vital signs by age

			<ul style="list-style-type: none"> ▪ Measuring weight in kilograms ▪ Availability of procedural supplies ▪ Perform regular systematic review of quality of care. ▪ Establish principles for pediatric centered care. • Financial considerations: <ul style="list-style-type: none"> ○ Employing a child life specialist ○ Regularly replacing rarely used pediatric equipment ○ Providing financial incentives for general EDs to provide high quality pediatric care by linking reimbursement with improved patient care outcomes • Leverage technology to improve clinical care, education, enhanced collaboration and communication, and using electronic medical records to collect data and use in decision support.
	<p>2. What is the role of the Pediatric Emergency Care Coordinator?</p>	<p>PECCs should play a major role in ED preparedness for pediatric patients in four domains:</p> <ul style="list-style-type: none"> • Quality of Care <ul style="list-style-type: none"> ○ Provide quality improvement oversight. ○ Establish benchmarking. ○ Establish process measures. ○ Conduct peer review. ○ Use markers such as: <ul style="list-style-type: none"> ▪ Return visits ▪ Patient complaints ▪ Medical/medication errors ○ Establish inter-facilities transfer policies. • Clinical Care Oversight <ul style="list-style-type: none"> ○ Manage pediatric care issues. ○ Ensure staff adherence to recognizing abnormal vital signs. 	<p>Evaluate the effect of PECC on pediatric readiness in the four domains:</p> <ul style="list-style-type: none"> • Quality of Care <ul style="list-style-type: none"> ○ Percent of PALS-certified nurses ○ Percent of pediatric patients with pain assessment within 1 hour of ED presentation ○ Frequency of return visits (within 24 hours and 30 days) ○ Transfers – e.g. <ul style="list-style-type: none"> ▪ Fewer or more efficient transfers for certain illnesses ▪ Times to transfer to definitive care facility ○ Standard quality indicators before and after PECC ○ Improvement of disease-specific measures where greatest gaps in care have been identified • Clinical Care - examples of common diseases to use for evaluation of the effect of PECC included: <ul style="list-style-type: none"> ○ Asthma exacerbation: e.g. steroids given in a timely fashion ○ Ultrasound versus CT Scan of abdomen for appendicitis

		<ul style="list-style-type: none"> ○ Ensure the availability and access to pediatric specific equipment in a cost-effective manner. ○ Establish a central area for guidelines, pathways and pediatric policies. ○ Develop protocols for common and life threatening pediatric diseases. ● Education <ul style="list-style-type: none"> ○ Provide access to evidence-based medicine pathways for all healthcare professionals caring for children in the ED ○ Increase availability of continuing education ● Communication <ul style="list-style-type: none"> ○ Conduct regular meetings with other general EDs and pediatric EDs to streamline processes and enhance communication/knowledge sharing to improve patient outcomes. 	<ul style="list-style-type: none"> ○ Medication dosing errors ○ Head and C-Spine CT use in trauma patients ○ Chest radiography use in bronchiolitis ● Education <ul style="list-style-type: none"> ○ Implementation of evidence-based guidelines ○ Opportunities provided for skills acquisition and maintenance, particularly for low frequency/lifesaving procedures ● Communication <ul style="list-style-type: none"> ○ Patient experience (e.g. Press Ganey scores) ○ Collaboration and timely feedback among various EDs to provide high quality, patient-centered care ○ Frequency of medical errors
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AAFP denotes American Academy of Family Physicians, AAP American Academy of Pediatrics, ACEP American College of Emergency Physicians, AHRQ Agency for Healthcare Research & Quality, CEDR Clinical Emergency Department Registry, CMS Centers for Medicare & Medicaid Services, CT Computed Tomography, EDAP Emergency Departments Approved for Pediatrics, EDs Emergency Departments, EMR Electronic Medical Record, EMSC Emergency Medical Services for Children, EIIC Emergency Medical Services for Children Innovation and Improvement Center, HCUP Healthcare Cost and Utilization Project. KID Kids' Inpatient Database, NPRP National Pediatric Readiness Project, PALS Pediatric Advanced Life Support, PECARN Pediatric Emergency Care Research Network, PECC Pediatric Emergency Care Coordinator, PEM Pediatric Emergency Medicine, PICU Pediatric Intensive Care Unit, and QI Quality Improvement.