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# Uncomfortable yet Necessary: The Impact of PPE on Communication in Emergency Medicine

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## Citation Details

Aengst, Jennifer; Walker-Stevenson, Grace A.; Harrod, Tabria; Ivankovic, Jonathan; Neilson, Jacob; and Guise, Jeanne-Marie, "Uncomfortable yet Necessary: The Impact of PPE on Communication in Emergency Medicine" (2022). *Anthropology Faculty Publications and Presentations*. 263.

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## **Uncomfortable yet Necessary: The Impact of PPE on Communication in Emergency Medicine**

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## ABSTRACT

**Background:** The efficacy of pre-hospital emergency services is heavily dependent on the effective communication of care providers. This effective communication occurs between providers as part of a team, but also among providers interacting with family members and patients. The COVID-19 pandemic introduced a number of communication challenges to emergency care, which are primarily linked to the increased use of PPE.

**Methods:** We sought to analyze the impacts of the Covid-19 pandemic on Emergency Medical Service (EMS) workers and pre-hospital care delivery. We conducted focus groups and one-on-one interviews with fire-EMS first responders between Sept 2021 and 2022. Interviews included questions about job related stress, EMS skills, work experiences and changes during Covid-19. Interviews were recorded, independently dual coded, and analyzed for themes.

**Results:** 223 first responders participated in 40 focus groups and 40 lead paramedics participated in individual interviews. We found that additional use of personal protective-equipment (PPE) was reported to have significantly impaired efficiency and perceptions of quality of care--among EMS team members and also between EMS workers and patients. EMS personnel also experienced on scene hostility on arrival (from both families and other agencies). Use of extensive PPE muffles voices, obscures facial expressions, and can cause team members to have difficulty recognizing and communicating with one another and can be a barrier to showing empathy and connecting with patients. Creative solutions such as putting a hand on someone's shoulder, wearing name tags on suits, and explaining rationale for perceived delays were mentioned as methods to transcend these barriers. The appearance of providers in heavy PPE can be unsettling and create barriers to human connection, particularly for pediatric patients.

**Conclusion:** Human connection is an important element of health care delivery and healing. These findings shed light on new skills that are needed to initiate and maintain human connection in these times of PPE use, especially full body PPE. Awareness of the communication and empathy barriers posed by PPE is the first step to improving provider-patient interactions in pre-hospital EMS. Additionally, "communication-friendly" adaptations of PPE equipment may be an important area for future research and development in manufacturing and the healthcare industry.

## INTRODUCTION

Errors in medical care are often due to poor communication, which can lead to adverse safety events that impact patient care.<sup>[4] [11] [13] [23]</sup> This is particularly pronounced in emergency medicine, as communication is occurring in a frenetic and rapidly changing environment. There is a range of communication challenges unique to emergency medical services, such as having to communicate rapidly, delegate, and instigate medical care with team members in high stress scenarios. Fire-based Emergency Medical Technicians (EMTs) are also in high stress communication scenarios and experience time pressure, yet they must wear additional safety

gear and Personal Protective Equipment (PPE). Furthermore, they respond to both fire and medical scenarios in environments that are often less conducive to effective communication and with fewer medical resources at hand.<sup>[2][14]</sup> Unlike the controlled environment of the hospital, fire-EMTs often work in settings that are public, crowded, unhygienic, and loud.

There are unique factors that shape communication among fire-EMTs for medical care. First, they communicate simultaneously with three groups: their co-workers, the transport agency, and families and witnesses. For example, when a pediatric emergency happens outside of the hospital, fire-EMTs must quickly elicit reliable information from a frightened parent.<sup>[11][14]</sup> Second, communication with the transport agency can be challenged by different logistical and cultural approaches.<sup>[17]</sup> For co-workers, their specific role may change during a call. Furthermore, they often work with new colleagues, including volunteers.

Since March 2020, the COVID-19 pandemic introduced a number of communication challenges to emergency care, which are primarily linked to the increased use of PPE.<sup>[12]</sup> While our study did not anticipate this pandemic, we gained important insights on how communication in out of hospital emergency medicine scenarios was impacted by PPE. As fire-EMTs adapted to the pandemic, they found creative strategies to communicate while wearing PPE. Yet, at the same time, increased use of PPE during the COVID-19 pandemic contributed to political tension and protocol changes, both of which additionally challenged communication between fire crew, transport agencies, and the public. As a result, communication in many scenarios became strained, uncertain, and tense, all of which can impact quality of care. The present study aims to describe and understand the ways that communication among emergency medical service providers were impacted by the Covid-19 pandemic.

## METHODS

This qualitative study was part of a larger project funded by the US National Heart, Lung, and Blood Institute (R01HL141429) that examines Adverse Safety Events (ASE) that occur in pediatric out of hospital cardiac arrests. Our research was interrupted by the Covid-19 pandemic, which gave us the unique opportunity to assess the impact of Covid-19 on emergency medical services and compare pre and post attitudes and practices. Prior to the pandemic, the qualitative portion of our research was focused on better understanding cognitive load, stress, decision-making, and teamwork among fire-based EMS providers through focus groups and in-depth individual interviews. We explored a combination of these themes and new themes related to Covid-19. By using a grounded theory approach, we looked for patterns that emerged from the data, following guidelines from Bernard et al.<sup>[3]</sup>

We conducted 40 one-on-one interviews with the resuscitation team leader—known as the Person in Charge (PIC)—and 36 focus groups with 223 Fire-EMS crew members in the Portland metro region. We surveyed regions including Portland, Hillsboro, Clackamas, Banks, Gresham, and Tualatin Oregon. These interviews and focus groups were conducted between September 2020 and August 2021, which allowed us to track changing perspectives on PPE during the

COVID-19 pandemic. Informed consent was obtained prior to the onset of the interviews and could be revoked at any time during the interview process. Interviews included questions about job related stress, EMS skills, work experiences, decision-making, and changes during COVID-19.

During data analysis, we coded interview transcripts, identified potential analytic categories, and compared how these categories correlate with one another.<sup>[3]</sup> We also modeled our criteria after the COREQ list of 32 criteria for qualitative research in healthcare.<sup>[27]</sup> Through interdisciplinary efforts, we developed a qualitative codebook which guided our analysis of focus groups and PIC interview transcripts. Interview transcripts were then reviewed and coded by two members of the research team using NVivo 11. Researchers jointly coded 15% of the interviews, to ensure agreement. The data we present are selected based on recurrent themes throughout the data and their relative importance to the relationship between PPE and communication.

## RESULTS

PPE became a more significant feature of emergency medical care during the COVID-19 pandemic. While fire-EMTs extensively use masks and protective equipment in fire scenarios, it was an adjustment for them to regularly wear full-body PPE suits, P100 and N95 masks, and protective glasses for all calls during the pandemic. Wearing PPE impacted four key areas in emergency medicine: a) efficiency in responding to the call; b) detection of patient symptoms; c) the ability to effectively communicate information with the team, transport agencies, and facility and physician teams and d) the ability to communicate with patients. We present the following findings alongside quotes derived from participant transcripts.

Respondents characterized PPE as personally uncomfortable yet medically necessary. Their overwhelming response to PPE was frustration that it impacted efficiency.

*“It slows us down. We’ve got to get a gown on. We’ve got to get a mask on. Doing CPR work, a couple of times, we were in a gown, an N95, a face shield, and glasses. I mean, you’re dripping all over this patient.”*

Fire-EMTs felt that their own efficiency and that of their team was hampered by the increased time it took to put on PPE.

*“It’s the frustration. It’s...we’re all standing outside the rig, trying to get these suits on, and the dad’s freaking out because his kid’s in there, or his grandma or whoever. And this minute, you’re trying to get all your stuff on. Minutes count.”*

Efficiency also impacted the detection of patient symptoms. The rush to put on extra PPE was reported to delay patient care by 2-3 minutes, which in turn had a determinantal impact on patient survival.<sup>[6][28]</sup>

*“This slows everything down a little bit to get all that gear on, and you can't manipulate things as well with double gloves, so it's a slower process. Anything that requires client touch... Yeah, just those safety protocols that were meant to put on as... Yeah, it slows things down a little bit.”*

Touch, vision, and hearing were all compromised by PPE. As a result, it was both harder for fire-EMTs to detect patient symptoms and communicate with their team and the transport agency. Even though fire-EMTs regularly wore gloves before the pandemic, the switch to double gloves made certain practices more difficult (e.g., mixing medicines, opening vials, using iPad touch screens). There was variation in this, as not all agencies wore double-gloves. As this firefighter explained, even just wearing double gloves could make palpation harder.

*“Well, your vision and your hearing because your touch is going to be... You're double-gloved, so you're not getting the tactile feedback that you would normally get. We're wearing a mask and you're in a fishbowl a little bit, and so your field of view is different and affected. Your information inputs are just off just a little bit, so getting used to that.”*

Vision was also impacted by wearing all the forms of PPE. Most fire-EMTs noted that their eye protection fogged up (e.g., they described needing windshield wipers to see), and some had their N95 masks leak. The fogging up of masks made it difficult to read drug dosage amounts, see the text on monitors, read facial expressions, and read lips. In a few cases, fire-EMTs were not able to recognize their co-workers beneath their PPE.

*“I thought the hardest thing to deal with was everybody being in PPE to where we couldn't see each other...I ran a code where I didn't know who anybody was. I think since then, a lot of people have written their names on some of their PPE, but I was grabbing people by the shoulder so that they would know, “You're on compressions.” It was just really stressful for me. I didn't know who was a paramedic, who was a basic because I couldn't see anybody. I literally was like, “All the medics, raise your hand.””*

Hearing was significantly impacted by PPE. Fire-EMTs had a challenging time hearing each other clearly, when speaking through the mask. Cardiac scenarios were noisy and chaotic, which exacerbated the difficulty firefighters had with hearing each other. When directives and status reports were muffled, they had to repeat their commands, which slowed down their responses. This muffling was even more evident in radio communication to the hospitals, dispatch, and to each other.

*“You'll be listening to the radio. AMR is like, “what's the status of whatever hospital. “I can't understand a word you're saying through that face piece.””*

Whether it was vision, touch, or hearing, there were times that the lack of communication got so bad that fire-EMTs would rip off their PPE in moments of stress to communicate, particularly in

pediatric calls. One participant described the frustration of these types of scenarios:

*“Now I need to put this big mask on, it's fogging my stuff up. Our paramedics were like, “I can't even read the drug and... I just want to rip this off and do my job.””*

Fire-EMTs also reported using innovative techniques to circumvent the sensory deficits presented by the additional PPE. This included writing names on their full-body PPE suits, shouting to one another, using white-boards, and calling patients prior to scene arrival.

Building rapport is a key aspect of patient communication in medicine.<sup>[1]</sup> Fire-EMTs found it hard to connect with patients while wearing PPE, as many of the ways they would normally build rapport—eye contact, smiles, shaking hands, a gentle touch—were unavailable to them. Fire-EMTs described scenes where young children were terrified of the EMS crew, who walked in with their faces obscured and wearing so much gear.

*“The one thing that has been dramatic is wearing the masks and just having that relationship with kids, just unmasked versus masked, because they are scary, you know? And there's no way around that. Even I've had that with 20-year olds who are, maybe they're drunk or something, but they freak out. I mean, they are scared of, you know, Darth Vader walking into their apartment.”*

For EMS workers in particular, social connection is the foundation for having an easy exchange of trust and communication between patients, family, and providers.<sup>[7]</sup> Firefighters noted that the PPE made it harder to express compassion and empathy.

EMS workers reported that increased PPE use during the COVID-19 pandemic had both political and policy implications. Specifically, they reported that political tensions were evident in their interaction with patients, families, and co-workers. These political tensions further complicated issues of communication among team members, agencies, and with the public. Providers told stories of encountering hostile communication from patients and families, where they were spat on, yelled at, or otherwise aggressed for wearing PPE. As one firefighter explained:

*“People say, “No, you don't need to wear your mask. We're not sick with COVID.” They don't necessarily understand that while those situations... Those things in that situation may be true, they don't necessarily see the issue for us. We have to go back to our families. We have to treat the next patient. We're going to go back to the station and potentially be exposed to other firefighters.”*

For many of the fire-EMTs, one of the most challenging aspects of working in emergency medicine during COVID-19 was balancing the risk of exposure with the desire to help patients, through responding efficiently and with clear communication.

*“So it's you're in this toss up where it's like, “I'm here to help people and I'm here to do things and I want to give them the best care that I can. But also I can't bring this home to*



*my grandmother or my grandfather or my parents." At one point, it's just a weird line between, "I want to help but I also don't want to hurt my family from trying to help someone." If I get hurt on the job, that's one thing, cool. But it's totally different if I bring something to my older parents."*

As the pandemic progressed, fire-EMTs became accustomed to the regular use of PPE in emergency scenarios, and many came to appreciate these changes in protocol. Masks had become so normalized that most fire-EMTs expected to continue wearing them on all calls. They also stated a desire to wear masks to avoid getting sick during flu season. Fire-EMTs appreciated the increased hygiene and sanitation, noting that it led to a sense of safety against their occupational exposures. Yet, there was also some resentment expressed about the mandatory practices, with many firefighters stating a preference to determine mask wearing on a case-by-case basis.

## DISCUSSION

**Statement of principal findings:** Our research found that COVID-19 presented unique challenges to communication, due to increased PPE use, specifically in these five areas: 1) delays in efficiency; 2) communication with team members; 3) communication with families and patients; 4) tactile feedback; and 5) hostility.

### Strengths and Limitations

One of the strengths of our study is that our data captured fire EMS perspectives on communication pre and post COVID-19. While we did not anticipate the pandemic, we were able to learn how attitudes towards PPE protocols—specifically masking—changed over time. Yet, the pandemic was also the source of a study limitation. Due to the changing nature of the pandemic, there is a gap in our data collection. There were months when we were unable to conduct research, as the fire EMS crews were busy dealing with patients in uncertain emergency scenarios. In fact, we had to surmount our own communication challenges, as we needed to conduct focus groups and interviews in outdoor ventilated settings with notable physical distance between the participants.

A second strength of our study is that our data is representative of different views amongst fire EMS in the Portland metro area, as stations had different resources and experiences with protocols during the pandemic. Yet a limitation of our study is that we were not able to conduct interviews and focus groups with transport paramedics, which would have offered additional insight into communication challenges.

Another strength of our study is that our use of multiple qualitative methods (focus groups and interviews) gave us a fuller understanding of how communication is impacted by hierarchy and authority in fire EMS. Through observing group dynamics in the focus groups, we saw how frequently firefighters referenced the importance of following the 'chain of command' and the need to prioritize team dynamics to avoid conflict. Through individual interviews with team

leaders, we gained additional insight into the struggles with cognitive load and communication uniquely faced by those in leadership positions.

Our interdisciplinary team is comprised of both social scientists and clinical researchers with experience in emergency and out of hospital medicine. We have drawn upon the expertise of our team members, who have contributed insight into specific clinical practices as well as themes of communication and decision-making.

### **Interpretation within the context of the wider literature**

Medical literature notes the importance of communication in healthcare, specifically for improving patient-provider interaction and resulting in improved health outcomes.<sup>[1][2][7]</sup> Yet, there is less written about the unique communication factors that fire-EMTs face in out of hospital scenarios.<sup>[20]</sup> Furthermore, communication failures in emergency medicine settings can lead to medical errors.<sup>[5][7][13][22]</sup> Fire-EMTs rely heavily on communication with patients, family members, and the transport agency to inform their decisions. Yet, there is little written about the communication dynamics between pre-hospital EMS workers and how they are impacted by changes to PPE protocols.

Our research contributes to the recent literature on COVID-19. Much of the COVID-19 literature tends to focus on 'lessons learned' and the need for more PPE; there is less attention paid to the ways that increased PPE impacted communication. Communication among fire EMTs was challenged during the COVID-19 pandemic by the extensive use of PPE, which included full body PPE suits, masking, and eye protection. The appearance of providers in full-body suits also seemed to startle the public. This could lead to impaired communication with families and uncertainty surrounding care decisions.

### **Implications for policy, practice and research**

**Policy:** Our findings suggest that necessary Covid-19 policy decisions impacted the efficacy of Fire-EMT response. Masking, which became politicized in the U.S., also resulted in tension among Fire-EMTs. It was unclear if future policy would mandate masks for all calls, some calls, or be left to be determined on a case-by-case basis. Poor communication of protocol changes throughout during the pandemic led some respondents to express doubt in future leadership. Political tensions among fire-EMTs, patients, and families complicated issues of trust and communication in the field. For example, providers encountered hostile communication from patients and families, where they were spat on, yelled at, or otherwise aggressed for wearing PPE. This indicates that there may be a need for policy to address on-scene hostility.

**Practice:** Respondents admitted that they did not always follow PPE protocols. Non-compliance typically occurred in pediatric emergencies and in scenarios with muffled radio communication. Firefighters reported ripping off their masks when their ability to communicate to team members or read medication doses was inhibited. Yet, at the same time, firefighters also found innovative

ways to compensate for these communication challenges. For example, they wrote their names on their full-body PPE suits and used hand-gestures as additional methods of communication.

**Research:** There is a clear need for additional research on the impacts of PPE on pre-hospital emergency medicine and interpersonal communication. We believe that this research should aim to find adaptable solutions that both protect the workforce from viral spread and allow for ease of use in high-pressure communication scenarios. Clear masks that enable lip-reading, anti-fogging eyewear, and full-body PPE suits with built-in radio communication are all potential areas for PPE equipment innovation. While there may not be a one-size-fits-all solution to PPE communication challenges, we feel that the leaders should explore novel approaches to PPE through soliciting feedback from providers. Further research into the communication of prehospital medical professionals and as well as the impact that the pandemic had on their workforce is also needed.

## CONCLUSION

The onset of the Covid-19 pandemic brought unique challenges to pre-hospital EMS providers. Our findings demonstrate that changes to care protocols and PPE requirements impacted the ability of Fire-EMTs to work as teams and communicate with patients efficiently and effectively. Simultaneously, our findings also demonstrate a fear of spreading Covid-19 among fire crews and a desire for increased sanitation practices. By analyzing lessons learned from this pandemic, we argue that there is a clear need to address the communication challenges that arise from increased PPE. For leaders in emergency medicine, this pandemic is an opportunity to develop new policies that specifically address the concerns of their workforce. For example, improving communication across fire and transport agencies and integrating anonymous feedback into evaluation could result in meaningful improvements and boost morale.

What remains a larger challenge for fire-EMTs is understanding how to work efficiently and communicate clearly during the Covid-19 pandemic and future pandemics. Future research could explore ways to incorporate PPE effectively into out of hospital emergency care. This pandemic has renewed attention to the importance of communication in emergency response. Not only is communication critical to effective teamwork but it can also be significantly impacted by a single protocol change.

Ethics and other permissions: All research activities have been approved and overseen by Oregon Health and Science University's Institutional Review Board, Study ID: STUDY00018494. Contact: [irb@ohsu.edu](mailto:irb@ohsu.edu).

Funding: This work was funded by the National Institutes of Health, National Heart, Lung, and Blood Institute. 5R01HL141429-04.

Conflict of interests: The authors declare no conflicts of interests.

Acknowledgements: We would like to thank our research partners at Portland Fire & Rescue, Tualatin Valley Fire & Rescue, Banks Fire Department, Gresham Fire Department, Hillsboro Fire Department, and Clackamas Fire Department.

Data Availability Statement: Our original data are qualitative in nature. In order to protect the anonymity of our research participants, full transcripts have not been made available to the general public.

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Safety1 this study was funded by a generous grant from the National Patient Safety Foundation. *Communication Monographs*, 72(4), 390–413.

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