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Research Pioneers in Emergency Medicine—Reflections on Their Paths to Success and Advice to Aspiring Researchers: A Qualitative Study

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Study objective: Research in basic, translational, and clinical emergency medicine has made great strides since the formalization of emergency medicine as a specialty. Our objective is to identify and analyze strategies used by emergency medicine research pioneers to inform further advancement of research in emergency medicine, particularly for aspiring researchers and those in emerging areas, using emergency medicine medical education as one example.

Methods: This was a prospective, grounded-theory, qualitative study, using a constructivist/interpretivist paradigm. Leading basic science, translational, and clinical emergency medicine researchers who completed residency before 1995 were eligible for structured interviews. Thematic coding followed an iterative process until saturation was reached. A theoretic model was developed and analyzed.

Results: Research pioneers valued advanced methodological training and mentorship. Barriers to funding were lack of recognition of emergency medicine as a specialty, absence of a research history, and lack of training and funding resources. Deliberate interventions to improve emergency medicine research included educational sessions at national meetings, external (to emergency medicine) mentor pairings, targeted funding by emergency medicine organizations, and involvement with funding agencies. Pioneers facilitate research excellence by serving as mentors and allocating funds or protected time to develop researchers. To advance emerging subfields of research in emergency medicine, pioneers recommend advanced methodological training that is specific to the area, deliberate mentorship, and the formation of research consortia to conduct generalizable outcomes-based studies.

Conclusion: Research pioneers in emergency medicine cite mentorship, advanced skills obtained through fellowship or graduate degrees, deliberate collaboration with experienced researchers, support from emergency medicine organizations, and forming networks as the cornerstones of success. [Ann Emerg Med. 2018;■:1-10.]

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INTRODUCTION

The discipline of emergency medicine arose in the 1960s in response to changing expectations for the US health care system to provide high-quality care for acutely ill and traumatized patients. Administrative and educational systems were developed to address core knowledge and skills, and in 1979, emergency medicine became the 23rd recognized medical specialty.[1] During the next several years, emergency medicine investigators and organizations took deliberate steps to define a unique research agenda and infrastructure that addressed the core tenets of the specialty, with a goal of improving outcomes in patient care. The Future of Emergency Medicine Research conference, held in 1997 in Washington, DC, with representatives from emergency medicine, other clinical disciplines, and governmental agencies, developed objectives and strategies to advance research focused on acute injury and disease.[2] They recommended defining new methods to assess outcomes of emergency care,[3] developing a suitable infrastructure,[4,5] recognizing the importance of research collaborations,[6] and identifying strategies for obtaining funding.[7] These pioneers' efforts eventually led to a National Academy of Medicine committee report on the future of emergency care in the US health system in 2003, a National Institutes of Health (NIH) Task Force on Research in Emergency Medicine, and several NIH

Editor's Capsule Summary

What is already known on this topic

A successful emergency medicine investigative career requires important strategic decisions and behaviors, things many are unfamiliar with early in their journey.

What question this study addressed

What career insights from successful emergency medicine investigators can aid the next tranche of knowledge creators?

What this study adds to our knowledge

Structured interviews of 10 senior emergency medicine investigators elicited consistent themes of training, networking, mentoring, and collaboration to achieve success.

How this is relevant to clinical practice

This has no effect on clinical care directly but will aid individual early-stage faculty and their departmental guidance groups in fostering emergency medicine investigative influence.

roundtables reporting on ways to advance emergency care through research, and they yielded modifications to federal funding agencies, including the 2006 development of the K12 institutional research program in emergency care research and the 2010 announcement of the National Heart, Lung, and Blood Institute's Research Career Development Programs in emergency medicine.[8–14]

Because of these metrics of success, many consider emergency medicine research to be a thriving, respected discipline. However, the journey of research pioneers was not an easy one, and the current state of emergency care research was built on the groundwork they laid while facing significant challenges. Obstacles included a lack of funding opportunities for emergency medicine research, lack of external recognition of the unique value of studying emergency care, and difficulties meeting standards for high-quality research because of limited training and mentorship. These struggles may resonate with researchers in emerging emergency medicine–focused research fields, such as gender bias in emergency medicine, social determinants of health, medical education, evolving models of health care delivery, teamwork and communication, and emergency department (ED) crowding, as well as among researchers who use methods that are less common in existing emergency medicine research (eg, qualitative methodology, ethnography, quality improvement methodology).

Of these examples, emergency medicine education research has been targeted as a field requiring improved rigor and may display parallels to early emergency medicine research to serve as a framework to apply the advice from the emergency medicine research pioneers. Education research aims to address a crucial need to advance the science of teaching and learning by exploring educational questions, problems, and theories in a rigorous, outcomes-based approach.[15,16] Emergency medicine education researchers face obstacles that are common to other nascent fields, such as lack of training, limited funding and mentorship, and difficulty achieving high-level outcomes with methodological rigor.[17–24] The limited applications of randomized study designs, vulnerability of subjects, clinical and administrative workload of emergency medicine education researchers, and pitfalls of using a patient outcomes–based approach present unique challenges when researchers submit articles to journals and compete for funding with a basic science or clinical research perspective.[25–31]

The purpose of this study was to explore the perceptions of emergency medicine research pioneers in regard to the landscape of early emergency medicine research and their lived experience of the obstacles faced, and strategies for success, as the field evolved to its current state of methodological rigor, funding, and respect. Our primary aim was to explore themes that may be relevant to all aspiring researchers, with a particular focus on emerging subsets of emergency medicine research, methodologies, and research disciplines. The secondary aim was to engage the pioneer subjects in applying the experience accrued during the early days of emergency medicine scientific research to inform the advancement of emergency medicine education research, which serves as one example of an emerging area of research within emergency medicine.

MATERIALS AND METHODS

Selection of Participants

We used a purposive sampling strategy, which uses investigator judgment to select a sample that has representative characteristics of a larger population, including attention to sex, age, and geographic distribution. Potential interviewees were identified initially by one member of the research team (W.C.C.), who is a contemporary of the limited subject pool, and identified subjects who met inclusion criteria for the representative characteristics according to personal knowledge, review of published literature and funding announcements, and

membership in national organizations and research sections. Inclusion criteria were leading emergency medicine researchers who specialize in basic science, translational, or clinical research; completed residency training before 1995; were engaged actively in funded research; and made substantial contributions to the medical literature. Snowball sampling was applied to corroborate and augment the subject pool because each participant was asked to recommend additional emergency medicine research pioneers to include in the study. Each subject was invited by a personal e-mail with standard text describing the project's objectives, interview process, and how responses would be handled.

This prospective qualitative study was conducted between November 2016 and January 2017. We applied a grounded-theory approach, which aims to identify theories from data through an iterative process of data gathering, coding, theme identification, and theoretic sampling, with a constructivist/interpretivist paradigm to allow individual opinion generation and open interpretation of experiences by participants.[32,33] The constructivist/interpretivist paradigm aims to explore and understand the lived experiences of subjects within a historical social reality, and this conceptual framework was chosen to understand emergency medicine research pioneers' experiences in the context of the reality of emergency medicine education research in the early days of the field (1970s to 1990s).[34] Individuals who agreed took part in a 30-minute semistructured telephone interview conducted by a single member of the research team (W.C.C.). The interviewer conducted member checking in real time to ensure understanding of intended meaning. Interviews were audio-recorded with consent, anonymized, and then transcribed verbatim by a research associate (J.K.) for coding and analysis. The study was approved by the institutional review boards of all researchers.

Methods of Measurement

We designed the interview protocol with cognitive interviewing methods.[35] Study group members discussed key topics that the proposed study population was uniquely qualified to answer to optimize content validity; namely, this group is composed of original researchers in the field of emergency medicine who can provide insight into their experiences of overcoming funding and mentorship challenges, approaches to skill development, and obstacles they faced. For response process validity, clarity, and comprehension, we read aloud the script (Appendix E1, available online at http://www.annemergmed.com) to comparable volunteers who were not taking part in the study. We enacted modifications to question length, uniformity of terminology, and wording according to feedback. Semistructured questions sought discrete information (sex, age, advanced training, funding sources, and publications). Open-ended questions allowed respondents to reflect on their experiences as both fledgling researchers and as current leaders to provide insight to present and aspiring researchers. The protocol was designed to explore subjects' perceptions of their lived experiences of the barriers faced in the early days of emergency medicine research and strategies they used to overcome them, current practices to support emergency medicine research, and the state of emergency medicine education research and advice to advance the field, as well as to suggest other potential study subjects.

Primary Data Analysis

Two experienced researchers in qualitative methods (W.C.C. and J.J.) independently coded sample transcripts line by line, using a constant comparative method to identify and refine concepts to discrete categories until thematic saturation was reached, and then a theoretic model was developed and analyzed[36] with a coding scheme that integrated the identified themes. Saturation was determined when iterative analysis revealed that no new concepts were being identified, the evolution of the identified themes and concepts had slowed, and individuals who were interviewed had a high degree of repetition in their responses. The authors independently coded all of the transcripts (including recoding the initially reviewed ones), using this structure (91.5% agreement rate) for all transcripts. Disagreements were resolved by discussion.

RESULTS

We identified potential research subjects in a rolling fashion and interviewed 10 research pioneers before discontinuing data collection. One potential subject declined, citing lack of continuation in an academic position. Saturation was achieved after the seventh subject. Interviews of 3 additional subjects who were already scheduled continued as planned to meet our goal of sex and geographic diversity. Using our snowball technique, we also noted that the pool of suggested potential interviewees centered on our invited subjects. Demographic data and research accomplishments are summarized in Table 1. Seven subjects completed additional training (fellowship, advanced degree, or both). Subjects received substantial

Table 1. Characteristics of research pioneers in emergency medicine.

Interviewee	Sex	Decade of Residency Completion	Advanced Degrees	Fellowship Completed	Peer-Reviewed Articles*	Grants as PI*	Grants as Mentor*	Federal and Major Foundational Funding Agencies†
1	M	1980s	MD		60	6	8	EMF, NHLBI, NINDS
2	M	1980s	MD	Research	220	10	16	AHRQ, NIH
3	M	1970s	MD, MS		120	6	6	AHA, EMF, HRSA, NCI, NHLBI, NIGMS, NIH, NIMHD
4	M	1990s	MD		350	50	50	ACR, AHRQ, DOD, EMF, NIH, PCORI, SAEM, STATE
5	M	1990s	MD	Research	250	15	12	AHA, AHRQ, EMF, NHLBI, NIGMS
6	M	1970s	MD		125	10	10	AHA, EMF, NIH
7	F	1980s	MD, MS	Research	160	Continuous	15	CDC, DOD, EMF, NIH, STATE
8	F	1980s	MD	Pediatric emergency medicine	80	9	30	AHRQ, HRSA, MATTEL, MCHB, STATE, UniHealth
9	M	1980s	MD, PhD		200	6	12	AHRQ, EMF, NHLBI, NINDS, SAEM
10	F	1990s	MD	Research	40	10	6	DOD, EMF, NIH
Totals	7 M, 3 F	Mean 1987			Mean 160.5	Mean 13.6	Mean 16.4	

PI, Principal investigator; *M*, male; *EMF*, Emergency Medicine Foundation; *NINDS*, National Institute of Neurological Disorders and Stroke; *AHRQ*, Agency for Healthcare Research and Quality; *AHA*, American Heart Association; *HRSA*, Health Resources and Services Administration; *NCI*, National Cancer Institute; *NIGMS*, National Institute of General Medical Sciences; *NIMHD*, National Institute on Minority Health and Health Disparities; *ACR*, American College of Radiology; *DOD*, Department of Defense; *PCORI*, Patient Centered Outcomes Research Institute; *STATE*, California, Minnesota, Pennsylvania; *F*, female; *CDC*, Centers for Disease Control and Prevention; *MCHB*, Maternal Child Health Bureau; *NHLBI*, National Heart, Lung, and Blood Institute.

*These figures represent estimates by the interviewees of the number of peer reviewed publications.

†Self-reported agency descriptions.

funding from federal agencies, major foundations, and state governments (Tables 1 and 2).

Pioneers reflected on the early days of emergency medicine research and recounted the struggles the discipline faced. Subjects' perceptions in regard to factors that were crucial in overcoming obstacles to successful research in the emerging field comprise 4 key themes: value of training, "underdog mentality," importance of specialty organization support, and mentorship. These themes, along with representative comments, are demonstrated in Table 3.

Subjects who completed research training valued the experience because it provided them with dedicated training in research methodology, including the discipline needed to conduct research and to frame a research question properly, as well as access to mentors who could model effective behaviors.

Participants described that the absence of a history for emergency medicine–focused research topics as a separate entity and the lack of qualified or expert emergency medicine researchers made it difficult to compete for existing avenues of funding. Several reported feelings of frustration and described a perception of discrimination against the specialty. All qualified this statement by reflecting on how little they actually knew at the time and conveyed that, in retrospect, they did not believe there was discrimination, but rather a deficiency in their skills and experience that individuals and organizations

Table 2. Major funding agencies summary.

Name of Funding Agency	Type of Funding
ACR	Foundational
AHA	Foundational
AHRQ	Federal
CDC	Federal
DOD	Federal
EMF	Foundational
HRSA	Federal
MCHB (of HRSA)	Federal
NCI	Federal
NHLBI	Federal
NIGMS	Federal
NIH	Federal
NIMHD	Federal
NINDS	Federal
PCORI	Federal
SAEM	Foundational
STATES	State

Table 3. Overcoming research obstacles: key themes with representative quotes from research pioneers in emergency medicine.

Theme	Representative Quotes
Value of training	"The advanced research degree…taught me how to think scientifically and how to analyze data. It allowed me to learn how to formulate questions, identify the data required to answer those questions, analyze data, and present analyses [effectively]. Those skills translate well across a wide variety of scientific disciplines, including medical education research." "An important feature of an advanced degree…is that it gives you credibility that is completely independent of your actual expertise. People just assume that if you have a PhD, you must be a real card-carrying scientist, even before they have any evidence to suggest that's true. It gives you a credibility that's helpful when you're joining a research team or trying to contribute to a research effort." "[The training] taught me how to formulate a really good question that could be answered and gave me insight into when to let go of a bad idea…. I gained a network, and how to establish networks in the [emergency medicine] research community."
Underdog mentality	"The real barrier was us…. [W]e thought we were special,…nobody appreciated us,…and that we weren't on a level playing field. In retrospect, what was wrong is we never knocked on the right doors and kept saying the NIH isn't fair to [emergency medicine]; there is no [emergency medicine] institute." "People asked unimportant questions. And by unimportant, I don't mean they were unimportant to a practicing emergency physician, but they didn't resonate beyond [that] narrow group." "[Emergency medicine] researchers really didn't have a strong enough academic background or track record to qualify for a lot of the big grants and we felt it was a symptom of a young specialty. People who were getting a lot of grant funding in the early days of [emergency medicine] research usually had collaborations with more established disciplines of medicine."
Importance of specialty organization support	"The professional organizations, in particular SAEM and ACEP, developed curriculum[s] in their annual meetings to talk about basic research concepts and about…how to establish networks with established investigators even outside of [emergency medicine], as well as networks with federal funding agencies. Early on, I think the leadership understood what was needed in terms of the educational effort." "We made a big push in the late 1990s to have SAEM dedicate substantial funds to the SAEM research foundation to fund seed grants, grants for career development for people who wanted to get advanced research training." "The Institute of Medicine [National Academy of Medicine] convened its committees in the early 2000s on the future of emergency care in the United States health system; they were very much interested in a report on research for [emergency medicine] and what the barriers were… [I]t became clear that the lack of any type of institute for [emergency medicine] was a potential barrier, and eventually there became an office within the NIH for [emergency medicine] research."
Mentorship	"One of the most important things was to find the proper mentor…. [M]ost of us had to go outside of our departments. It was hard to get advice about whom to approach because people we worked with had not had this experience." "[Mentors] allowed me to present my research in a very early stage at an SAEM national meeting in 1986 and to be the lead author on publications that came out. They were very encouraging. I think they were obviously very influential in me pursuing an academic career and then one that involves research." "The next step I had to learn to be a really impactful researcher was to put your ego to the side and partner with somebody else who is equally impactful…. [G]reat stuff doesn't usually come from a singular mind." "I think the theme is that people were willing to be generous with their time, efforts, and connections in supporting me along the way."

worked hard to overcome. Individuals or groups who compete with those who have advantages for defined outcomes can be referred to as underdogs, and although being in this position can be discouraging, there may be an advantage to the underdog mentality that contributes to an ability to overcome seemingly unsurpassable obstacles.[37] The representative quotes in Table 3 illustrate that, although in retrospect emergency medicine pioneers recognized their shortcomings as budding researchers, they had a lack of awareness of these limitations at the time, which may have contributed to an underdog mentality.

Pioneers described the effect of support and interventions by specialty organizations as being instrumental to the early success of emergency medicine education research. Organizations such as the American College of Emergency Physicians (ACEP),[38] Society for Academic Emergency Medicine (SAEM),[39] and its precursor, University Affiliates of Emergency Medicine, offered educational sessions on research topics such as grant writing and methodology at national and regional meetings. They offered targeted funding sources for seed grants to promising researchers. The *Journal of the American College of Emergency Physicians*, precursor to *Annals of Emergency Medicine*,[40] was created as a venue for publication of the newly emerging body of research that focused on the acute presentation of disease. Organizations and specialty leaders facilitated involvement and partnership opportunities for burgeoning researchers with successful investigators outside the specialty of emergency medicine and with key national agencies, such as NIH funding agency committee members.

Individuals uniformly credited mentor relationships as key to their success. Most reported they sought mentors

Table 4. Fostering the advancement of aspiring emergency medicine researchers: key themes with representative quotes from research pioneers in emergency medicine.

Theme	Representative Quotes
Training	"If they don't have the skill set, we help them get it through training grants, K grants, [and] research fellowships, and then…make sure that they have enough time to do the work, but not enough that they lose sight of the fact that it's a job and there has to be success." "The way that I've done it is to make sure that we're strongly encouraging junior faculty and graduating residents who want to do academics to get advanced training. We're both encouraging that, but we're also funding it; we fund a number of grants from our own department, seed grants, that are directed toward junior faculty, that will allow them to have the protected time or the money to pay for advanced training, a master's and the like."
Expecting results	"I think one of the common mistakes in the [emergency medicine] investigative career is to expect unending protected time, which means someone else pays by being full time while you continually try to succeed. You eventually have to succeed and help fund your own work." "It's a balance between making people get real about what matters and about what will have longevity, in terms of holding their feet to the fire. This includes people that want to do clinical research, and the very few that want bench research."
Systemic contribution	"We developed the center that brought scientists together both from within and outside of [emergency medicine] to do research and have policy impact." "We developed networks of EMS providers who have collaborated on larger projects that were more likely to be funded because of the collaboration." "With collaborative teams including [other departments] like trauma, it was possible to get people engaged in larger national multisite trials to raise visibility and involvement."
Departmental mission	"I think it's recognizing that while the department mission is to create new knowledge that's impactful, everybody's role in that is not the same. In other words, I don't have 11 quarterbacks on the field."

EMS, Emergency medical services.

outside the discipline of emergency medicine so they could work on research with established experts to expand topics to the initial presentation of patients with a variety of clinical conditions because there were limited experienced researchers within emergency medicine. Through this experience, they learned to ask important, innovative questions. Mentors connected the subjects with others who shared similar research interests, and they formed networks and collaborated with multiple study sites. They recalled that mentors gave them opportunities to excel and to establish their reputations by presenting research at national meetings and by serving on national committees. Most of our subjects reported that they were busy balancing clinical and administrative duties with their research once they became faculty members. They credit department chairs for giving them protected time and seed-grant monies to establish themselves as researchers.

Many of the research pioneers are currently serving in leadership roles as department chairs, deans, agency leaders, and research or fellowship directors. All have prominent roles in broad or specialty organizations (eg, American Academy of Pediatrics, American Board of Emergency Medicine, ACEP, corporate boards, National Academy of Medicine, NIH, SAEM). They are now in a position to act as mentors, support career development of upcoming emergency medicine researchers, and facilitate collaborative networks. Their activities focus around 4 primary themes: encouraging (and funding) mentored training in research methods (fellowship, MS/PhD degree), expecting results from emerging researchers, building collaborative research networks on a larger scale, and balancing the individual department's overall mission. These themes, along with representative comments, are demonstrated in Table 4.

There was a range of opinions about emergency medicine education research, including their lack of knowledge of the specific subdiscipline, critique of its current state, and a recognition that it is a work in progress that has potential. They acknowledged there are unique educational methods that differ from those of their disciplines, but most perceive that the overall methodological rigor should improve significantly. Pioneers commented that many education studies have low-level outcomes and are not generalizable, and thus they rarely read them. Approximately half of individuals interviewed noted that they skim the tables of contents of emergency medicine journals and occasionally read an education research article. When asked, "How could education research be more relevant to you?" pioneers stated they might read a "big-picture" education research study that answered a well-constructed research question relevant to their institution or practice and

Table 5. Perspectives on emergency medicine education research: key themes with representative quotes from research pioneers in emergency medicine.

Theme	Representative Quotes
Unique methods	"People who have been trained in the biomedical sciences [must] understand that educational research is different—it has a different appearance, the methods are different—and that you would expect it to look a little different." "I don't think educational research should just try to duplicate the way that research is done in basic science or clinical research because it's a different animal."
Developing state	"They don't know much at the research side and they often see themselves as, 'I'm not a researcher. I'm an educator; therefore, you should accept stuff because I'm an educator.'" "The real people that are in charge of peer review and deciding what's getting funded or what's getting attention are not going to pay much attention to those before-and-after studies. There's going to be some hurt feelings as people begin to catch up and understand that there needs to be real training. You can't just graduate from your residency and become an assistant program director and then do research in this area. You've got to get specific training." "It's in a transition state, where it reminds me of what ultrasound was maybe 15 years ago." "Medical education research reminds me of EMS research in the '80s; it's basic questions with incredibly basic design that invariably cannot detect causality or truly inform (which is even more important) about the best way to teach or learn or impact a career. What I see is the infancy to early childhood of medical education research."
Relevance to patient outcomes	"Education researchers are taking it to the next level in demanding a theoretical construct. They are injecting a totally new level of professionalism in terms of how the thing was thought out [and] then demanding that there's some outcome that shows that people think, act, and do better in real practice." "The question to me in education research is, does it actually improve performance of whatever you are doing? If you go to the sim[ulation] lab[oratory], I don't care if your performance gets better in the sim[ulation] lab[oratory]; I want to know whether your intubation rates in the ED get higher after you do sim[ulation] training on how to intubate someone."
Advice for aspiring researchers	"Make sure that everything that's currently available in [emergency medicine] is well publicized and that people are taking advantage of it. Whether that's through SAEM, CORD, [or] AAMC, make sure that people who are interested in educational research are able to tap into those resources." "Take time off to make sure that you have the skills and knowledge to ask and answer questions." "I think surrounding oneself with mentors and collaborators who have a similar interest, but also have increased expertise, is huge." "You always need mentors. Everyone, regardless of how advanced in their career, requires some kind of guidance." "They need to have the same rigorous research training as a basic scientist when it comes to focusing questions, understanding what kind of data you need to collect to answer those questions, and developing a quantitative assessment technique. Make sure you understand statistics."

demonstrated long-term outcomes and durability across multiple institutions. These themes, along with representative comments, are demonstrated in Table 5.

Research pioneers expressed hope for the future of education research in emergency medicine and recommended actionable goals that could be achieved both in a systemic fashion and by individuals. These fell into 3 main categories: First, there was uniform agreement that formal training in research methods is essential, either by earning an advanced degree (master's or PhD) or through dedicated fellowship training in education research. Second, networking and collaboration opportunities should be sought. On a systemic level, an education research network would facilitate collaboration; however, individuals could also seek partnerships with others to conduct generalizable outcomes-based studies. Third, mentorship was cited as a key component for success, and aspiring education researchers should seek mentors both inside and outside emergency medicine.

LIMITATIONS

The population of interest of our study, research pioneers who completed their training before 1995, comprised an inherently small group. Although we specifically used a purposive sampling technique with snowball sampling to increase the representative sample, the small size of our population of interest may have limited our sample in a way that did not capture the perceptions of the greater population. We may have missed outlier comments as a result of discontinuing our interviews after we achieved thematic saturation; however, we believe the degree of agreement from our sample underscores the importance of the responses. Our interview script may have omitted questions that could have led to other important themes.

DISCUSSION

In this qualitative study of emergency medicine research pioneers, subjects described a shared journey from novice

to expert as emergency medicine research evolved from humble beginnings to its significant role in the medical research world today. Key themes in subject perceptions in regard to the factors that contributed the most to overcoming barriers included previously recognized strategies, such as obtaining training and finding mentorship, as well as factors that are specific to the historical context of a burgeoning field, such as the importance of specialty organization support and the constructive influence of an underdog mentality.

The literature supports pioneer perceptions of the roles that training, mentorship, and support have played. Subjects played significant roles in developing successful networks to address unique research agendas, such as the Pediatric Emergency Care Applied Research Network, as well as training opportunities for future researchers that include emergency medicine organizational offerings,[38,39] departmental infrastructure that supports discovery (seed grants and dedicated fellowships), and the availability of federal training grants (eg, K12 program) to emergency medicine researchers. Newgard et al[41] reported on the magnitude of success of the National Heart, Lung, and Blood Institute's K12 training grant. Sixty percent of the scholars secured grant funding and scholars' publication rates increased significantly as a result of participation in the program. The most successfully funded cohorts were more likely to have had an advanced degree and prolific publications. The scholars appreciated the mentorship and networking opportunities afforded them through the K12 program and benefited from protected time during the training period. The published descriptions of these initiatives may serve as a road map for researchers in emerging fields.

The research pioneers emphasized that deliberate actions were critical in their ability to organize and achieve their goals. Applying this to our example emerging discipline, emergency medicine education research, all individuals in the specialty may contribute to enhancing the state of the science through deliberate actions.[18,42] Chairs can facilitate faculty development opportunities for education scholars, as our respondents have done in their departments for other researchers, to ensure proper skill development and the time needed to establish themselves as education researchers. Organizations can offer targeted interventions for aspiring and existing education researchers, as they did in the early days of basic science, translational, and clinical research. Several programs exist already, including seed grants, dedicated didactic sessions during regional and annual meetings,[43,44] guidance on standards for postgraduate fellowships,[39] and venues for the dissemination of education research,[38,39,45] as well as emergency medicine journals that focus solely on education research in emergency medicine,[46] have dedicated education issues,[47] or consider submissions based on education research. The existence of a robust education research presence in emergency medicine is likely to produce advances in both educational and patient care outcomes.

Most important, current and future researchers in any emerging field or discipline may find resonance in pioneers' experience that enacting agency support, demonstrating persistence, and continuing to aim for excellence will gradually produce change. The pioneers in emergency medicine research began by feeling ostracized by funding agencies and that their work was unimportant to the research community at large. To combat this, they proactively obtained training, sought mentorship, and forged collaborations with experts from other disciplines who could provide a rigorous training ground and give them opportunities to demonstrate success and build a history of research excellence. Along with their mentors, researchers participated meaningfully in discussions with governmental agencies and forged both individual and organizational relationships. Individuals who succeeded mentored junior colleagues to develop a critical mass of talented researchers in emergency medicine. These steps seem logical for emerging scholars to emulate.

Our results, viewed in the context of the literature, suggest that an actionable road map for emerging research in emergency medicine might include definitions of desired outcomes and a defined, discipline-specific research agenda; recommendations and resources for training new and existing scholars; networking strategies for expanding the support base to include federal and foundational entities and a method to develop high-level researchers; and establishment of collaborative networks among researchers and other disciplines to improve mentorship and generalizability of studies.

Research pioneers in emergency medicine cite mentorship, advanced scientific inquiry skills obtained through fellowships or graduate degrees, deliberate collaboration with experienced researchers (often outside of the specialty), support of emergency medicine organizations, and research networks as reasons they attained success. They advise aspiring and existing researchers who focus on nascent areas, such as emergency medicine education, to follow similar strategies to achieve generalizable and meaningful high-level outcomes.

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