

ORIGINAL RESEARCH CONTRIBUTION

A Qualitative Assessment of Factors That Influence Emergency Medical Services Partnerships in Prehospital Research

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Abstract

Objectives: Recent efforts to increase emergency medical services (EMS) prehospital research productivity by focusing on reducing systems-related barriers to research participation have had limited effect. The objective of this study was to explore the barriers and motivators to participating in research at the agency and provider levels and to solicit suggestions for improving the success of prehospital research projects.

Methods: The authors conducted a qualitative exploratory study of EMS personnel using focus group and focused interview methodology. EMS personnel affiliated with the Pediatric Emergency Care Applied Research Network (PECARN) hospitals were selected for participation using a purposive sampling plan. Exploratory questioning identified identified factors that influence participation in research and suggestions for ensuring successful research partnerships. Through iterative coding and analysis, the factors and suggestions that emerged from the data were organized into a behavioral change planning model.

Results: Fourteen focus groups were conducted, involving 88 EMS prehospital providers from 11 agencies. Thirty-five in-depth interviews with EMS administrators and researchers were also conducted. This sample was representative of prehospital personnel servicing the PECARN catchment area and was sufficient for analytical saturation. From the transcripts, the authors identified 17 barriers and 12 motivators to EMS personnel participation in research. Central to these data were patient safety, clarity of research purpose, benefits, liability, professionalism, research training, communication with the research team, reputation, administrators' support, and organizational culture. Interviewees also made 29 suggestions for increasing EMS personnel participation in research. During data analysis, the PRECEDE/PROCEED planning model was chosen for behavioral change to organize the data. Important to this

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model, factors and suggestions were mapped into those that predispose (knowledge, attitudes, and beliefs), reinforce (social support and norms), and/or enable (organizational) the participation in prehospital research.

Conclusions: This study identified factors that influence the participation of EMS personnel in research and gathered suggestions for improvement. These findings were organized into the PRECEDE/PROCEED planning model that may help researchers successfully plan, implement, and complete prehospital research projects. The authors provide guidance to improve the research process including directly involving EMS providers throughout, a strong theme that emerged from the data. Future work is needed to determine the validity of this model and to assess if these findings are generalizable across prehospital settings other than those affiliated with PECARN.

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In 2006, the Institute of Medicine (IOM) recognized the lack of evidence-based practice in prehospital emergency medical services (EMS) and the need for high-quality prehospital research.¹ The report, *Emergency Medical Services: At the Crossroads*, noted that most current protocols for prehospital care are based on evidence extrapolated from hospital-based medical research, a setting that differs substantially from the prehospital environment. Further, they acknowledged that while there is a dearth of high-quality prehospital research, some studies have resulted in significant improvement in patient outcomes or have challenged conventional wisdom.

The IOM report outlined the many system-related barriers to conducting research and described “lessons learned” from the limited number of successful prehospital researchers. These findings are supported by the work of the National Highway Traffic Safety Administration and the Maternal and Child Health Bureau, who have conducted a series of expert consensus panels that summarized the barriers to prehospital research, prioritized EMS research topics and outlined strategic plans for bridging the EMS prehospital research gap.^{2–9} Central to these reports are system-based changes that are needed to improve prehospital research quality and productivity. Notably, these panels outline a need for increased community awareness and support for research activities, standardization of EMS care across systems, use of electronic medical records, establishment of research priorities for the profession, structured career development for EMS researchers, the creation of centers of EMS excellence, and greater support from federal agencies including increased research funding.

These consensus panels have provided in-depth analysis into the systems-related challenges to conducting prehospital research. Limited attention, however, was paid to the obstacles faced at the agency and provider levels, which may be more amenable to change by individual investigators. EMS researchers have independently outlined the obstacles that they faced while conducting prehospital research.^{10–22} While these experiences provide important insights into the potential challenges faced by the EMS researcher, they only provide one side of the story. They lack the perspectives of those directly involved in prehospital research in the field (EMS providers) and those making decisions about participating in prehospital research (EMS agency leadership). The purpose of our study was to explore the

barriers and motivators to participating in research at the agency and provider levels and to solicit suggestions from EMS personnel for improving the success of prehospital research projects.

METHODS

Study Design

We conducted an exploratory, qualitative study of EMS personnel using a grounded theory approach (for definition see Data Supplement S1, available as supporting information in the online version of this paper).^{23–25} Researchers have used qualitative methods to identify factors that influence implementation of clinical protocols among EMS personnel.^{26,27} These same methods can be used to assess EMS provider participation in prehospital research protocols.

Sampling Strategy

We identified participants using purposive sampling (see Data Supplement S1).²⁸ We convened a meeting of members of the Pediatric Emergency Care Applied Research Network (PECARN)²⁹ to facilitate the selection of the sample of EMS interviewees. First, we identified domains believed to be relevant to agency participation in prehospital research: locus of control (local, county, state, region), research experience (yes, no), research infrastructure (yes, no), catchment area (urban, suburban, rural), organizational structure (municipal, contractor), and remuneration (volunteer, paid). We also identified candidate agencies for participation in the study that would result in sampling across these domains. This process resulted in the identification of 18 candidate agencies. From these, the study principal investigators chose 14 agencies that as a group represented all relevant domains. Each agency was contacted and invited to participate by the PECARN site investigators and research coordinators.

At each agency, we conducted at least one focus group and interviewed at least one administrator or medical director. In addition, we interviewed prehospital researchers and/or EMS system administrators associated with participating agencies. By doing this, we were able to investigate the consistency of responses across agency-level personnel. To achieve homogeneity within groups (see Data Supplement S1), we limited the focus groups to prehospital providers. We also limited the size of the focus groups (range in

size 4 to 13 participants) to ensure ample opportunity for participants to express their ideas and opinions.

PECARN site investigators and research coordinators assisted with recruitment at their affiliated agencies. Institutional review board approval for the study was obtained from all participating PECARN sites. We obtained verbal consent from participants at the time of interview and when allowed, provided gift cards in appreciation of participation.

Study Protocol

We used focus groups and in-depth interviews to identify potential barriers and motivators to participating in prehospital research and to solicit suggestions for means to improve prehospital research. The interviews proposed a hypothetical research situation (cervical spine immobilization in children) for respondents to discuss barriers and facilitators; however, participants were encouraged to provide responses based on any type of research experience. Probes were developed based on an ecologic framework (see Data Supplement S1)^{30,31} so that a broad set of responses were obtained. We asked questions related to attitudes and beliefs, peers, agency, hospital, and the profession. The guides that were used to conduct the focus groups and focused interviews can be reviewed in Data Supplements S2 and S3 (available as supporting information in the online version of this paper), respectively. The flow of questions followed traditional interview format (introductory, key, ending, and summary) to ensure maximum participation.²⁸ We queried participants about specific topics of interest if these topics were not spontaneously generated. As data collection progressed, the scripts were modified to allow the natural flow of the group or individual interview process and to explore specific ideas.

Focus groups were 1.5 hours in length, while in-depth interviews were approximately 1 hour. We conducted the focus groups at a central location of each agency's choosing and in private rooms to stimulate open dialogue. Focused interviews were conducted either in person, at a location of the participants' choosing, or by telephone. A moderator (DPS) with an extensive background in behavioral science and qualitative methods conducted all interviews and facilitated all of the focus groups to elicit information without introducing personal or systematic bias. All interviews and focus groups were audiotape recorded and transcribed by a professional transcriptionist. The focus group comoderators (JCL or VK) recorded real-time major topics, non-verbal cues, and descriptions of the group process.

Data Analysis

The study coordinator (VK) audited the transcripts for accuracy to the recorded data. We used a combination of focused and open coding in the first phase of analysis.^{32,33} We developed an initial set of codes from the original focus group guides and preliminary review of the transcripts. Each of three study team members (JCL, DPS, VK) independently coded all of the transcripts using the preliminary codebook, and generated new codes, as appropriate. Where inconsistencies in the coding occurred, the raters came to consensus on discrepancies and developed decision rules to reduce them. As

a quality check at the end of coding, we reviewed coded text from the earliest transcripts to assess for missing concepts or themes. A priori it was determined that focus groups and focused interviews would be discontinued when all agency domains were sampled and when saturation of ideas occurred. We used QSR N6 qualitative software (QSR International, Melbourne, Australia) to code, retrieve, merge, and analyze chunks of data and annotate data about group dynamics.

Once saturation of ideas occurred in coding, we reorganized coded data into three primary categories: barriers, motivators, and suggestions. Each of three study investigators (JCL, DPS, VK) rated each of the codes ($n = 86$; low, medium, high) for magnitude based on frequency, intensity, extensiveness, and specificity to identify salient themes. Codes that were rated medium-high were retained for final analysis ($n = 54$).

Using grounded theory (see Data Supplement S1), we evaluated our data in relation to models for behavioral change and chose a model that explained the multiple factors that influence participation in prehospital research.^{23,24} We decided a priori that a behavior change model would be most relevant to guide this process because ultimately we are investigating a behavior, participation in prehospital research.

RESULTS

Description of Study Sample

We approached 14 agencies for participation and obtained preliminary approval. After conducting focus groups and focused interviews at 11 of the agencies over a 1-year period, saturation of ideas was achieved. These agencies represented five different regional EMS systems affiliated with PECARN. The characteristics of the agencies are presented in Table 1. These agencies met our purposive sampling plan and include agencies with a range of catchment areas, organizational structures, remuneration methods, locus of control, research experience, and research infrastructure.

Within these 11 agencies, we conducted 14 focus groups that involved 88 EMS prehospital providers. The characteristics of the focus group participants are presented in Table 2. The majority of providers were male, white, and between 25 and 48 years of age. Even proportions of basic emergency medical technicians (EMTs) and paramedics participated. Most participants had some college education beyond a 2-year associate's degree, worked full-time as EMS prehospital providers, and had worked in EMS for greater than 5 years. We also conducted 35 in-depth interviews with EMS personnel representing all levels of influence at the agency including seven active EMS prehospital researchers, nine agency medical directors, 11 agency administrators, eight agency education directors, one state EMS medical director, and three state EMS system administrators.

Model for Behavioral Change

For this study, we selected the PRECEDE/PROCEED behavior change planning model (Figure 1) because it allows us to gain an in-depth understanding of why a behavior occurs and provides guidance for behavior

Table 1
Purposive Sampling: Agencies Participating in the Focus Groups and Focused Interviews

Domains																	
Agency	Number of EMS Personnel Sampled	Catchment Area			Organizational Structure		Remuneration		Locus of Control			Research Experience†		Strong Research Infrastructure‡			
		Urban	Suburban	Rural	Municipal*	Contractor	Volunteer	Paid	Local	County	State	Regional	Yes	No	Yes	No	
1	13		✓			✓		✓	✓			✓			✓		✓
2	5	✓			✓			✓	✓						✓		
3	3	✓			✓			✓		✓			✓		✓		
4	16§		✓			✓		✓			✓				✓		
5	15¶	✓	✓			✓											✓
6	12	✓	✓	✓			✓						✓		✓		✓
7	6	✓	✓			✓						✓					
8	13	✓						✓							✓		✓
9	12		✓		✓	✓		✓		✓	✓				✓		✓
10	12		✓				✓		✓	✓	✓						✓
11	11	✓			✓	✓		✓	✓				✓			✓	
Total	123	58	86	24	73	50	36	123	62	32	24	50	53	70	54	69	

*Municipal includes governmental, fire, and police.

†Research experience is a subjective assessment of the agency's experience with research.

‡Strong research infrastructure is a subjective assessment of the agency's infrastructure.

§Includes medical directors, administrators, and researchers for agencies 4 and 11.

¶Includes medical directors, administrators, and researchers for agencies 5, 6, and 7.

||Includes medical directors, administrators, and researchers for agencies 9 and 10

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change based on the determinants of the behavior. Using this model, we reorganized the barriers and motivators into positive and negative predisposing (individual knowledge, attitudes, and beliefs), reinforcing (social factors such as supports and norms), and enabling (organizational expertise, structure, resources, and processes) factors (determinants of behavior).³⁴ Subsequently, the data resulted in an expanded approach to the research process which maps to the important determinants of behavior outlined in the PRECEDE/PROCEED model and incorporates the specific suggestions for improving the prehospital research process (Figure 2).

Factors That Decrease the Likelihood of Participation in Prehospital Research (Barriers)

We identified 17 factors that reduce the likelihood that EMS prehospital personnel will participate in research. These factors and representative quotations are presented in Table 3. Individual knowledge, attitudes, and beliefs that hinder participation in research (negative predisposing factors) included concern for patient safety, lack of clear benefit of the research, unclear study purpose, fear of liability, lack of confidence, negative perceptions among allied health care providers, and lack of professionalization. Rewards and feedback that discourage participation in research (negative reinforcing factors) included inadequate study training and a general lack of feedback and rewards for participation. Organizational expertise, structure, resources, and processes that hinder participation in research (negative enabling factors) included an unawareness by investigators about the prehospital environment, too much paperwork, not enough time, lack of research education, conflicts between the research protocol and existing standards, agencies with a culture that is resistant to change, and incompatible organizational structures.

Factors That Increase the Likelihood of Participation in Prehospital Research (Motivators)

We identified 12 factors that increase the likelihood that EMS prehospital providers will participate in research. These factors and representative quotations are presented in Table 4. Individual knowledge, attitudes, and beliefs that facilitate motivation to participate in research (positive predisposing factors) included identifiable benefits to patient care or improvement of practice. Rewards and feedback that encourage participation in research (positive reinforcing factors) included feedback regarding patient care, organizational pride, organizational culture that values participation in research, approval from the administration and medical director, recognition for agency participation, participation in prior studies that have advanced their profession, and remuneration. Organizational factors that facilitate participation in research (positive enabling factors) included provision of adequate study training and resources.

Suggestions for Improved Participation in Research

Table 5 presents guidance for promoting successful EMS agency partnerships in research. We combined

Table 2
Characteristics of EMS Provider's Focus Group Participants

Characteristic	Frequency (n = 88)	Relative Frequency (%)
Age, yr		
Under 18	1	1
18 to 24	14	16
25 to 36	39	44
37 to 48	22	25
49 and older	11	13
Missing	1	1
Sex		
Female	17	19
Male	70	80
Missing	1	1
Level of training		
EMT-1 (Basic)	36	41
EMT-I (Intermediate)	6	7
Paramedic (Advanced)	41	47
Critical care	3	3
Missing	2	2
Years worked in EMS		
Less than 5	23	26
5 to 10	26	30
11 to 15	16	18
16 to 20	9	10
more than 20	13	15
Missing	1	1
Full- or part-time		
Full-time (35+ hours per week)	80	91
Part-time [<35 hours per week]	6	7
Missing	2	2
Education level		
High school or equivalent	4	5
Vocational/technical school/associate degree (2-yr)	13	15
Some college	53	60
College graduate (4-yr)	14	16
Graduate degree	3	3
Missing	1	1
Race		
White	76	86
Black or African American	6	7
Other	5	6
Missing	1	1
Ethnicity		
Hispanic	1	1
Non-Hispanic	71	81
Other	13	15
Missing	3	3

EMT = emergency medical technician.

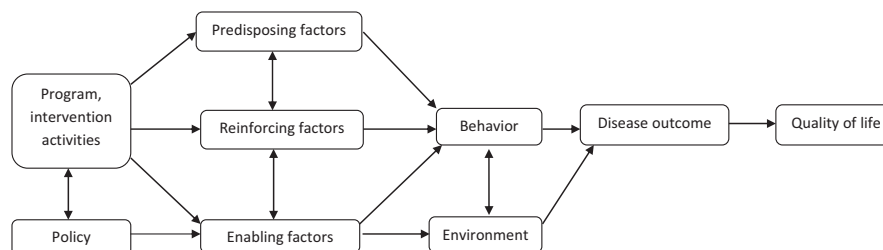


Figure 1. PRECEDE/PROCEED model.

implicit suggestions from the barriers and motivators with explicit suggestions provided by participants. We organized the suggestions that may result in improved participation of prehospital providers into the various phases of the research process (planning for prehospital

research, formative work required to prepare the agency for participation in the research project, preparation of study methods and materials, study maintenance, and dissemination of study findings). It is important to note that EMS personnel engagement

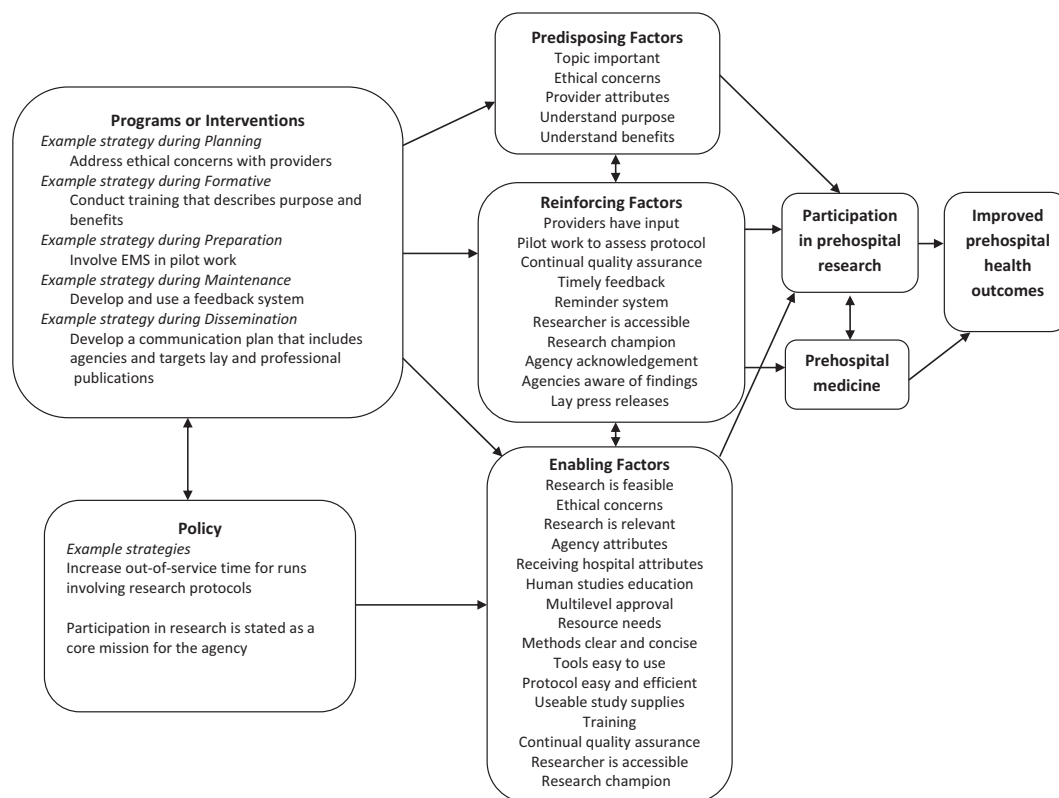


Figure 2. The PRECEDE/PROCEED model for improving participation in research among prehospital providers.

throughout these phases, particularly in planning and formative activities, emerged as imperative to increasing participation in prehospital research. Within the table, we indicated which determinant of behavior (predisposing, reinforcing, or enabling factors) the suggestion addresses, which will help guide the type of strategies (program or policies) to use for reducing the barriers and increasing the motivators to participation in prehospital research.

DISCUSSION

The need to improve the evidence that guides EMS practice has been clearly articulated.¹⁻⁹ Achieving this goal requires increases in both the quantity and the quality of EMS research. Considerable effort has been made to identify and improve the system-based challenges to conducting research in the prehospital setting; however, little effort has been made to identify the changes that are needed at the provider and agency levels. Using rigorous and established qualitative methods, we identified determinants of EMS provider participation in prehospital research. We also identified practical suggestions to assist EMS researchers in planning for successful partnerships in EMS research. These findings were organized into a model for behavioral change that can help researchers choose strategies that will be the most effective in improving EMS prehospital research participation.

We chose the PRECEDE/PROCEED model to organize our results for two reasons. First, it takes an ecological approach to demonstrate the complex nature of

the determinants of behaviors. Second, it forces us to plan the appropriate strategies (programs and/or policies) that will address the determinants specific to the behavior of interest. To illustrate the relationship of our findings to the PRECEDE/PROCEED model, we organized our determinants of research participation into predisposing, reinforcing, and enabling factors (Tables 3 and 4) and provided examples of programs (addressing predisposing, reinforcing, and enabling factors) and policies (addressing enabling factors) that researchers should undertake in each of the phases of the research process (Table 5).

The barriers and motivators to participation in research were cognitively based (e.g., beliefs and attitudes about participation), had a social element (e.g., support of employers), or required mechanisms to be in place that allow for it to occur (e.g., time to get the research done). This is in alignment with the predisposing, reinforcing, and enabling factors that serve as determinants of behavior and environment as outlined in the PRECEDE/PROCEED planning model for behavior change (see Figures 1 and 2). According to Green and Kreuter,³⁴ behavior is determined by cognition (predisposing factors), social support, social networks (reinforcing factors), and environmental structures and processes (enabling factors). Program or intervention activities influence these factors and lead to a change in behavior and ultimately outcome. Additionally, policy can influence enabling factors that alter the environment and affect behavior and the health outcome. It is important to recognize this because in some circumstances,

Table 3
Barriers: Factors That Decrease the Likelihood of Participation in Prehospital Research

Factor	Explanation	Quotes
<i>Negative predisposing factors: individual knowledge, attitudes, and beliefs that hinder participation in prehospital research</i>		
Concern for patient safety	Belief that the study protocol may compromise the health and safety of patients.	Do not let the research get in the way of the fact that we have to take care of somebody.
Lack of clear benefit	Neither EMS personnel nor patient gain from participating in the research.	We as paramedics, who are doing all the legwork, we see nothing from it. And that gets very frustrating, especially in the event that we screw up one of the exclusion criteria, one of the inclusion criteria, and get held completely accountable.
Unclear study purpose	EMS personnel do not understand the purpose of the study.	First thing is purpose. You know, why, why, why are we, why are we doing this?
Fear of liability	Fear of liability as it relates to participation in the research study.	They will sue us, they will sue our department, they will sue our training coordinator, they will go all the way back.
Lack of confidence	EMS providers may not feel confident in carrying out the study protocol or in doing the new procedure.	I don't think people necessarily like the idea of being put on the spot, especially if they're not comfortable doing something themselves.
Negative perceptions among allied health professionals	Belief among EMS providers that negative research findings will reflect poorly on them.	If it's one more thing for them to be able to look at and criticize then I wouldn't want to help.
Lack of professionalization	Emergency medical technicians belong to a young health profession with its origins in the trade of firefighting, thus being less established in the hierarchies of both medical care and emergency services.	When anybody talks about emergency service, they're talking about fire and police. Nobody ever talks about EMS. So I think that there is a perception of the ambulance driver and that they don't do very much but get you to the hospital.
<i>Negative reinforcing factors: rewards and feedback that discourage participation in prehospital research</i>		
Inadequate study training	EMS providers are not trained appropriately or are trained too soon before the study commences.	I think another big barrier to studies is to make sure it's ready to go before you bring it to us. We have been trained for studies and then trained again and then trained again and still delayed, delayed, delayed. And then when it comes out, it's not what you're trained on.
Lack of feedback	EMS providers do not receive feedback regarding study progress and outcomes.	We have become a little more reluctant to want to do the studies because what we've seen in the past is that we don't get information back.
Research participation not rewarded	Participation in research is not part of the agency's mission.	Some services are money- and time-driven. Some supervisors will get bonuses if their crews are back on the streets in X amount of time. So if my crews are filling out your papers, they're going to suffer, I'm going to suffer. It's money out of their pockets.
<i>Negative enabling factors: organizational expertise, structure, resources, and processes that hinder participation in prehospital research</i>		
Investigators unaware of prehospital environment	Researchers do not understand the prehospital environment and challenges faced by EMS personnel when caring for patients.	There's a hospital mindset. The way they do things in the hospital where they have the luxury of this, this, this, and this, all laid down in front of them. And they're in good lighting and they're in good conditions. When you're talking about being out on a call where you're sitting down in the snow with a patient or you're sitting in the middle of a rainstorm, or sitting in the mud, or have a car that's rolled over, you really don't have time to do this, this, and this procedure. You have an idea of what you need to accomplish and get it done. That's what counts.

Table 3
(Continued)

Factor	Explanation	Quotes
Too much paperwork	Study methods require too much paperwork to be filled out and tracked while on shift.	I think you already addressed the major one. That's paperwork. I mean research that adds paperwork. We already have too much.
Not enough time	EMS personnel do not have enough time during patient runs to carry out research procedures.	But when push comes to shove, they're busy. They're going to do what's expedient, because patient care is going to be their priority. Getting back in service and getting on the next call will be their priority. Research will fall out if you have a busy, strained system.
Lack of research education	EMS personnel curriculum does not include specific education regarding the research process.	So there's a lack of education, knowledge. What is research? What is safe research? When does it become experimenting on our patients?
Research protocol differs from existing standards	Research protocol conflicts with the EMS agency's or receiving hospital's protocols, policies, or procedures.	I can add another potential barrier, which would be the impression at the hospital after using whatever standard operating procedures are presented by the researcher. The emergency rooms are used to receiving a patient packaged a certain way for a particular situation. If we immobilized the spine this new way, the physician at the hospital can be very upset by that.
Agency culture	Agency's culture is resistant to change.	We've always been an afterthought with that kind of stuff. Some of our regional faculty and some of our docs, I don't want to use the term "old," but that mindset isn't as progressive as I feel it should be.
Organizational structure	Agency's catchment area or staffing of calls is not conducive to participation in research or particular types of studies.	It's always paramedic level and EMT on a unit, at least in this county. We're very fortunate; that is not always the case in other counties. If you have a bunch of volunteers, they may ride the ambulance once a week; they may do only one call a month. How do you maintain them with this skills competency to be able to accurately enroll for your study?

the outcome will be dependent on environmental factors that can be heavily influenced by policy. As an example, a change in agency policy to encourage participation in research by reducing a barrier (e.g., allowing additional time on calls for research) alters the research environment (the agency culture is supportive of research), which both improves and reinforces participation. Witnessing improved prehospital practice through participation in research (predisposing factor) was identified as an important determinant of participation and would suggest a feedback loop (reinforcing factor) whereby success in meeting the goal of the behavior affects future successes.

Consistent with the PRECEDE/PROCEED planning model for behavior change, the predisposing, reinforcing, and enabling determinants for conducting prehospital research that were identified in our study should form the basis of any work we do to improve participation. The model advises that for behavior change to occur, we must avoid the tendency to focus on only reducing barriers and focus more on increasing motivation. The suggestions for EMS prehospital researchers

illustrate that engaging partnering agencies in all phases of the research process is an important motivator. Our data strongly suggest that the planning and formative phases of the research process are necessary to increase participation in prehospital research. These phases guide researchers to establish relationships with agencies so that any concerns can be addressed early and that important steps are taken to ready prehospital providers for research participation.

When planning for prehospital research, the investigator should work with the participating agency to ensure that the proposed project is suited to the prehospital environment by addressing research that is relevant to providers (predisposing) and assessing and clarifying ethical concerns and necessary attributes for participation (enabling). During the formative phase, researchers should work closely with EMS agency stakeholders to assure a clear understanding of the study purpose and human studies implications (predisposing) and that the necessary resources and approvals are obtained (enabling). Preparation should involve the EMS providers in assisting with pretesting the study

Table 4
Motivators: Factors That Increase the Likelihood of Participation in Prehospital Research

Factor	Explanation	Quotes
<i>Positive predisposing factors: individual knowledge, attitudes, and beliefs that facilitate participation in prehospital research</i>		
Benefits patient care	Belief that the findings from the study will improve patient care and outcomes.	One thing that I'd have to be sold on is that there are likely to be benefits for our patients.
Improves practice	Belief that participation in the research process will improve EMS personnel's practice or make their job easier.	If somebody wanted to do a research project on a piece of equipment that would make our job easier, it doesn't directly affect patient care, it may not save a person's life, but if it makes my job easier and it's not hokey, then it's something that we would look at.
<i>Positive reinforcing factors: rewards and feedback that encourage participation in prehospital research</i>		
Feedback	EMS personnel receive feedback, both positive and negative, regarding the effects of their patient care.	For me it would. I think to myself [that] one of the needs of EMS is to hear [if] what we're doing is right or wrong, how it can be improved, and some of the thought behind it.
Organizational pride	Agency prides itself in being a leader in prehospital emergency care.	It's an attitude that kind of developed over time. And pride. Really, we've worked very hard to get where we are and I think we're starting to feel that now. It's the pride of being part of an organization that is becoming one of the best in the county. And that sounds arrogant to me and I don't mean it [to be arrogant], but I think we are among the best in the county.
Organizational culture	Agency values participation in research.	We always, with the organization, want to make sure we have the best grade individuals out there with the best medical knowledge, best practice. And to do that you have to be involved in research. And we take pride that we have some of the best paramedics in the region, the best EMTs in the region. And to do that you have to go forward, you have to learn new things, you have to be on the cutting edge to bring that new knowledge to the field, to the forefront. And we have a strong desire as an organization to do that.
Administrative approval	Agency's administration approves of participation in research.	Knowing that your company or other people are behind you 100%. Maybe knowing that everybody's on the same page. You're not by yourself trying to explain what you're doing. Getting your supervisors to support you when you say "I can't go in service this minute because I'm filling out this survey for Dr. So-n-So."
Medical director approval	Agency's medical director approves of participation in research.	One is the agency or the system medical director. Just so that there's some physician backing that [says], "Hey, this is an important research project and you guys need to do this."
Agency recognition	Agency is recognized for participation in research both locally and nationally and within the medical and lay communities.	What we'd really like to see is, instead of just being published in the national journal, to see [the research] in a local paper. I think that would be a huge, huge thing for that research to be put in our local press. Citizens in our community understand what we are doing.
Advances the profession	Findings from prior studies in which the agency participated in the advancement of the field of prehospital medicine.	Some of these CPR studies came back and now, nationally, we're doing CPR differently based on the research we did. And I think people take pride in that.
Remuneration	Incentives provided at the individual and/or agency level for participation in research.	I hate to say it but money always is a motivator. I mean, certainly, if there were unlimited amounts of capital, they could encourage people to participate through some sort of perks or equipment for the agency, company, or individual.
<i>Positive enabling factors: organizational expertise, structure, resources, and processes that facilitate participation in prehospital research</i>		
Adequate training	Agency and its personnel receive adequate training for the study.	As long as we're trained ahead of time on what it is and how to do it, that's what we will do.
Adequate resources	Agency and medics have adequate resources for participation in the study.	Obviously support at the local level, administrative support, having the tools, [having] the time to be able to do these sorts of issues, having a medical director and an administrator that are supportive of research. They can't just talk the talk; they have to walk it. If you're going to do research, just don't put it on the back of the providers. Make sure that you accommodate them to let them do the research.
CPR = cardiopulmonary resuscitation.		

Table 5
Guidance for Ensuring Successful EMS Partnerships in Prehospital Research

	Predisposing Factors	Reinforcing Factors	Enabling Factors
Planning for prehospital research			
Determine if it is feasible to answer the research question in prehospital setting			X
Choose a research topic that is important to prehospital providers	X		
Identify and address ethical concerns voiced by the providers	X		X
Select study personnel who can relate to the prehospital setting			X
Make sure that the participating agency has the necessary attributes to participate in prehospital research			X
Make sure the participating prehospital providers working within the agency have the necessary attributes to participate in prehospital research	X		X
Make sure the receiving hospitals have the necessary attributes to participate in prehospital research			X
Formative work required to prepare the agency for participation in the research project			
Solicit prehospital provider input during planning		X	
Thoroughly explain the purpose of the study to the prehospital providers	X		
Demonstrate to the agency and the prehospital providers the benefits that will be incurred by participating in the study	X		
Provide education regarding research and human studies to the agency			X
Obtain approval to participate in research from all levels of influence both internal and external to the agency			X
Meet the agency's resource needs for participation in the study			X
Preparation of study methods and materials			
Obtain approval from appropriate oversight committees			X
Have EMS personnel review the study methods and materials and incorporate their input		X	X
Make sure the study methods are clear and concise			X
Make sure the data collection tool is uncomplicated and quick to complete			X
Make sure the study protocol is efficient and easy to implement in the prehospital setting and does not disrupt patient care			X
Make sure the study supplies are useable in the prehospital setting			X
Complete pilot work in the prehospital setting before study implementation		X	
Conduct study-related training for agency personnel, which is thorough and well timed to the implementation of the study			X
Provide a mechanism to ensure continual quality and adherence to the research protocol		X	X
Study maintenance			
Establish a system for timely feedback and communication that reaches all those who are influenced by the study and test the system		X	
Design and implement a method to remind the providers about the study while on shift		X	
Make sure the researcher is readily accessible for problem-solving and decision-making		X	X
Identify a person internal to the agency who can serve as a research champion		X	X
Dissemination of study findings			
Acknowledge the participating agencies in the peer reviewed manuscript		X	
Return to the agencies and present the study findings		X	
Release local lay press communications regarding the agency's participation in the study and the study findings		X	

materials and pilot testing the study methods to assure appropriateness to the prehospital environment (reinforcing) and establishing a mechanism for quality oversight (enabling). Successfully maintaining the study requires the researcher to establish an effective system of continual feedback and to identify “research champions” to provide regular communication and support to providers (reinforcing). Dissemination of study findings should be timely and acknowledge the agency's contri-

butions. Publication should be in both the professional and the lay press, and results should be formally presented to all EMS agency stakeholders (reinforcing). Following these suggestions can help assure that the ultimate goal, improved prehospital health outcomes, is achieved (see Table 5).

The barriers and motivators that we identified in our multiagency study are consistent with the opinions reported by individual investigators. In particular,

EMS personnel are cognizant of the multiple layers (community, hospital, administrators, union, etc) that have to be involved and approve the research project.^{14,21,22} EMS personnel are concerned that research activities may be harmful to patients and that this may reflect poorly on or jeopardize their practice. They therefore need to fully understand the purpose of the study and receive assurances of patient safety prior to participation. There is a desire to be involved earlier in the research process, in particular during the formative and planning phases, to ensure that the study can be implemented by the participating providers within their catchment area, the prehospital environment, and their agency structure.^{14,21,22} Additionally, there is a perceived need for better research training, both in general and specific to the proposed study.^{14,21,22} Providers should be able to identify clear “champions” for research within their agencies and should receive ongoing feedback regarding their performance.^{14,21,22} Finally, there are cultural barriers and motivators within both the EMS profession and the individual agencies that should be acknowledged and addressed.²¹

Our findings are more specific to the individual provider and the agency than previous reports on the systemwide changes that are needed to improve participation in research. Expert panels have implicated several factors that have contributed to gaps in EMS research, including the lack of an integrated EMS infrastructure and funding mechanisms for EMS researchers.^{2,5,7,9} Individual EMS investigators have raised concerns about human subjects protections, including availability of institutional review boards, informed consent in the emergency setting, preservation of patient confidentiality, and safe transfer of patient data.¹⁴⁻¹⁶ They have also raised methodologic concerns such as lack of standardized data definitions, lack of reliable patient randomization techniques, and lack of focus on system-based research.¹²⁻²² While these challenges are clearly important and were mentioned by individual subjects in our study, they were not as pronounced, suggesting that they are not as strong an influence on research participation at the agency and provider levels. While the broader, systems-based challenges to prehospital research must be addressed for increases in prehospital research participation to occur, researchers must also focus on those factors identified by EMS providers and agency leadership as important determinants for participation.³⁵

LIMITATIONS

This was a qualitative, observational study that enabled us to explore potential determinants of EMS prehospital provider participation in research. Because of the observational nature of the study and our inability to directly link specific findings to characteristics of the providers (level of training) or agencies, the findings may not be generalizable to all settings. However, we did use purposive sampling techniques to include the range of EMS agency characteristics to maximize the generalizability of our results. Tables 1 and 2 summarize the diverse characteristics of the participating institutions and individuals. We proposed a research

scenario for the participants to think about when responding to the questions, which may have biased responses toward that particular scenario. The stories provided by participants, however, were rarely about children or specific to any injury or disease. Therefore, we believe that the data reflect prehospital research, in general. We rated specific findings according to how frequently they were identified and the intensity of the comments; however, further quantitative work would be needed to rank the magnitude and effect of each factor. Finally, because we selected agencies that were affiliated with a previously established research network, we may have introduced selection bias favoring research participation. However, we conducted a multitude of focus groups and in-depth interviews that achieved a saturation of ideas, and we were successful at obtaining a robust description of both barriers and motivators of EMS research that is consistent with the recommendations of EMS researchers.

CONCLUSIONS

This study describes factors that are deemed by EMS prehospital personnel to be important to their successful participation in research. We identified a comprehensive set of factors that address individual provider beliefs and knowledge and agency and professional norms and policies. The consistency of our findings with the observations and experiences of individual EMS researchers supports their validity. Further, the proposed guidance for ensuring successful EMS partnerships in prehospital research is likely to be accepted by EMS providers since they were consulted as part of the improvement process.³⁵ Future work is needed to determine the validity of this model and whether these findings are generalizable across all prehospital settings.

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APPENDIX A

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Pediatric Emergency Care Applied Research Network (PECARN)

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Maryland Institute for Emergency Medical Services Systems, Baltimore, MD
Milwaukee County Emergency Medical Services, Milwaukee, WI
New York State Bureau of Emergency Medical Services, Albany, NY
Rural/Metro Corporation, Buffalo, NY
Rural/Metro Corporation, Rochester, NY
Salt Lake City Fire Department, Salt Lake City, UT
St. Louis Fire Department, St. Louis, MO
Unified Fire Authority, Salt Lake City, UT

Supporting Information

The following supporting information is available in the online version of this paper:

Data Supplement S1. Qualitative research and behavioral science definitions.

Data Supplement S2. PECARN focus groups front line personnel (EMTs): introduction and explanation of the meeting.

Data Supplement S3. PECARN EMS agency leadership (provider) interviews: introduction and explanation of the interview.

The documents are in PDF format.

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