

ORIGINAL RESEARCH

Infectious Disease

Understanding uptake of information about innovations among emergency department clinicians during the COVID-19 pandemic

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Abstract

Objectives: Early in the COVID-19 pandemic, little was known about managing sick patients, but emergency department (ED) clinicians had to decide which treatments and care processes to adopt. Our objective was to describe how ED clinicians learned about innovations and how they assessed them for credibility during the pandemic.

Methods: We purposively sampled clinicians from hospital-based EDs to conduct focus groups with ED clinicians and staff. We used both inductive and deductive approaches to conduct thematic analysis of transcripts.

Results: We conducted focus groups with clinicians from eight EDs across the United States. We found that ED clinicians in our sample relied on friends and colleagues or departmental and institutional leadership for information on innovations. They used social media sources when they came from credible accounts but did not directly seek information from professional societies. Clinicians reported a range of challenges to obtain credible information during the pandemic, including a fractured and changing information environment, policies misaligned across clinical sites or that conflicted with clinical knowledge, high patient volume, fear of harming patients, and untimely information. Facilitators included access to experienced and trusted colleagues and leaders and practicing at multiple EDs.

Conclusion: Participants cited anecdotal evidence, institutional practice, and word-of-mouth—rather than peer-reviewed evidence and professional society communications—as their primary sources of information about care innovations during the early phases of the pandemic. These results underscore the importance of developing trusted local mechanisms and wider networks to identify and vet information for frontline clinicians during rapidly emerging public health emergencies.

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1 | INTRODUCTION

1.1 | Background

In the beginning of the COVID-19 pandemic, little was known about treatments and care processes.¹ Clinicians in the emergency department (ED) were the first line of defense for most patients with COVID-19.^{2,3} Other than some isolation practices, there were few guidelines or studies (ie, traditional sources of information) for clinicians and administrators.⁴ ED clinicians also faced surging patient volumes,⁵ sometimes exacerbating already high volumes experienced before the pandemic.⁶

Given limited information and constraints due to patient volumes, ED clinicians used non-traditional sources of information like social media, podcasts, and the recently established medRxiv pre-print database to learn about emerging treatments and care processes.^{7,8} While ED clinicians have used a variety of information channels previously,⁹ the use of non-traditional sources expanded rapidly during the pandemic.^{7,10,11} This facilitated dissemination of care innovations, which we define as “*new or improved health policies, systems, products and technologies, and services and delivery methods that improve people’s health*” (see Figure 1).¹²

1.2 | Importance

Most research on dissemination and implementation of care innovations has been conducted outside of public health emergencies. There are studies of innovations during localized disasters,^{13–15} but investigations are limited regarding how decision-making differs when uncertainty about effective treatments and fear of harming patients are salient driving forces.¹⁶ In an emergency, ED clinicians need to rapidly assess the credibility of new information and innovations to determine which to adopt and which to disregard.¹⁷ ED clinicians vary in *where* they are getting information and *how* they judge the credibility

Example Innovations:

Paxlovid
 Ivermectin
 Expanded care areas for surge management
 Expediting care transitions to community settings
 Proning to improve oxygenation
 High-flow oxygen delivery
 PPE sterilization and conservation
 Cohorting staff to reduce cross-contamination
 Telemedicine
 Pre-visit triage
 HVAC installation
 Vaccination and associated campaigns

FIGURE 1 Example innovations examined in larger project.

of those sources.^{18,19} In general, clinicians balance their own assessments and heuristics with the credibility assessment of others when learning about and judging innovations.^{20,21}

1.3 | Goals of this investigation

This study is part of a larger examination of the dissemination and implementation of innovation in care during COVID-19 (see Figure 2). We focused on identifying and understanding key communication channels. Our objective was to investigate how ED clinicians learned information about innovations and how clinicians assessed innovations for credibility during the COVID-19 pandemic to support future efforts to disseminate trusted, evidence-based information and innovations to clinicians.

2 | METHODS

2.1 | Study design

We conducted semi-structured focus group discussions with ED physicians [Doctors of Medicine (MDs)/Doctors of Osteopathic Medicine (DOs)], advanced practice providers (APPs), ED nurses [registered nurses (RNs)], and respiratory therapists (RTs) from four hospitals across the United States, with a goal of two focus groups per site. We included RTs because of the critical respiratory disease management issues associated with COVID-19. We had separate groups for MDs/APPs (clinicians) and RNs/RTs (staff) to limit issues with professional hierarchy dynamics.²² The discussion guide was developed and piloted with an MD, RN, and NP separately at different EDs (see the Supporting Information [Appendix](#)). No changes were made to the protocol after testing, so we included pilot interviews in our final analysis.

The interview guide included topics related to domains from Greenhalgh et al.²³ (see Figure 2). A key topic of the focus groups was understanding the dissemination process (*key communication channels and implementation process* domains). Discussion topics included how clinicians gained information about emerging COVID-19 treatments and care processes and any facilitators and barriers to adopting innovations they faced.

Focus group discussions lasted 60–90 min, and interviews lasted 60 min. Individuals were included if they had experience providing care during the COVID-19 pandemic while working at the participating hospital’s ED. Before each focus group, the moderator provided a brief description of the goals of the participants. Three project team members (S.F., C.B., and C.C.), who have experience as clinicians (MD or RN) and as health services researchers (PhD or MS) and facilitating focus groups, led the discussions. One RN researcher (C.C.) led the focus groups of RNs/RTs. Moderators fielded questions, asked probing follow-up questions, and facilitated transitions between topics of discussion.

Focus group discussions were conducted virtually via a secure Zoom.gov video meeting between November 2022 to June 2023,

The Bottom Line

In this study, we identify key sources of information and criteria used to assess the credibility of information for innovative approaches to treating COVID-19 among emergency department (ED) clinicians. We found that previously trusted sources, such as colleagues and leadership were the primary sources of information, while newer sources like podcasts and social media were increasingly used as the pandemic progressed. Clinicians cited low trust when encountering information that conflicted with their existing medical knowledge. Our results underscore the importance of leveraging existing communication networks and supporting dissemination by getting information into existing, trusted networks.

recorded, and transcribed for analysis. Participants were compensated with a \$150 gift card. This study was approved by the RAND Human Subjects Protection Committee (project 2021-N0714).

2.2 | Selection of participants and setting

We purposively sampled and recruited hospitals to participate.²⁴ Hospitals were sampled to capture a diversity of perspectives based on location (four regions in the United States, as defined by the US Census Bureau),²⁵ type of facility (academic or community hospital), rurality (urban or rural), and safety net status. We worked with a main contact

at each ED to recruit a convenience sample who had experience providing care during the onset of the pandemic. Each participant provided verbal consent before the focus group.

2.3 | Data analyses

We utilized content and thematic coding to analyze focus group data.²⁶ First, we created a preliminary codebook defined by topics included in the focus group discussion guide. New codes were added based on emergent themes and insights and shared via weekly team meetings.²⁷ After finalizing the codebook, two coders (N.Q. and S.H.) applied codes to a single transcript to establish inter-rater reliability ($\kappa = 0.72$, indicating good agreement).²⁸

The coding team met regularly to review coding, update the codebook, and address any questions. We reviewed coded excerpts holistically and by focus group type to identify general themes, and subthemes that differed across groups. All qualitative analysis was conducted using the Dedoose qualitative analysis platform.²⁹ We followed the Consolidated Criteria for Reporting Qualitative Research (COREQ) for data reporting.³⁰

3 | RESULTS

3.1 | Hospital and participant characteristics

We conducted 13 focus groups at six hospital EDs with one hospital only having a clinician focus group, and interviews with clinicians and staff at three EDs (see Table 1). We included clinicians and staff from

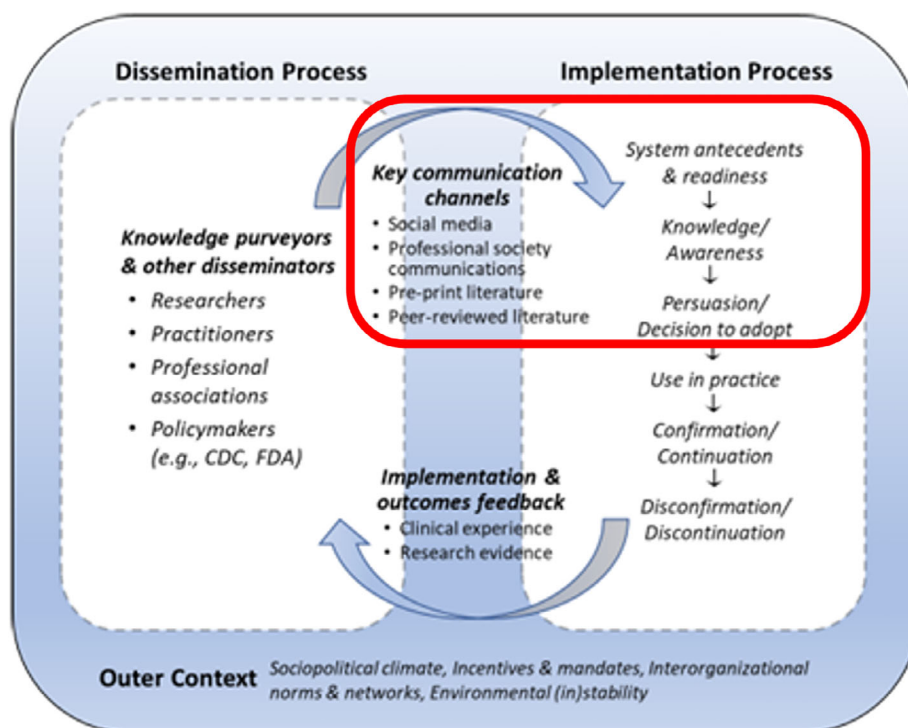


FIGURE 2 Diffusion framework for COVID-related emergency department (ED) innovations. Adapted from Ref. ²³.

TABLE 1 Focus group hospital characteristics and clinician counts by hospital.

Hospital ID	Region	Focus group type: Physicians (MDs) and advanced practice providers (APPs)		Focus group type: Registered nurses (RNs) and respiratory therapists (RTs)		Total
		MDs	APPs	RNs	RTs	
Hospital 1	Midwest	6	0	5	0	11
Hospital 2	West	4	0	2	1	7
Hospital 3 ^a	West	3	1	5	2	11
Hospital 4	Northeast	2	1	1	4	8
Hospital 5	South	1	2	4	0	7
Hospital 6	South	0	3	0	0	3
Hospital 7 ^a	West	0	0	1	0	1
Hospital 8 ^a	West	1	0	0	0	1
All	National	17	7	18	7	49

^aA hospital was used for a pilot interview.

these eight EDs in our final analysis. Four EDs were in the West, two in the South, one in the Midwest, and one in the Northeast. Five hospitals were academic medical centers, two were stand-alone hospitals, three were safety net hospitals (one was both an academic medical center and a safety net hospital), and one operated in a rural area. Each focus group included either MDs/APPs (three to six participants per group), or RNs/RTs (three to six participants per group). A total of 24 ED clinicians (17 MDs and 7 APPs), 18 RNs, and seven RTs participated. Overall, participants averaged 11.2 years of experience and 8.1 years in their ED. Sixty-seven percent were identified as female, 71% were identified as White, and 6% were identified as Hispanic, similar across clinician type.

3.2 | Sources of information

Focus group participants discussed a range of sources of information about innovations in care for COVID-19 during the early part of the pandemic.

The most cited primary sources of information was colleagues local and elsewhere treating patients with COVID-19. Participants reported talking to colleagues who saw patients earlier in the pandemic in locations like Italy and New York, and colleagues who had tried innovations and were seeing positive patient results. This varied from pre-pandemic times, where clinicians would learn from colleagues more broadly.

Another highly cited primary source of information was departmental and institutional leadership sharing information (i.e., guidelines) through various communication channels (i.e., emails and meetings with guidance). Management included medical and nursing leadership within the ED and institutional leadership included Chief Medical Officers and department leaders. Leaders could also encapsulate champions who were actively involved in addressing issues related to COVID-19 and may not be formal managers. This was similar to their pre-pandemic perceptions of this source of information. That said, par-

ticipants' trust of leadership was important in how they interpreted information from this source (discussed below). Among RT, a key secondary source cited was prior education regarding techniques that were not part of regular practice but became relevant in the pandemic, including ventilator splitting.

Notably, no participants mentioned seeking out information directly from specialty society communications or websites, pre-prints, or clinical research articles, instead relying on leadership to filter the information necessary to learn about and implement innovations. In contrast to clinicians, staff noted they deferred to clinician judgment and relied on their leadership to communicate innovations to the group for consideration, similar to pre-pandemic practice.

Some information sources required participants to seek out the information on their own, including podcasts and social media that were secondary sources of information for clinicians. For example, among podcasts, participants noted three that included information on how to treat COVID-19: EM:RAP,³¹ EMCrit,³² and The Internet Book of Critical Care,³³ which is hosted on the EMCrit website. Social media sources were more varied, with clinicians noting that "MedTwitter," or an online community of researchers and practitioners using Twitter (now X) as a medium to share information and network, was a major source of information. Participants mentioned using Facebook groups and Instagram to collect information from other clinicians who were treating COVID-19 patients. While sources were similar to pre-pandemic sources, clinicians reported using these sources more to gain information from colleagues and hear real-time experiences.

3.3 | Challenges to gaining knowledge

Participants reported several major challenges to gaining knowledge about care innovations throughout the course of the pandemic (see Table 2 of themes with exemplar quotes).

One major challenge reported near universally across participants was related to the fractured and constantly changing information

TABLE 2 Factors impacting ability to gain knowledge about innovations.

Theme or subtheme	Description	Key quotations
Challenges		
Fractured and constantly changing information environment	Early in the pandemic, clinicians reported a “barrage” of information from multiple sources, including the news, their institution, their departments, colleagues, and their own patients. This information also changes as new evidence was compiled.	“Well, early on, frankly, it was kind of a mess... I remember one of our ER charge nurses posted a Facebook picture of the character on the TV show with the red yarn on his murder board. And the caption was something to the effect of, like, ‘adapting to new COVID treatment guidelines.’ And I really wanted to take a picture of the three witches from Macbeth, us cooking up those treatment guidelines. Because we were just—it was a mess. There was a huge amount of information coming in. Some of it was significantly contradictory.”—MD in West
Misalignment between the clinician’s underlying knowledge and implemented policies	Clinicians’ perceptions that decisions for medical care were made for non-medical reasons based on provider’ previous medical knowledge.	“And we were so short staffed, I think they implemented a new policy stating that if you were [symptom] free for 12-hours you could come back to work versus initially in COVID, you had COVID you were out for 14-days, it didn’t matter if you had a fever or not. But it was very interesting that when you were so short staffed that you all of a sudden could come to work.”—RN in Midwest
Impact of patient volume over time	Clinicians reported significant levels of burnout and the inability to focus on more than the necessary daily activities they had. When patient volume was low, there was not enough patient volume to test innovations.	“We went through stages early in COVID that we really had no patients in the department, pretty much, which makes it really hard to actually implement things. We had very little volume. Times when we have so much volume, now we have 50 people in the waiting room. We’ve tried to implement a lot of protocols at triage so, like, hey, if a patient comes in and they need these screening tools please swab them for COVID, get it started early. All that thing is great but when there’s 50 people in the waiting room the nurses aren’t able to actually do that. So that volume or our patient really, really affects how thorough our staff usually is on following up on our protocols and treatment plans.”—RN in West
Trying something new versus the fear of it hurting patients	While clinicians wanted to jump in effective treatments early to help patients, they were not sure if any particular innovation would become a standard of care. Clinicians cited many instances of treatments that were ineffective and potentially harmful like Ivermectin.	“There were so many things floating around, ‘Oh, this looks promising,’ ‘Oh, this was tried experimentally and had some success or didn’t have some success,’ and so you didn’t want to be the doctor who was not doing the experimental things because maybe in two months that was going to be the new standard of care. But you also didn’t want to be the person who was trying Ivermectin on a patient and then clearly that was not a great idea.”—MD in Midwest
Difficulty getting timely and accurate information on treatment outcomes	Early in the pandemic, there was not enough time to study innovations and their effectiveness, so clinicians relied on background medical knowledge and anecdotal data from trusted colleagues and reports.	“I would say that I used a lot of my own background knowledge and what I was really focusing on... is this aerosol or droplet, because if it’s one of those we know what to do. And then based on whether our PPE was soiled or whatever the case... I would follow what my institution said. I guess the point is I went off of what my own knowledge was in the past and then whatever they were coming out with.”—RN in Midwest
Facilitators		
Positive experiences of individuals at other locations	Leveraging the experiences of others at locations that experienced the early surges of the pandemic or had positive experiences with treatments in other locations.	“New York City was one place that I remember in particular having a big peak before we ever did. And Italy—reading about other countries’ experiences and lessons learned, that was a big source of information for me.”—MD in West “Also like with the proning, when people started proning, again, a lot of the nurses, we’d talk about it with each other and then we’d talk about it with other nurses at other hospitals, whether it was just our friends that work at other places or different parts of the city. And I think hearing someone starting and getting good results and then us starting it and getting good results kind of helped validate what you were doing was correct.”—RN in Midwest
Strong leadership and cohesive units	Cohesion and camaraderie between colleagues created a better flow of information, and trust of leadership who were the main individuals communicating information about COVID-19 treatment innovations.	“The medical director of our main ER was also the medical quality officer at that time and was sending out pretty much daily clinical operations update. And from those emails, I think they were creating algorithms and processes in collaboration with other hospitals across the country and also communicating with the hospital leadership on the inpatient side, as well. So I think as they were learning about it and learning from—as the pandemic was spreading and we were anticipating either more or less ER visits or spikes in COVID, we were constantly updating our algorithms about how we would see patients, if we needed to see them outside, if we needed mobile care spaces, telemedicine.”—MD in South

(Continues)

TABLE 2 (Continued)

Theme or subtheme	Description	Key quotations
Moderators		
Underlying levels of trust in the leadership	Nursing staff members reported less trust in medical leadership or champions than physicians. There was discussion about negotiating and discussing treatments and protocols through the union rather than through leadership.	"Anything that came from admin I trusted because I'm sure they have a very intensive vetting process or like they have to have people come together to an agreement, so that okay, if you guys agree with it, then sure."—MD in West "What was interesting is we brought up our union, or that we have a very strong union, and they would come up with a lot. We would hear a lot of stuff from them, where they would be having—they would be very vocal with things they thought should be done and shouldn't be done."—RN in West
Taking innovations from one site and apply them directly to another based on their own experience	These individuals were also able to see different practice structures in place and different protocols, particularly related to PPE use, that changed their perception about the voracity of the information that was shared from other sites of care.	"I think we all heard from friends and colleagues who were in emergency medicine in different places, and so chatting with them as well, like what they did in their areas was really helpful. But that also created a lot of discord too because everyone had different PPE requirements, everyone had different de-isolation requirements. Every place around was different. Even within [our hospital], we had different de-isolation protocols and different protocols for how we all operated, which made it challenging because there was always the question of "Are they doing it better? Are we doing it wrong? Or maybe we're doing it better and they're doing it wrong?" And so that brought up a lot of concerns in that respect."—ED in West

environment, making it difficult to know how to appropriately treat patients and effectively manage the limited supplies of personal protective equipment (PPE). Participants reported a "barrage" of information from countless sources that felt nearly ubiquitous, including from the news, their institution, their departments, colleagues, and even their own patients. Early in the pandemic, there was much less peer-reviewed data and information and a lot more hearsay on effective treatments.

Second, participants questioned guidelines related to PPE early in the pandemic. They were aware of different, misaligned policies between clinical sites and further, some policies misaligned with participant's underlying knowledge related to PPE, how often PPE should be changed, and whether they were still effective while providing care. Among some participants, there was a perception that clinician safety was considered secondary by administrators compared to keeping facilities open in the context of low levels of PPE.

In addition, participants reported an overwhelming volume of patients that left little to no time to seek information about new treatment options or innovations during the first COVID-19 surge. Participants reported significant levels of burnout and the inability to focus on more than the necessary daily activities they had.

Participants also reported hesitancy to try new practices due to the fear of hurting patients. While clinicians wanted to implement effective treatments early to help patients, they were not always sure if any innovation would become standard of care. Participants cited many instances of treatments that were ineffective and potentially harmful, such as prescribing ivermectin.

Finally, in line with a fear of trying something new was the difficulty getting timely and accurate information on treatment outcomes. Early in the pandemic, there was not enough time to study innovations and their effectiveness, so participants relied on anecdotal data from trusted colleagues and reports. In contrast, participants did not rely on anecdotal data from patients. Patient-driven

treatments like ivermectin were requested but not provided by the participants.

3.4 | Facilitators to gaining knowledge

Participants reported some facilitators to learning about and using innovations in practice (see Table 2). Facilities leveraged the experiences of others at locations during early surges of the pandemic and used treatments they adopted. For example, participants on the west coast used insights from those on the east coast, and some east coast sites relied on colleagues from Italy to adopt treatment they heard were successful.

Participants noted that strong leadership and cohesive units facilitated innovation adoption by supplying information about innovation best practices. Cohesion and camaraderie between colleagues and trust of leadership who were the main individuals vetting and communicating information about COVID-19 treatment innovations created a better flow of information within EDs that supported innovation.

Participants also described several factors that modified their trust in information (see Table 2). While trust in leadership was reportedly high among most participants, several participants had lower underlying levels of trust in leadership. At one site in particular, nursing staff members reported less trust in medical leadership than physicians, particularly around staff safety. For example, there was discussion about negotiating and discussing protocols through the union rather than through leadership to ensure clinicians would be safe and have access to the right PPE to safely treat patients, while clinicians deferred to leadership at the same site.

In addition, while some clinicians were able to hear secondhand about innovations from colleagues at other sites, some participants worked across sites and were able to take innovations from one site and apply them directly to another based on their own experience.

These individuals were also able to see different processes in place and different protocols, particularly related to PPE use, that changed their perception about the veracity of the information that was shared from other sites of care.

3.5 | Trust in information sources

Among sources of information for gaining knowledge about innovations in COVID-19 treatment, participants discussed their level of trust in sources and what factors impacted their level of trust among common communication channels. Overall, participants sought out trusted sources and identified factors that impacted their assessments of trust.

The least trusted source across participants was local news. Participants mentioned several factors that impacted this assessment, including a perceived poor discussion of medication information, bias from local news coverage based on political alignment of the news source, and a misalignment of information shared from local news sources with previous medical knowledge.

However, participants who received patients earlier in the pandemic noted that information was so scarce early in the pandemic that local news was one of the only sources of information available. They viewed the information with skepticism but did attend to this source when few other sources of information were available.

In contrast, the most trusted sources of information were colleagues, mentors or administrative leadership (ie, executive suite) within the organization, and ED leadership. Among colleagues, mentors, and administrative leadership, participants reported trusting these sources because they were determined to be trustworthy before the pandemic. Clinicians noted that they looked to ED leadership and hospital leadership to determine acceptable clinical care practices. Staff also noted they followed the lead and instruction of clinicians and were more consistent in their practice. In addition, participants noted that information from these sources aligned with their medical understanding.

Participants also noted sources of information in which trust was mixed or contingent. Among clinicians who expressed the greatest trust in leadership, they noted that because leadership was trusted, they could filter and apply guidelines that were relevant to their organizations, in contrast to staff who expressed less trust in hospital leadership who also noted that local guidelines developed by leadership were often conflicting and hard to follow. In addition to differences and changes over time in federal/state guidelines, participants reported similarly mixed feelings about local treatment guidelines, especially among participants working across institutions who could see how different organizations created different guidelines for the same practices. This was particularly true regarding guidance on PPE use early in the pandemic. Participants noted that guidelines seemed to be dictated by supply of PPE and the ability of clinicians to work, rather than on the health and safety of clinicians and patients.

Trust in information from other clinicians also changed over the course of the pandemic. Early on, participants experienced a high-information, low-certainty environment, which meant they had to filter

information based on their current understanding of the pandemic and respiratory diseases. As the pandemic progressed and more standardized treatments and care protocols became available, participants reported seeking information less frequently and were more apprehensive to try new innovations until there was an evidence base showing its effectiveness (ie, similar to a pre-pandemic information environment). Here again, the level of trust and consensus around the source of the information moderated the level of trust with the innovation; information from trusted clinicians in well-known institutions were considered with more deference than those from less well-known institutions.

4 | LIMITATIONS

Our study has several limitations. First, we recruited a purposive set of EDs and markets. The majority of EDs were larger EDs associated with major medical centers. While these EDs were not nationally representative, they do represent a range of experiences that widely apply to many other EDs. We also assessed this information later in the pandemic, so there may be some recall bias. When possible, we noted specific time frames and seminal events to anchor responses. Finally, there may be some social desirability bias. During focus groups, we stressed that we were interested in sources of information and how clinicians used and access those sources of information and were not judging the information they received. Finally, while the sample size was pre-defined, we did achieve saturation of themes related to information acquisition and dissemination.

5 | DISCUSSION

Overall, we found that ED clinicians and staff consulted many sources of information, including colleagues, management, podcasts, and experts with experience in the early spread of the COVID-19 virus, with none reporting to use government agency or professional group sources. Participants reported the highest trust in their colleagues and leadership, citing their competence and trustworthiness as experts and colleagues, with the least trust in news sources. Participants cited low trust when encountering information that conflicted with their existing medical knowledge. Clinicians described leadership and management as being key sources of information, while staff noted some reluctance to trust them.

When reflecting on the NIH response to the pandemic, Collins et al.³⁴ included the following lessons learned: “ensure immediate public release of research results, build trust through ongoing support of community-engaged networks that are based on partnerships between community organizations and scientists,...[and] develop and deploy a creative and rapid-fire communications network that...uses all forms of media to provide accessible and accurate information.” Our participants frequently cited anecdotal evidence from other clinicians, institutional practice, and word-of-mouth as their primary sources of information about innovations, all built around the existing networks

of information clinicians had before the pandemic. Peer-reviewed evidence and professional society communications were not highlighted as important sources of information among our participants.

While information likely trickled down from peer-reviewed articles and professional society communications to individual clinicians, this trickling effect may not occur evenly. In addition, participants noted that there was an information “war zone” during COVID,³⁵ making it difficult to identify useful information.³⁶ Sources of information were distributed, including through newer mediums like podcasts.^{37,38} Our results underscore the importance of leveraging existing communication networks and supporting dissemination by getting information into existing, trusted networks. If stakeholders such as the National Institutes Health wish to build “creative and rapid-fire” networks in preparation for the next pandemic, construction should begin now and leverage existing trusted networks for rapid dissemination in low information, high acuity contexts.

Our findings underscore the importance of utilizing existing, trusted networks and building communication strategies around those networks to provide accurate and accessible information for clinicians.³⁴ Future research should seek to identify key disseminators across channels with credibility among the clinical community and identify ways to build their activity into a coordinated dissemination strategy to identify and elevate promising innovations while also identifying and addressing misinformation.

AUTHOR CONTRIBUTIONS

Study concept and design: Shira H. Fischer, Peter Mendel, and Carl T. Berdahl. *Acquisition of data:* Carl T. Berdahl, Shira H. Fischer, Catherine C. Cohen, Nabeel Qureshi, and Shreya S. Huilgol. *Analysis and/or interpretation of data:* Nabeel Qureshi, Shreya S. Huilgol, Carl T. Berdahl, Shira H. Fischer, and Catherine C. Cohen. *Preparation of manuscript:* Nabeel Qureshi and Shreya S. Huilgol. *Supervision:* Shira H. Fischer, Carl T. Berdahl, and Peter Mendel. All authors approved the final manuscript.

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CONFLICT OF INTEREST STATEMENT

The authors declare no conflicts of interest.

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DATA AVAILABILITY STATEMENT

Data are available from the corresponding author on reasonable request.

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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