



## *Technical Brief Disposition of Comments Report*

**Research Review Title:** *Infection Prevention and Control for the Emergency Medical Services and 911 Workforce*

Draft report available for public comment from March 25, 2022, to April 22, 2022.

**Citation:** Jenkins JL, Hsu EB, Russell A, Zhang A, Wilson LM, Bass EB. Infection Prevention and Control for the Emergency Medical Services and 911 Workforce. Technical Brief No. 42. (Prepared by the Johns Hopkins University Evidence-based Practice Center under Contract No. 75Q80120D00003.) AHRQ Publication No. 22(23)-EHC039. Rockville, MD: Agency for Healthcare Research and Quality; November 2022.

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### **Comments to Draft Report**

The Effective Health Care (EHC) Program encourages the public to participate in the development of its research projects. Each draft report is posted to the EHC Program website or AHRQ website for public comment for a 3- to 4-week period. Comments can be submitted via the website, mail, or email. At the conclusion of the public comment period, authors use the commentators' comments to revise the draft report.

Comments on draft reports and the authors' responses to the comments are posted for public viewing on the website approximately 3 months after the final report is published. Comments are not edited for spelling, grammar, or other content errors. Each comment is listed with the name and affiliation of the commentator if this information is provided. Commentators are not required to provide their names or affiliations in order to submit suggestions or comments.

This document includes the responses by the authors of the report to comments that were submitted for this draft report. The responses to comments in this disposition report are those of the authors, who are responsible for its contents, and do not necessarily represent the views of the Agency for Healthcare Research and Quality.



## Summary of Peer Reviewer Comments and Author Response

This research review underwent peer review before the draft report was posted for public comment on the EHC website. We received comments from two technical experts and four peer reviewers. Below is a summary of the more substantive edits we made based on the peer review comments.

- We revised the wording of our Guiding Questions to reflect that we were interested in occupationally acquired infectious diseases and related exposures.
- We provided additional details or clarifications of individual studies.
- We changed N95 masks to N95 respirators.
- We included additional articles from the gray-literature search.
- We added additional limitations to conducting research among the emergency medical services/911 workforce, such as heterogeneity.
- We clarified that we did not include firefighters or police whose roles were not primarily involved in medical care.

## Public Comments and Author Response

Commentator & Affiliation	Section	Comment	Response
<b>NAEMSO</b>	ES-1 Executive Summary	ES-1 Executive Summary: In the second sentence Background and Purpose, I disagree saying the 911 workers have contact with the public and multiple patients per day. That statement is probably truer for EMS and Firefighters (FF) who respond to EMS calls.	We have edited the wording in the first paragraph of the background section to indicate that public-facing EMS clinicians have contact with multiple patients per day.
<b>NAEMSO</b>	General	Throughout the document there is 911 workers, EMS/911 and EMS workforce we believe that one term should be used throughout the document.	We revised the report to refer to EMS and 911 workers when referring to the entire workforce. We now refer to EMS clinicians when referring to only those responsible for direct patient care.
<b>NAEMSO</b>	General	We also believe that combining EMS/911 does not fit this document. There are two separated roles and function within emergency services and different levels of threat for infection.	This was the requested research charge from AHRQ and accepted by the key informants.
<b>NAEMSO</b>	General	I agree with the statement that telecommunicators are often in a communal work environment with shared eating places	Thank you.
<b>NAEMSO</b>	Page 1	while 911 telecommunicators have varying degrees of contact with EMS responders. I am not sure that is true. Most telecommunicators do not talk in person with EMS responders, this is done mostly thru communication systems such as radios.	A study of the 911 telecommunicators and the amount of direct face-to-face contact with EMS personnel and firefighters was not part of the research goal.
<b>NAEMSO</b>	Page 5 table 1	Page 5 Table 1: The statement says FF personnel roles not primarily related to medical care. Major emergency urban and rural emergency services systems include firefighters as care givers and respond with EMS to all EMS calls	Yes, this statement refers to firefighters who are not primarily providing patient care.
<b>NAEMSO</b>	Page 8 under Modifications	Page 8 under Modifications: Agree with the change to "training and education"	Thank you for your comment.
<b>NAEMSO</b>	Page 9 under Scope	Page 9 under Scope: Disagree with the statement that says 911 whose primary role is delivery or support of patient care. That is more a statement for an FF who responds to EMS calls.	To address the charge we were given by AHRQ, we indicate in the text that "we decided to keep the brief focused on studies of EMS and 911 workers whose primary role is delivery or support of medical care."
<b>NAEMSO</b>	Page 16	Page 16, NREMT is National Registry of Emergency Medical Technicians not MEDICINE	We have changed this typo.

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Commentator & Affiliation	Section	Comment	Response
<b>NASEMSO</b>	Page 22 under Standard Precautions	Page 22 under Standard Precautions: Are you differentiating between licensed vs. certified EMS personnel. If not you may want to change that to read certified/licensed EMS personnel	We are not differentiating between licensed and certified personnel and have changed this typo in the document.
<b>NASEMSO</b>	Page 24 under Vaccine Policies	Page 24 under Vaccine Policies: use of the term "emergency medical technicians" is that for all EMS personnel or specific to one level of certification/licensure. May want to clarify that	We have changed the wording from emergency medical technician to EMS clinician where appropriate in the document. In certain circumstances, data reflected only refers to certain levels of education such as EMT-B or EMT-P. The verbiage in the brief reflects this.
<b>NASEMSO</b>	Page 32 Under strengths and Limitations	Page 32 Under Strengths and Limitations: Should define if the study included private, public, volunteer or paid on call as well as was this just prehospital calls or did it include interfacility transports too.	This was an all-inclusive research review and included all pre-hospital and interfacility transport data available.
<b>NASEMSO</b>	Page 32 under Implications for Clinical Practice	Page 32 under Implications for Clinical Practice...: The sentence that states the EMS/911 workforce is at higher risk for exposure than other first responders. Not sure you can say that without the data to back that statement up and 911 does not have the same threat level as EMS.	Please refer to the results and discussion section regarding the increased rate of COVID in EMS clinicians vs telecommunicators. We have changed this verbiage to make the data and its meaning more clear.
<b>NASEMSO</b>	General	The use of 911 workforce seems to be a general term to discuss all of public safety. That is not a normal use of the terminology for those who actually work in public safety. Clarification and appropriate terminology use is important	The term EMS/911 workforce was used in the task order from AHRQ and NHTSA. It was vetted through our key informants. We have revised the text to refer to the EMS and 911 workforce to encompass EMS clinicians and telecommunicators.
<b>Emily J. Haas</b>	Intro/General	In general, the report was cohesive and easy to follow except for the way EMS/911 was sometimes referenced. I know that this term was defined in the introduction but I don't quite see how 911 telecommunicators are at the same or increased risk of exposure in comparison to EMS. Sometimes EMS is referenced alone and other times EMS/911 is used and I can't always determine why this decision was made. So I think a general run through to mitigate the terms throughout the document and a more thorough explanation/justification for grouping these two job roles together may be needed. Other than that I appreciated the conclusions and important reference to the need for safety culture research and acknowledgements in this topic.	Yes, the authors and key informants agree that the risk for exposure to infectious disease is different for telecommunicators. However, the charge from the agency which requested this report was to include them in the evidence review.

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Alexander Isakov	Executive Summary	When the authors state that “Research into the field effectiveness of N95 respirator and surgical face mask personal protective equipment (PPE) is limited, especially in the arena of airborne diseases” do they mean in the emergency medical services work environment? If so, that should be stated explicitly.	The statement refers to research in the field environment which is reflected in the sentence.
Alexander Isakov	Executive Summary	When the authors state that “Research into EMS/911 infectious disease issues would be strengthened by improved data uniformity, use of appropriate comparison groups, and comparable outcome measures”, perhaps this finding could be strengthened by stating that a national research agenda and uniform research methodology should be promulgated to aid investigators conducting this research.	We agree that a national research agenda for EMS which includes the above would be helpful and have changed this statement to reflect this suggestion.
Alexander Isakov	Introduction	Where the authors state that the “EMS/911 workforce also is at risk for airborne exposure to infectious diseases, such as tuberculosis, influenza, and the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2)”, they should probably more accurately say risk for droplet and airborne exposure.	This statement is from a reference which did not mention droplets.
Alexander Isakov	Introduction	When authors state that “some previous PPE research may be relevant to EMS providers, but this is subject to the limitations related to changes in work environment, movement, exertion, and safety concerns” they are quite correct, and this is an important gap in the evidence base that must be addressed. It would however be incorrect to imply that the evidence base supporting the need for standard and transmission-based precautions, and implementation of a hierarchy of controls to prevent infection is not valuable for informing EMS infection control practice. We think it important to note that infection prevention practices that require research and validation in the EMS setting will be informed by this IPC evidence base.	This systematic review examined research only in the EMS environment, and we do not mean to imply that other evidence is not important. However, those studies were not part of this review.
Alexander Isakov	Introduction	Where the authors defined occupationally acquired exposures to infectious diseases as “contact exposure (intact skin), respiratory exposure (inhaled and aerosolized), and bloodborne exposure (needle sticks, blood to non-intact skin, etc.)”, it might be better to describe respiratory exposure as large droplet and airborne, or large droplet and aerosol.	The use of the term droplet comes from our key informants and literature as examined for this review. Data examined in the papers did not differentiate between large and small droplets, so would not have been affected by this difference.
Alexander Isakov	Introduction	Where the authors describe organisms of interest and explicitly named “MRSA, SARS-CoV2, influenza, tuberculosis, HIV, and hepatitis B and C”, enteric pathogens like norovirus should also be included.	Norovirus was added to the list.

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Alexander Isakov	Introduction	In Figure 1, it is not clear what it means to “prevent infectious diseases”, in contrast with “recognize and control infectious diseases”. Since the component parts in these two categories are the same in this Figure, perhaps it should be “interventions to identify and prevent transmission of infectious diseases” Further, in this category the authors should expand beyond examining PPE protocols and should more broadly include implementation of a hierarchy of controls, that includes engineering controls, administrative policies and work practices, as well as PPE and other safety equipment. The authors should also indicate that the scope includes interventions implemented by both 911 telecommunicators and field responders.	The terms prevent versus recognize and control were vetted through our key informants. While it would make epidemiological sense that some interventions prevent infectious diseases and some recognize infectious diseases, this was not always the case. Some did both. Please see Figure 1 for a conceptual framework regarding our hierarchy and guiding questions 3 and 4 regarding the data on interventions.
Alexander Isakov	Methods	The authors should describe how their external panel of experts was identified and recruited	We have added that we recruited the external expert panel in consultation with AHRQ and the partner, NHTSA.
Alexander Isakov	Methods	The authors might consider revising the statement that studies older than 15 years have little relevance to modern IPC practices. The IPC practices implemented for the SARS epidemic, as an example, are quite similar to the IPC practices implemented for COVID-19. Also, much of the evidence base that informs standard and transmission-based precautions is older than 15 years	We have deleted the statement that older studies have little relevance to modern IPC practices.
Alexander Isakov	Methods	The authors should describe the qualification of the team members that “assessed each citation to determine whether it met inclusion criteria”.	We added a statement that team members had expertise in emergency medicine, emergency medical services, infection control, or evidence synthesis.
Alexander Isakov	Results	The authors should describe how the eight Key Informants were identified and recruited.	We have added a statement to the Methods chapter that we recruited the external expert panel in consultation with AHRQ and the partner, NHTSA.

Commentator & Affiliation	Section	Comment	Response
Alexander Isakov	Results	<p>We strongly support the modifications to the analytical framework as recommended by the Key Informants, specifically:</p> <ul style="list-style-type: none"> <li>o “training” should be replaced by “training and education”</li> <li>o protocols, guidelines, standard operating procedures, and procedures are needed to serve as the basis for the education and training</li> <li>o training and education should be competency-based with incorporation of requisite knowledge, skills, and attitudes, and methods for independent evaluation of competency</li> <li>o expand scope to looking for evidence on diverse types of interventions across the hierarchy of controls: elimination, substitution, engineering, administration, and PPE, recognizing what has been learned with Ebola virus and COVID-19.</li> <li>o acknowledge that exposures may result from activities not involving direct contact with patients</li> </ul>	<p>We agree that the elements mentioned in your comment are important to training efforts and that our intent of the word training encompasses many of the elements mentioned here such as protocols, SOPs, and procedures. It would be reasonable to add the word education, however the analytical framework was designed in conjunction with our key informants, prior to the data collection and analysis. At this point in time, we decided not to change the analytical framework that was part of our previously submitted research protocol. These elements certainly make vital components of future research and educational efforts. We have included some of these points in our discussion section.</p>
Alexander Isakov	Results	<p>We strongly support the Key Informant suggestion that mental health of the EMS workforce be examined</p>	<p>Thank you for your comment.</p>
Alexander Isakov	Discussion	<p>We strongly support the call for future research as described:</p> <ol style="list-style-type: none"> <li>1) Studies on workforce practices or engineering methods to improve hand hygiene in the field;</li> <li>2) Studies examining the effectiveness of various levels of PPE in the field;</li> <li>3) Studies regarding the creation of a culture of safety regarding infectious diseases; and</li> <li>4) Studies of multi-component strategies for improving vaccine uptake by targeting predisposing, enabling, and reinforcing factors.</li> </ol> <p>We would add that future research should also include</p> <ol style="list-style-type: none"> <li>1) evaluation of strategies implemented by 911 call centers that aid in the detection of infectious patients and aid to prevent unprotected exposure,</li> <li>2) effectiveness of all interventions associated with the hierarchy of controls implemented by EMS personnel, to include engineering controls, administrative policies, work practices and safety equipment (PPE, exhaust filters, portable isolation units, etc.) and</li> <li>3) human factors research that can inform physical fitness standards for use of certain PPE ensembles, and for extended operations.</li> </ol> <p>We would also underscore the value of an adequately funded national research agenda and uniform research methodology to aid investigators conducting this research.</p>	<p>We also agree that these research elements would be important for the future. We have included them and also strongly support a call for a national EMS research agenda.</p>

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Alexander Isakov	Conclusion	We agree that the conclusions are supported by the results of the study, 1) that the evidence base for effectiveness of IPC practices among EMS personnel in their work setting is modest and that more research is needed on personal protective equipment effectiveness and vaccine acceptance, and 2) that a more uniform approach for conducting this research in the EMS setting is needed.	Thank you for your comment.
Alexander Isakov	References	The reference section is robust.	Thank you for your comment.
Alexander Isakov	General	We agree with the findings and conclusions of the report. We appreciate the inclusion of the appendices which adds to an already robust reference section. The authors may want to note in the discussion section that many peer-reviewed publications not eligible for inclusion in their study can still serve to inform infection prevention practice for the EMS community absent more robust evidence. We think it important to make this point so that practitioners in the EMS community don't erroneously conclude that there is little or no evidence base supporting their implementation of a hierarchy of controls, to include standard and transmission-based precautions.	We agree and to that end included the grey literature search. We also refer to articles in the discussion section that did not meet our criteria for inclusion in the evidence review.
NAEMT	Executive Summary	The executive summary provides a good overall view. We were pleased to see that the study recognized that little EMS research has been conducted, much more research is needed and that the study was based on limited data.	Thank you for your comment.
NAEMT	Methods	Overall, we had concern with the methodology used to select the studies. Some of the studies selected did not seem to be at the quality level needed to reach conclusions or make recommendations. There was no evidence presented that the study data accurately reflects the overall demographics of EMS practitioners. We were pleased to see that interfacility, air and ground were included to provide a better cross-section of the industry.	In the Methods under Published Literature Search, we clarified that we included studies that met our inclusion criteria regardless of study quality. We present the results of our assessment of study quality in Tables 2 and 4. The limited applicability of the results is presented in the various evidence maps (Figures 4, 11, and 12). The demographics of the study populations are presented in Evidence Table C-2.



Commentator & Affiliation	Section	Comment	Response
NAEMT	Results	The limited number of applicable studies reflects the overall lack of understanding of EMS. For example: (pg. 21) The fact that hospital workers had higher vaccine uptake than EMS workers may be due to hospitals being mandated by federal and state governments to have their personnel vaccinated. EMS agencies were largely not included in those mandates if they were not hospital-based providers. (pg. 22) Reporting that Advance Life Support (ALS) EMS personnel are at greater risk for needle sticks than Basic Life Support (BLS) personnel because BLS personnel are not able to perform procedures with needles is not accurate for many states. Furthermore, the assumption that most BLS practitioners are volunteers is also inaccurate and not based on evidence or data.	The comments for the populations in the studies refer specifically to the studies being mentioned.
NAEMT	Discussion	We agree that more research needs to be completed.	Thank you for your comment.
NAEMT	Conclusion	We agree with the conclusion that more research is needed.	Thank you for your comment.
NAEMT	General	Overall, we believe that this report is a good starting point to begin the discussion of change. Infection control has been a “back-burner” portion of the educational process in EMS, and needs to be elevated to a higher position of importance.	Thank you for your comment.

Commentator & Affiliation	Section	Comment	Response
Aubrey Brown	General	<p>We are pleased to see the effort put forth by the AHRQ as it pertains to the health and practice of EMS providers. As co-authors of two of the cited studies selected to inform Guiding Questions 1,4 (Murphy et al. 2020) and 2-4 (Brown et al. 2021), we would like to provide input as it pertains to the interpretation and conclusions rendered in this report.</p> <p>In the study by Brown et al., we demonstrated very low risk for COVID-19 infection among EMS providers donning appropriate PPE who did and did not perform an AGP as part of patient care. The vast majority (29/30) of provider-level infections that occurred during the study period were deemed unrelated to the qualifying patient encounter. Further, the single EMS provider who developed symptomatic COVID-19 within the transmission window had cared for <math>\geq 1</math> COVID-19 patient and provided both AGP and non-AGP care. Although specific causality is not possible, we a-priori attributed this exposure to AGP given what was understood about the increase risk related to AGP treatments. Although both the incidence and incidence rate ratio are <math>&gt;1</math>, the confidence intervals vary widely and cross 1, indicating no statistical significance. The median interval between days where a provider cared for a COVID-19 patient and EMS provider positive COVID-19 PCR swab was 73 days –well outside the incubation period of SARS-CoV-2. This highlights the potential for other occupational risk (e.g. fire station spread between coworkers) and community exposures. The results of these studies underscore the effectiveness of appropriate PPE, infection prevention, and exposure investigation practices (Murphy et al, 2020) in preventing COVID-19 infections, in that there was a total of 288,032 person days “at risk” where an EMS provider cared for at least one COVID-19 patient and yet only a single infection attributed to EMS patient care.</p>	<p>In results about “Alternatives to Aerosol-Generating Procedures” we revised the wording to clarify that AGP procedures were not associated with a significantly increased risk of SARS-CoV-2 diagnoses, given the wide confidence interval for the incidence rate ratio reported in the study by Brown et al. We also noted the important limitation that this estimate was based on only one EMS provider developing COVID-19 infection.</p>

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<b>Aubrey Brown (cont'd)</b>	General (cont'd)	We believe that characterizing a positive correlation between AGP-related patient care and risk of COVID-19 transmission to EMS providers is a misrepresentation of the results and fails to explain the important role of occupational exposures not involving patient care as well as community spread. Additionally, the current messaging suggests the futility of PPE, yet only 3% of infections (one of 30) were attributable to patient care despite hundreds of thousands of person days at risk. These findings should reassure first responders that emergency care, in general and specifically when performing AGPs, can be delivered safely as long as PPE are properly deployed.	(response above)
<b>Aubrey Brown</b>	Executive Summary, Results, paragraph 4	One study demonstrated that the lack of PPE and PPE breach or failure were correlated with higher SARS-CoV-2 seropositivity. Another study demonstrated that aerosol generating procedures (AGPs) have low risk of transmission when using appropriate PPE. No included study examined the protectiveness of N95 respirators or Powered Air-Purifying Respirators during AGPs in comparison with use of surgical masks alone or when paired with a face shield.	We have changed this paragraph to a statement which we feel more accurately reflects the data published.
<b>Aubrey Brown</b>	Results, page 23	Alternatives to Aerosol-Generating Procedures Aerosol-generating procedures (AGPs) are procedures such as intubation or the use of positive airway pressure therapy that may generate copious amounts of potentially infectious aerosolized particles. In 2021, Brown reported that AGPs demonstrated no statistically significant increased risk for SARS-CoV-2 infection when appropriate PPE is used (unadjusted incidence ratio [IRR] 1.64; 95% CI 0.22-12.26). <sup>18</sup> Notably, this data point is based on only one EMS provider developing COVID-19 infection in the cohort studied out of 182 total AGPs performed and 8,582 person-days at risk while in PPE and performing AGP, underscoring the low incidence of infection (1.17 per 10,000 person days; 95%CI 0.03-6.49).	Yes, we have revised the wording to clarify that AGPs were not associated with a significantly increased risk of infection given the wide confidence interval reported by Brown et al and the fact that the data point is based on a single EMC provider developing COVID-19.

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<b>Aubrey Brown</b>	Results, page 24-25	<p>GQ 4: Context and Implementation Factors of Studies with Effective EMS/911 Workforce Practices</p> <p>Studies relevant to GQ 4 included evaluation of a PPE protocol and examination of the context and implementation factors of previously mentioned studies on GQ 2/3d.</p> <p>During the beginning of the COVID-19 pandemic, Murphy et al. examined the risk for COVID-19 infection among EMS providers in King County, Washington. They deployed and studied a PPE protocol,<sup>12</sup> which included appropriate masks, eye protection, gown, and gloves (MEGG). Surgical masks were deemed sufficient for routine patient encounters, but an N95 respirator was required PPE for AGPs. For any physical contact with the patient, a gown was required. EMS providers were advised to don full MEGG PPE if a patient had a febrile respiratory illness or had recently traveled from an endemic area. Later in the study period, as cases increased, EMS providers began to treat all congregate living facilities and dialysis centers as having elevated risk for exposure.</p> <p>In a subsequent study from the same EMS system, Brown et al. were able to identify one COVID-19 infection in an EMS provider potentially occurring due to a patient encounter with an AGP. There were 1,592 EMS providers with one or more COVID-19 patient encounters and 520 (33%) with 3 or more COVID-19 patient encounters. During the study period, 30 EMS providers tested positive for COVID-19 by polymerase chain reaction (PCR), although 11 of these had never had a documented patient exposure. Of the remaining providers, 18 had a COVID-19 patient encounter but did not develop infection within the exposure window of 2-14 days, and only one provider developed COVID-19 after an AGP within the exposure window. The median interval between when an EMS provider cared for a COVID-19 patient and EMS provider positive COVID-19 PCR swab was 73 days. The authors noted that sources of infection risk for EMS personnel for SARS-CoV-2 are most certainly not confined to patient exposures. The study observed that most of the COVID-19 illness was attributable to non-patient workplace or community exposures.</p>	<p>We have taken your explanation of the data into account when reviewing the papers, and we have retained a focus on the main data that was reported in the results section of the original article.</p>

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Commentator & Affiliation	Section	Comment	Response
<b>Aubrey Brown</b>	Discussion, page 30, paragraph 4	<p>Effectiveness of IPC Practices in the EMS/911 Workforce Paragraph 4</p> <p>One study examined the real-world implementation and effectiveness of a MEGG protocol which included appropriate masks, eye protection, gown, and gloves at the beginning of the COVID-19 pandemic in Washington state.<sup>12</sup> In a subsequent study from the same EMS system, Brown et al. reported that AGP procedures with appropriate PPE demonstrated no increased risk of COVID-19 infection and that overall risk to EMS providers was very low.</p>	We have revised the description of the results that were reported in the study by Brown et al.
<b>Aubrey Brown</b>	Discussion, pages 31-32	<p>Increase in Research Since Onset of the COVID-19 Pandemic</p> <p>Since the onset of the COVID-19 pandemic, the examination of infectious diseases in EMS care has increased. Accordingly, most publications meeting our inclusion criteria have been published in the last two years, mostly focusing on the epidemiology of infections or exposures in the prehospital workforce. Several studies, however, examined workforce practices.</p> <p>The effectiveness of PPE in AGPs was examined in one study demonstrating low risk of transmission.<sup>18</sup> With evolution of SARS-CoV-2 to an endemic infection and with an overwhelmed public health contact tracing system, it was also challenging to determine whether COVID-19 infections in EMS providers were the result of occupational or nonoccupational exposures. Prior to the COVID-19 pandemic, a small number of studies examined the epidemiology of exposure and effectiveness of workforce practices regarding influenza (including H1N1), MRSA, and hepatitis C.</p> <p>No studies were identified that examined dispatchers or telecommunicators specifically.</p>	In the discussion of the increase in research since the onset of the COVID-19 pandemic, we have acknowledged that the study of effectiveness of PPE in AGPS was limited by having a small number of EMS providers who developed COVID-19. We also acknowledged that it was challenging to determine whether COVID-19 infections in EMS providers were the result of occupational or non-occupational exposures.
<b>Anonymous</b>	Results	I dispute the effectiveness of the vaccine uptake and mandatory vaccinations. I do however agree that good hygiene and standard precautions are effective.	Our team is reporting the evidence as it is published in the peer-reviewed literature. As new studies are published and data are collected, the evidence of mandatory vaccinations may change. This document reflects the current state of evidence.
<b>Anonymous</b>	Conclusion	Same as section 4.	Thank you.

Commentator & Affiliation	Section	Comment	Response
<b>Katherine West, Infection Control Emerging Concepts</b>	Key Questions	<p>First let me say that I am so pleased to see infection control in Fire/EMS recognized as an important need. I have been working toward this since 1978.</p> <p>This needs to be greatly expanded to address specific needs regarding education, true risk assessment, infection control subject matter expert knowledgeable in Fire/EMS needs to have a seat at the table.</p>	<p>Our team also agrees that infection control and prevention is an important issue in the EMS workforce. Some of our personnel have 30 years of experience in EMS care, and we have recruited key informants from the Centers of Disease Control and Prevention and National Association for Public Safety Infection Control Officers (NAPSICO).</p>
<b>Katherine West, Infection Control Emerging Concepts</b>	Introduction	<p>Review of the literature I have seen does not support "high risk" in fact some studies say lower risk than the general public. Factors that influence this - short transport times, rear exhaust fan and masking the patient suspect for an airborne or droplet transmitted disease (source control). Sharp safe devices lead to the decrease in risk related to contaminated sharps injuries. CDC, OSHA, NIOSH data do not show an increased risk for bloodborne pathogen disease in this work discipline. The Needlestick Safety &amp; Prevention Act of 2000 was passed by the U.S. Congress and required sharps safe devices this is what led to a decrease in contaminated sharps injuries and risk for transmission of bloodborne pathogens.</p>	<p>This review includes only peer-reviewed published literature which included intervention or epidemiologist studies. It is possible that other valuable studies did not fit the inclusion criteria. For this reason, we have included, where relevant, other excluded studies in our discussion.</p>
<b>Katherine West, Infection Control Emerging Concepts</b>	Methods	<p>More involvement regarding the infection control principles and practices</p> <p>Query on training - I conducted a survey published in September, 2019 which clearly showed that training is not on the mark. Not even OSHA compliant. Proper training needs to be a stronger focus and presented using the Hierarchy of Safety. This makes an important imprint on risk and use of PPE - should be included</p>	<p>We agree that training is an integral intervention in infection prevention and control. As such, we have included it in our conceptual framework- Figure 1.</p>
<b>Katherine West, Infection Control Emerging Concepts</b>	Results	<p>Training needs more emphasis - OSHA requires that the trainer needs to have "additional specialized training to present this information" - this is rarely complied with as departments rotate this position. See reference -</p> <p>Compliance Monitoring is an OSHA requirement and for the most part not conducted and not addressed in department policy. See General Duty Clause of the OSH Act, 1970 under Duties- Part B. Personnel need to understand that they have a role in their own safety.</p>	<p>We have included in this evidence review every peer-reviewed published article on EMS/911 workers on interventions (which would include training) if it included a control group and fit our inclusion criteria. We recognize that some interesting articles may not have met the inclusion criteria that were approved by AHRQ and our key informants. However, we have included some of those excluded articles in the discussion.</p>

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Commentator & Affiliation	Section	Comment	Response
<b>Katherine West, Infection Control Emerging Concepts</b>	Discussion	<p>The Formula for Infection is key to understanding risk. Viruses do not survive outside the living host in numbers to infect. They are dying off when exposed to the elements. Example - medical waste studies do not show that medical waste poses a risk. Training needs to include the protections our own bodies give us like skin - that pathogens cannot pass the skin barrier. Other protections afforded EMS - Short transport times for most areas, the rear exhaust fan air exchange and placing a mask on the patient if suspect for an airborne or droplet transmitted disease (source control) and placing HVAC on the non-recirculating cycle. That PPE is not the only protection.</p> <p>Vaccination - EMS training programs are requiring vaccines to enter the programs. Medical facilities will not permit trainees to do clinical rotations if they have signed declination forms. It is clear that required vaccination should be the same for all persons in the healthcare discipline.</p>	<p>We agree that training is an integral intervention in infection prevention and control. As such, we have included it in our conceptual framework- Figure 1. Vaccines and vaccine mandates are included in our data as workplace practices for infection prevention and control. We present the intervention data regarding the implementation and uptake of vaccines with mandates. We also include vaccines and vaccine mandates in our discussion and conclusion sections.</p>
<b>Katherine West, Infection Control Emerging Concepts</b>	Conclusion	<p>Regarding COVID-19 in fire/EMS - studies have shown that most cases were not acquired on the job but in the family home situation. Proper Perspective is important! Example - University of Washington study in EMS - showed low risk for transmission even when performing aerosol-generating procedures- reference attached Infection Control education and training must be required to bring about proper understanding of risk, proper patient care risk reduction practices as well as personal protection.</p>	<p>Our evidence review focuses on the data as reported in the published studies which met our inclusion criteria. We also acknowledged that it was challenging to determine from the published studies whether COVID-19 infections in EMS clinicians were the result of occupational or non-occupational exposures</p>

Source: <https://effectivehealthcare.ahrq.gov/products/ems-911-workforce-infection-control/report>

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<b>Katherine West, Infection Control Emerging Concepts</b>	References	Expand into the infection control literature for references addressing EMS many articles showing that there is no increased protections when using an N95 respirator for these diseases over a surgical mask on the patient CDC and OSHA list EMS personnel in the definition of health care personnel - exception COVID-19 aerosol-generating procedures	We searched for all peer-reviewed published articles on infection control in EMS/911 workers specifically, as well as the grey literature on infection control in EMS personnel. We did not include articles about infection control in the overall health care workforce if they did not specifically report on EMS personnel. Our evidence review of workforce practices that prevent and control infectious diseases in EMS personnel did not find any studies showing increased protection when using an N95 respirator over a surgical mask in the prehospital setting. The statement of work for our technical brief was to review the evidence specifically for research performed in the prehospital setting. However, our discussion section notes that some research performed for other healthcare personnel may translate to the prehospital environment, although this was not our focus.
<b>Katherine West, Infection Control Emerging Concepts</b>	General	Addressed in the above sections Need to insure that documents like National Fire Protection Standards are evidence based and correct such as 1581 and 1582	We added discussion of NFPA Standards 1581 and 1582 to the section on implications for clinical practice, education, and health policy.
<b>Katherine West, Infection Control Emerging Concepts</b>	General	Needs more expansion and infection control expertise input to problem identification and solutions	We agree that infection control expertise inclusion is important to the discussion surrounding EMS infection control and prevention. Our key informants included experts from the Centers for Disease Control and Prevention and the Board of Directors of the National Association for Public Safety Infection Control Officers (NAPSICO).

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<b>Katherine West, Infection Control Emerging Concepts</b>	General	Needs more clarify and expansion	We have mentioned additional articles in the discussion section on surgical masks vs N95s and the benefits of glove use in preventing needlesticks. In addition, we have expanded the recommendations and further steps to include a call to action for national EMS research standards, metrics, and outcomes.
<b>Former Designated Infection Control Officer</b>	Methods	Excluding fire and police personnel is short sighted in light of cross-trained individuals that are involved in the field care of patients. I worked as a firefighter/paramedic at the beginning of the pandemic. We routinely would assist police/sheriffs on calls and they had deplorable levels of PPE available to them. While the main focus is EMS - the 911 telecommunicators are less of a concern to me than the other field staff who interact with patients. Expanding the methods to include the multiple arms would provide a better picture that the authors mention multiple times: the difficulty because of the multiple levels and types of providers.	The specific aim of this report as charged by AHRQ and NHTSA was to summarize the current state of evidence on infection prevention and control in EMS/911 workers. Telecommunicators were included at the request of AHRQ and NHTSA, multiple stakeholders, and our key informants. This certainly does not negate the important contribution of police personnel which are certainly deserving of their own body of research.
<b>Former Designated Infection Control Officer</b>	Results	The authors noted the difficulty of being able to assess the efficacy of PPE and other interventions in the field because of the standard being set in a controlled environment. This should prompt more research into the scope of work activities being done in the field setting and how the situations interact to alter outcomes in efficacy (i.e. rough/sharp objects puncturing PPE, weather, limited personnel to perform tasks, provider fatigue from PPE stressing their bodies). Discussion on Vaccine policy to me is not relevant - the line worker has not much choice, receive or loose their job; that is not a choice. Because there is no choice - there is the expectation of results to be 100%.	We agree that more research is imperative. To that end, we included research recommendations and a call for action in our discussion section. The technical brief includes vaccines because they are an infection prevention and control intervention.
<b>Former Designated Infection Control Officer</b>	Discussion	Authors mention the particular difficulty of the research being conducted in a dynamic environment and how to approach the situation of garnering more data. Discussion on the associated cost for applying standards not only financially, but in turn-around/over time, length of call compared to prior to PPE in sometimes excess.	We agree that costs for PPE are an important consideration in jurisdictions when setting policy. We added wording to the discussion about the need for giving more attention to the resources needed to implement infection prevention and control interventions in EMS settings.
<b>Former Designated Infection Control Officer</b>	Conclusion	An observation from someone familiar with EMS could have told you the conclusion that ALS providers are exposed to more chances of disease transmission. I liked the effort to include research to support the colloquial observations.	We agree that a scientific review and analysis of data helps to verify the observations of EMS leaders.

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<b>Former Designated Infection Control Officer</b>	References	All references should either have hyperlinks or not. Many that are DOI references do not have hyperlinks whereas the web-site references do. Make them all standard text that is no different for consistency. Optionally, if providing a digital version of the report: include hyperlinks to all referenced articles that do not require additional logins or purchasing to review.	We have reviewed the references to ensure that they conform to AHRQ's standards.
<b>Former Designated Infection Control Officer</b>	General	Excellent start to addressing the disparaging data gap between field based and hospital based providers.	Thank you for your comment.
<b>Former Designated Infection Control Officer</b>	General	Yes - but I am also used to reading and creating research reports.	Thank you for your comment.
<b>Curtis Jones, Jr. Civilian</b>	Key Points	Standard precautions, such as gloves, decrease the chance of needlestick exposures. How can gloves prevent needlesticks? Won't the needle penetrate most any glove?	This is an interesting question and not one answered in our data analysis. However, hospital studies have shown that the glove can slightly decrease the amount of exposure from a needlestick versus bare skin. We have added the information regarding gloves and needlesticks to the discussion section on workforce practices for infection control and prevention.
<b>Curtis Jones, Jr. Civilian</b>	General	No specific research noted on maintaining a workforce trained and skilled in up to date practices for exposure limitation. Particularly to address the required base headcount, retention rate, projected retirement statistics and general headcount turnover trends.	We agree that the retention and training of the EMS/911 workforce is an important aspect of limiting exposure to infectious diseases, but we did not find any studies that specifically addressed maintenance of an EMS/911 workforce trained in infection prevention and control. We have added these research ideas to our potential research studies for the future in the discussion section.