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I have no known conflict of interest to disclose.

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Are EMS Prepared to Respond to a Pandemic or Bioterrorist Attack?

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A Dissertation Presented in Partial Fulfillment

Of the Requirements for the Degree

Doctor of Philosophy in Criminal Justice

Liberty University, Lynchburg, VA

2022

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Abstract

The 2019 Coronavirus (COVID-19) pandemic increased America's awareness of the amount of death and damage to the economy that pandemics and bioterrorism can cause. Additionally, the COVID-19 pandemic exposed significant shortfalls in national preparedness for a pandemic or bioterrorism event. The purpose of this study is to evaluate the current preparedness level of Emergency Medical Services (EMS) personnel in the United States to prepare for, respond to, mitigate, and recover from a natural or manufactured pandemic across the United States. The significance of this study is an accurate picture of preparedness for pandemic and bioterrorism events by American EMS systems. This preparedness level can be compared to the desired preparedness posture to address the delta between desired and observed preparedness. The theoretical foundation for this quantitative research project was based on multiple streams theory and utilized descriptive and inferential statistics. The research questions focused on the current preparedness of EMS providers to effectively respond to a pandemic or bioterrorist attack and possible improvements to current EMS practices that would improve the effectiveness of future responses. The study population consisted of 398 (N – 398) individual and currently credentialed EMS providers representing various prehospital certification levels from all types of EMS systems through an electronic standardized ethically reviewed questionnaire. A chi-square test of statistical significance and inferential statistical analysis revealed a statistically significant difference in the perception of EMS providers in various demographic categories and their perception of preparedness to respond to a pandemic or bioterrorist attack.

Keywords: Emergency Medical Services, pandemic, preparedness, bioterrorism

Dedication

This dissertation is dedicated to my incredible family for their continued support and mental relief over the years. My older sister, Mara, has been an unwavering source of support. Her insistence on taking care of me while I serve the public is both all-encompassing and without limitation. It is only through her efforts that I have been able to focus my energies on supporting others. She has made it quite clear to me that despite my personal achievements, and the volume of people that call me for help in their darkest hours, I will always be her little brother and she will do anything within her power to protect and care for me. She is driven by service to the community, and our conversations never cease to enlighten me on other ways to view the world and the various problems and challenges therein.

My niece, Vivien, has been the greatest driving force in my career in public safety since her birth. Watching her grow up and learn about the world around her has made me singularly driven to do anything and everything that I can to ensure that the world is the very best place that I can make it for her. Her innocence and drive to explore the world have been a motivational factor for me to ensure that there are exceptional policies, procedures, and practices as possible to protect the innocent in America from multiple different potential risks and challenges. While I am well aware that I will never be able to make the world worthy of her, she is a living reminder of why it is worth to continue driving towards a safer and better society for the benefit of every person therein.

My brother, Peter, is a meticulous, rational, and motivated individual. While we come from very different worlds and have very disparate interests, his focus on practical solutions to complex problems has been a critical learning point. His dedication to his

family and providing a safe environment for them to enjoy is another example of my goal in conducting this research. Peter's dedication and drive during both the pursuit and obtainment of his architecture license is a lesson in character that I was honored to witness. I just hope that my niece understands what a role model he is through his behavior.

Acknowledgments

It was only through the significant support and exceptional assistance of multiple people that this dissertation was possible. First and foremost is Katie Elkins of the DOT's National Office of Emergency Medical Services. She has been an extraordinary friend and mentor in my life ever since she started my career in EMS by training me in my first volunteer EMS agency and facilitating my initial EMT course in 2000. Her continued support allowed me to join the FEMA and HHS/ASPR COVID-19 Task Force's prehospital working group. This year and a half of my life opened my eyes to more significant issues that needed to be more directly addressed. They allowed me to create and foster relationships with key individuals in the EMS community across the nation.

Furthermore, my dissertation chair, Dr. Mullane, has been positively essential to this research. Dr. Mullane's proactive and highly communicative approach to this work consistently illuminated the path to both completion of this work and an increase in academic research on my chosen topic. Dr. Mullane's knowledge and awareness of the University's requirements and expectations allowed me to meet all University expectations while adding to the overall body of knowledge on a topic near and dear to my heart.

The great flexibility and responsiveness of Dr. Bryan surged the successful completion of both this dissertation and my degree forward. It was only with her efforts and academic guidance that I was able to complete this extensive degree program.

Table of Contents

List of Acronyms and Abbreviations

AAA	American Ambulance Association
ANCOVA	Analysis of Covariants
ANOVA	Analysis of Variance
ASPR	Assistant Secretary of Preparedness and Response
ADPH OEMS	Alabama Department of Public Health Office of Emergency Medical Services
ADHSS DPH	Alaska Department of Public Health and Social Services Division of Public Health
AZDHS	Arizona Department of Health Services
ADH EMS	Arkansas Department of Health Emergency Medical Services
CDC	Center for Disease Control and Prevention
CEMSA	California Emergency Medical Services Authority
CDPHE EMTS	Colorado Department of Public Health & Environment Emergency Medical and Trauma Services
CDPH OEMS	Connecticut Department of Public Health Office of Emergency Medical Services
COOP	Continuity of Operations Planning
COVID-19	Novel Coronavirus of 2019
CPR	Cardiopulmonary Resuscitation
DCFEMSD	District of Columbia Fire and Emergency Medical Services Department
DDHSS DPH	Delaware Department of Health and Social Services Division of Public Health
EMS	Emergency Medical Services
EPPM	Extended Parallel Process Model
FDH	Florida Department of Health
FDNY	Fire Department of New York
FICEMS	Federal Interagency Committee on Emergency Medical Services
GDPH	Georgia Department of Public Health
GMR	Global Medical Response
HDH EMS	Hawaii Department of Health Emergency Medical Services
HHS	Department of Health and Human Services
HIV	Human Immunodeficiency Virus
IDHW BEMSP	Idaho Department of Health & Welfare Bureau of Emergency medical Services and Preparedness
IDPH	Illinois Department of Public Health
IDHS EMSC	Indiana Department of Homeland Security Emergency Medical Services Commission

IDPH BETS	Iowa Department of Public Health Bureau of Emergency and Trauma Services
KBEMS	Kansas Board of Emergency Medical Services
KEBEMS	Kentucky Board of Emergency Medical Services
LDH EMS	Louisiana Department of Health Emergency Medical Services
MDHHS EMSS	Michigan Department of Health & Human Services Emergency Medical Services System
MDHSS BEMS	Missouri Department of Health & Senior Services Bureau of Emergency Medical Services
MDPHHS EMSTS	Montana Department of Public Health and Human Services Emergency Medical Services and Trauma Systems
MEMS	Maine Emergency Medical Services
MEMSRB	Minnesota Emergency Medical Services Regulatory Board
MIEMSS	Maryland Institute for Emergency Medical Services Systems
MERV	Middle East Respiratory Syndrome
MOEMS	Massachusetts Office of Emergency Medical Services
MSDH EMS	Mississippi State Department of Health Emergency Medical Services
MST	Multiple Streams Theory
NAEMT	National Association of Emergency Medical Technicians
NASEMSE	National Association of Emergency Medical Services Educators
NASEMSO	National Association of Emergency Medical Services State Officials
NCDHSR OEMS	North Carolina Division of Health Service Regulation Office of Emergency Medical Services
NDDOH DEMS	North Dakota Department of Health Division of Emergency Medical Systems
NDHHS EMS	Nebraska Department of Health and Human Services Emergency Medical Services
NDHHS NPBH EMS	Nevada Department of Health and Human Services Division of Public and Behavioral Health Emergency Medical Services
NGO	Nongovernmental Organizations
NHDOS FSTEMS	New Hampshire Department of Safety Fire Standards and Training and Emergency Medical Services
NHTSA	National Highway Traffic Safety Administration
NIMS	National Incident Management System
NJDOH EMS	New Jersey Department of Health Emergency Medical Services
NMDOH EMSB	New Mexico Department of Health Emergency Medical Services Bureau
NREMT	National Registry of Emergency Medical Technicians
NYDOH BEMS	New York Department of Health Bureau of Emergency Medical Services
ODH EMSD	Oklahoma Department of Health Emergency Medical Services Division
ODPS EMS	Ohio Department of Public Safety Emergency Medical Services
OGA	Other Governmental Agency

OHA PHD EMSTSP	Oregon Health Authority Public Health Division Emergency Medical Services and Trauma Systems Program
PDOH EMS	Pennsylvania Department of Health Emergency Medical Services
PPE	Personal Protective Equipment
PSAP	Public Safety Answering Point
PTSD	Post-Traumatic Stress Disorder
RIDOH CEMS	Rhode Island Department of Health Center for Emergency Medical Services
ROSC	Return of Spontaneous Circulation
SARS	Sudden Acute Respiratory Syndrome
SCDHEC EMST	South Carolina Department of Health and Environmental Control Emergency Medical Services and Trauma
SDDOH EMS	South Dakota Department of Health Emergency Medical Services
SS	Summated Scale
TDOH EMS	Tennessee Department of Health Emergency Medical Services
TDSHS EMSTS	Texas Department of State Health Services Emergency Medical Services and Trauma Systems
UDOH BEMSP	Utah Department of Health Bureau of Emergency Medical Services and Preparedness
US	United States
USFA	United States Fire Administration
VDH EPEMSIP	Vermont Department of Health Emergency Preparedness, Emergency Medical Services & Injury Prevention
VDH OEMS	Virginia Department of Health Office of Emergency Medical Services
WDHS EMS	Wisconsin Department of Health Services Emergency Medical Services
WDOH EMSS	Washington Department of Health Emergency Medical Services Systems
WDOH OEMS	Wyoming Department of Health Office of Emergency Medical Services
WHO	World Health Organization
WMD	Weapon of Mass Destruction
WVDOHHR BPH OEMS	West Virginia Department of Health & Human Resources Bureau for Public Health Office of Emergency Medical Services

List of Tables

List of Figures

Is EMS Prepared for a Pandemic or Bioterrorist Attack?

Chapter I: Background and Scene Setting

People are always at risk of infection by a pathogen. There are few, if any, people who have never been affected by an illness from a virus, bacteria, or fungus throughout their lives. Not all pathogens are equally inimical to life, nor are the illnesses that they bring about. In addition to causing varying diseases in their hosts, different pathogens also have different degrees of contagiousness. Contagiousness is a quality that has a value dependent upon perspective. While being highly contagious is undoubtedly a less desirable quality from the community's perspective through which it spreads, it benefits the pathogen since contagion ensures continued promulgation throughout a species. Pandemics are characterized by widespread illness from pathogens, and a bioterrorist attack occurs when either natural or manufactured pathogens are purposely released upon a population to spread disease and condition. Bioterrorist attacks tend to use highly contagious pathogens that create incapacitating illness, but not always. Cenciarelli et al. (2015) pointed out that bioterrorist attacks are a genuine risk to modern society. Cenciarelli et al. (2015) further asserted that the use of biological pathogens as a means of a terror attack is so likely that it must be seen as an inevitable occurrence. It is the United States' responsibility to be ready to respond to such potential disasters and terrorist attacks.

The capability of Emergency Medical Services (EMS) providers to respond to pathogens, especially weaponized ones that are the norm in a bioterrorist attack, has been called into question after various events, including the non-weaponized 2014 Ebola epidemic (Ejike, 2019) and the COVID-19 pandemic. There is increasing concern as to

whether these well-intentioned and highly driven healthcare providers are resourced, equipped, and able to meet the exceptionally high burden that pandemics and bioterrorist attacks create. Further evidence suggests, “When disasters occur, the immediate challenges EMTs confront are stabilizing patients and transporting them to designated acute healthcare facilities for medical treatments without putting themselves, their families, and their immediate communities at further risks” (Ejike, 2019, p. 1). The success of the EMS response is critical not only to the EMS provider’s welfare but also to the nation’s well-being.

While the burden on these EMS providers is high, so is the risk that they assume during every response. EMS providers learn about risk mitigation and infection control procedures during their training, but these lessons need to be continually reviewed and reinforced. Risk avoidance is often not practical, but according to the Centers for Disease Control and Prevention (2015), the risk to the EMS providers can be mitigated to the maximum extent possible through the donning of Personal Protective Equipment, adequate training in infection control, and additional education above and beyond their initial training courses.

Problem Statement

According to Ejike (2019), the United States of America depends on EMS for the detection and awareness of public health emergencies such as pandemics and bioterrorism attacks. Despite this fact, the Center for Disease Control and Prevention (2018) indicates that EMS personnel need to evaluate, identify, and resolve gaps in preparedness and responses to a pandemic and bioterrorist attacks. There is a lack of timely recognition and effective response to a pandemic or bioterrorist attack in the

current state. The failure of EMS personnel to effectively and efficiently recognize and respond to a pandemic or bioterrorist attack could result in unnecessary loss of life.

There have been multiple studies assessing both the state of EMS's ability to recognize a pandemic or bioterrorist attack and the capability of EMS providers to respond to a pandemic or terrorist attack effectively. One of these studies was conducted but limited its focus to New Jersey State EMTs. Another focused more on the willingness than the preparedness posture of EMS providers across the nation. The most significant shortfall with existing data on this topic is that it was all performed before the COVID-19 pandemic revealed local, state, and national level pandemic response shortfalls. The proposed research would be a quantitative analysis of survey data created and collected to evaluate EMS providers across the nation on various components of their preparedness to recognize and respond to a pandemic or bioterrorist attack.

Theoretical Foundation

This academic research study utilized a guiding philosophy to maximize the likelihood of a return on investment while progressing the study. The initial consideration was of the garbage can model that was put forth by Cohen et al. (1972). In this theory, four streams are the leading cause of the delta between recognizing a problem and adopting a substantive and impactful solution. These four streams are the problem stream, the solution stream, the participant's stream, and the choice opportunities stream. After careful review and consideration, the researcher determined that the garbage can model did not seem to be the best path to ensure success in answering the specific research questions posed in this document. This was because the garbage can model did not accurately reflect the streams that directly influenced the preparedness of the American

EMS systems during and after the COVID-19 Pandemic. The search for a more applicable theory to the problem statement was conducted.

The garbage can model was then modified and improved upon by the multiple streams theory model. The numerous stream theory narrows down the four streams of the garbage can model into only three streams. The multiple stream model was expressed by Kingdon (1984) and asserts that three streams are the leading cause of the delta between recognizing a problem and adopting a substantive and impactful solution. The multiple streams theory "described how issues acquire agenda status and the basis on which policy alternatives are developed, and the theory focuses on how ideas fit policy problems" (Alshoubaki & Harris, 2021, p. 76). Because the researcher believed that the participant variable was not the specific item that would need to be reviewed to understand the root causes of the problem, the garbage can study was abandoned for the multiple streams theory. Howlett (2019) points out that public policy, including EMS knowledge and capabilities, was not exclusively dependent upon the desires of a single group. However, EMS knowledge and capabilities were the results of a complex interplay of partially independent patterns and actors, each of which was attempting to effectuate a different policy or practice dependent upon their group's perceptions. The multiple streams theory seemed appropriate given the significant public policy nexus and the higher prominence of the issue and the politics behind it.

The multiple streams theory was based upon the relative interplay of three separate and distinct streams. These three streams are the problem stream, the policy stream, and the political stream. The problems stream contains the various issues and challenges that draw the attention of policymakers and politicians. According to

Alshoubaki & Harris (2021), the political stream sets the stage for circumstances and situations conducive to influencing the plan. The policy stream captures the various viable solutions and ideas that may solve the addressed issue of concern. These streams interact with each other, but they generally function independently. However, to bring out substantive and impactful policy changes, the three streams must co-exist, especially during critically opportune times. The multiple streams theory was an incredibly influential tool to increase comprehension of policy forming processes and analyze the process of making policy and the setting of political agendas.

These various streams are not independent and exclusive in their desire or impact. EMS educators, EMS agency medical directors, municipal Emergency Managers, EMS administrators, and disaster planners all have different agendas and policies that would render drastically different practices and results if instituted without interference from other streams. However, Howlett (2019) explains that some drastic situations could result in a temporary alignment of streams that create a fortuitous window to advance key issues and potential solutions to a known problem. The COVID-19 pandemic provided one of these windows. This study uses the multiple strains theory with the hope of identifying and employing some of the most critical solutions to the challenges faced by the EMS community that significantly impact the nation's health. It was during this rare time when the problem stream was a matter of daily discussion by the public, the political stream was the routine topic of the news, and policy streams are being constantly evaluated and adjusted by the greatest minds in the world, that there was an opportunity to create public policy change for the betterment of all people in the United States that rely upon EMS response.

Therefore, despite the independent functioning of the streams, policy changes best occur when the various streams converge within a unique window of opportunity. It is relevant to note that "Kingdon pointed to the role of focusing events as important events that push public and elites to become aware of an issue's importance. It is tantamount to exogenous factors that open the window of opportunity" (Alshoubaki & Harris, 2021, p. 76). This alignment of the streams during a period of an exceptionally fortuitous political, social, and economic environment can result in the best policy adjustments.

Multiple streams theory, as it relates to this segment of academic research, was based upon the premise that vulnerabilities of the EMS providers to a pandemic and bioterrorist attacks constitute the problem stream. The assertion of various possible perspectives on the correct manner to increase preparedness was the policy stream. Policymakers such as politicians, EMS administrators, and emergency managers can be pressured to enact regulations, procedures, practices, laws, and techniques to increase EMS provider preparedness for a pandemic or bioterrorist attack in the politics stream. As noted by Ejike (2019), "MST [multiple streams theory] is a useful analytical tool for the examination of the operations of EMSOs [emergency medical service operators], the experiences, and vulnerabilities of EMTs, and identification of factors that could help harden them in their responses to biological attacks" (p. 14).

Research Questions

The following two research questions guided the study:

1) Is the EMS community in the United States ready to respond to a pandemic or bioterrorist attack?

2) Moreover, what practices, procedures, or policies should be implemented in the US EMS system for a pandemic or bioterrorist attack?

Nature of the Study

The study used the quantitative research design approach to examine EMS's pandemic and bioterrorism preparedness and practices in the United States. The target population for data collection was EMS providers who have varied experiences in emergency medical responses in their respective organizations. The data was collected through an anonymous online survey tool. A random sampling technique was utilized, and the data were analyzed using various statistically standardized methods. A quantitative research approach was best suited to answer the research questions. Vaske (2019) expressed that research through survey instruments has many advantages. One such benefit is the ability to capture the characteristics of a larger population. Another advantage is the survey instrument's capability to employ consistent and standardized questions that permit comparisons between groups. Another value in quantitative survey techniques is the large sample size obtained in a relatively short period. The last stated benefit is that numerous questions can be asked in a simple research project.

By implementing this study and employing survey techniques to EMS providers involved in response to pandemics and bioterrorist attacks, the analysis was intended to better understand the various components that aggregate into disaster preparedness for a pandemic bioterrorist attack. Furthermore, the data created a snapshot of EMS's current preparedness for future pandemics and bioterrorist attacks.

Definitions of Key Terms

One term that was utilized as a part of the research is "representative sample." A sample is used as a microcosm for the relevant population: "A representative sample from a population will be a scaled-down version of the entire population, where all different characteristics of the population are present" (Grafström et al., 2014, p. 279). The online survey was defined as a collection of questions created on universally accessible electronic media that respondents accessed through the internet.

For this study, the following definitions apply:

- "EMS providers" are individuals who are credentialed to provide emergency medical services outside of a hospital by either a state or the National Registry of Emergency Medical Technicians (NREMT). An EMS provider must hold a current and valid license or certificate to provide care in the prehospital environment (Virginia Emergency Medical Services Regulations, Virginia Stat. § 12VAC5 31-10, 2018).
- "Pandemic" is a significant spread of a disease over a wide geographic area or region.
- "Bioterrorist Attack" is defined by the US Federal Government as "the intentional release of viruses, bacteria, or other germs that can sicken or kill people, livestock, or crops" –Center for Disease Control and Prevention (n.d.-c).
- "Workforce Preparedness" is a workforce that is able to maintain minimum staffing levels, is adequately trained to meet the expectations of

the community, has access to adequate mental health and support avenues, and is confident in its ability to handle an event.

- "Personal Protective Equipment (PPE) Preparedness" means that adequate PPE capable of protecting the providers against the specific pathogen is either readily available or can be ordered in time to meet the needs and demands of EMS providers during a pandemic or bioterrorist attack.

Assumptions

This study assumes that survey respondents would answer the surveys entirely and honestly. This assumption is made because of the volunteer nature of the survey completion, the anonymity that is built into the study, and the overall desire for EMS providers to be as prepared as possible for future pandemics and bioterrorist attacks that would potentially pose a significant danger to these EMS providers and their families. A second assumption is that EMS providers will be on the front lines of battling future pandemics and bioterrorist attacks. This assumption is based upon the carryover of current infection control, bioterrorist, and pandemic response practices. The last assumption utilized within this study is that not each EMS provider has the same level of training, experience, and knowledge related to pandemics and bioterrorist attacks. The NHTSA's Office of EMS promulgates a standardized national EMS curriculum for the various levels of training (National Highway Transportation Safety Administration, 2021). The states can then promulgate their education standards, and the NREMT interprets these education standards into its credentialing and accreditation process. Even without this variation, the different quality of instructors, depth of material review,

individual experience in responding to infectious disease, and volume of training impacts the personal preparedness of the providers and creates a spectrum among EMS providers.

Scope and Delimitations

The quantitative approach utilized in this study aligns with comprehension of the multiple streams theory and how such a theory can be used to evaluate the shortfalls in the preparedness of EMS for a pandemic or bioterrorist attack. Data were obtained through anonymous online survey instrument collection methods. The scope of the study's participants was limited to credentialed and licensed EMS providers within the United States, excluding hospital-based healthcare providers and EMS providers outside of the United States. The research focused on the pandemic and bioterrorist attack preparedness of EMS providers in the United States because of the large volume, diversity of the population, and extraordinary impact that these events have on the people they serve.

It is relevant to note that this study might challenge extrapolation to foreign nations because of the great diversity in policies, practices, and public health expectations between countries and regions. However, this limitation may still not prevent the applicability of the study results to foreign nations. The findings of this study may be applied to understand the preparedness of EMS providers in the United States for a pandemic or bioterrorist attack.

Limitations

The principal purpose of this research project was to evaluate the preparedness of EMS providers and, by analogy, EMS systems to respond to a pandemic or bioterrorist attack. The goal was to identify the current status of preparedness and then evaluate other

factors that could be modified to increase the overall preparedness posture of EMS providers and EMS systems regarding responding to pandemics and bioterrorist attacks. The data collected could be used to extrapolate the current preparedness posture. Awareness of the current state of preparedness can then be used to improve the preparedness of EMS and public safety response systems.

The initial limitation that is posed by this study is that the study is limited to licensed and credentialed EMS providers. This significantly decreased information from public safety and response agencies who respond to care for the community with a first aid and Cardiopulmonary Resuscitation (CPR) certification. This exclusion also eliminated other healthcare provider certifications such as physicians, nurses, nurse practitioners, and physician assistants who maintain an EMS licensure and certification.

A second limitation within the study was the availability of data relating to the preparedness and response by EMS providers and EMS systems to the COVID-19 pandemic. While a significant amount of data is still being disseminated daily, noticeable gaps arose during the COVID-19 pandemic, which has yet to be reviewed, analyzed, synthesized, and published publicly. For this reason, continual reviews of literature and relevant journals were conducted throughout the data collection and analysis part of this research project to identify information that was subsequently released after the initial literature review and background literature were obtained.

A third limitation of this study was the technological tools utilized to advertise, solicit, and collect data. This limitation had the unintentional consequence of eliminating the target audience and sample group members who do not have e-mail addresses, do not routinely access EMS-based websites, or cannot access and complete an online survey.

While not an intentional decision, the ubiquity of technology in the modern world, coupled with the NREMT's almost exclusively online-based certification and credentialing process, resulted in the understanding that this would not eliminate a significant population of the desired sample population.

Another limitation of this study was the geographic disbursement of the sample population. The inclusion criteria were limited exclusively to EMS providers currently credentialed within the United States. While there are possibly similarities between the US and other EMS systems across the globe, this research is designed for, and specifically applicable to, EMS systems in the United States.

Significance of the Study

The significance of this study is that it bridges a gap in current literature between the perception of EMS providers' preparedness for a pandemic or bioterrorist attack before the COVID-19 pandemic and after. The previous most topical study is now more than a decade old. At that time, FICEMS noted that EMS and 911 response systems were poorly integrated into pandemic planning (Federal Interagency Committee on EMS, 2009). FICEMS recommended increasing coordination and preparedness by this critical community for the future threat of pandemics. However, up to this point, there has been no comprehensive and evaluative study that has captured whether the level of integration and preparedness by EMS has improved, been maintained, or declined since 2009.

This study adds directly to the field of research on disaster preparedness regarding both pandemics and weapons of mass destruction (WMD) attacks. The researcher achieves this goal by determining the current national status of preparedness for such events. It then compares the recent findings against those promulgated by FICEMS in

2009 for a comparison that revealed the trending and tracking of preparedness by EMS systems and providers.

Many challenges experienced by the EMS community during the COVID-19 pandemic indicated that policy realignment and changes were necessary. The necessity was demonstrated by the need to prevent significant shortfalls in preparedness by EMS for future pandemics and bioterrorist attacks. The findings in this study provide critical data to drive policy changes in pandemic planning and bioterrorist preparedness across the EMS systems across the United States.

The CDC, FICEMS, and NHTSA's National Office of EMS have promulgated policy guidelines and recommendations for the preparedness of EMS for pandemics and bioterrorist attacks (Center for Disease Control and Prevention, 2018; Federal Interagency Committee on EMS, 2009; National Highway Transportation Safety Administration, 2007). However, many EMS agencies across the United States have failed to adhere to these guidelines when it comes to pandemic and bioterrorism preparedness. This study simultaneously evaluates the EMS providers and the EMS system's preparedness, practices, and policy implications. The data generated by this study provides an effective tool for benchmarking current preparedness. This data can then provide a firm base to advocate for the generation of an increased preparedness capability.

Significance to Social Change

Emergency responders who are EMS providers have minimal time to make risk-based decisions about patient care and infection control practices that can result in the illness, injury, or death of themselves, their patients, and their coworkers (Ahmad et al.,

2016). According to Ejike (2019), it is for this reason that it is paramount that EMS providers have current and accurate information on infection control practices, PPE access, and infection control training. The author anticipates that this study will increase awareness of pandemic and bioterrorist attack practices. Furthermore, the author intends to increase awareness of pathogens and change the attitude of EMS providers and the public to increase respect and emphasize preparedness for pandemics and bioterrorist attacks. Increased recognition of infectious pathogens through disease surveillance will improve EMS providers' precautionary procedures and PPE adherence. The improved infection control posture would prevent further community spread by stymying secondary infections through contamination. This study will bring about improvement in pandemic and bioterrorist attack preparedness practices and policies.

Summary and Transition

EMS personnel are critical to identifying and managing a pandemic or bioterrorist attack. A future pandemic or bioterrorist attack in the United States is not theoretical but rather a certainty when considering the history of pandemics and bioterrorist attacks in the US. These events cause extraordinary challenges to EMS providers and the agencies for which they work. EMS providers are on the frontline to both recognize and respond to pandemics and bioterrorist attacks. They are often exposed to the same pathogen causing widespread illness before the risk and contagion are recognized and thoroughly understood. However, these challenges must be handled effectively to save lives and improve public health.

One of the most effective ways to gain information about a specific topic from a particular population is to establish a sample and collect data directly. In this case, a

survey of pandemic and bioterrorist preparedness-focused questions were asked of EMS providers credentialed either nationally or at the state level. The level of preparedness of public health and public safety for a pandemic or bioterrorist attack is far from a unique topic of discussion. There is often a cycle of great attention to this topic in the aftermath of a pandemic or bioterrorist attack. The debate begins to wane as the public's memory of the public health event dissipates, and there are new, different, and more apparently imminent risks for the public to fear. This decrease in discussion and concern over preparedness rarely impacts the EMS providers themselves, as they constantly fear these events. However, as the political discourse shifts away from this topic, so does the public's awareness. Resourcing for such events often dissipates accordingly.

It is critical to define preparedness and evaluate what level of preparedness has been achieved to control the specific problem this paper addresses. To this end, there has been a collection of actively researched and retrospective studies. These studies consider two elements. One element is the meaning of preparedness of EMS for a pandemic or bioterrorist attack. The other element is the definition of what it means for EMS to improve their preparations for such an event.

Chapter II: Literature Review

Background

The US Federal Government defines bioterrorism as the intentional deployment of a biologic pathogen, or its derivative, to target a civilian population for harm or death (Rebmann, 2014). The US Department of Health and Human Services (2019) points out that disease outbreaks can be catastrophic to the American population. This significant impact on the population is because of the outbreak's ability to cause illness, death, widespread physical and mental disability, and social and economic disruption. In a world where the United States has repeatedly been the target of terrorism, "it is a vital interest of the United States to prepare for, counter, respond to, and recover from biological incidents at home and abroad…. To ensure an integrated, comprehensive approach, agencies shall coordinate and manage biodefense activities…" (The White House, 2018b, p. 2). While eliminating biological threats is unrealistic, the danger can be mitigated and managed (The White House, 2018a). A diverse and widespread biologic threat requires a unified and comprehensive response posture. To obtain such a posture requires the collaborative efforts of the US government, state governments, local governments, tribal governments, territorial governments, and private and commercial stakeholders.

As reported by Vaida (2017), "public health leaders agree that, statistically, the world is overdue for a lethal pandemic. They don't know whether it could begin with a rapidly evolving regional outbreak…or a bioterrorist attack" (p. 474). There is a substantial threat of bioterrorism in the United States, and history indicates that pandemics will undoubtedly occur in the future (Leider et al., 2017). In early September

2019, the US accounted for only 4% of the world's population but almost 25% of the worldwide COVID-19 cases (Vaida, 2020). When referring to the COVID-19 pandemic in the US, the former Health and Human Services Secretary-turned-Congressperson Donna Shalala stated, "Boy, we weren't ready" (Vaida, 2020, p. 5).

A pandemic or bioterrorist attack can be catastrophic but is somewhat predictable. Mirvis (2020) reports that many pundits and key government officials refer to these events as "black swans" or high-impact, low-probability events. These perceptions are inaccurate when considering the prevalence of these events in this nation's recent past. Significant outbreaks of Human Immunodeficiency Virus (HIV) occurred in 1980, Sudden Acute Respiratory Syndrome (SARS) in 2002, the Middle East Respiratory Syndrome (MERS) in 2012, H1N1 in 2009, and the Ebola virus in 2014. The probability and the omnipresent possibility of widespread pandemics have even been the fodder for many famous films such as *Seventh Seal*, *Outbreak*, *I am Legend*, and *Contagion*. The government's failure to cooperatively plan for such events violates its duty to provide the best possible care under the circumstances (Leider et al., 2017).

The responsibility to prepare for and effectively manage a pandemic or bioterrorist attack poses substantial challenges for Emergency Medical Services providers, as evidenced by the COVID-19 pandemic. EMS providers were unprepared despite the opportunity to prepare after the recent experience of anthrax attacks in the United States in 2001 and an Ebola epidemic in 2014 (Ejike, 2019). A significant allocation of time, effort, and funding was expended in the wake of these events. Still, the ability of EMS systems in the United States to respond to these types of events has not been comprehensively evaluated since the beginning of the COVID-19 pandemic. A lack

of preparation for either pandemics or bioterrorist attacks could result in a tremendous loss of life in a future event. Maguire et al. (2007) stated:

> Although the estimates vary, experts believe that >500,000 Americans and perhaps 50 million people worldwide perished during that [1918 flu] pandemic. If the next pandemic is as virulent, 100 million cases can be expected, along with three million fatalities in the US. At the community level, it means that one-third of the population could be stricken. (p. 237)

The United States has endured terrorist attacks as a matter of historical record. There have also been multiple pandemics throughout US history, many of which shaped public policy at the time and today. While there are more considerable resources and efforts focused on the prevention component of events such as these, the weight of the response rests heavily upon the shoulders of EMS personnel. The burden on the EMS providers is evident whether the responders are from a municipal dedicated EMS system, a fire-based EMS system, a hospital-based EMS system, or a privatized EMS system.

The National Incident Management System (NIMS) is a nationally standardized response system. NIMS is both scalable and flexible to accommodate a wide range of disasters. It was designed on the west coast by wildland firefighters. According to Barbera and Macintyre (2002), emergency management policymakers intended to create a nationalized incident management system for multiple casualty incidents and disasters that impact the world of police, fire, and EMS. Still, there is no equivalent system to handle public health emergencies such as anthrax bioterrorist attacks. This national incident management system is not designed to handle many patients spread over thousands of miles and days after exposure to the pathogen.

EMS agencies must coordinate with other healthcare and public health community members to participate in a planned and coordinated response to pandemics and bioterrorist attacks. Ventura et al. (2020) point out that minimal pandemic planning by EMS agencies currently exists. For instance, American EMS agencies are unprepared to respond to a pediatric infectious disease surge because of shortfalls in their structure, staffing, and available resources and space.

Pandemics and bioterrorist attacks fundamentally change virtually all aspects of EMS responses. EMS responses depend on emergency notifications to a Public Safety Answering Point (PSAP). EMS providers are not legally permitted to transport patients if the patient does not desire to be transported, except in rare cases. Siman-Tov et al. (2021) point out that the call volume overall significantly decreased during the COVID-19 pandemic. However, the severity of the medical calls increased while the calls for traumatic injuries decreased. There was also a significant increase in patients who would accept care on-site but refused transport to an emergency department. A surprising trend was noticed, and "…during the initial period of the COVID-19 pandemic, we found a decline in overall EMS response volumes and an increase in their rate of non-transports that was independent of patient demographics and other response characteristics" (Satty et al., 2021, p. 7). While there was an overall reduction in EMS activations in the US during COVID, the EMS scene death rate doubled (Lerner et al., 2020). Some logical conclusions drawn from this data are that at least some patients were afraid of significant healthcare bills since there was record high unemployment during the pandemic. Some patients were reluctant to seek healthcare because of contagion in the hospital, and some patients believed that they were safer at home. As a result, these patients were not calling

as early as they historically would have. They waited until their symptoms were more severe and requested only EMS providers' treatment without further transport.

Description/Methodology of Review

A comprehensive literature review was performed by accessing multiple commercial journals' reporting services. The literature research was conducted by utilizing Liberty University's Jerry Falwell Library Online to achieve this goal. The search criteria included the words "EMS," "prepared," "pandemic," and "bioterrorism." This search yielded 24 results. The search criteria were then filtered down to peer-reviewed articles and those that were published within the last five years. This filtering brought the results down to 16. The abstracts of those articles were reviewed, and from those abstracts, it appeared that 14 of them were directly relevant to the research question. Those were stored, and the bibliography of each of those 16 was then reviewed. Individual articles that appeared relevant to the research question, based on the title, were then obtained and evaluated for relevancy after a complete review of the article.

Once the articles from the Jerry Falwell library identified items were stored, Google Scholar was then utilized. The search criteria included the words "EMS," "prepared," "pandemic," and "bioterrorism." This search yielded 1260 results. The search criteria were then filtered down to peer-reviewed articles and those that were published within the last five years. This research method brought the results down to 271. The abstracts of those articles were reviewed. Of those abstracts, 202 of them were directly relevant to the research question. Those were stored, and the bibliography of each of those 202 was then reviewed. Individual articles that appeared relevant to the research

question, based on the title, were then obtained and evaluated for relevancy after a complete read of the article.

Organization of the Review

The literature review is formatted to allow for an overview of the problem that this research product is designed to solve. It then narrows in scope to the individual factors that determine whether preparedness exists. Once those independent factors have been thoroughly reviewed, the yardstick to evaluate EMS preparedness for a pandemic or bioterrorist attack is reviewed. Lastly, possible recommendations for improving preparedness are discussed, and a conclusion summarizes the relevant trends in the current literature on the research questions.

Most Relevant Resources

A plethora of resources was located throughout this literature review that addressed the research question of this study. One of the most relevant resources was Young (2017). This specific research analyzed data resulting in the generation of eight recommendations to improve paramedic preparedness.

A federal committee study was located that directly evaluated the EMS preparedness for pandemics at the state level. This study topic is almost perfectly aligned with the research question. The tables below capture the evaluation of the readiness of state EMS systems to manage a pandemic or bioterrorist event (Federal Interagency Committee on EMS, 2009, p. 3-7).

Table 1

Scoring Criteria to Evaluate Preparedness

SCORE	Description
3	Complete response: documentation indicates actionable plan.
2	Substantial, but incomplete response; documentation indicates that state has largely addressed activity, but response is not complete or actionable.
1	Minimally responsive; documentation only indicates intention or beginning of planning for activity, or only a part of the activity has been addressed.
0	Response mission: documentation does not address activity.

Note. Adapted from Federal Interagency Committee on EMS (2009). "State EMS System Pandemic Influenza Preparedness: A Report of the FICEMS" (https://www.ems.gov/pdf/preparedness/Resources/State_EMS_System_Pandemic_Influenza_Preparedness.pdf). In the public domain.

Table 2

Questions asked of States regarding supporting activities for EMS pandemic influenza preparedness with the most frequent (modal) score by question for all the States, Territories, and DC

Supporting Activities	Most Frequent Score
EMS Planning	
Has the state adopted EMS pandemic influenza plans and operational procedures that define the role of EMS in preparing for, mitigating, and responding to pandemic influenza?	1
Has the state established a Statewide program of pre-pandemic training and exercising to prepare EMS personnel for their role in preparing for, mitigating, and responding to pandemic influenza?	1
Has the state established a method for developing and distributing pandemic influenza information, including clinical standards, treatment protocols and just-in-time training to local EMS medical directors and EMS agencies?	1
Has the state established methods to integrate best practices or lessons learned during the previous pandemic wave into EMS system operations and to issue an after-action report?	1
Has the state adopted EMS pandemic influenza plans and operational procedures that define the role of EMS in preparing for, mitigating, and responding to pandemic influenza?	1

Supporting Activities	Most Frequent Score
Has the state established a Statewide program of pre-pandemic training and exercising to prepare EMS personnel for their role in preparing for, mitigating, and responding to pandemic influenza?	1
The Role of EMS in Influenza Surveillance and Mitigation	
Has the state established procedures for involving EMS agencies in ongoing disease surveillance?	1
Has the state identified procedures for involving EMS providers in pandemic influenza community mitigation strategies, including Targeted Layered Containment?	1
Maintaining Continuity of EMS Operations During an Influenza Pandemic	
Does the state have backup plans to augment the local EMS workforce if needed?	1
Does the state have backup plans to address disruptions in the availability of EMS equipment, supplies, and services throughout the state?	1
Does the state have an effective, reliable, interoperable communications system among EMS, 9-1-1, emergency management, public safety, public health, and health care agencies?	3
Is there a Statewide communications plan, including communications equipment and radio frequency plan to support common hospital diversion and bed capacity situational awareness at the local, state, and regional level?	1
Legal Authority	
Has the state established procedures for EMS providers to deviate legally from their established treatment procedures to support mitigation of and response to pandemic influenza and other public health emergencies while still assuring appropriate education, medical oversight, and quality assurance?	1
Has the state identified mechanisms to ensure freedom of movement of EMS assets (vehicles, personnel, etc.)?	1
Clinical Standards and Treatment Protocols	
Is there coordinated Statewide medical oversight of EMS pandemic influenza planning, mitigation, and response?	1
Has the state developed mechanisms for rapid development, adoption, or modification of prehospital clinical standards and triage/ treatment protocols before or during an influenza pandemic based on the most recent scientific information?	1
Has the state defined consistent, system-wide procedures for the rapid distribution of new or modified prehospital EMS treatment and triage protocols before or during an influenza pandemic?	1

Supporting Activities	Most Frequent Score
Has the state defined a process for providing just-in-time training for EMS agencies, EMS providers, EMS medical directors, and PSAPs?	1
Has the state defined the role of EMS providers in "treating and releasing" patients without transporting them to a healthcare facility?	1
EMS Workforce Protection	
Has the state identified strategies to assist local EMS agencies with the protection of the EMS and 9-1-1 workforce and their families during an influenza pandemic?	1
Does the state have requirements or recommendations for EMS agencies for basic infection control procedures?	3
Does the state have system-wide processes for providing vaccines and anti-viral medication to EMS personnel?	2
Have State EMS agencies and public health agencies identified mechanisms to address issues associated with the isolation and quarantine of EMS personnel?	1
Has the state-defined processes to supplement local EMS agencies in offering support services, including mental health services, to EMS personnel and their families during an influenza pandemic?	1

Note. Adapted from Federal Interagency Committee on EMS (2009). "State EMS System Pandemic Influenza Preparedness: A Report of the FICEMS" (https://www.ems.gov/pdf/preparedness/Resources/State_EMS_System_Pandemic_Influenza_Preparedness.pdf). In the public domain.

Table 3

Summary of Most Frequent EMS Supporting Activities by Score for the States, Territories, and the District of Columbia

SCORE	MOST FREQUENT SUPPORTING ACTIVITY
3 = Completely Addressed	Basic infection control procedures
2 = Largely Addressed	Information dissemination and workforce backup plans
1 = Minimally Addressed	Just-in-time training
0 = Not Addressed	Treating and releasing patients
Total Number of EMS Supporting Activities	***22***

Note. Adapted from Federal Interagency Committee on EMS (2009). "State EMS System Pandemic Influenza Preparedness: A Report of the FICEMS" (https://www.ems.gov/pdf/preparedness/Resources/State_EMS_System_Pandemic_Influenza_Preparedness.pdf). In the public domain.

Table 4

Summary EMS Ratings for the States, Territories, and the District of Columbia

SUMMARY RATING	**NUMBER OF STATES AND TERRITORIES**
No Major Gaps	1
A Few Major Gaps	3
Many Major Gaps	16
Inadequate Preparedness	36
Not Applicable	0
Total States and Territories	***56***

Note. Adapted from Federal Interagency Committee on EMS (2009). "State EMS System Pandemic Influenza Preparedness: A Report of the FICEMS" (https://www.ems.gov/pdf/preparedness/Resources/State_EMS_System_Pandemic_Influenza_Preparedness.pdf). In the public domain.

Workforce Preparedness

Mirvis (2020) expressed that preparedness for all disasters, including pandemics and bioterrorist attacks, best comes from facing the actual challenge, thinking and fighting through it, and then implementing lessons learned on the other side. Previews, simulations, and situation-based scenarios are the best tools for gaining institutional knowledge and capability for handling these large-scale events. Inevitably, the passage of time degrades this workforce preparedness, as those who learned the critical lessons firsthand forget them, retire, or seek employment elsewhere.

The consequences of EMS personnel not fulfilling their ethical and social duties by coming to work during a crisis and answering the calls for help would be exceptionally dramatic (Alwidyan, Trainor, et al., 2020a). In a recent study, 12% of US EMS personnel reported that they would not work during a flu pandemic if asked, and 7% reported that they would not function during a flu pandemic even if required (Ventura et al., 2020, p. 5). Barnett et al. (2010) report that 52% of the same study population reported that they would not work during a flu pandemic if there were risks of spreading the disease to their families. Furthermore, in another study "evaluating the same pandemic, it was found that several factors could be influential in willingness to work, such as sex, position, employment type, training and education, availability of personal protective equipment, and trust in one's employer" (Ventura et al., 2020, p.5). Watt et al. (2010) independently supported the conclusion that EMS providers who believe they are well trained and educated on infectious pathogens are more willing to report to work during a pandemic.

Alwidyan, Trainor, et al. (2020b) show that another study of EMS providers' willingness to work during a pandemic in 2010 reported that 44% of EMS providers were unwilling to work during a pandemic. However, another study, also published in 2010, indicated that 93% of EMS providers would be willing to work EMS if ordered, and 88% would work if requested but not required. Furthermore, it is essential to note that even in this second and more optimistic survey, the willingness of EMS providers to work during a pandemic dropped to 48% if there is a possibility of their families becoming infected. Lakoff (2008, p. 417) points out:

> Every one of those people you are trying to mobilize is going to have to be vaccinated. You can't expect them to go in there and expose themselves and their family to smallpox or any other deadly disease without vaccination. (Lakoff, 2008, p. 417)

The above study results roughly align with the same line of inquiry regarding EMS workers in the nation of Jordan about their willingness to work during a pandemic. While this research consisted exclusively of EMS providers in the US, there are certainly lessons that can be learned from a review of the willingness of EMS providers in Jordan to report to work during a pandemic. Another 24% of Jordanian EMS providers answered that they would only work their previously scheduled shifts and not take any further work during a pandemic. This same study showed that 69% of EMS providers worry about becoming ill during a pandemic, and 79% worry about their families becoming sick. Furthermore, 75% are concerned about the lack of information during the pandemic, 70% answered that they are worried about the lack of PPE, and 80% are worried about a lack of vaccines or effective medical response procedures.

Mackler et al. (2007) conducted a study to capture EMS providers' willingness to report to work during a pandemic. Much like the previous study, researchers used the same methodology, which consisted of a survey of a sample of credentialed EMS providers. The results indicated that 54% of EMS providers would be willing to respond to work during an emergency. However, only 34% of respondents felt confident in their personal safety when doing so. As per Lakoff (2008), this survey of EMS providers proved to be a reliable and consistent research method in evaluating this topic.

Oliver et al. (2012) report the finding of the FICEMS report conducted in 2008 and published in 2009 (Federal Interagency Committee on EMS, 2009). This study uses a different collection methodology to evaluate the preparedness of state EMS systems by the Federal Government. The results indicate a general lack of preparedness. While the methodology is different from the above-stated study, the results align with findings of similar reports with different methodologies, such as Alwidyan et al., (2020b).

Adequate Staffing

Understanding the factors that persuade healthcare workers to report to work or abandon their responsibilities during a pandemic or bioterrorist attack is critical to preparedness during these events (Devnani, 2012). Multiple factors statistically influence whether individual healthcare workforce members would continue to work through a pandemic. Those who have worked through a previous pandemic or bioterrorist attack are more likely to report to work during a subsequent one. Employees in their 40s or older are more likely to work during a pandemic or bioterrorist attack than those providers who are 20–34 years of age. According to Devnani (2012), fear for the well-being of one's family is such a decisive factor that it even superseded the concern for the personal safety

of the healthcare providers. Other factors that significantly impacted the willingness of healthcare providers to work during a pandemic are the implementation of bonus salaries, flexible hours, and insurance requirements.

Delaney (2008) reported that "international and health organizations estimate that 25 to 40 percent of the population will be infected with the virus during the course of a pandemic" (p. 13). During the COVID-19 pandemic in New York City, over 3,000 EMS providers from FDNY EMS were absent from work because of illness (Friedman et al., 2020). According to Delaney (2008), this absenteeism rate constitutes a 20% reduction in EMS providers to handle a 40% increase in call volume during that same time.

Young (2017) expressed that EMS providers have an increased risk of illness during a pandemic and bioterrorist attack because of the unpredictable nature of their job, the ubiquity of pathogens at their worksite, and repeated exposure to initial patient contact. As a direct result of potential increased exposure to pathogens, a reduction in the available workforce of EMS providers is a concern because of the balance of workload among those EMS providers who report to work during a pandemic or bioterrorist attack.

Adequate Training

To get the maximum benefit out of training, "training sessions should engage staff in all aspects of pandemic preparedness, including familiarization" (Young, 2017, p. 70). According to Maguire et al. (2007), research indicated that only a tiny percentage of public health personnel had ever received training on prehospital operations or capabilities by EMS providers. Likewise, at that same time, only a few EMS providers and their respective agencies had ever received training from either local or state public health agencies (Maguire et al., 2007). This belief contradicts a report by Watt et al.

(2010), which states that almost 50% of EMS providers had education and training on infectious pathogens in general, but 42% demonstrated inadequate knowledge in practice on this topic. Ventura et al. (2020) assert that significant data indicates that additional training in pandemic response has increased EMS providers' rate of compliance and willingness to respond during a pandemic.

Gershon et al. (2009) expressed that one of the best methods to evaluate a training program is to evaluate the individuals performing the required tasks before and after the training program. The method of this study was to test a sample group of EMS providers (N=129). A block of training was then provided to the sample group on the proper use of PPE, virus transmission methods, and agencies' policies and practices related to infection control. Then a performance evaluation was conducted of the individuals in the sample to determine the extent to which knowledge was transferred to and integrated into the practices of the EMS providers. While this is a highly effective evaluation to determine the improvement of knowledge related to a training program, it is very costly and prohibits a robust sample size.

According to a comprehensive study of 21,438 EMS providers, EMS participates in disaster and terrorist drills (Fernandez et al., 2011). This study reports that 40% of EMS providers had not participated in a multi-agency exercise within the 24 months of the survey. This lack of multi-agency preparation is troubling because effective management of a pandemic or bioterrorist attack will require cooperation and coordination between EMS agencies, public health agencies, and emergency preparedness and response agencies. This lack of coordination and preparation was true even after the Department of Health and Human Services funded a report in 2005 that

provided bioterrorism exercise step-by-step guidance to facilitate more and better pandemic and bioterrorism exercises (Dausey et al., 2005).

There is a documented failure of decontamination knowledge and practice among American EMS systems. Ventura et al. (2020) stated that EMS providers do not routinely clean their stethoscopes between patient contacts despite being an effective pathogen transmission vector. Furthermore, EMS providers that serve urban populations do not participate in accepted sanitation and hygiene standards, such as disinfecting items that come into contact with mucous membranes with soap and water, a commercial disinfectant, or alcohol between patient contacts (Ventura et al., 2020). Even further, while EMS agencies often make bloodborne pathogen training a prerequisite for employment, rarely, if ever, is aerosolized pathogen containment training provided or reinforced (Ventura et al., 2020, p. 5).

Keebler et al. (2017) indicated that a training program for EMS providers must establish the need for teamwork before the training program begins. An emphasis on teamwork will increase the buy-in for both the trainees and the organization and help keep focus and increase the participants' knowledge retention. Rather than the norm, it is the exception that EMS providers receive simulation-based team training. However, simulation-based team training "has been shown to improve teamwork as well as clinical performance on the job" (Keebler et al., 2017, p. 190). There is also a great value in ensuring that the simulation-based team training focuses on the wide breadth of situations in which EMS providers will operate during a pandemic or bioterrorist attack. There is statistical proof that team debriefs can improve EMS providers' performance, both in scenarios and during actual response situations, by as much as 25% (Keebler et al., 2017).

The results of better job performance when routine debriefs are conducted by EMS personnel were recently confirmed. In a study by Villani et al. (2021), the regular inclusion of debriefs and a debriefing form was shown to have a statistically significant increase in the quality of CPR that EMS providers performed, including a higher proportion of chest compressions to the desired depth and greater compliance with the desired recoil velocity.

EMS Provider Mental Health

The mental health of EMS providers is always a concern for the community, EMS agencies, and the EMS providers themselves. This mental health concern is even more paramount when this community is under the exceptional stress of responding to a pandemic or bioterrorist attack. As proof, Ventura et al. (2020) wrote that the EMS response during a pandemic exacerbates EMS providers' preexisting and predisposed mental health comorbidities, including addiction, Post-Traumatic Stress Disorder (PTSD), and depression. During COVID-19, record-high 911 calls, including a 40% increase in call volume, were responded to by a workforce reduced by 20% for illness (Friedman et al., 2020). With all these factors combined, there is no question that the remaining workforce has experienced increased burnout and decreased productivity. Furthermore, while many workers leave clinical care, the training programs for new providers have been paused because of the risk associated with allowing students to perform clinical and internship skills under the staggered attention of existing staff, in a highly infectious environment, and with extremely high patient counts.

As Rosenbaum (2020) expressed, it is part of the training for healthcare providers to make high-impact judgments amid uncertain data. Healthcare providers must gain the

ability to make rapid decisions that could ultimately mean the difference between life and death for the patient, rapidly and with missing or spurious information on the patient's condition. Such uncertainty often includes the cause of the patient's illness or injury and the correct path to treat what ails the patient. However, during a pandemic or bioterrorist attack, EMS providers must consider both the patient's best interest and what is in their own best interest. The performance of this calculation is in the provider's best interest, and the calculation should include the consequences to future patients if that EMS provider becomes sick during the crisis. Such an illness might render them unable to treat hundreds of patients that they otherwise could. The opportunity cost of future patients is especially true when there is a shortage of PPE. According to Jaffee et al. (2020), "the physical and psychological well-being of our HCWs [Health Care Workers] are being tested as patient loads continue to increase and fellow coworkers become infected with COVID-19, contributing significantly to burnout among healthcare workers" (p. 1527). EMS providers' psychological and emotional health must be supported to the same degree as their physical health.

The US Fire Administration (n.d.) also sets forth multiple recommendations to prepare and support the mental health of EMS providers during pandemics and bioterrorist attacks. These recommendations include:

- to actively engage in peer support,
- to acknowledge the acceptance of the increased risk of the EMS providers,
- to minimize response teams,
- to cross-train personnel, and
- to stay in contact with sick providers to allow for social support mechanisms.

Confidence in Ability to Respond Effectively

As expressed by Barnett et al. (2010), those EMS providers who describe themselves as "concerned and confident" were more than four times as likely to go to work during a pandemic or bioterrorist attack. The best method to make EMS providers concerned and confident is to provide them with education and training on the specific threat they face and effective countermeasures. EMS agencies can use the Extended Parallel Process Model (EPPM) to inform educational efforts for EMS providers. This data strongly advocates for not only cognitive education but also effective education. An EMS provider's perception of efficacy is one of the most significant driving factors that will make them willing to respond in a pandemic or bioterrorist attack across all risk levels.

However, one shortfall with using the EPPM is that it simultaneously captures vector data. Data points are grouped not only by a single factor but also by two separate variables. As reported in Barnett et al. (2010), the EPPM evaluates risk based upon a combination of both the understanding and fear of that risk. While this does have a place in the evaluation of EMS providers' knowledge during a pandemic, it would require less specific multi-variate analysis that could introduce potential confounding factors and decrease the analysis's statistical value. Furthermore, the EPPM decreases the effectiveness of improvement recommendations that can be drawn from the collected dataset. Additionally, the MST is more objective than the EPPM by design and allows for a more comprehensive review of the various streams of influence that can converge for meaningful public policy change to improve the current state of affairs.

Fernandez et al. (2011) assert a moderate correlation between the amount of disaster-specific training received by EMS providers and their willingness and confidence to respond to the pandemic and bioterrorist events. It is significant to note that all EMS providers are expected and required to respond to these events, regardless of training. There is a high correlation between the quantity and currency of training received by public safety personnel and their self-efficacy. The researcher described self-efficacy as a person's ability to effectively handle a prospective situation's required actions. Few would be surprised by the data-driven conclusion that "…respondents who took part in a mass-casualty incident or disaster as a healthcare worker evaluate their own preparedness much better than respondents who had not been involved in such an event" (Goniewicz & Goniewicz, 2020, p. 6).

Studies report that EMS providers fear the responsibility of responding to events that they know little about, involve some aspect of bioterrorism, or could potentially infect them with a pathogen more than other types of response situations (Smith et al., 2011). This study supports the empirical data proving that EMS providers are least likely to work and less confident in responding to calls when the providers are undertrained or when a threat may infect the providers. This reluctance is often the case in responding to calls during a pandemic or bioterrorist attack caused by the spread of a new pathogen. EMS providers are not familiar with and significantly fear a terrorist attack and an outbreak of a new infectious disease.

Personal Protective Equipment (PPE) Preparedness

When it comes to inadequate medical resources, the community must adopt crisis standards of care to stretch the available supply. There is legal support for adopting crisis

standards of care in an emergency. Appropriate officials can create policies well ahead of a crisis to increase preparedness for pandemics and bioterrorist attacks. Many jurisdictions may not provide adequate guidance to educate those in the EMS system and other stakeholders regarding the most practical and efficient strategies to allocate scarce resources (Romney et al., 2020). The Federal Government determined that "the extent of crisis standards of care planning and implementation varies across local, state, territorial, tribal, and federal stakeholders" (US Department of Health and Human Services. 2020, p. 1).

It is concerning to note that "PPE and other medical supplies are expected to be insufficient or depleted during an infectious disease disaster" (Rebmann, 2014, p. 120-14). According to the US Department of Health and Human Services (2020), the current supply and production capacity of such equipment in the United States is inadequate compared with the expected demand seen during past pandemics. According to Ventura et al. (2020), ambulance ventilation systems reduce but do not eliminate the risk of airborne particle exposure from the infectious patient. The availability of PPE designed to protect the respiratory tract of EMS providers is decreasing while the demand is significantly increasing (Ventura et al., 2020, p. 5). Devnani (2012) expressly asserts that the statistical data shows a direct correlation between PPE adequacy, a place of employment, and a healthcare worker's willingness to report to work during a pandemic or bioterrorist attack. Furthermore, as asserted by Underwood (2021), "World-wide PPE shortages have also been a problem. To address this in the US, action was taken to reuse and to extend the use of PPE to attempt to supply enough N95 respirators (face masks)." (p. 4).

There is a concern among EMS providers that they will have an inadequate supply of PPE during a pandemic or bioterrorist attack (Young, 2017). According to the US Department of Health and Human Services (2017), responders should be aware of infectious disease outbreaks and be ready to immediately don PPE, based upon a doorway evaluation, to protect themselves as needed. Additionally, when there are adequate quantities of equipment, studies show that it is common for EMS providers to doubt the veracity and reliability of the PPE to which they have access. One way to foster and increase trust among EMS providers is to consider their input when making equipment selection decisions that will directly impact them.

One way to help mitigate the loss of an adequate supply of PPE during a pandemic or a bioterrorist attack is to ensure that PPE is donned, doffed, and consumed only when necessary for the safety of individuals. According to Suppan (2020), practical training can help preserve PPE for the uses when it is most critical to the protection of EMS providers. Additionally, knowledge and training, including a computer-based training module on the appropriate use and application of PPE, help reduce exposure to EMS providers and stretch the current supply of PPE by avoiding unnecessary usage. This PPE supply could then be augmented by contracts executed at the time of need and managed by emergency management agencies. As COVID-19 demonstrated, this is a much more effective option during a regional epidemic than a global pandemic. This is because nations that produce the PPE will provide the needed PPE to their governments before selling them to the United States, where there is an extraordinary shortage of organic PPE production capability.

Public Safety Answering Point (PSAP)

PSAPs play a critical role in a pandemic or bioterrorism attack. They are the main point of contact between the public and response personnel, and their interplay sets the perception of how ready the government is to respond in the people's eyes. Marrazzo et al. (2020) expressed that the "worried well" concept is well-documented in disasters. For example, in 1989, during a Brazilian radiation contamination event, 120,000 people sought medical treatment. This surge in demand overloaded the healthcare system when radiation contacted less than 250 individuals. PSAPs need to be flexible to adjust practices to meet the capability expectation to respond effectively in the triage and evaluation of callers; the PSAP could increase hospital crowded and overload of the EMS response capability. A prepared PSAP would have a disease-tailored response algorithm, the ability to add specially trained personnel to the PSAP, and the ability to reorganize and adapt to dynamic changes rapidly. Implementation of these practices will optimize the suitable disposition of victims, stretch EMS response capabilities, and mitigate hospital overcrowding and PPE shortages.

The ability to monitor the increasing indicators of disease spread is critical to the recognition and response of a pandemic or bioterrorist attack. According to Groenewold (2008), this is referred to as health situational awareness. PSAPs provide this health situational awareness to the public health community through the timely and accurate coding of the emergency response request coding system. In addition to recognizing a health emergency, the PSAPs call coding can provide the capability to monitor and pandemic or bioterrorist attack's size, location, and severity. The National Highway

Traffic Safety Administration explicitly identifies PSAPs to track health situational awareness in their document to increase EMS' preparedness for pandemics.

The tables below capture the evaluation of the readiness of state PSAPs to manage a pandemic or bioterrorist event (Federal Interagency Committee on EMS, 2009, p. 8-10).

Table 5

Scoring Criteria to Evaluate Preparedness.

SCORE	Description
3	Complete response: documentation indicates actionable plan.
2	Substantial, but incomplete response; documentation indicates that state has largely addressed activity, but response is not complete or actionable.
1	Minimally responsive; documentation only indicates intention or beginning of planning for activity, or only a part of the activity has been addressed.
0	Response mission: documentation does not address activity.

Note. Adapted from Federal Interagency Committee on EMS (2009). "State EMS System Pandemic Influenza Preparedness: A Report of the FICEMS" (https://www.ems.gov/pdf/preparedness/Resources/State_EMS_System_Pandemic_Influenza_Preparedness.pdf). In the public domain.

Table 6:

Questions asked state regarding supporting activities for 9-1-1 pandemic influenza preparedness with a most frequent (modal) score by question for all the States, Territories, and DC

Supporting Activities	Most Frequent Score
Guiding Principles for Public Safety Answering Points	
Does the Statewide pandemic influenza plan delineate the role of PSAPs?	0
Are PSAPs involved in Statewide pandemic influenza planning?	0
Does the Statewide pandemic flu plan establish mechanisms for "Just-in-Time" training and education to call-takers and other PSAP personnel?	0
Is there a consistent Statewide mechanism for communications of pandemic flu updates to PSAPs?	1
Does the State pandemic influenza plan establish standardized 9-1-1 protocols that capture symptoms specific to the pandemic?	0
Does the state have established processes for integrating best practices or lessons learned during the previous pandemic wave across the 9-1-1 system and issue an after-action report?	0
Provision of Information to the Public	
Does the state have a mechanism and protocols in place to coordinate quickly the latest public health and other information and messages with PSAPs to assure a coordinated system-wide message?	1
Facilitation of Call Screening	
Does the State pandemic influenza surveillance system incorporate the role of the PSAPs in implementing automated data gathering and data packaging of specific symptoms for purposes of real-time analysis to identify geographic and temporal clusters of symptoms and patients?	0
Does the state have a mechanism to disseminate rapid updates to pandemic influenza symptoms set to PSAPs for caller screening and data collection/analysis?	1
Are there Statewide policies and procedures and legal protections for sharing pertinent data with State and local public health authorities?	0
Are there Statewide protocols and procedures in place to guide PSAP triage and patient classification during an influenza pandemic?	0
Assistance with Priority Dispatch of Limited EMS	
Is there Statewide legal authority and protocols to allow tiered response of different EMS units during a pandemic influenza?	0

Supporting Activities	Most Frequent Score
Does the State pandemic influenza plan establish mechanisms to identify those 9-1-1 callers or patients appropriate for transfer to a secondary triage specialist or alternate call center? Is there coordination between public health, EMS, and PSAPs to coordinate this transfer?	0
Education and Training of PSAPs	
Does the state identify PSAP pandemic influenza continuing education and training?	1
Does the state identify methods for pandemic influenza "just in time" training for PSAP personnel and their medical directors that is coordinated with EMS, public safety, and public health?	0
Continuity of Operations	
Does the state define isolation and quarantine policies and procedures for PSAPs?	1
Does the state define system-wide processes for vaccinating 9-1-1 personnel as an element of the critical infrastructure?	0
Does the state identify mechanisms for freedom of movement of PSAP personnel?	0

Note. Adapted from Federal Interagency Committee on EMS (2009). "State EMS System Pandemic Influenza Preparedness: A Report of the FICEMS" (https://www.ems.gov/pdf/preparedness/Resources/State_EMS_System_Pandemic_Influenza_Preparedness.pdf). In the public domain.

Table 7

Summary of Most Frequent 9-1-1 Supporting Activities by Score for the States, Territories, and the District of Columbia

SCORE	MOST FREQUENT SUPPORTING ACTIVITY
3 = Completely Addressed	Involving PSAPs in Statewide pandemic influenza planning
2 = Largely Addressed	Establishing a mechanism for information dissemination to PSAPS
1 = Minimally Addressed	Isolation and quarantine procedures for PSAP personnel
0 = Not Addressed	PSAP triage and patient classification
Total number of 9-1-1 Supporting Activities	***18***

Note. Adapted from Federal Interagency Committee on EMS (2009). "State EMS System Pandemic Influenza Preparedness: A Report of the FICEMS" (https://www.ems.gov/pdf/preparedness/Resources/State_EMS_System_Pandemic_Influenza_Preparedness.pdf). In the public domain.

Table 8

Summary 9-1-1 Ratings for the States, Territories, and the District of Columbia

SUMMARY RATING	**NUMBER OF STATES AND TERRITORIES**
No Major Gaps	1
A Few Major Gaps	0
Many Major Gaps	4
Inadequate Preparedness	51
Not Applicable	0
Total	***56***

Note. Adapted from Federal Interagency Committee on EMS (2009). "State EMS System Pandemic Influenza Preparedness: A Report of the FICEMS" (https://www.ems.gov/pdf/preparedness/Resources/State_EMS_System_Pandemic_Influenza_Preparedness.pdf). In the public domain.

Administrative Preparedness

While history indicates that "future pandemics are inevitable…protocols and guidelines are important resources to assist the healthcare sector to prepare and respond to pandemics" (Young, 2017, p. 65-66). According to Young, the Center for Disease Control and Prevention (Center for Disease Control and Prevention, 2018), the World Health Organization, and various other public health disaster response agencies have developed algorithms and protocols for EMS providers to adhere to during a pandemic (2017). The National Office of EMS even came out with 100 pages of pandemic preparedness guidance for EMS providers (National Highway Transportation Safety Administration, 2007). Some paramedics are unaware that these resources already exist while simultaneously desiring them. To ensure the proper support for EMS providers and sufficient preparation, pandemic and bioterrorist planning should be comprehensive, collaborative, and effectively and strategically communicated. One option would entail a central clearinghouse of educational resources for pandemics and bioterrorist attacks that serves as a community of practice for all EMS in the United States.

For over 15 years, FEMA's National Incident Management System (NIMS) has been the national standard for domestic disaster response within the United States (Hambridge et al., 2017). However, a significant divide exists between agencies primarily focused on emergency response and supporting agencies, like public health care providers, with a broader or different focus. It is true that "FEMA has recognized the need to simplify the NIMS doctrine and is in the process of doing so, not only due to second and third circle concerns but also to a general perception of NIMS' over-complexity" (Hambridge et al., 2017, p. 20). NIMS is the logical tool to customize and

coordinate the various resources and agencies required to support a large-scale pandemic or bioterrorist response. However, there is tension between the varied resources that different agencies allocate to prepare and integrate such a response. There is a natural trend for agencies focusing on disaster response to allocate more resources towards achieving that goal, while agencies that are less focused on disaster response give fewer of their scarce resources towards disaster preparedness.

NIMS, the nationally standardized system, is both scalable and flexible to accommodate a wide range of disasters. NIMS was designed on the west coast by wildland firefighters. According to Barbera and Macintyre (2002), a significant effort was made to create such a nationalized incident management system. This system is necessary for diverse agencies to respond to and interoperate multiple casualty incidents and disasters that impact the world of police, fire, and EMS. While NIMS is very well developed for its initial purpose, there is no effective equivalent system to manage public health emergencies like anthrax bioterrorist attacks. This national incident management system is not designed to handle many patients spread over thousands of miles and days after exposure to a pathogen.

During an actual national disaster, the allocation of scarce resources will undoubtedly occur, as Leider et al. (2017) argue. The government must coordinate and plan for such events so that governmental practices at all levels incorporate the broadly approved medical and legal ethical principles. This assertion does not mean that any specific items are incorporated into an effective disaster plan but that the document is developed and implemented considering ethical and legal principles that are implemented concurrently with the disaster at hand. These ethical principles, once incorporated, must

be evaluated along with their practical implications to determine whether such a plan is ethical and feasible for implementation.

Reporting is critical for coordinating, allocating, and distributing these scarce resources. The distribution and assignation of these resources should be data-driven and based on a defensible, reproducible, and rigorous process. The best way to obtain accurate and timely information regarding the needs for such resources is through end-user reporting. However, this consistency has not been demonstrated to exist in large-scale federal exercises because of the lack of a template or guidance from federal agencies on how they need to report information across community lifelines (US Department of Health and Human Services, 2020). After standardizing details across the various reporting agencies, decisions can be made based on objective, rational, and reliable data.

All disasters, including pandemics and bioterrorist attacks, disproportionately impact less affluent community members. They have fewer available resources, options, and flexibility (Emergency Medical Services for Children, 2021). To obtain socially desirable outcomes, “disaster planning must be designed to address such inequities” (Emergency Medical Services for Children, 2021, p. e164). Part of future preparedness by EMS for disasters such as these is to coordinate and facilitate with local public health officials, hospital systems, and other public safety personnel. The purpose of this coordination is to ensure that the plan in place accounts for these underserved members and the increased support they will require. The effects of COVID-19 demonstrated the disparate impact that a pandemic can have on different sections of the population (Brousselle et al., 2020).

For this reason, local political leaders should create and execute pandemic and bioterrorist response policies that are sensitive to the unique factors that impact their constituents on the micro-level (Brousselle et al., 2020). One example would be to leverage EMS providers to conduct infectious disease testing, as was done during COVID-19, to test ill patients, bedridden patients, and patients without private transportation for the disease at home (Goldberg et al., 2020). The consideration of all community members' needs can be done using a healthcare coalition to lessen the burden on any single agency while increasing the system's capabilities (McElwee, 2012).

Coordinated messaging platforms should be drafted and practiced informing as much of the population as possible on the status of the response and potential safety and mitigation measures to minimize the impact of a pandemic or bioterrorist attack (Pei et al., 2020). The public tends to rely on past experiences to gain information during disasters, so preparedness depends on consistency and simplicity. Thoughtful and detailed messaging platforms will significantly reduce public fears and increase cooperation and coordination with government efforts to respond (Hoffman, 2003). These platforms would have to be highly efficient and filled with accurate and timely verified information to compete with the torrent of misinformation routinely disseminated through unvetted resources during disasters. In the absence of official messaging, the public tends to believe whatever is reported on social media and other information-sharing platforms.

Public health officials are hesitant to share medical and epidemiologic information with law enforcement agencies in the current state (Hoffman, 2003). Legal concerns are associated with strict federal punishment for violating vague regulations designed to protect private health information. Furthermore, there is an ideologic fear that

reporting this information to law enforcement agencies will discourage some from seeking care and accurately reporting potential exposures. According to the US Department of Health and Human Services (2020), different agencies must align their data-sharing policies to ensure coordination within a disaster response and increase corroboration and synergism between the various coordinating response agencies.

According to Hoffman (2003), another administrative item that legal representation should address is a comprehensive legal review of possible governmental restrictions to limit disease transmission and their impact on civil liberties. Preparedness should include lawyers reviewing potential emergency measures. These include quarantine orders, isolation orders, and "stay at home" orders, especially those focused on people for a specific region, as opposed to direct contact with the infected, to protect the rights of all humans.

In 2008, the Department of Homeland Security and the Department of Health and Human Services disseminated guidance regarding the disaster preparedness benefit of vaccinating critical infrastructure personnel, including EMS providers (Moulia et al., 2017). Seven years after this guidance was released, a survey reported that less than 44% of public health emergency planning programs stated that they had a viable plan to rapidly identify and vaccinate critical infrastructure personnel during a bioterrorist attack or attack pandemic. Furthermore, only 26% of existing public health emergency planning identified EMS personnel as essential public health resources. This identificatory process is a critical loss in speed regarding EMS provider medical prophylaxis during a pandemic or bioterrorist attack.

Financial Preparedness

The total cost of a pandemic or bioterrorist attack is quite significant. The cost of the federal response to deploy supporting resources, the lost labor of sick people, and the lost transactions of those who shelter in their houses and do not participate in commerce to their normal degree is the cost associated with the local hospitalizations and other commerce. The cost of increased unemployment is associated with businesses' failure that depends upon mass gatherings and public interactions of a large volume of workers with disposable income. According to Vaida (2017), Ebola cost the world's economy $32 billion, and Zika cost South American countries and the Caribbean $18 billion. As Vaida (2020) points out, US political officials have historically emphasized pandemic planning and response. Still, as that threat faded, political priorities shifted away from these programs, resulting in decreased or complete elimination of funding support.

The typical response structure of EMS providers does not effectively allow for reimbursement of the most necessary items during pandemics. There is a significant financial deficit when the need for patient care, supplies, PPE, and decontamination supplies spike, with an associated decrease in reimbursement associated with the public's fear of being transported to a hospital. Such a delta in revenue versus expenditures can injure or permanently collapse an EMS agency. According to Gallagher and Humphreys (2020), firefighters had a $100 million grant to counteract the COVID-19 response expenses, such as increased PPE, response supplies, and decontamination supplies. However, these funds often prohibit additional supplemental funding sources to agencies that receive them. These funds are directed through state agencies which slow down and reduce the receipt of these monies by the individual agencies performing the responses.

The federal statute that allocates disaster management and response funding is the Robert T. Stafford Act (42 U.S.C. ch. 68 § 5121 et seq). The Stafford Act is used to fund the federal response to disasters. According to the US Department of Health and Human Services (2020), the definition of a significant disaster under this statute does not include pandemics. Therefore, as a direct result, the primary source of funding and resources for any disaster would not be actuated and implemented for a pandemic. HHS can fund such a response under the Economy Act. However, they are not budgeted to accomplish such a task, so this reaction could only occur after Congress receives a supplemental funding request from HHS, or the lead agency, to support the response.

Criteria of Preparedness

There is a significant challenge in identifying what it means for an agency to be "prepared" for a pandemic or bioterrorist attack. Despite multiple attempts to decipher EMS disaster readiness, "no nationally accepted methodology or process is in place to evaluate and measure an EMS system's level of disaster preparedness systematically. However, several methods have been proposed or tested" (Elliott, 2010, p. 2). Therefore, since no nationally standardized criteria or methodology currently exists, one must be created. This research study lays out the standards through which the preparedness of EMS agencies to respond to a pandemic or bioterrorist attack is evaluated. This criterion was generated by aggregating existing data and foundational documents for defensibility and ensuring credibility.

Biodefense preparedness aims to anticipate and effectively respond to biological threats promptly (Lakoff, 2008). According to Lakoff (2008), this involves the ability to mass-produce vaccines for pandemic and bioterrorist pathogens and fortify the

infrastructure that supports the nation's public health. Another preparatory requirement is to ensure that healthcare surge capacity is adequate to meet the public need during a pandemic or bioterrorist attack and create contingency and response plans to allow the nation to function throughout the threat.

The Federal Interagency Committee on EMS (2009) indicated that addressing several specific criteria is critical in preparing for EMS's pandemic or bioterrorist attack. These categories include planning, legal authority, pathogen surveillance and countermeasures, ensuring Continuity of Operations Planning (COOP), response protocols, treatment crisis standards of care, and protection of the EMS workforce.

Five general requirements must be met for an EMS system to be prepared for a pandemic or bioterrorist attack. The five areas that must be solidified are 1) EMS integration into more extensive government pandemic preparedness planning, 2) availability of adequate PPE for EMS, 3) ample medical oversight of EMS and 9-1-1 systems, 4) EMS system integration with pandemic mitigation strategies within the community, and 5) COOP planning and surge capacity within the EMS and 9-1-1 systems (Federal Interagency Committee on EMS, 2009, p. 11-12).

Methods to Improve Preparedness

According to Skryabina et al. (2017), emergency exercises increase preparedness for public health emergencies. Benefits to the individual participants of the practice, the use to the organization, and a longitudinal impact of preparedness are the three main categories in which increases can be obtained. These preparedness increases come in the form of three major categories. The personal improvement comes from the training provided to the individuals before the facilitation of the exercise. The activity is relevant

and job-related to the participants, increasing adult learners' retention. Individuals benefit from the quality facilitation that improves meaningful conversation among participants and the artificial pressure of an exercise that identifies gaps in performance commonly missed in less stressful environments. Evaluators should use disaster response preparedness and effectiveness to remove weaknesses and holes in the effective management of pandemics and bioterrorist attacks (Goniewicz & Goniewicz, 2020).

There is a clear affirmative correlation between the execution of emergency preparedness drills and the improvement of emergency systems during pandemics and bioterrorist attacks. A comprehensive evaluation system requires that "emergency preparedness exercises are believed to help identify gaps in emergency plans and procedures that, when addressed, will improve an organization's or system's emergency preparedness" (Skryabina et al., 2017, p. 280). There has also been significant reporting that emergency preparedness exercises' employment results in longitudinal organizational benefit. This improvement is because those who prepare or participate in emergency preparedness drills repeatedly ask more thoughtful questions about the organization's emergency preparedness and solve the problems identified as gaps from those exercises (Skryabine et al., 2017, p. 281).

According to Lakoff (2008), there is a clear need for public health personnel, including EMS providers, to conduct more exercises designed to better prepare them to manage a widespread pandemic and bioterrorist response effectively. The American College of Emergency Physicians believes healthcare providers should execute more large-scale real-world scenario-based pandemic response exercises. Once this is done, the individual healthcare providers will improve their knowledge and skill from experience,

and the response plans can be enhanced based on the lessons learned from the exercise. The framework for an effective response has been established by Lakoff (2008), but it must be implemented and executed to increase its robustness.

Clear guidance and thorough awareness of a simple and effective pandemic response plan would improve any response to a pandemic or bioterrorist attack. According to Venture et al. (2020), a new and evidence-based protocol to be used by EMS response would improve the national EMS response by structuring alignment in countermeasures and decrease rapid transmission within the community. One such method of achieving this goal is to use standardized products to reduce the burden of creating emergency preparedness while simultaneously increasing national alignment. According to the Center for Disease Control and Prevention (n.d.-a), such a checklist should include the contact information for pandemic planners, accessibility to the pandemic plan by all members, effective pandemic surveillance and detection measures, as well as guidance for triage and management of patients during a pandemic or bioterrorist attack.

Barnett et al. (2010) report that EMS personnel's family preparedness is critical towards ensuring their ability and willingness to respond during a pandemic and bioterrorist attack. Workers who were confident in the safety of their work environment were more than three times more likely to work during a pandemic. Education of EMS workers on the specific hazards they face during either a pandemic or bioterrorist attack makes members more than twice as likely to respond during that crisis. Education on the importance of EMS providers for that specific crisis increases the willingness to respond during the emergency by a factor of six.

There are also moral and ethical obligations that EMS providers and other healthcare providers have toward their families and the public. These are often stressed or placed in direct conflict during pandemics and bioterrorist attacks. EMS providers and healthcare providers need to understand the fears of home caregivers and their patients to craft policies and practices that meet their needs to the greatest extent possible (Bruno & Rose, 2020).

In response to the COIVD-19 pandemic, the CDC did release a list of recommendations to increase and improve the preparedness of EMS systems to prepare and respond to pandemics. This list includes a diverse set of solutions that target shortfalls that have historically existed in the readiness of EMS systems. The CDC asserts that employers of EMS providers are required to:

- guide donning and doffing PPE specific to the pandemic threat,
- provide all EMS providers with the job and task-specific training and education specific to the pandemic threat,
- ensure that EMS providers are trained and practiced in using PPE,
- provide adequate PPE to EMS providers to fulfill their responsibilities, and
- ensure that those who decontaminate medical equipment are trained and knowledgeable in decontamination practices that will kill the threat of the pandemic (Centers for Disease Control and Prevention, 2020).

Summary and Transition

There is substantial data that the American EMS system cannot respond to a pandemic or bioterrorist attack as a unified front because of inadequate preparation (Ventura et al., 2020). The most significant challenges recognized in existing research

seem to be EMS provider's absenteeism during pandemics and bioterrorist attacks, inadequate quantity and quality of training for EMS providers, a lack of adequate mental health support for EMS providers, and a lack of confidence by EMS providers that they can respond appropriately. Additional shortfalls exist in the form of an inadequate supply of PPE to support EMS, uncoordinated PSAP support, missing administrative preparedness, and financial realities that could jeopardize response effectiveness. Despite a substantial number of pandemic threats in America since the 1918 influenza outbreak, there is a lack of collaborative planning and preparation.

There was comprehensive research performed by FICEMS in 2009 on the preparedness of EMS to respond to a pandemic or bioterrorist attack. This study evaluated each state's EMS and PSAP system individually using a subjective scoring system by two independent federal EMS subject matter experts and assigning them on a scale of preparedness in various categories from one to four. While this provided a thorough perception of the state EMS's preparedness to respond to a pandemic or bioterrorist attack, it lacks some defensibility. It evaluates EMS only at the state level rather than at the level of individual EMS agencies and providers.

The current community of knowledge on this research demonstrates that preparedness evaluation should focus on key categories of preparedness (Alwidyan et al., 2020b). These include the maintenance of an adequate workforce, the obtainment of sufficient quantities of PPE, and the ability of PSAPs to adapt practices, administrative preparedness, and financial preparedness to sustain responses during a pandemic or bioterrorist attack. There is also ample research to indicate what criteria constitute

preparedness and some available methods to increase EMS's preparedness to respond to a pandemic or bioterrorist attack.

While significant research exists on EMS preparedness during a pandemic, that research was done a decade before the COVID-19 pandemic. The COVID-19 pandemic called into question some of the fundamental principles for EMS pandemic preparedness upon which disaster plans were based. A world pandemic created situations where entire nations competed for scarce resources and supplies for the first time. The call volume decreased for EMS during COVID-19 when, historically, call volume skyrocketed during past pandemics and bioterrorist attacks.

Therefore, further review is needed regarding some of the postulates upon which EMS pandemic and bioterrorist preparedness are based. A further evaluation of these principles, and their associated consequences, should be reexamined to determine the effectiveness of EMS preparedness given data obtained from all past disasters, including the COVID-19 pandemic.

Chapter III: Research Method

Overview

When disasters occur, Emergency Medical Services (EMS) providers stabilize and transport patients to healthcare facilities for medical treatment without putting themselves, their families, or their immediate communities at risk (Ejike, 2019). However, considerable risk is involved when providing emergency care to patients with a contagious disease. EMS providers are trained in infection control and risk mitigation procedures. Some procedures include wearing Personal Protective Equipment (PPE), engaging in adequate baseline training, and reviewing and reinforcing medical education to include regular refamiliarization with additional, more advanced training courses (Centers for Disease Control and Prevention, 2015).

Disasters that involve contagious diseases include pandemics and bioterrorist attacks. A pandemic is a disease outbreak on a global scale. A pandemic affects a substantial number of people as it exerts considerable pressure on emergency responders and resources, including available hospital beds. Both epidemics and pandemics can result from bioterrorism. A bioterrorist attack occurs when highly contagious natural or manufactured pathogens are purposely released to create incapacitating illness in an extensive portion of the population. Because the widespread release of biological pathogens seems inevitable, this form of bioterrorism is a genuine risk to modern society (Cenciarelli et al., 2015). It is the United States' responsibility to be prepared to respond to pandemics and bioterrorist attacks involving contagious pathogens.

However, the actual accountability for response lies with EMS providers. EMS providers are the frontline personnel responsible for recognizing and responding to

pandemics and bioterrorist attacks as they are simultaneously exposed to the pathogen causing widespread illness, often before the risk and contagion are recognized and understood. The welfare of individual EMS providers and our nation is critically dependent on the success of the EMS response (Ejike, 2019).

There is increasing concern about whether these well-intentioned, highly driven and trained healthcare providers are adequately resourced and equipped to meet the exceptionally high burdens created by pandemics and bioterrorist attacks. EMS providers' capabilities to respond to pathogens, and whether the pathogens had been weaponized, were questioned following the non-weaponized 2014 Ebola epidemic (Ejike, 2019). However, the problem with the CDC edict of inadequate preparation, as with all the existing publications on EMS preparedness, is that the data emanates from studies conducted before the current and disastrous COVID-19 pandemic. Data regarding EMS preparedness during and after the COVID-19 are needed.

COVID-19 was first detected in the United States in February 2020. By mid-March, cases were reported in all 50 states, the District of Columbia, and four U.S. territories. COVID-19 dramatically increased America's awareness of the widespread impacts of illness, death, and economic carnage caused by pandemics and, by inference, by a catastrophic bioterrorist attack. However, COVID-19 also revealed numerous shortfalls in EMS providers' preparedness to respond at local, state, and national levels. The problem that initiated this research is the existence of shortfalls in EMS provider preparedness. As expressed by Cash et al. (2021), "impacts from COVID-19 have affected EMS service call volume, increased EMS professional fatigue, worsened well-being, and slowed the education pipeline" (p. 2).

The purpose of this study is to evaluate the current preparedness level of EMS providers across the United States to respond, mitigate, and recover from a natural or manufactured pandemic or bioterrorism attack in the United States. The proposed research aims to employ a survey to quantify both EMS providers' views on current capabilities to recognize and respond to a pandemic or bioterrorist attack as well as response shortfalls. This information was used to generate recommendations to increase America's effectiveness and sustainability of response to future pandemics or bioterrorism events.

This chapter explains the data collection methods in nine sections, followed by a summary. The first section describes the research design. The second section identifies the research questions. The third section lists hypotheses. The fourth section describes the participants and setting. The fifth section describes the data collection instrument, which is a researcher-generated survey and provides operational definitions of variable constructs. The sixth section describes procedures. The seventh section presents data analysis. The eighth section lists assumptions, limitations, and delimitations. The ninth section provides ethical assurances. The concluding section is a summary.

Design

The design for this study is an exploratory, descriptive, quantitative group-comparison design using data obtained from an online survey. The justification for an exploratory design is that all the existing data on EMS provider preparedness emanate from studies conducted before the COVID-19 pandemic; thus, current data are needed. The rationale for a descriptive quantitative design is to collect data to identify trends in preparedness that can be generalized. The rationale for group comparisons is that EMS

providers fall into four categories that are anticipated to yield different views on preparedness related to differences in the amount of training: According to National Highway Transportation Safety Administration (2021), Emergency Medical Responders or EMRs have 48 hours of training, Emergency Medical Technicians or EMTs have 150 hours of training, Advanced Emergency Medical Technicians or AEMTs have 350 hours of training. Paramedics have 1600 hours of training. The goal is to collect as large a sample of EMS providers across the United States as possible to maximize representativeness as it captures perspectives. Therefore, the rationale for conducting survey research is its many advantages (Vaske, 2019), including the ability to capture the characteristics of a large sample economically and in a relatively short period, ask numerous questions, and employ consistent and standardized questions that permit comparisons between groups. In addition, the results of surveys from a representative sample can be generalized to the target population that the sample represents (Creswell & Creswell, 2018). There are not any anticipated time or resource constraints with this quantitative design choice. This descriptive study does not include a formal intervention, although the COVID-19 pandemic intervened to create this study.

Research Questions

Two research questions that guided this study:

RQ1: Is the EMS community in the United States ready to respond to a pandemic or bioterrorist attack?

RQ2: What practices, procedures, or policies should be implemented to prepare the US EMS system for a pandemic or bioterrorist attack?

Hypotheses

The problem that initiated this research is the existence of shortfalls in EMS provider preparedness. The problem of pandemic preparedness is related to the research questions (the extent of preparedness and subsequent implementation of best practices), the quantitative design, and the survey data collection method. Hypotheses took the following generic forms.

H_0: Differences in perspectives of preparedness across different constructs of EMS are not statistically significant.

H_1: Differences in perspectives of preparedness across different constructs of EMS are statistically significant.

H_0: Differences in perspectives of preparedness across EMS providers with various levels of training are not statistically significant.

H_1: Differences in perspectives of preparedness across EMS providers with different levels of training are statistically significant.

H_0: Associations between demographic characteristics and survey variables are not statistically significant.

H_1: Associations between demographic characteristics and survey variables are statistically significant.

Participants and Setting

The theoretical or target population is composed of all the individuals who are of theoretical interest to the researcher, is the larger group from which the sample is drawn and is the group of individuals to whom the researcher would like to generalize the findings (O'Sullivan, Rassel, Berner, & DeVance, 2017). For this study, the theoretical or

target population was composed of EMS providers working in the United States with diverse prehospital training levels, licenses, and certifications from hospital-based, fire-based, and independent EMS systems. They represent varied experiences in emergency medical responses and with respective organizations.

Sampling is the process of selecting part of the theoretical or target population to obtain findings that are then generalized to its members (O'Sullivan et al., 2017). The accessible population or sampling frame is composed of the individual members of the theoretical population to whom the researcher has access (O'Sullivan et al., 2017). In this study, the accessible population is composed of the members of the stakeholder agencies within the US EMS system listed in Table 9. Representatives of these agencies have expressed interest in this research and offered to assist with data collection by providing access to their membership (explained in the section titled "Procedures"). The National Association of Emergency Medical Services State Officials (NASEMSO), the National Registry as well as dozens of other EMS regulators and NGOs were contacted to invite EMS providers in each of the 50 states. Depending on the response, a targeted social media ad may also be generated.

Table 9

Stakeholder Agencies within the US EMS System

Acronym	**Explanation of the Acronym**
AAA	American Ambulance Association
ADPH OEMS	Alabama Department of Public Health Office of Emergency Medical Services
ADHSS DPH	Alaska Department of Public Health and Social Services Division of Public Health
AZDHS	Arizona Department of Health Services
ADH EMS	Arkansas Department of Health Emergency Medical Services
CEMSA	California Emergency Medical Services Authority

CDPHE EMTS	Colorado Department of Public Health & Environment Emergency Medical and Trauma Services
CDPH OEMS	Connecticut Department of Public Health Office of Emergency Medical Services
DCFEMSD	District of Columbia Fire and Emergency Medical Services Department
DDHSS DPH	Delaware Department of Health and Social Services Division of Public Health
FDH	Florida Department of Health
GDPH	Georgia Department of Public Health
GMR	Global Medical Response
HDH EMS	Hawaii Department of Health Emergency Medical Services
IDHW BEMSP	Idaho Department of Health & Welfare Bureau of Emergency Medical Services and Preparedness
IDPH	Illinois Department of Public Health
IDHS EMSC	Indiana Department of Homeland Security Emergency Medical Services Commission
IDPH BETS	Iowa Department of Public Health Bureau of Emergency and Trauma Services
KBEMS	Kansas Board of Emergency Medical Services
KEBEMS	Kentucky Board of Emergency Medical Services
LDH EMS	Louisiana Department of Health Emergency Medical Services
MDHHS EMSS	Michigan Department of Health & Human Services Emergency Medical Services System
MDHSS BEMS	Missouri Department of Health & Senior Services Bureau of Emergency Medical Services
MDPHHS EMSTS	Montana Department of Public Health and Human Services Emergency Medical Services and Trauma Systems
MEMS	Maine Emergency Medical Services
MEMSRB	Minnesota Emergency Medical Services Regulatory Board
MIEMSS	Maryland Institute for Emergency Medical Services Systems
MOEMS	Massachusetts Office of Emergency Medical Services
MSDH EMS	Mississippi State Department of Health Emergency Medical Services
NAEMT	National Association of Emergency Medical Technicians
NASEMSE	National Association of Emergency Medical Services Educators
NASEMSO	National Association of Emergency Medical Services State Officials
NCDHSR OEMS	North Carolina Division of Health Service Regulation Office of Emergency Medical Services
NDDOH DEMS	North Dakota Department of Health Division of Emergency Medical Systems
NDHHS EMS	Nebraska Department of Health and Human Services Emergency Medical Services

NDHHS NPBH EMS	Nevada Department of Health and Human Services Division of Public and Behavioral Health Emergency Medical Services
NHDOS FSTEMS	New Hampshire Department of Safety Fire Standards and Training and Emergency Medical Services
NHTSA Office of EMS	National Highway Traffic Safety Administration
NJDOH EMS	New Jersey Department of Health Emergency Medical Services
NMDOH EMSB	New Mexico Department of Health Emergency Medical Services Bureau
NREMT	National Registry of Emergency Medical Technicians
NYDOH BEMS	New York Department of Health Bureau of Emergency Medical Services
ODH EMSD	Oklahoma Department of Health Emergency Medical Services Division
ODPS EMS	Ohio Department of Public Safety Emergency Medical Services
OHA PHD EMSTSP	Oregon Health Authority Public Health Division Emergency Medical Services and Trauma Systems Program
PDOH EMS	Pennsylvania Department of Health Emergency Medical Services
RIDOH CEMS	Rhode Island Department of Health Center for Emergency Medical Services
SCDHEC EMST	South Carolina Department of Health and Environmental Control Emergency Medical Services and Trauma
SDDOH EMS	South Dakota Department of Health Emergency Medical Services
TDOH EMS	Tennessee Department of Health Emergency Medical Services
TDSHS EMSTS	Texas Department of State Health Services Emergency Medical Services and Trauma Systems
UDOH BEMSP	Utah Department of Health Bureau of Emergency Medical Services and Preparedness
USFA	US Fire Administration
VDH EPEMSIP	Vermont Department of Health Emergency Preparedness, Emergency Medical Services & Injury Prevention
VDH OEMS	Virginia Department of Health Office of Emergency Medical Services
WDHS EMS	Wisconsin Department of Health Services Emergency Medical Services
WDOH EMSS	Washington Department of Health Emergency Medical Services Systems
WDOH OEMS	Wyoming Department of Health Office of Emergency Medical Services
WVDOHHR BPH OEMS	West Virginia Department of Health & Human Resources Bureau for Public Health Office of Emergency Medical Services

The selected sample is the group of potential participants whom the researcher solicits to participate in the study and meet the inclusion criteria (O'Sullivan et al., 2017). The two inclusion criteria for participating in this research are a person who 1) is a licensed or certified Emergency Medical Responder (EMR), Emergency Medical Technician (EMT), Advanced Emergency Medical Technicians (AEMT) and/or a paramedic and 2) provided emergency medical care during the COVID-19 pandemic. Those who do not have these qualifications were thanked and restricted from completing the survey (see Procedures for a description of the data collection steps).

The actual sample was composed of participants who met the inclusion criteria, who completed the survey, and whose data are used in the analysis. The ratio of the actual sample to the selected sample is the response rate (O'Sullivan et al., 2017). A low response rate can dilute or invalidate the results of a study if those who respond represent a substantial deviation from the selected sample or theoretical population.

A power analysis was run on G*Power 3.1.9.2 software to identify the minimum number of participants needed to find effects. Based on a medium effect size (justified in the absence of published effect sizes on post-COVID-19 preparedness among EMS providers), a significance level of $\alpha = .05$, power level of $1 - \beta = .80$ (80%), 4 groups, 6 numerator degrees of freedom and one covariate, the estimated minimum is $N = 225$ participants.

There was not a structural research setting because the venue was the digital environment that allowed each participant to complete the survey.

Instrumentation

The researcher-generated Pandemic Preparedness Survey is made up of 68 items (Appendix A). The survey begins with the informed consent form (Appendix B). The first two questions establish the inclusion criteria. The survey then poses statements on 9 constructs (Table 11 lists the constructs and their operationalizations). Each survey statement is a declarative statement to which the participant is asked to respond by choosing one response from a 5-point Likert scale of agreement (1 = strongly disagree, 5 = strongly agree). There are 8 statements about training, 10 statements about the workforce, 6 statements about personal protective equipment, 2 statements about provisions for EMS providers' mental health, 13 statements about administration, 1 statement about financial resources, 3 statements about the public safety answering point, 7 statements about EMS integration, and 5 statements about recommended preparedness improvements. General demographic items are listed at the end.

Table 10

Breakdown of Survey Questions by Topic Area

Subject Area	Quantity of Applicable Statements
Training	8
Workforce	10
EMS Provider's Mental Health	2
Administration	13
Financial Resources	1
Public Safety Answering Point	3
EMS Integration into Disaster Management	7
Recommended Improvements	5

Obtaining required information from a survey instrument in a valid and precise manner depends on crafting survey questions carefully to ensure they are well-defined and have clear links to research concepts under investigation (Ruel et al., 2016). The

researcher took the following steps to ensure a valid and precise survey. One, the topics or constructs of interest were identified (Table 9). Two, survey items were generated in the form of declarative statements to which the participant indicated his or her degree of agreement. Three, once the survey questions were established (Appendix A), survey items were cross-referenced with their answer options to ensure that those two elements acted in concert to accurately capture perspectives describing EMS provider preparedness and insights related to areas in need of improvement. Four, each survey statement was linked to a research concept under investigation. Five, survey items were evaluated for the possibility of bias, specifically by inspecting the wording of each statement to see if it led the participant to a specific answer or contained other flaws. Such a detailed evaluation takes a trained eye, patience, and often double redundancy to ensure that the question is clearly understood and does not present an unintended bias as currently written (Ruel et al., 2016), so the researcher obtained second opinions from a professional statistician and two colleagues who agreed to pilot test the survey. Moreover, the researcher has 21 years of EMS experience and was the owner of Strategic Medical Training, LLC at the time of this study. His resultant familiarity and extensive experience with EMS put him in a strong position to create the survey and evaluate the appropriateness of its depth and breadth. However, the survey was pilot tested by asking two colleagues (who were not be invited to participate in the study) to complete the survey, provide any feedback on improvements, and measure the time it takes to complete the entire survey.

Operational Definitions of Variables or Constructs

Table 11 lists the primary constructs and operationalizations. Each surveys statement refers to one of these variables.

Table 11

Variables, Operationalizations, or Explanation of Constructs

Variable	Operationalization or Definition of Construct
Administration	The process of ensuring that organizational practices that govern emergency response tactics, techniques, procedures, and legal capabilities necessary to respond to, mitigate, and recover from pandemics and bioterrorist attacks can be accelerated, modified, streamlined, and employed (Hurst, Sharpe, & Yeager, 2017).
EMS Integration	EMS incorporation with a jurisdiction's larger disaster preparedness agencies. This includes, but is not limited to, categories such as planning, illness surveillance and mitigation, continuity of operations, clinical standards, legal authorities, treatment protocols, and workforce protection (Federal Interagency Committee on EMS, 2009).
EMS Providers' Mental Health	Prevalence or absence of symptoms or formally diagnosed mental health conditions including, but not limited to, anxiety, burnout, depression, and PTSD (Smallwood, Pascoe, Karimi, Bismark, & Willis, 2021).
Financial Resources	Currency and other monetary equivalents required to conduct organizational business (Kulkov, Berggren, Eriksson, Hellström, & Wikstrom, 2020).
Personal Protective Equipment	Equipment worn to reduce exposure to hazards that cause serious workplace illnesses and injuries (Occupational Safety and Health Administration, n.d.).
Public Safety Answering Point	Communication facilities that receive requests for the community's emergency assistance (Lerner, Farrell, Colella, Sternig, Westrich, Cady, & Liu, 2019).
Recommended Preparedness Improvements	Tactics, techniques, procedures, and policies that would increase the effectiveness of response of EMS during a pandemic or bioterrorist attack (Federal Interagency Committee on EMS, 2009).
Training	Formalized learning that is planned and executed to address stable job competency requirements (Polo, Cervia, & Kantola, 2018).
Workforce	The employees who work within a particular EMS system (Murray & Holmes, 2021).

Procedures

Data collection procedures complied with ethical guidelines for the protection of participants. Before the actual study took place, the researcher obtained permission to conduct the study from Liberty University's Institutional Review Board (IRB). Relevant IRB approval numbers were included in the final dissertation. Then the researcher obtained written permission from representatives of the agencies listed in the accessible sample (Table 9) to solicit participation from members.

After agency permission had been obtained, each agency in the accessible population was contacted and asked to distribute the invitation to participate (Appendix C) and link to the online survey to all credentialed providers. All members of the accessible population were invited to participate; therefore, sampling was non-probabilistic because there is no way of estimating the probability that each participant has of being included. However, it was representative of the target population, and the findings can be generalized to the population. The researcher did not have direct access to participants or their email addresses during the study, so participants remained anonymous to the researcher.

Additionally, the researcher followed best practice guidelines to ensure that each participant understood the purpose of the study and signed the informed consent form (Appendix B). Participants were recruited as follows. Agency administrators were asked to either 1) email the invitation to participate in this study (Appendix C) and the link to the survey to their members whose email information is on file with the agency or 2) post the invitation and survey link on their websites (in either a public-facing or member-only subsite). The invitation email briefly described the purpose of the study, steps taken to

ensure confidentiality of participants' personal information, and the benefits of participation. It included the link to the online survey. After this initial invitation, members received two follow-up reminders at one-week intervals prior to the survey closing date. After 2-3 weeks, the responses were evaluated, and it was decided whether to continue or stop soliciting participants.

Consent Form. The first page of the survey was the "Informed Consent Form" (Appendix B) to obtain participants' informed consent before taking the survey. The form is written in understandable language. It describes the purpose of the survey, the volunteer nature of participation, procedures to maintain the confidentiality of participants' information, and their right to decline to answer any questions or finish the survey. Participants were further informed that they would not be compensated and could receive the study results after completion of the study if they wished. The Consent Form included the researcher's contact information. Participants were asked to agree to the consent form before data collection began.

Survey data were downloaded from the web-based survey site as an .xls file from Google Sheets. No personal information (such as name, email address, computer IP addresses, etc.) was collected, stored, evaluated, or transmitted.

Data Processing and Analysis Procedures

Dedicated statistical SPSS software v. 28 was used for all analyses. Significance was set at $\alpha = .05$. All data were screened for missing data points. Likert-scaled variables were evaluated for normality, linearity, outliers, and homoscedasticity. The reliability of the data was measured by generating Cronbach's α statistics for conceptually related survey items. Percentages were rounded off to whole numbers. To answer the research

questions, findings were examined with descriptive and inferential statistics for group comparisons and associations between constructs.

Assumptions

There are four untested assumptions. One, this study assumes that EMS providers will be forthcoming. Medical personnel are trained to react from positions of strength in emergency situations. The lives of other people, and at times their own lives, depend on the extent of their preparedness. Accordingly, it is assumed that EMS providers will not view the Pandemic Preparedness Survey (Appendix A) and their responses not as disclosures of weakness or professional failings but as a means of evaluating both proper and poor preparedness to combat pandemics or bioterrorism and identifying needs for subsequent training. The assumption regarding EMS provider's perception of the survey is made because of the volunteer nature of participation, the anonymity built into the study, and the overall desire for EMS providers to be as prepared as possible for future pandemics and bioterrorist attacks that would potentially pose a significant danger to them and their families.

Two, it is assumed that EMS providers will be on the front lines of battling future pandemics and bioterrorist attacks. This assumption is based upon the carryover of current infection control, bioterrorist, and pandemic response practices.

Three, it is assumed that EMS providers have different levels of training, experience, and knowledge related to pandemics and bioterrorist attacks. The NHTSA's Office of EMS promulgates a standardized national EMS curriculum for the various levels of training (National Highway Transportation Safety Administration, 2021). The states can then promulgate their education standards, and the NREMT interprets these

education standards into its credentialing and accreditation process. Even without this variation, the different quality of instructors, depth of material review, individual experience in responding to emergencies involving infectious diseases, and volume of training impacts the personal preparedness of the providers and creates a spectrum among EMS providers.

Four, it is assumed that using digital technology to complete this study will not eliminate a significant population of the desired sample population, based on the ubiquity of technology in the modern world and coupled with the NREMT's almost exclusively online-based certification and credentialing process.

Limitations

Limitations are inherent features of a study that can limit the researcher's ability to obtain accurate findings over which the researcher has little or no control (O'Sullivan et al., 2017). In the current study, limitations include EMS providers' willingness to participate and the researcher's inability to verify that the survey-taker meets the inclusion criteria and personally takes the survey. Limitations also include the absence of knowledge of participants' potential exposure to ethical dilemmas regarding medical emergencies, either before or during the COVID-19 pandemic.

A further limitation is that this study generated self-reported data. Self-reported data can be artificial because they are not direct measures of participants' behavior in the environment where the behavior typically occurs, could be prejudiced by participants' uncomfortable awareness that they are "being studied," and/or by participants' inherent desires to appear acceptable to the researcher (the social desirability bias, O'Sullivan et al., 2017). Given the sensitivity of emergency medical preparedness during a demanding

pandemic that has required most medical personnel to work far more than the standard 40-hour week, another limitation is that participants may wish to conceal agency or personal shortcomings or err on the side of the "professional response." The accuracy and candor of their responses is a related limitation. This study assumes that EMS providers viewed their participation as a means whereby EMS providers can honestly acknowledge any impediments to solid professional preparation at all levels.

A final limitation is related to using online technology to advertise the study, solicit participants, and collect data. This may have unintentionally eliminated members of the accessible population who do not have e-mail addresses, do not routinely access EMS-based websites, and/or cannot complete an online survey.

Delimitations

The main delimitation is that the study's participants were restricted to credentialed and licensed EMS providers working in the United States. These criteria exclude hospital-based healthcare providers and EMS providers outside the United States. They also exclude public safety and response agencies and personnel who respond to care for the community with first aid, Cardiopulmonary Resuscitation (CPR) certifications, and other healthcare providers who maintain an EMS licensure and certification but who also hold different certifications as well (e.g., physicians, nurses, nurse practitioners, and physician assistants)

Ethical Assurances

Survey participants are more likely to answer truthfully when they believe their responses are confidential (O'Sullivan et al., 2017). This study involves a sobering and at-times fatal subject: pandemics or bioterrorist attacks involving contagious pathogens.

Any leak of information suggesting that the American EMS providers are not adequately prepared could elicit criticism. Therefore, the confidentiality of participants' identifying information took priority. Confidentiality of personally identifiable information was maintained by replacing all such information with an untraceable case number and maintaining the data in a password-protected computer. All data will be shredded or erased three years after the completion of the proposed study. Each participant was informed that their participation is voluntary, they have the right to withdraw without penalty at any time, and that their personally identifying information would remain confidential.

Summary

This chapter explains the data collection methods in nine sections. The first section described the research design as an exploratory, descriptive, quantitative group-comparison design using data obtained from an online survey. The second section identifies and lists the two research questions (RQ1: Is the EMS community in the United States prepared to respond to a pandemic or bioterrorist attack? RQ2: What practices, procedures, or policies should be implemented to prepare the US EMS system for a pandemic or bioterrorist attack?). The third section lists generic hypotheses used to test group comparisons and associations. The fourth section describes the participants as EMS provided working in the United States and labels the setting as the digital environment where the participant takes the survey. The fifth section describes the data collection instrument as a researcher-generated Pandemic Preparedness Survey consisting of 68 items and provides operational definitions of variable constructs. The sixth section describes procedures by which stakeholder agencies that have expressed interest in this

research were contacted to invite members to participate through email. The seventh section presents data analysis, which includes descriptions of screening and general analyses. The eighth section lists assumptions, limitations, and delimitations. The ninth section provides ethical assurances.

Chapter IV: Findings

Overview

COVID-19 cases were reported in all 50 states, the District of Columbia, and four U.S. territories by mid-March. The COVID-19 pandemic also revealed numerous deficits in EMS providers' readiness to respond at local, state, and national levels as it gained international momentum. This state of readiness is hereafter termed "preparedness."

The problem that initiated this research was the need for current information on the preparedness of American EMS personnel to respond to a pandemic effectively, which is related to this study's quantitative design, its survey data collection method, and the following research questions that guided this study. The specific purpose of this quantitative, exploratory group-comparison study was therefore to provide a current evaluation of the preparedness of EMS personnel in the United States to prepare for, respond to, mitigate, and recover from a natural or manufactured pandemic or bioterrorism attack across the United States. Data were obtained from an online survey that quantified EMS providers' views on current capabilities to recognize and respond to a pandemic as well as on current preparedness shortfalls.

This findings chapter is divided into six sections. The first section lists the research questions. The second section describes data processing and analysis procedures. The third section presents demographics. The fourth and longest section presents results for Research Question 1. The fifth section presents the results for Research Question 2. The final section is a summary.

Research Questions

RQ1: Is the EMS community in the United States ready to respond to a pandemic or bioterrorist attack?

RQ2: What practices, procedures, or policies should be implemented to prepare the US EMS system for a pandemic or bioterrorist attack?

Hypotheses

Hypotheses are presented in the sections that present results. In each section, the null hypothesis indicates that there is no statistical correlation between the independent and dependent variables being evaluated. Further specificity is provided at the beginning of each subsequent findings section.

Data Processing and Analysis Procedures

All data were initially screened for entry errors and missing data points. The data were collected online, so there were no entry errors. Scattered missing data points did not show any systematic pattern. The internal consistency or reliability of conceptually related survey items was checked with Cronbach's alpha (α), values of which range from 0 to 1. The closer Cronbach's alpha is to 1, the greater the reliability of the database. Summated scales (described in detail below) were generated because deriving a single measure from several related aspects decreased original measurement error, increased data reliability and validity, and increased analytical parsimony (Tabachnick & Fidell, 2019) as it allowed data science to compare pandemic preparedness at the suitable level of complexity and accuracy. Once derived, summated scores were screened for normality, linearity, homoscedasticity, and outliers; none show any substantial departures from statistical normality. Categorical data (described in detail below) were not screened

for normality because used they were used in chi-square tests, which do not require that data meet any statistical assumptions. Percentages were rounded off to whole numbers. All analyses were conducted with dedicated statistical SPSS software v. 28. Significance was set at $\alpha = .050$.

Analyzing Constructs

The researcher-generated Pandemic Preparedness Survey used in this study (See Appendix A) measured nine dimensions or constructs of preparedness (training, workforce, personal protective equipment or PPEs, mental health, administration, financial preparedness, public safety answering points, EMS integration into disaster planning, and recommended preparedness improvements). The first eight were used to answer RQ1. The last construct was used to answer RQ2.

The constructs were examined with the same two basic analytical approaches. The first analysis approach involved comparing the numbers of EMS providers who chose disagree, neutral, or agree (i.e., the response array) to numbers that were expected by chance. These analyses aimed to identify differences between reported data and chance expectations that were statistically significant. These results provided detailed information on preparedness status that was defined as either well-prepared or ill-prepared. These analyses were conducted with chi-square goodness of fit tests.

The second analysis approach involved comparing groups based on EMS certifications to identify which group(s), if any, differed in their perspectives on preparedness from other groups. EMS providers fall into four certification levels of EMS, each with its own training requirements (National Highway Transportation Safety Administration, 2021, p. 59).

- Emergency Medical Responders or EMRs have 48 hours of training
- EMTs have 150 hours of training
- AEMTs have 350 hours of training
- Paramedics have 1600 hours of training

The rationale for comparing perspectives on pandemic preparedness across the four certification levels was that EMS certification levels represent considerably different amounts of training. Thus, perspectives on preparedness were predicted to differ as well. However, of the 398 participants, only two were EMRs, which was an insufficient number for inclusion in group comparisons. Therefore, three groups were compared: EMTs, AEMTs, and paramedics.

Group comparisons were either conducted with chi-square tests of independence or Analysis of Variance (ANOVA) tests. These two approaches to group comparisons arose from differences across the nine constructs in the number of survey items used to measure each construct and the inter-relationships among the survey items themselves (See Appendix A). The test that was used depended on whether variables were best examined as stand-alone categorical variables (stand-alone because they measured a unique feature of an EMS construct) or as sets of variables that could be combined into numeric summated scales (because they measured the same conceptually-related feature of an EMS construct). For example, the training construct was measured with eight survey items that reflected the single idea of training designed to result in pandemic preparedness. These eight items could be (and were) collapsed into a single summated scale whose scores could be used to compare the EMS groups with an ANOVA test.

In contrast, the administration construct was measured with 13 survey items that reflected eight subcategories that involved both stand-alone variables and sets of related variables: procedures that allow participants to legally deviate from established treatment procedures, EMS roles, treatment protocols, resource allocation, messaging the public, integrating best practices, and ongoing disease surveillance. Therefore, an explanation of how the variables were generated for each construct is presented in the section that shows the results of analyzing that construct. Each test is briefly described below.

Comparing Responses: Chi-Square Goodness of Fit Tests

The first of the two main analytical approaches involved comparing responses (i.e., disagree, neutral, or agree) for statistical differences with chi-square goodness of fit tests. Chi-squares work by comparing the number of participants in a database who are *observed* to occur in each category (e.g., the number of participants who disagreed with a survey item) to the number of participants who are *expected* to occur in that category by chance (Siegel & Castellan, 1988). These are referred to as observed and expected counts, respectively.

A chi-square goodness of fit test examines one categorical variable at a time. In this study, a goodness of fit test was performed on every survey item to provide detailed information on the percentages of participants across the agreement categories. The aim of these analyses was to identify well-prepared and ill-prepared EMS features to inform training needs. The original data were measured on a 5-point response array of agreement (1 = strongly disagree, 5 = strongly agree, See Appendix A). To streamline interpretation, the five categories were aggregated into three categories (disagree = strongly disagree + disagree, neutral = neutral, agree = agree + strongly agree). For goodness of fit tests,

researchers must generate expected counts based on theoretical or practical considerations (Siegel & Castellan, 1988). In this study, there were 396 participants. If the original 5-point response array was used and participants did not show any answer preferences, 396 participants divided by 5 responses yielded 79.2 participants (20%) that, ceteris paribus, would be expected to occur in each response category by chance. However, the collapsed version of "disagree" represented two responses (disagree and strongly disagree) so the number of participants who would be expected to disagree by chance was the sum of 79.2 + 79.2 = 158.4 participants (40% of the participants). The same held for the collapsed version of agree (158.4 participants, 40% of the participants). The expected number of participants in the neutral category was 79.2 (20% of the participants). Therefore, expected numbers or counts of participants for goodness of fit tests were 158.4, 79.2, and 158.4 participants for the disagree, neutral, and agree categories, respectively. These tests aimed to identify the response category that garnered the majority of participants, if there was one. The hypotheses were:

Goodness of fit H_0: Observed counts do not differ statistically from expected counts.

Goodness of fit H_1: Observed counts differ statistically from expected counts.

Comparing EMS Groups: Chi-Square Tests of Independence

The second analytical approach involved comparing groups based on EMS certifications to see if EMS personnel with different medical capabilities perceived pandemic preparedness differently (i.e., to identify differences in perceptions of preparedness). There were two analytical methods to approach these group comparisons. The first method involved survey items that measured a unique feature of an EMS

construct as a stand-alone categorical variable. An example of a stand-alone categorical variable on the Workforce construct was item 16 (more EMS providers would work during a pandemic or bioterrorist attack if they were better trained or educated in infectious disease management); it was a stand-alone variable because it was the only workforce survey item that measured infectious disease management. To see if the EMS groups differed on stand-alone measures, tests of the association were conducted with chi-square tests of independence. Tests of independence work by cross-tabulating the two variables (the stand-alone categorical variable and EMS certification groups) to generate observed counts and compare them to expected counts (Siegel & Castellan, 1988). The expected counts in tests of independence are calculated directly from the observed counts. When the association is significant, individual observed-expected count pairs are inspected to identify those that accounted for significance. This evaluation was accomplished by transforming the difference between the counts into *z* scores called adjusted residuals. Statistically significant relationships were identified by adjusted residuals that were equal to or greater in value than ±1.96 (Siegel & Castellan, 1988). The hypotheses were:

Test of independence H_0: The association between (observed responses per stand-alone survey item) and EMS certifications is not statistically significant.

Test of independence H_1: The association between (observed responses per stand-alone survey item) and EMS certifications is statistically significant.

Comparing EMS Groups: ANOVA and ANCOVA Tests

The alternative approach to group comparisons in this study was based on sets of survey items that could be combined because they measured the same feature of an EMS

construct. An example of conceptually related items were Items 17, 18, and 21 on the Workforce construct, which together measured efforts to protect the EMS workforce during a pandemic or bioterrorist attack (Item 17: My agency has identified strategies to assist local EMS agencies with protecting the EMS and 9-1-1 workforce and their families during a pandemic or bioterrorist attack. Item 18: My agency has system-wide processes for providing vaccines and anti-viral medication to EMS personnel. Item 21: my agency and public health agencies have identified mechanisms to address issues associated with the isolation and quarantine of EMS personnel). For each participant, the numeric values of their responses to these three items were used to generate their average response or mean. Each participant's mean was based on the 5-point response array (1 = strongly disagree, 5 = strongly agree) to take advantage of a greater breadth of information. The resulting single numeric summated scale (SS) was labeled the Workforce Protection SS, which was then compared across the three EMS certifications. This summated scale evaluation across EMS certifications was done for all sets of conceptually related survey items.

Group comparisons on SS were conducted with ANOVA and ANCOVA tests. ANOVA tests require at least five individuals per group. Again, because there were only two EMR participants, only three EMS certifications were compared (EMTs, AEMTs, and paramedics) in group comparisons.

It is an entire family of tests that compare means of continuous variables across three or more groups (Weaver & Goldberg, 2011). The dependent variable provides the group means that are compared (e.g., Workforce Protection SS). The independent variable is the source of the groups (i.e., types of EMS certification). Results of an

ANOVA test indicate whether the group means were statistically non-significant or significant. Significance is indicated by the probability of obtaining a given ANOVA *F* statistic, which is a ratio of the variance between the groups divided by the variance within the groups and always positive in value. Roughly comparable variances are close to the value of 1 and are generally non-significant. Increasingly higher values of the *F* statistic reflect increasingly greater differences between at least two of the groups. Further, the impact of the independent variable (in this study, EMS certification) on the dependent variable is quantified with an effect size statistic called partial eta squared ($p\eta^2$), which is the amount of variance in the dependent variable that is explained by the independent variable. Partial eta squared values are interpreted categorically as indicative of small (0.01), moderate (0.06), or large effects (0.14). Planned comparisons with Tukey's tests were used to evaluate the statistical significance of each pair of groups.

A few group comparisons in this study were conducted with ANCOVA tests. ANCOVA is an acronym for analysis of covariance and includes one or more covariates. A covariate is a variable that correlates with the dependent variable and, because of this, has the potential to mislead researchers about differences in the dependent variable across the groups. Therefore, an ANCOVA test controls or removes the effect of the covariate before comparing the groups. Pearson correlations were generated to identify variables that were correlated significantly with the demographic variable, years of experience providing EMS, to incorporate the relationship as appropriate.

ANOVA tests one set of hypotheses, which refers to comparing means across the groups. ANCOVA tests two sets of hypotheses, one set for the covariate (tested first in

the ANCOVA calculations) and the other set for comparing means across the groups. These are the generic hypotheses, presented here to save page space:

Covariate H_0: Years of EMS provider experience was not a statistically significant covariate.

Covariate H_1: Years of EMS provider experience was a statistically significant covariate.

Mean Comparisons H_0: Differences across participant groups on [construct or construct subcategory] were not statistically significant.

Mean Comparisons H_1: Differences across participant groups on [construct or construct subcategory] were statistically significant.

Demographics

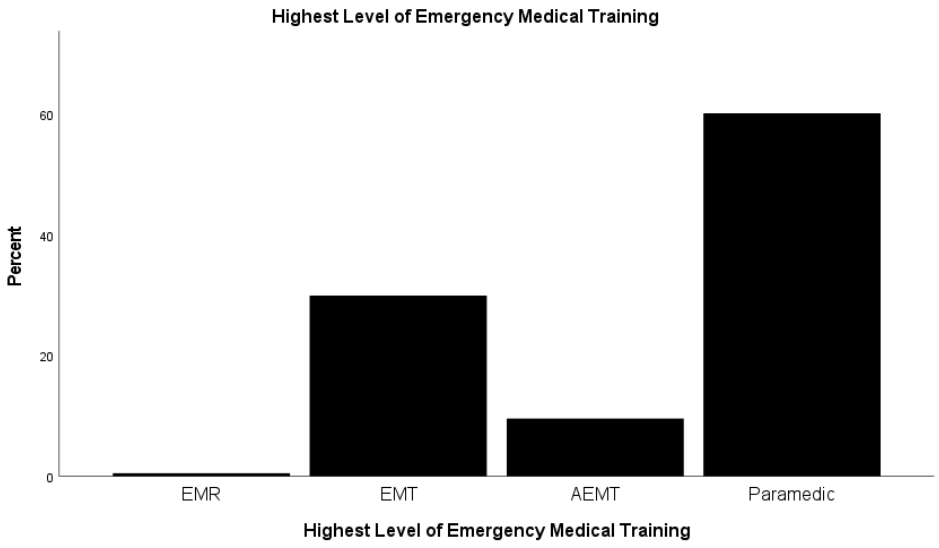
A total of 400 emergency medical service (EMS) providers opened the survey and consented to complete it. Two participants were removed from the analysis because they did not meet eligibility screening. One of these answered “no” to the eligibility question about currently holding an EMS license. The other one answered “no” to the eligibility question of being at least 18 years old, final N = 398 participants.

In this chapter, certification levels are synonymous with the “highest level of emergency medical training” and EMS certifications. Figure 1 shows that the number of participants differed across the four EMS certification categories. Only two participants with EMR certifications (0.5%) participated. About 10% held AEMT certifications (n = 38 participants) and another third held EMT certifications (n = 119 participants, 30%). The largest group was composed of participants with paramedic certifications (n = 239

participants, 60%). There were twice as many paramedics as EMTs and six times as many paramedics as AEMTs.

Figure 1

Percentages of Participants across the Four EMS Certifications



For gender, *n* = 7 participants (2%) preferred not to report their gender. The remaining participants included about three times as many males as females overall (male: female ratio 2.7:1, *n* = 282 men, 71%, *n* = 106 women, 27%). Figure 2 shows that, across the different levels of EMS certification, the ratios or proportions of males to females varied from the overall proportion. Among the 119 EMT participants, there were approximately 2 males per female (male: female ratio 1.85:1, *n* = 76 males, 64%; *n* = 41 females, 34%). Among the 38 AEMT participants, there were also approximately 2 males per female (male: female ratio 2.36:1, *n* = 26 males, 68%; *n* = 11 females, 29%).

However, among the 239 paramedics, there were approximately 3 males per females (male: female ratio 3.38:1, *n* = 179 males, 75%; *n* = 53 females, 22%).

Figure 2

Crosstabulation of Gender by EMS Certifications

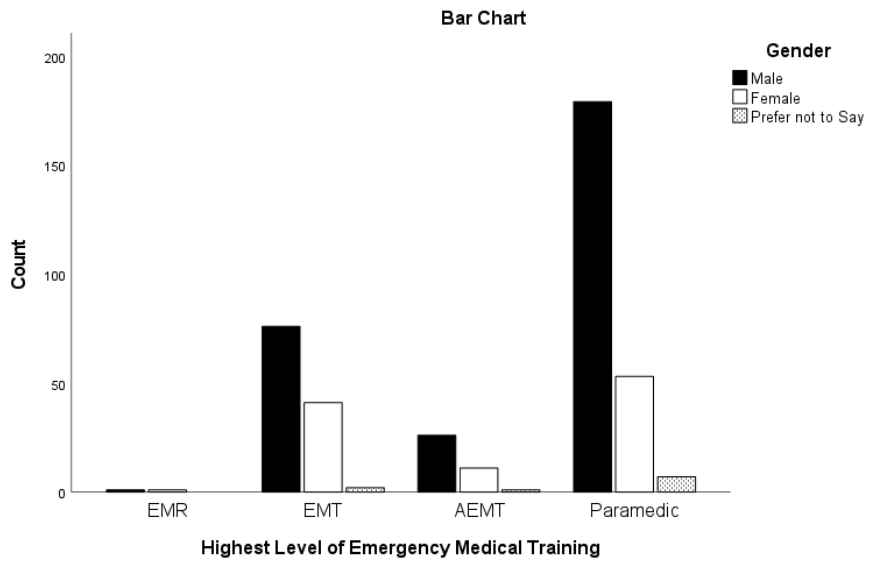


Table 12 lists professional demographic characteristics for the three largest groups of participants. Means and standard deviations reflect the average years of EMS provider experience, whereas modes were used to represent the categorical variables. All three groups shared the primary response type of 911 emergencies and fire-based EMS systems. Otherwise, there were differences. AEMTs and paramedics shared an average of 20 years of EMS provider experience compared to the average of 13 years for EMTs. However, the minimum-maximum statistics for years of experience in Table 12 show that the overall range of years represented by this study's participants was comparable.

AEMTs tended to be volunteers for non-governmental employers in rural areas. EMTs and paramedics tended to work full-time for government employers in suburban settings.

For EMTs, fire-based was the major modal EMS system (major mode *n* = 53 participants) but the minor mode of stand-alone EMS was close in value (minor mode *n* = 50 participants). For AEMTs, the major modal employer was non-government (major mode *n* = 18 participants) but the minor mode of government was close in value (minor mode *n* = 17 participants). For AEMTs for the EMS system, fire-based was the major mode (major mode *n* = 15 participants) but the minor mode of stand-alone EMS was close in value (minor mode *n* = 14 participants).

Demographic data for the two participants with EMR certifications were excluded from Table 12 because the central tendencies did not apply. That is, one EMR had one year of experience working full-time for a government employer and stand-alone EMS system in an urban area. The other EMR had 20 years of experience as a 911 volunteer for a government employer and stand-alone EMS system in a suburban area.

Table 12

Professional Development Characteristics

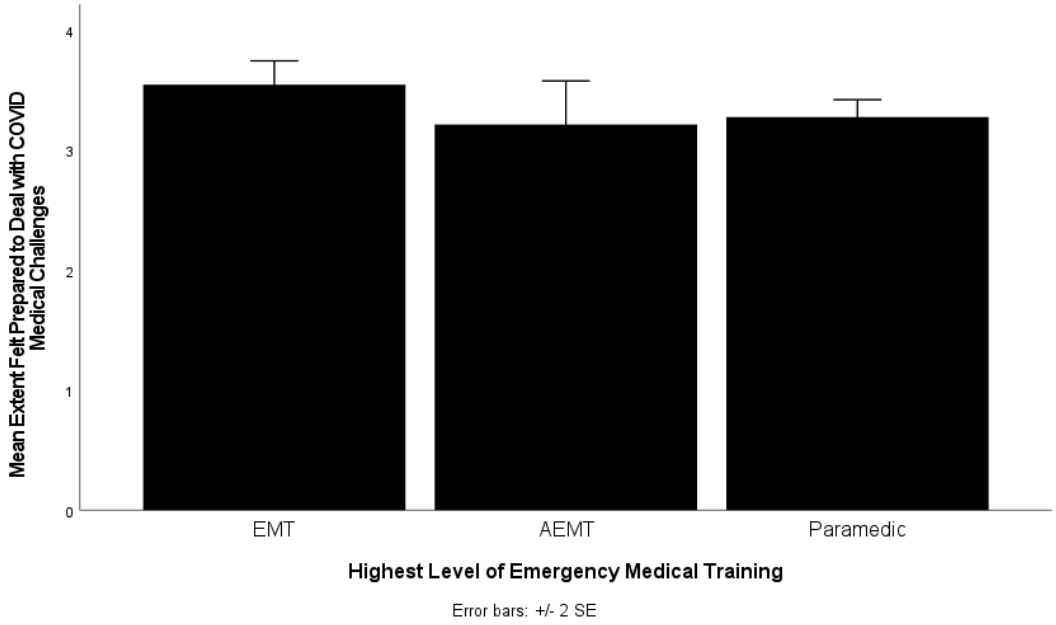
Demographic Variable	EMTs, *n* = 119	AEMTs, *n* = 38	Paramedics, *n* = 239
Years of EMS Provider Experience Mean (SD) Min-Max	12.68 (11.95) 1-50	21.62 (11.15) 3-45	20.17 (10.94) 3-48
Employment Status with EMS	Fulltime	Volunteer	Fulltime
Primary Response Type	Emergency Response (911)	Emergency Response (911)	Emergency Response (911)
Employer	Government	Non-government	Government
EMS System	Fire-based	Fire-based	Fire-based
Supported Area	Suburban	Rural	Suburban

Note. Government = Governmental (Federal, State, Local, Tribal, and Territorial)

Participants were asked to identify the extent to which they felt prepared to deal with the medical challenges of COVID-19 as an EMS provider. They were given a 5-point Likert response array of levels of preparedness (1 = not at all prepared, 5 = very prepared). As illustrated on Figure 3, perspectives were comparable: All felt prepared to mostly prepared (EMTs *M* = 3.54, *SD* = 1.07; AEMTs *M* = 3.21, *SD* = 1.12; paramedics *M* = 3.27, *SD* = 1.12).

Figure 3

Mean Levels of Feeling Prepared for the Medical Challenges presented by the COVID-19 Pandemic



Attractive Features of the EMS Career

The researcher-generated Pandemic Preparedness Survey used in this study (See Appendix A) opened with the question of what the participant liked most about his or her work in EMS. Responses varied and are listed verbatim in Appendix D. Highlights

included the intense pride and pleasure of helping others when they need it most, feeling a strong sense of community, deep connections with coworkers, and looking forward to workdays that often become something out of the routine. As Paramedic Case 398 put it succinctly, “Making the difference between life and death.”

Results for Research Question 1

RQ1 was, Is the EMS community in the United States ready to respond to a pandemic or bioterrorist attack? Results for RQ1 are presented for 8 constructs, so this is a long section. Before providing the details, Table 13 shows the results of reliability tests with Cronbach’s α statistics.

Table 13:

Cronbach’s α Statistics for Constructs

Construct	Cronbach’s α
Construct 1 – Training	.63
Construct 2 – Workforce	.59
Construct 3 – Personal Protective Equipment (PPEs)	.79
Construct 4 – Mental Health	.89
Construct 5 – Administration	.73
Construct 6 – Financial Preparedness	NA
Construct 7 – Public Safety Answering Points	.77
Construct 8 – EMS Integration into Disaster Planning	.60
Construct 9 – Recommended Preparedness Improvements	.80

Note. NA = not applicable because the Financial Preparedness construct had only one measure.

Construct 1 – Training

Comparing Responses with Goodness of Fit Tests

Table 14 shows the results of comparing the percentages of participants who disagreed, were neutral, or who agreed with training survey items using goodness of fit tests (recall that the five response categories were aggregated into the three response categories of disagree, neutral, or agree). All the tests were significant, and the null hypothesis was summarily rejected. Significance indicated that at least one observed count differed from its associated expected count. Arrows summarize the direction: ↓ = observed count significantly lower than expected count. ↑ = observed count significantly higher than expected count.

Based on the levels of agreement with training items, the answer to RQ1 (is the EMS community in the United States to respond to a pandemic or bioterrorist attack) was divided. Training features that were well-prepared were based on more EMS providers than expected by chance who worked for agencies that provided task-specific training (Train 6), decontamination training (Train 7), training and education to respond effectively (Train 11) and had confidence in their ability to respond to a pandemic or bioterrorist attack (Train 12). Training features that were ill-prepared were based on more EMS providers than expected who had *not* participated in pre-pandemic training (Train 5), in previews and simulations (Train 8), or in multi-agency attack exercises (Train 9).

Table 14

Percentage Agreement with Construct 1 – Training (df = 2)

Item #	Training Item	X^2	%D	%N	%A

5	My agency participates in a program of pre-pandemic training and exercising to prepare EMS personnel for their role in preparing for, mitigating, and responding to pandemics and bioterrorist attacks.	19.92*	47%	24%	29% ↓
6	My agency is able to provide all EMS providers with job and task-specific training and education specific to the pandemic threat.	79.28**	21%↓	19%	61% ↑
7	My agency is able to ensure that those who decontaminate medical equipment are trained and knowledgeable in decontamination practices that will kill the pathogen causing the pandemic or bioterrorist attack.	48.61**	27% ↓	16%	57% ↑
8	I have participated in previews, simulations, or situation-based scenarios of a pandemic or bioterrorist attack over the past two years.	47.71**	55% ↑	9% ↓	37%
9	I have participated in a multi-agency pandemic or bioterrorist attack exercise over the past two years.	202.95**	75% ↑	8%	17% ↓
10	My agency has defined a process for providing just-in-time training for EMS agencies, EMS providers, EMS medical directors, and PSAPs.	9.81*	38%	26% ↑	36%
11	I am both trained and educated to respond effectively to pandemics and bioterrorist attacks.	23.71**	29% ↓	21%	50% ↑
12	I have confidence in my ability to respond to a pandemic or bioterrorist attack.	83.34**	18% ↓	22%	59% ↑

Note. X^2 = chi-square statistic value. *Significant at α = .050 level. **Significant at α = .001 level. %D = percentage of participants who disagreed or strongly disagreed. %N = percentage of participants who reported neutrality. %A = percentage of participants who

agreed or strongly agreed. ↓ observed count significantly lower than expected. ↑ observed count significantly higher than expected.

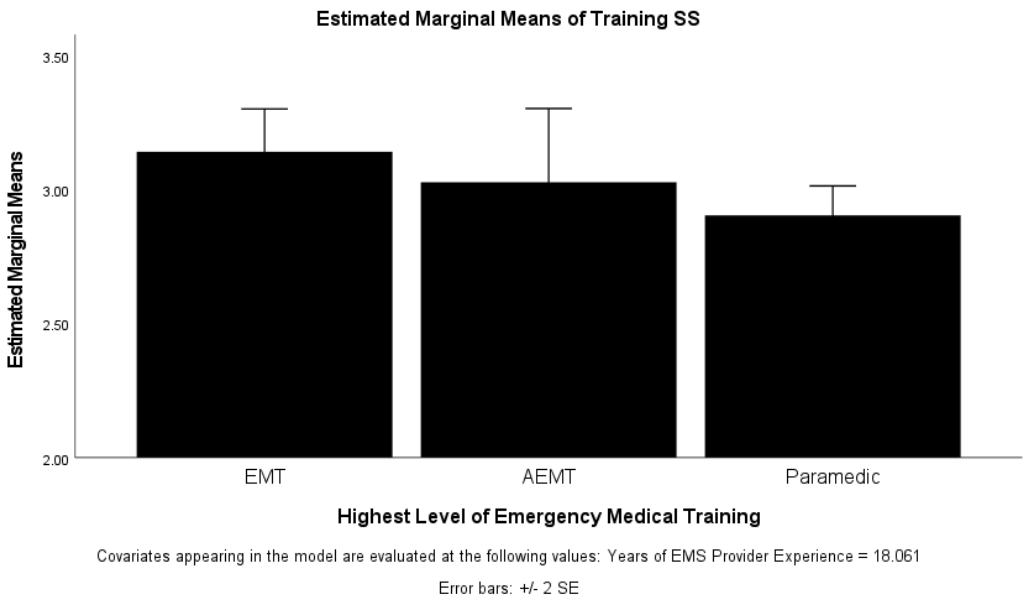
Comparing EMS Groups: ANOVA Test

The eight training survey items (listed in Table 14) all reflected the single idea of pandemic preparedness through thorough training. Therefore, for each participant, the mean of the numeric values of their responses to all eight items was calculated into a summated score labeled the Training SS (summated scale). The Training SS scores are interpreted the same way as the original 5-pt Likert scale (1 = strongly disagree, 5 = strongly agree). That is, higher values reflect greater agreement, in this case with the idea that pandemic training has been provided at sufficient depth and breadth to train and educate EMS providers to respond effectively to pandemics and bioterrorist attacks.

Mean Training SS scores were generated for each of the three EMS certifications and illustrated on Figure 4. The Training SS means were close in value and reflected a "neutral" response on average (EMTs $M = 3.10$, $SD = 0.81$; AEMTs $M = 3.05$, $SD = 0.81$; paramedics $M = 2.92$, $SD = 0.87$).

Figure 4

Means for Training SS across EMS Certifications



Correlations between years of EMS provider experience and Training SS scores were generated and inspected to decide whether to compare the groups with an ANOVA or an ANCOVA test. The correlations varied by magnitude and significance across the groups. The correlations for the EMTs and AEMTs were small and non-significant (EMTs $r(117) = -0.07$, $p = .458$, $r^2 < .1\%$; AEMTs $r(36) = .24$, $p = .139$, $r^2 = 13\%$). However, the paramedics' correlation was small to medium and significant ($r(237) = .17$, $p = .007$, $r^2 = 3\%$).

Therefore, the groups were compared with an ANCOVA test. Results for the Training SS in Table 15 showed that years of EMS provider experience was a statistically significant covariate. The covariate null hypothesis was rejected. After years of EMS provider experience were taken into account, differences across participant groups on the Training SS means were also statistically significant (Table 15). The Mean Comparisons null hypothesis was rejected. Paramedics reported significantly less pandemic preparedness compared to EMTs in terms of training. In keeping with results in Table 14, the gist of training results was that most participants strongly disagreed, disagreed, or

reported neutrality that pandemic training had been provided at sufficient depth and breadth to train and educate EMS providers to respond effectively to pandemics and bioterrorist attacks. Paramedics felt the least prepared of the three groups.

Table 15

ANOVA and ANCOVA Summary Table for Training, Workforce, PPEs, and Mental Health (Constructs 1 – 4)

Variable	Covariate: Experience	Group	Direction
C1 Training SS	Rejected: $F(1, 392) = 4.41$, $p = .036$, $p\eta^2 = .011$	Reject: $F(2, 392) = 2.97$, $p = .053$, $p\eta^2 = .015$	EMTs > Paramedics
C2 Workforce Protection SS	NA	Retain: $F(2, 393) = 2.03$, $p = .133$, $p\eta^2 = .010$	
C2 Multi-agency Pre-pandemic Training Program	NA	Retain: $F(2, 393) = 2.57$, $p = .078$, $p\eta^2 = .013$	
C2 Augment Workforce SS	NA	Reject: $F(2, 393) = 4.59$, $p = .011$, $p\eta^2 = .023$	EMTs & AEMTs > Paramedics
C3 PPE Supply SS	NA	Retain: $F(2, 393) = 0.51$, $p = .601$, $p\eta^2 = .003$	
C3 PPE Protocol SS	NA	Retain: $F(2, 393) = 0.68$, $p = .510$, $p\eta^2 = .003$	
C4 Mental Health SS	NA	Reject: $F(2, 393) = 5.40$, $p = .003$, $p\eta^2 = .027$	EMTs & AEMTs > Paramedics

Construct 2 – Workforce

Comparing Responses with Goodness of Fit Tests

Ten survey items measured features of workforce pandemic preparedness. Table 16 shows the survey items, results of goodness of fit tests, and the percentages of participants who disagreed, were neutral, or agreed with workforce survey items. All the tests but one (Workforce 21) were statistically significant, and the null hypothesis was

rejected for these. For significant tests, at least one observed count differed from its associated expected count. With respect to workforce preparedness, the answer to RQ1 (is the EMS community in the United States to respond to a pandemic or bioterrorist attack) was skewed in the direction of better workforce preparedness. Features of the workforce that were well-prepared were based on more participants who would work during a pandemics if asked, required, and even if it could put their families at risk through contagion (Workforce 13-15), who worked for agencies that had strategies to assist local EMS agencies (Workforce 17), who worked for agencies that had system-wide processes for providing vaccines (Workforce 18), and who worked for agencies that had identified mechanisms for addressing isolation issues associated with quarantining (Workforce 21). Features of the workforce that were ill-prepared were based on more participants who were neutral on the need for better infectious disease management (Workforce 16) and more participants whose agencies *lacked* multi-agency training (Workforce 19), lacked backup plans to augment local EMS workforces (Workforce 20), and lacked an adequate workforce during a pandemic (Workforce 22).

Table 16

Percentage Agreement with Construct 2 – Workforce (df = 2)

Item #	Survey Item	X^2	%D	%N	%A
13	I would work as an EMS provider during a pandemic or bioterrorist attack if asked.	379.52**	4% ↓	8%	88%↑
14	I would work as an EMS provider during a pandemic or bioterrorist attack if required.	435.56**	3% ↓	6% ↓	91% ↑

15	I would work as an EMS provider during a pandemic or bioterrorist attack even if there is a risk that the disease could spread to my family.	169.50**	12%↓	18%	70% ↑
16	More EMS providers would work during a pandemic or bioterrorist attack if they were better trained or educated in infectious disease management.	20.26**	35%	29% ↑	36%
17	My agency has identified strategies to assist local EMS agencies with protecting the EMS and 9-1-1 workforce and their families during a pandemic or bioterrorist attack.	15.68**	30% ↓	22%	47% ↑
18	My agency has system-wide processes for providing vaccines and anti-viral medication to EMS personnel.	88.83**	23% ↓	14%	63% ↑
19	My agency has established a multi-agency program of pre-pandemic training and exercising to prepare EMS personnel for their role in preparing for, mitigating, and responding to a pandemic or bioterrorist attack.	41.65**	52% ↑	24%	24% ↓
20	My agency has backup plans to augment the local EMS workforce if needed.	32.95**	52% ↑	22%	27% ↓
21	My agency and public health agencies have identified mechanisms to address issues associated with the isolation and quarantine of EMS personnel.	4.57	39%	16%	44%
22	My agency will have an adequate workforce during a pandemic or bioterrorist attack.	70.31**	58% ↑	21%	21% ↓

Note. X^2 = chi-square statistic value. *Significant at α = .050 level. **Significant at α = .001 level. %D = percentage of participants who disagreed or strongly disagreed. %N = percentage of participants who reported neutrality. %A = percentage of participants who agreed or strongly agreed. ↓ observed count significantly lower than expected. ↑ observed count significantly higher than expected.

The 10 workforce items reflected five subcategories: commitment (items 13-15), perspectives on infectious disease management (item 16), protecting the workforce (items 17, 18, and 21), multi-agency pre-pandemic training (item 19), and augmenting the workforce (items 20 and 22). Results of comparing these features across EMS certifications are presented below.

Comparing EMS Groups: Chi-Square Tests of Independence

Workforce Commitment. Three survey questions inquired whether the participant would work as an EMS provider during a pandemic or bioterrorist attack under three conditions: if simply asked, if required for one's job, and if working risked spreading the disease to their family. Table 17 lists the percentages of participants by EMS certification per workforce commitment item. The percentages across the three types of EMS providers for each response were similar to the total columns. For example, the percentages of the EMS providers who disagreed that they would work during a pandemic if asked were broadly comparable (5%, 0%, and 4%, respectively).

Table 17

Work as EMS during Pandemic by Highest Level of Emergency Medical Training Crosstabulation

		Work as EMS during Pandemic If…											
		Asked				Required				It Put My Family At Risk			
		EMT	AEMT	P	Total	EMT	AEMT	P	Total	EMT	AEMT	P	Total
Disagree	%	5%	0%	4%	4%	2%	5%	2%	2%	13%	8%	12%	12%
Neutral	%	10%	5%	8%	8%	8%	0%	6%	6%	18%	18%	18%	18%
Agree	%	85%	95%	88%	88%	89%	95%	92%	91%	68%	74%	71%	70%
X^2 Results		$X^2(4, N=396) = 3.07, p = .545$				$X^2(4, N=396) = 4.64, p = .326$				$X^2(4, N=396) = 0.95, p = .917$			

Note. % = Percentage within Highest Level of Emergency Medical Training. P = Paramedic

To determine whether the proportions of EMS providers were consistent or inconsistent across the groups, chi-square tests of independence were run to test the significance of associations between two variables. The hypotheses were:

H_0: The association between working conditions (asked, required, family at risk) and response is not statistically significant.

H_1: The association between working conditions (asked, required, family at risk) and response is statistically significant.

The bottom row of Table 17 shows the results of testing hypotheses for chi-square tests of independence. All three tests were non-significant. The null hypothesis was retained for all three tests.

Perspectives on Infectious Disease Management. The EMS providers who participated in this study were also asked whether, in their view, more of their colleagues would work during a pandemic or bioterrorist attack if they were better trained or educated in infectious disease management. Figure 5 illustrates the crosstabulation, which shows that the numbers of EMS providers by certification in each response category were proportionate. That is, for disagreement, 7% of the EMTs, 8% of the AEMTs, and 13% of the paramedics disagreed. For neutrality, 15% of the EMTs, 16% of the AEMTs, and 15% of the paramedics were neutral. For agreement, 78% of the EMTs, 76% of the AEMTs, and 73% of the paramedics agreed that training or education in infectious disease management would prompt more EMS providers to work during a pandemic or bioterrorist attack.

These proportions were examined for significance with a chi-square test of independence. The hypotheses were:

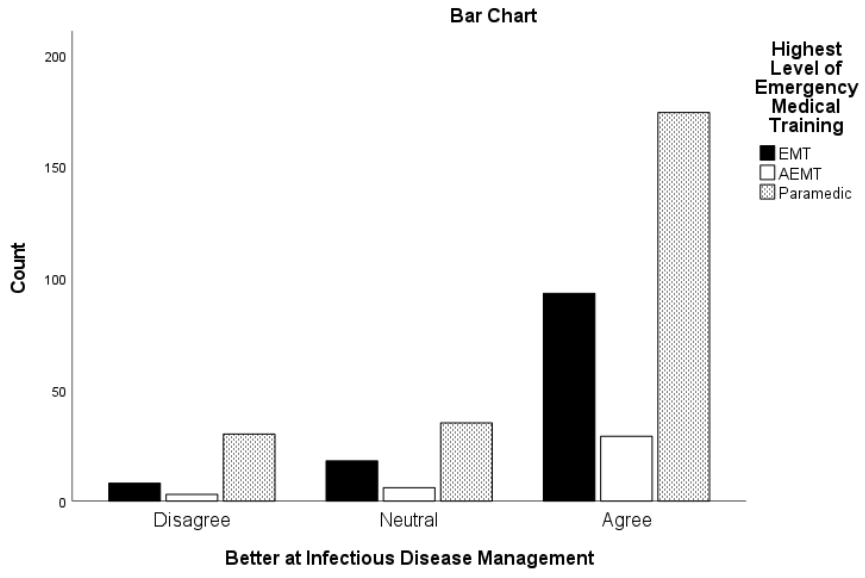
H_0: The association between better infectious disease management skills and EMS certification is not statistically significant.

H_1: The association between better infectious disease management skills and EMS certification is statistically significant.

Results showed that the association between better infectious disease management skills and EMS certification was not statistically significant ($X^2(4, N = 396) = 3.21$, $p = .524$). The null hypothesis was retained. That is, the majority of EMS providers agreed that more of their colleagues would work during a pandemic or bioterrorist attack if they were better trained or educated in infectious disease management.

Figure 5

Crosstabulation between Better Infectious Disease Management and EMS Certification



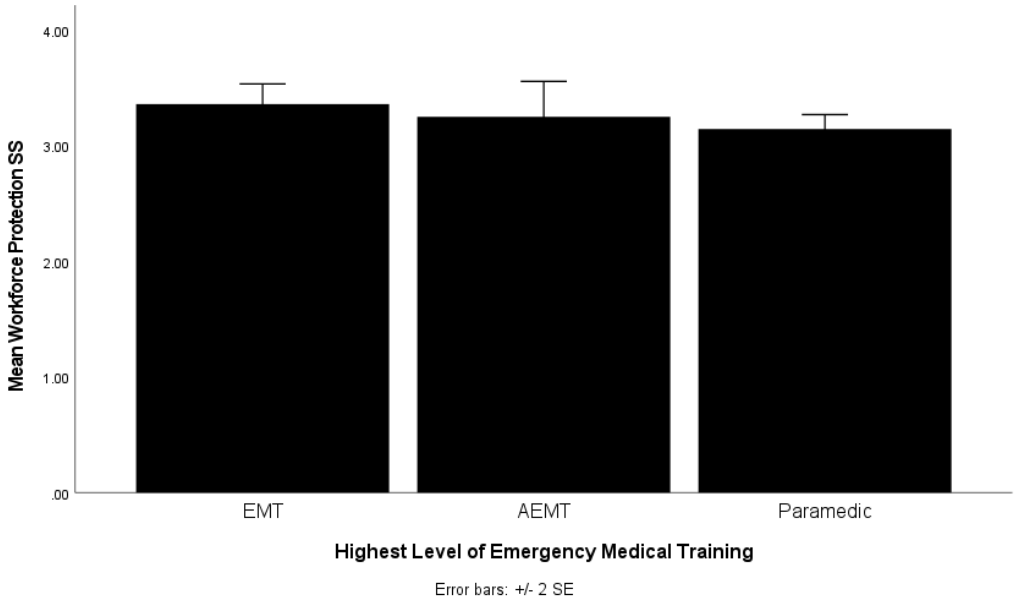
The following sections are ways of preparing the workforce and mitigating shortfalls during pandemics and bioterrorist attacks based on conceptually related subcategories of the workforce construct (summated scales).

Comparing EMS Groups: ANOVA and ANCOVA Tests

Protecting the Workforce. Workforce items 17, 18, and 21 measured levels of agreement that agencies had strategies and processes for protecting the EMS workforce during pandemics or bioterrorist attacks (Table 16). For each participant, the mean of the numeric values of their responses to these three workforce items was calculated into a summated score labeled the Workforce Protection SS. Means were then generated for each EMS certification. Figure 6 shows that the means were close in value (EMTs M = 3.36, SD = 0.95; AEMTs M = 3.24, SD = 0.94; paramedics M = 3.14, SD = 0.96). The means translated into the response category of "neutral."

Figure 6

Means for Workforce Protection SS across EMS Certifications

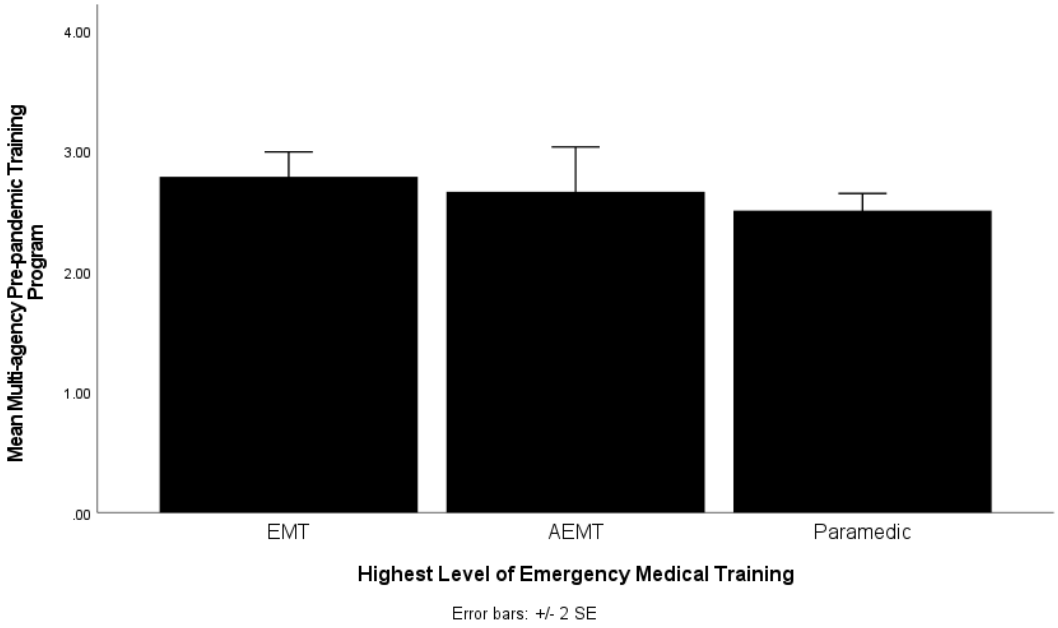


The correlations between the two variables, years of EMS provider experience and the Workforce Protection SS scores, were negligible and non-significant (EMTs $r(117) = 0.02$, $p = .828$, $r^2 < 1\%$; AEMTs $r(36) = -0.01$, $p = .947$, $r^2 < 1\%$; paramedics $r(237) = 0.07$, $p = .276$, $r^2 < 1\%$). Therefore, a one-way ANOVA was run without the covariate of years of EMS provider experience. Results of the ANOVA for the Workforce Protection SS (Table 15) showed that differences across participant groups on the Workforce Protection SS means were statistically non-significant. The Mean Comparisons null hypothesis was retained. EMS providers with different EMS certifications saw the level of workforce protection similarly. That is, the consensus was neutral that agencies had taken the necessary steps to protect the EMS workforce in terms of vaccines and quarantines during pandemics or bioterrorist attacks.

Multi-Agency Pre-pandemic Training. Workforce item 19 asked EMS providers whether their agency had established a multi-agency program of pre-pandemic training and exercising to prepare EMS personnel for their role in preparing for, mitigating, and responding to a pandemic or bioterrorist attack. Figure 7 illustrates the means across the three EMS certifications. The means fell in between disagreement and neutrality (EMTs $M = 2.78$, $SD = 1.13$; AEMTs $M = 2.66$, $SD = 1.15$; and paramedics $M = 2.50$, $SD = 1.10$). Again, paramedics had the lowest mean.

Figure 7

Mean Multi-agency Pre-pandemic Training Program



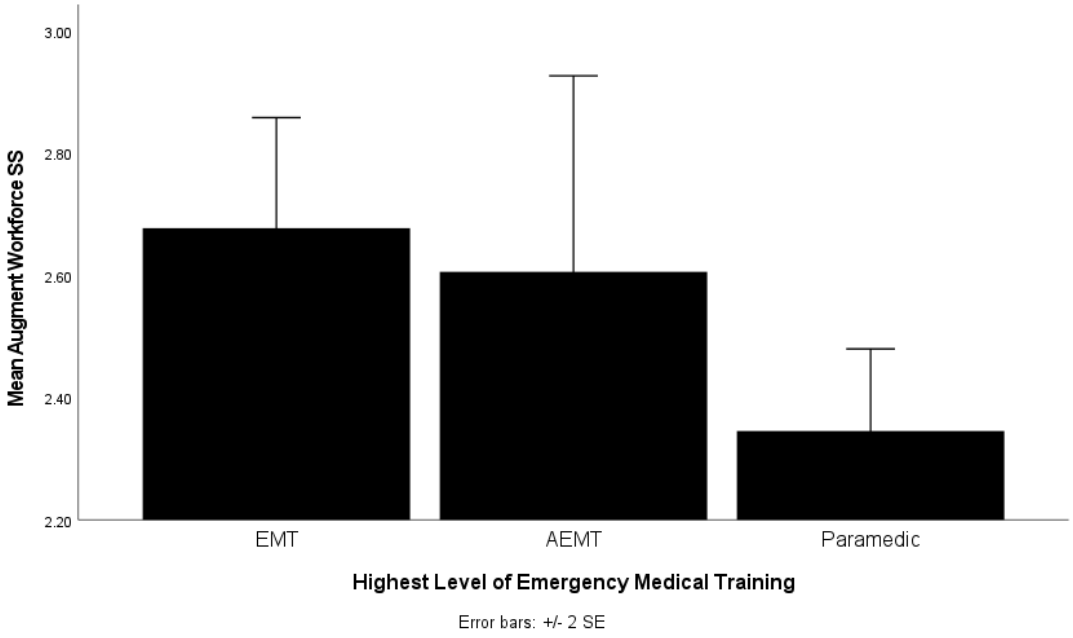
The correlations between the two variables, years of EMS provider experience and the Multi-agency Pre-pandemic Training Program scores, were small to negligible in magnitude and all non-significant (EMTs $r(117) = 0.08$, $p = .387$, $r^2 < 1\%$; AEMTs $r(36) = 0.16$, $p = .336$, $r^2 = 2\%$; paramedics $r(237) = 0.08$, $p = .277$, $r^2 < 1\%$). Therefore, a one-way ANOVA was run without the covariate of years of EMS provider experience. Results of the ANOVA for the Multi-agency Pre-pandemic Training Program scores on Table 15 showed that differences across the group means were statistically non-significant. The Mean Comparisons null hypothesis was retained. EMS providers with different certifications saw the level of pre-pandemic preparedness similarly. The consensus fell between disagree and neutral. That is, EMS agencies had not established a multi-agency program of pre-pandemic training and exercising that prepared EMS

providers to prepare for, respond to, mitigate, and recover from a pandemic or bioterrorist attack. Participants with all three EMS certifications were in consensus on this.

Augmenting the Workforce. Another two items on workforce preparedness pertained to whether agencies had plans to generate an adequate workforce given the demands of a pandemic or bioterrorist attack and had made backup plans to augment the local EMS workforce if needed (items 22 and 20, Table 16). A summated scale was generated as the mean of the numeric responses to these two items for each participant; the scores were labeled the Augment Workforce SS. Figure 8 illustrates the means across the three EMS certifications (EMTs $M = 2.67$, $SD = 0.98$; AEMTs $M = 2.60$, $SD = 0.99$; paramedics $M = 2.34$, $SD = 1.04$). The means fell in the response category of disagreement.

Figure 8

Means for Augment Workforce SS across EMS Certifications



The correlations between the two variables, years of EMS provider experience and Augment Workforce SS scores, were small and non-significant (EMTs $r(117) = 0.01$, $p = .917$, $r^2 < .1\%$; AEMTs $r(36) = 0.05$, $p = .786$, $r^2 < 1\%$, paramedics $r(237) = 0.08$, $p = .210$, $r^2 < 1\%$). Therefore, a one-way ANOVA was run without the covariate. Results for the Augment Workforce SS scores in Table 15 showed that differences across the group means were statistically significant. The Mean Comparisons null hypothesis was rejected. Compared to EMTs and AEMTs, paramedics were in significantly greater disagreement that agencies had plans to provide an adequate workforce to address unusual demands of a pandemic or bioterrorist attack or had backup plans to augment the local EMS workforce if needed.

Summary of Results for the Construct 2 – Workforce. Results for the Construct 2 – Workforce in terms of differences across the EMS certifications can be summarized as follows. For commitment levels, 87% and 91% of the EMS providers would work a pandemic if asked or required, respectively; however, only 70% would do so if concurrent risks of spreading the disease put their family at risk. For perspectives on better infectious disease management, the majority of EMS providers agreed that more of their EMS colleagues would work during a pandemic or bioterrorist attack if they were better trained or educated in infectious disease management. For workforce protection, EMS providers with different EMS certifications saw the level of workforce protection similarly. That is, the consensus was neutral that agencies had taken the necessary steps to protect the EMS workforce in terms of vaccines and quarantines during pandemics or bioterrorist attacks; this reflected inconsistency in that participants were as likely to report disagreement, neutrality, and agreement.

With respect to multi-agency pre-pandemic training programs, EMS providers with different certifications also saw the level of pre-pandemic preparedness similarly. Their consensus was essentially a disagreement that EMS agencies had established a multi-agency program of pre-pandemic training and exercising that prepared EMS providers to prepare for, respond to, mitigate, and recover from a pandemic or bioterrorist attack. Finally, regarding plans to augment the workforce, if need be, the majority of participants reported disagreement. Compared to EMTs and AEMTs, paramedics disagreed that agencies had plans to produce an adequate workforce or had backup plans to augment the local EMS workforce if needed during a pandemic or bioterrorist attack.

Construct 3 – Personal Protective Equipment (PPEs)

Comparing Responses: Chi-Square Goodness of Fit Tests

Six survey items measured dimensions of PPE pandemic preparedness. Table 18 lists these items, shows the results of goodness of fit tests and presents the percentages of participants who disagreed, were neutral, or agreed with PPE survey items. All of the tests were statistically significant, and all of the null hypotheses were rejected. Again, significance indicated that at least one observed count differed from its associated expected count.

With respect to PPE preparedness, the answer to RQ1 (is the EMS community in the United States to respond to a pandemic or bioterrorist attack) was strongly skewed in the direction of preparedness. Responses to all of the PPE survey items reflected well-prepared features based on significantly more participants who agreed and significantly fewer participants who disagreed that agencies had accumulated and provided adequate PPE supplies, guides for use, handling limited supplies, as well as providing the

necessary training for effective PPE use that extended to instructions on basic infection control procedures.

Table 18

Percentage Agreement with Construct 3 – Personal Protective Equipment (PPEs) (df = 2)

Item #	Survey Item	X^2	%D	%N	%A
23	My agency has an adequate supply of PPE for EMS providers during a pandemic or bioterrorist attack.	64.62**	24% ↓	17%	59% ↑
24	My agency is able to provide a guide for donning and doffing PPE specific to a pandemic or bioterrorist pathogen.	224.85**	12% ↓	12%	77% ↑
25	My agency has policies in place to extend the use of PPE if supply becomes limited.	83.27**	20% ↓	19%	61% ↑
26	My agency is able to ensure that EMS providers are trained and practiced in using PPE.	240.93**	12% ↓	10%	78% ↑
27	My agency has requirements or recommendations for EMS agencies for basic infection control procedures.	407.71**	5% ↓	5% ↓	90% ↑
28	My agency is able to provide adequate PPE to EMS providers to carry out their responsibilities.	286.07**	9% ↓	10% ↓	81% ↑

Note. X^2 = chi-square statistic value. *Significant at α = .050 level. **Significant at α = .001 level. %D = percentage of participants who disagreed or strongly disagreed. %N = percentage of participants who reported neutrality. %A = percentage of participants who agreed or strongly agreed. ↓ observed count significantly lower than expected. ↑ observed count significantly higher than expected.

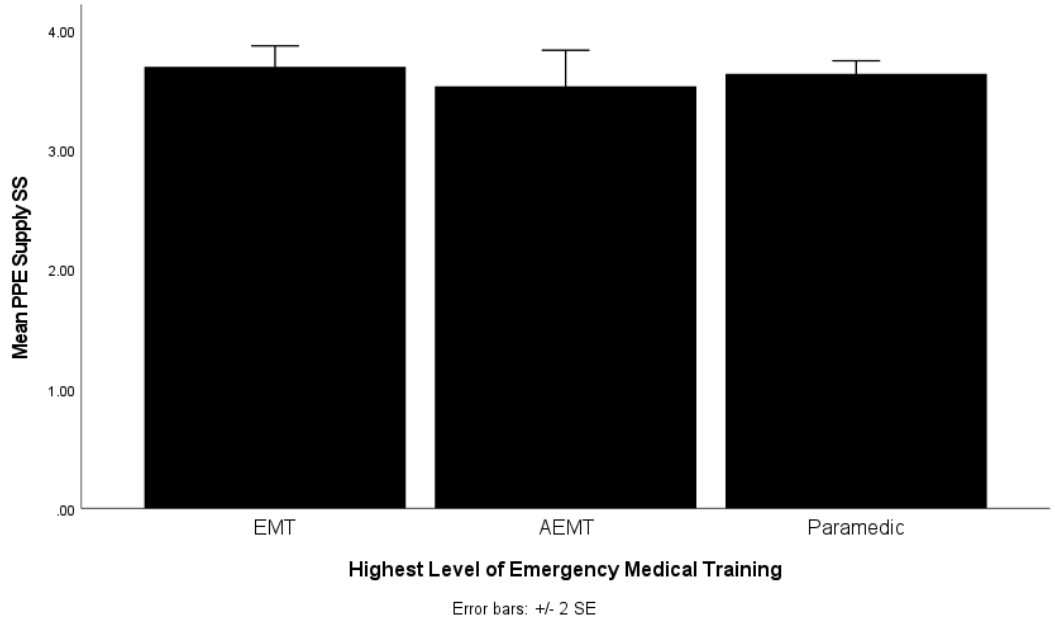
Comparing EMS Groups: ANOVA and ANCOVA Tests

PPE survey items collected data in two subcategories. One subcategory pertained to adequate supplies of PPEs during a pandemic. The other pertained to adequate training on PPE protocols for proper use. These items were combined into separate SSs to examine group differences across EMS certifications.

Adequate PPE Supplies. Three survey items pertained to the availability of adequate PPEs supplies during a pandemic (items 23, 25, and 28, Table 18). These were collapsed into a SS as the mean of the numeric values of each participant's responses and labeled PPE Supply SS. Figure 9 illustrates the means across certifications (EMTs M = 3.68, SD = 0.95; AEMTs M = 3.52, SD = 0.93; paramedics M = 3.63, SD = 0.84). The means were very close in value and reflected agreement.

Figure 9

Means for PPE Supply SS across EMS Certifications

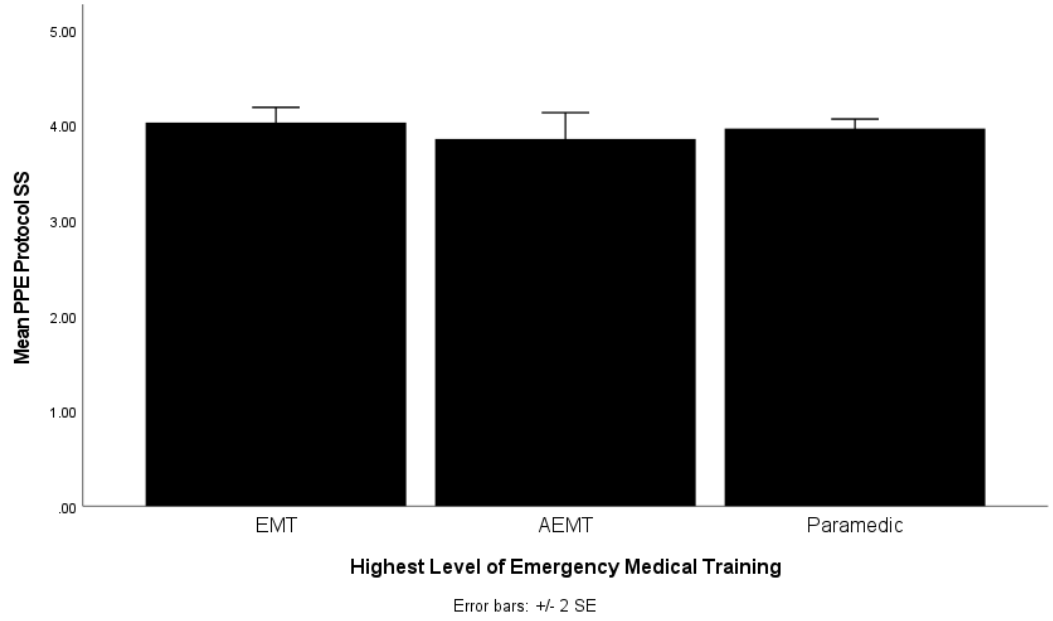


The correlations between the two variables, years of EMS provider experience and PPE Supply SS scores, were negligible and non-significant (EMTs $r(117) = -0.05$, $p = .608$, $r^2 < .1\%$; AEMTs $r(36) = -0.06$, $p = .704$, $r^2 < 1\%$; paramedics $r(237) = -0.05$, $p = .447$, $r^2 < 1\%$). Therefore, a one-way ANOVA was run without the covariate of years of experience. Results of the ANOVA test for the PPE Supply SS scores on Table 15 showed that differences across the group means were statistically non-significant. The Mean Comparisons null hypothesis was retained. EMTs, AEMTs, and paramedics agreed that adequate PPE supplies were available.

Adequate PPE Training. The other PPE subcategory pertained to adequate training on PPE protocols for proper use. Three survey items pertained to adequate training on PPE protocol (items 24, 26, and 27, Table 18). These were collapsed into a summated scale as the mean of the numeric values of each participant's responses and labeled the PPE Protocol SS. Figure 10 illustrates the means for the PPE Protocol SS across the three EMS certifications (EMTs $M = 4.02$, $SD = 0.87$; AEMTs $M = 3.85$, $SD = 0.85$; and paramedics $M = 3.96$, $SD = 0.77$). The means, which were very close in value, reflected agreement.

Figure 10

Means for PPE Protocol SS across EMS Certifications



The correlations between the two variables, years of EMS provider experience and PPE Protocol SS scores, were negligible and non-significant (EMTs $r(117) = -0.14$, $p = .141$, $r^2 = 2\%$; AEMTs $r(36) = -0.05$, $p = .771$, $r^2 < 1\%$; paramedics $r(237) = 0.01$, $p = .969$, $r^2 < 1\%$). Therefore, a one-way ANOVA was calculated without the covariate. Results for the PPE Protocol SS scores on Table 15 showed that differences across the group means were statistically non-significant. The Mean Comparisons null hypothesis was retained. EMTs, AEMTs, and paramedics all agreed equally that they had received adequate exposure and training to PPE protocols that ensured proper use.

Construct 4 – Mental Health

The Pandemic Preparedness Survey included two measures on mental health for EMS providers during pandemics and bioterrorist attacks (items 29 and 30, Table 19). The items asked for levels of agreement on whether their agency provided sufficient resources to maintain EMS providers' mental health and had defined processes to supplement local EMS agencies' support services to families during a pandemic or bioterrorist attack if needed.

Comparing Responses: Chi-Square Goodness of Fit Tests

Table 19 shows the results of goodness of fit tests and the percentages of participants who disagreed, were neutral, or agreed with survey items that addressed mental health. Both of the tests were statistically significant, and the null hypotheses were correspondingly rejected. The arrows in Table 19 indicate the direction in which observed counts differed from the associated expected count. With respect to mental health preparedness, the answer to RQ1 (is the EMS community in the United States to respond to a pandemic or bioterrorist attack) was strongly skewed in the direction of ill-preparedness. Features of mental health support that were ill-prepared were based on more EMS providers who disagreed and fewer who agreed than expected that their agencies provide sufficient resources to maintain EMS providers' mental health or have defined processes to supplement local EMS agencies in offering mental health services to EMS personnel and their families during a pandemic or bioterrorist attack.

Table 19

Percentage Agreement with Construct 4 – Mental Health (df = 2)

Item #	Survey Item	X^2	%D	%N	%A
29	My agency provides sufficient resources to maintain EMS provider mental health during a pandemic or bioterrorist attack.	12.81*	45% ↑	24%	31% ↓
30	My agency has defined processes to supplement local EMS agencies in offering support services, including mental health services, to EMS personnel and their families during a pandemic or bioterrorist attack.	11.34*	47% ↑	20%	32%↓

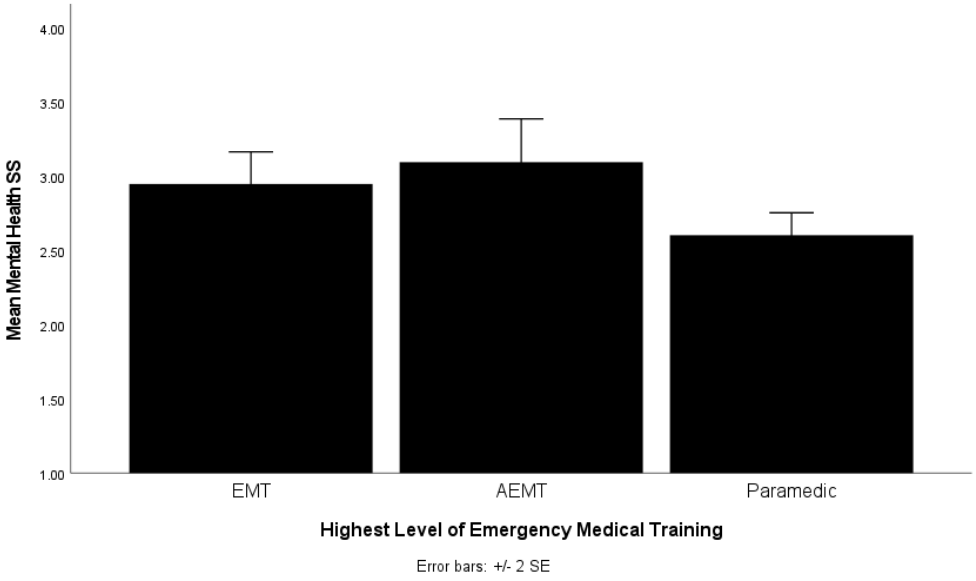
Note. X^2 = chi-square statistic value. *Significant at α = .050 level. **Significant at α = .001 level. %D = percentage of participants who disagreed or strongly disagreed. %N = percentage of participants who reported neutrality. %A = percentage of participants who agreed or strongly agreed. ↓ observed count significantly lower than expected. ↑ observed count significantly higher than expected.

Comparing EMS Groups: ANOVA and ANCOVA Tests

To inspect group differences, the two data sources on mental health were collapsed into a Mental Health SS. Figure 11 illustrates the means across certifications (EMTs *M* = 2.94, *SD* = 1.18; AEMTs *M* = 3.09, *SD* = 0.90; and paramedics *M* = 2.60, *SD* = 1.17). The means for the EMTs and AEMTs fell in the response category of neutrality, whereas the lower paramedics' mean fell between disagreement and neutrality.

Figure 11

Means for Mental Health SS across EMS Certifications



The correlations between the two variables, years of EMS provider experience and Mental Health SS scores, were negligible and non-significant (EMTs $r(117) = -0.04$, $p = .667$, $r^2 = 2\%$; AEMTs $r(36) = 0.07$, $p = .694$, $r^2 < 1\%$; paramedics $r(237) = 0.05$, $p = .489$, $r^2 < 1\%$). Therefore, a one-way ANOVA was run without the covariate of years of experience. Results of the ANOVA test for the Mental Health SS scores on Table 15 showed that differences across the group means were statistically significant. The Mean Comparisons null hypothesis was rejected. On average, EMTs and AEMTs were neutral regarding whether their agencies had provided sufficient resources to maintain EMS provider mental health and had defined processes to supplement local EMS agencies' support services to families during a pandemic or bioterrorist attack if needed. In contrast, paramedics disagreed, reporting that agency provisions for EMS providers'

mental health were inadequate. The difference between EMTs/AEMTs and paramedics was statistically significant.

Construct 5 – Administration

Comparing Responses: Chi-Square Goodness of Fit Tests

Table 20 lists the Administration construct survey items, the results of goodness of fit tests, and the percentages of participants who disagreed, were neutral, or agreed with survey items that addressed EMS agency administrations' operations and policies. All the tests were statistically significant except for ongoing disease surveillance (Administration 42). The null hypothesis was rejected for the significant tests but retained for the non-significant tests.

With respect to administrative preparedness for pandemics and bioterrorist attacks, the answer to RQ1 (is the EMS community in the United States to respond to a pandemic or bioterrorist attack) was strongly skewed in the direction of well-prepared. Features of EMS administrations that were well-prepared were based on all but two items (addressed below) about which fewer EMS providers disagreed than expected or fewer disagreed combined with more who agreed than expected (Table 20). The two exceptional features of EMS administrations that were ill-prepared presented in two ways. One was the failure to integrate best practices (Administration 41) based on more than expected neutral responses. The other was disagreement that administrations had established procedures for involving EMS agencies in ongoing disease surveillance (Administration 42); this was based on the distribution of responses that did not differ

from chance. Disagreement among the participants emerged from equal proportions who agreed and disagreed.

Table 20

Percentage Agreement with Construct 5 – Administration (df = 2)

Item #	Survey Item	X^2	%D	%N	%A
31	My agency has established procedures for EMS providers to deviate legally from their established treatment procedures to support mitigation of and response to pandemics, bioterrorist attacks, and other public health emergencies while still assuring appropriate education, medical oversight, and quality assurance.	20.25**	35%	29% ↑	36%
32	My agency has defined the role of EMS providers in "treating and releasing" patients without transporting them to a healthcare facility.	26.95**	31% ↓	16%	53% ↑
33	My agency has developed mechanisms for rapid development, adoption, or modification of prehospital clinical standards and triage/ treatment protocols before or during a pandemic or bioterrorist attack based on the most recent scientific information.	18.24**	30% ↓	26%	43%
34	I know of protocols and guidelines that can be implemented during a pandemic or bioterrorist attack.	115.60**	19% ↓	15%	66% ↑
35	My agency has allocated adequate resources toward the National Incident Management System (NIMS) to employ it during a pandemic or bioterrorist attack.	31.32**	27% ↓	27%	46% ↑

36	My agency has an approved method to allocate scarce resources (e.g., PPE, medical supplies, medical providers) ethically during a pandemic or bioterrorist attack.	23.93**	29% ↓	27%	44%
37	My agency has established a method for developing and distributing pandemic information, including clinical standards, treatment protocols, and just-in-time training to local EMS medical directors and EMS agencies.	34.08**	26% ↓	26%	49% ↑
38	My agency has a plan for messaging the public, as needed, during a pandemic or bioterrorist attack.	7.55	34% ↓	24%	43%
39	There is a plan in place to vaccinate EMS providers during a pandemic or bioterrorist attack.	66.90**	21% ↓	21%	58% ↑
40	My agency has adopted EMS pandemic and bioterrorism plans and operational procedures that define the role of EMS in preparing for, mitigating, and responding to pandemics and bioterrorist attacks.	34.32**	26% ↓	27%	47%
41	My agency has established methods to integrate best practices or lessons learned during the previous pandemic wave into EMS system operations and to issue an after-action report.	22.90**	29% ↓	27% ↑	43%
42	My agency has established procedures for involving EMS agencies in ongoing disease surveillance, like monitoring, reporting, and notification systems.	4.55	35%	22%	43%
43	My agency has adequate administrative preparedness (policies, plans, practices, agreements) to maintain operations during a pandemic or bioterrorist attack.	23.45**	28% ↓	22%	49% ↑

Note. X^2 = chi-square statistic value. *Significant at α = .050 level. **Significant at α = .001 level. %D = percentage of participants who disagreed or strongly disagreed. %N = percentage of participants who reported neutrality. %A = percentage of participants who

agreed or strongly agreed. ↓ observed count significantly lower than expected. ↑ observed count significantly higher than expected.

The 13 survey items that measured the Administration construct reflected eight subcategories. Results of examining each subcategory for group differences are presented below.

Comparing EMS Groups: Chi-Square Tests of Independence

Administrative subcategory: legal deviation. One subcategory pertained to extant procedures that allowed EMS providers to legally deviate when a pandemic or bioterrorist attack necessitated deviation (item 31: my agency has established procedures for EMS providers to deviate legally from their established treatment procedures to support mitigation of and response to pandemics, bioterrorist attacks, and other public health emergencies while still assuring appropriate education, medical oversight, and quality assurance). Figure 12 illustrates the distribution of participants across EMS certifications as a crosstabulation.

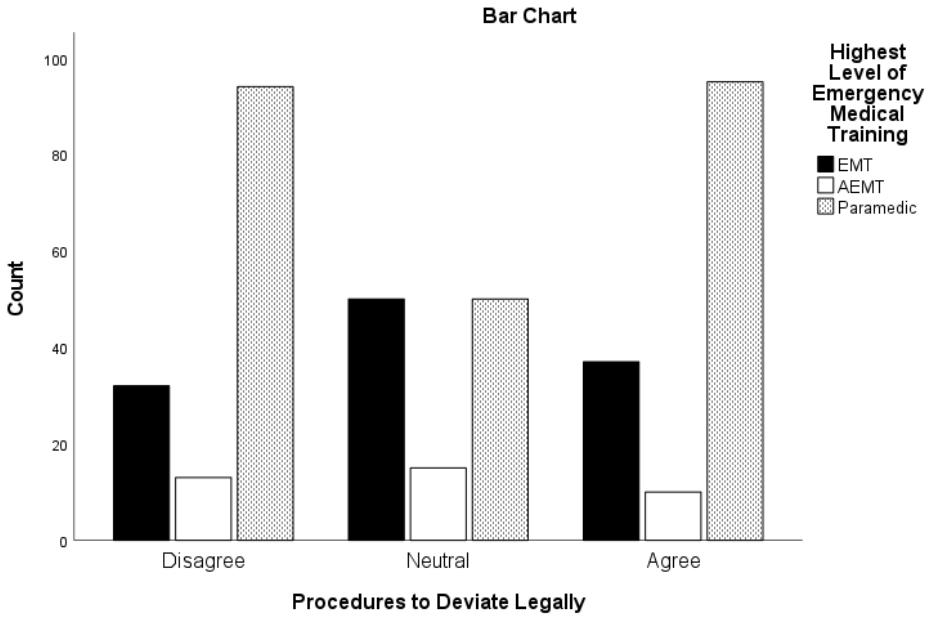
These proportions were examined for significance with a chi-square test of independence. The hypotheses were:

H_0: The association between procedures to deviate legally and EMS certification is not statistically significant.

H_1: The association between procedures to deviate legally and EMS certification is statistically significant.

Figure 12

Crosstabulation of Agreement with Procedures to Deviate Legally by EMS Certification



Results of the chi-square test of independence indicated that the association between procedures to deviate legally and EMS certifications was statistically significant ($X^2(4, N = 396) = 19.90, p < .001$). The null hypothesis was rejected.

Table 21 lists the results of crosstabulation. Adjusted residuals in Table 21 that were equal to or greater than ±1.96 in value revealed the pairs of observed versus expected counts that were significantly different. Specifically, significantly fewer EMTs disagreed and significantly more EMTs reported neutrality than expected by chance. In contrast, significantly more paramedics disagreed or agreed and significantly fewer expressed neutrality than expected by chance.

Table 21

Procedures to Deviate Legally by Highest Level of Emergency Medical Training Crosstabulation

Procedures to Deviate Legally		Highest Level of Emergency Medical Training			Total
		EMTs	AEMTs	Paramedics	
Disagree	Count	32	13	94	139
	%	27%	34%	39%	35%
	Adjusted Residual	-2.2	-0.1	2.2	
Neutral	Count	50	15	50	115
	%	42%	39%	21%	29%
	Adjusted Residual	3.7	1.5	-4.4	
Agree	Count	37	10	95	142
	%	31%	26%	40%	36%
	Adjusted Residual	-1.3	-1.3	2.0	
Total	Count	119	38	239	396
	%	100%	100%	100%	100%

Note. Count = observed count. % = % within Highest Level of Emergency Medical Training.

Administrative subcategory: messaging the public. A second subcategory pertained to messaging the public and was measured with one survey item (item 38: My agency has a plan for messaging the public, as needed, during a pandemic or bioterrorist attack). A chi-square test of independence was run to determine whether the proportions of EMS providers were consistent or inconsistent across the groups. The hypotheses were:

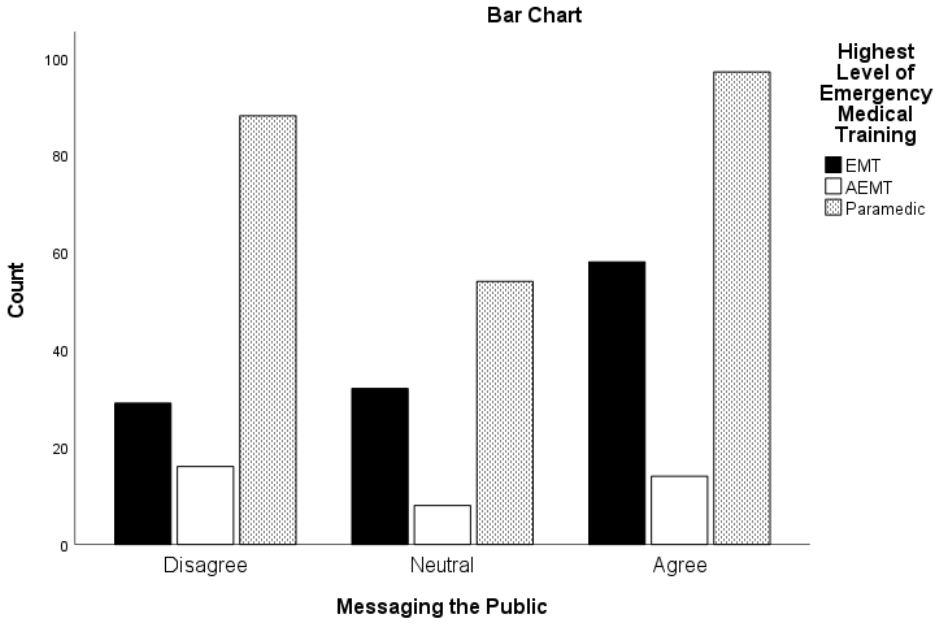
H_0: The association between agreement with messaging and EMS certifications is not statistically significant.

H_1: The association between agreement with messaging and EMS certifications is statistically significant.

Figure 13 illustrates the crosstabulation of response by EMS certification. The numbers of EMS providers by certification in each response category were mildly disproportionate due to the lower number of EMTs who disagreed and the higher number who agreed. For disagreement, 24% of the EMTs, 42% of the AEMTs, and 37% of the paramedics disagreed. For neutrality, 27% of the EMTs, 21% of the AEMTs, and 22% of the paramedics were neutral. For agreement, 49% of the EMTs, 37% of the AEMTs, and 41% of the paramedics agreed that their agencies had a plan for messaging the public during a pandemic or bioterrorist attack as needed. However, these mild disproportions fell short of significance ($X^2(4, N = 396) = 6.89$, $p = .142$). The null hypothesis was retained.

Figure 13

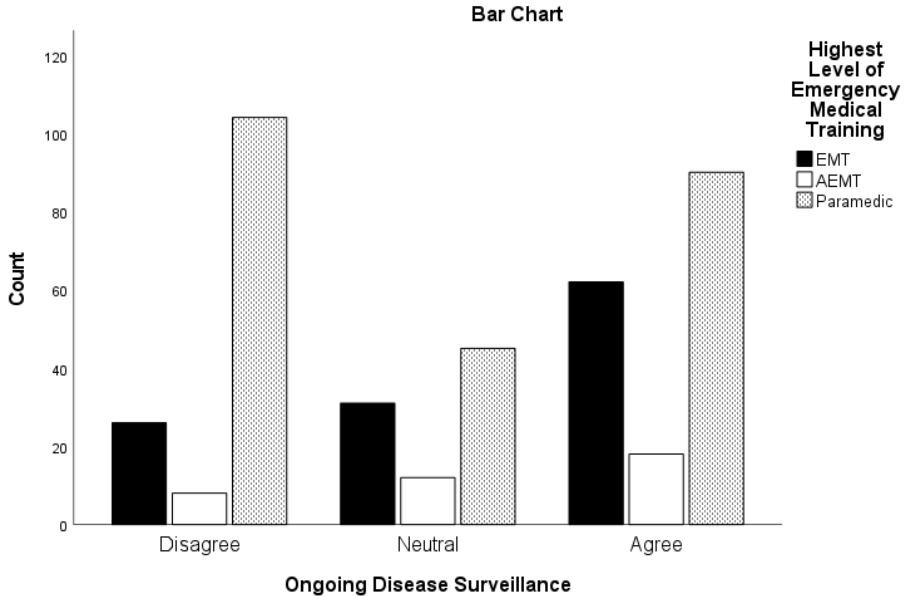
Crosstabulation of Messaging the Public and EMS Certifications



Administrative subcategory: ongoing disease surveillance. A third subcategory pertained to ongoing disease surveillance and was measured with one survey item (item 42: my agency has established procedures for involving EMS agencies in ongoing disease surveillance). Figure 14 illustrates the crosstabulation of the three responses by EMS certification. The number of EMS providers by certification in each response category was disproportionate. For disagreement, 22% of the EMTs, 21% of the AEMTs and 44% of the paramedics disagreed that their agencies have established procedures for involving EMS agencies in ongoing disease surveillance. For neutrality, 26% of the EMTs, 32% of the AEMTs, and 19% of the paramedics were neutral. For agreement, 52% of the EMTs, 47% of the AEMTs, and 38% of the paramedics agreed.

Figure 14

Crosstabulation of Ongoing Disease Surveillance and EMS Certifications



To determine whether the proportions of EMS providers were consistent or inconsistent across the groups, a chi-square test of independence was run to test the significance of associations between ongoing disease surveillance and EMS certification. The hypotheses were:

H_0: The association between agreement with ongoing disease surveillance and EMS certifications is not statistically significant.

H_1: The association between agreement with ongoing disease surveillance and EMS certifications is statistically significant.

Table 22 lists the crosstabulation statistics. Overall, a quarter of the EMS providers reported neutrality (22%), a third disagreed (35%), and nearly half agreed (43%). These disproportions were statistically significant ($X^2(4, N = 396) = 20.57$, $p < .001$). The null hypothesis was rejected. Specifically, adjusted residuals revealed that significantly fewer EMTs disagreed and significantly more EMTs agreed that there was ongoing disease surveillance. In contrast, significantly more paramedics disagreed that there was ongoing disease surveillance, leaving significantly fewer paramedics who agreed. Significantly fewer AEMTs were neutral about ongoing disease surveillance than expected by chance.

Table 22

Ongoing Disease Surveillance by Highest Level of Emergency Medical Training Crosstabulation

		Highest Level of Emergency Medical Training			
Ongoing Disease Surveillance		EMT	AEMT	Paramedic	Total
Disagree	Count	26	8	104	138
	%	22%	21%	44%	35%
	Adjusted Residual	-3.6	-1.9	4.5	
Neutral	Count	31	12	45	88

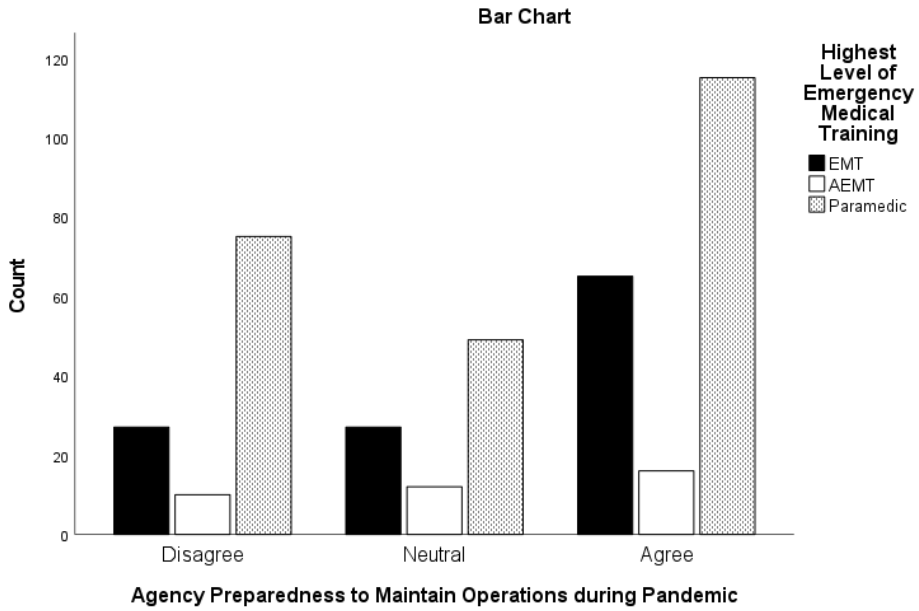
	%	26%	32%	19%	22%
	Adjusted Residual	1.2	1.5	-2.0	
Agree	Count	62	18	90	170
	%	52%	47%	38%	43%
	Adjusted Residual	2.4	.6	-2.6	
Total	Count	119	38	239	396
	%	100%	100%	100%	100%

Note. % = Percentage within Highest Level of Emergency Medical Training.

Administrative subcategory: agency preparedness to maintain operations during pandemics. A fourth subcategory pertained to administrative preparedness to maintain ongoing operations. This was measured with one survey item (item 43: my agency has adequate administrative preparedness [policies, plans, practices, agreements] to maintain operations during a pandemic or bioterrorist attack). Figure 15 illustrates the crosstabulation of response by EMS certification. The number of EMS providers by certification in each response category was disproportionate. For disagreement, 23% of the EMTs, 26% of the AEMTs, and 31% of the paramedics disagreed that their agencies had adequate administrative preparedness to maintain operations. For neutrality, 23% of the EMTs, 32% of the AEMTs, and 21% of the paramedics were neutral. For agreement, 55% of the EMTs, 42% of the AEMTs, and 48% of the paramedics agreed.

Figure 15

Crosstabulation of Administrative Preparedness to Maintain Ongoing Operations by EMS Certifications



A chi-square test of independence was run to test the significance of the association between ongoing operations and EMS certification. The hypotheses were:

H_0: The association between agreement with ongoing operations and EMS certifications is not statistically significant.

H_1: The association between agreement with ongoing operations and EMS certifications is statistically significant.

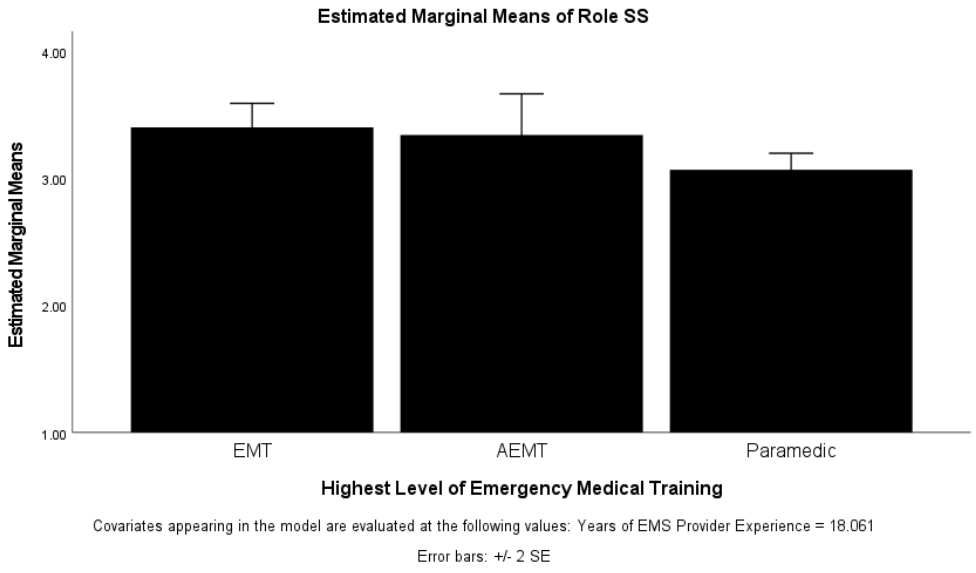
Overall, about a quarter of the EMS providers reported neutrality (22%), a quarter disagreed (28%), and half agreed (50%). These proportions did not differ statistically from chance ($X^2(4, N = 396) = 5.15$, $p = .272$). The null hypothesis was retained.

Comparing EMS Groups: ANOVA and ANCOVA Tests

Administrative subcategory: EMS roles. A fifth subcategory pertained to EMS roles measured with two survey items (item 32: my agency has defined the role of EMS providers in "treating and releasing" patients without transporting them to a healthcare facility; item 40: my agency has adopted EMS pandemic and bioterrorism plans and operational procedures that define the role of EMS in preparing for, mitigating, and responding to pandemics and bioterrorist attacks). These items were combined into the Role SS by calculating the mean of the numeric values of the two survey items for each participant. Figure 16 illustrates the means for Role SS across the three EMS certifications (EMTs $M = 3.36$, $SD = 0.87$; AEMTs $M = 3.37$, $SD = 0.93$; paramedics $M = 3.08$, $SD = 1.06$). The means for the EMTs and AEMTs fell between neutrality and agreement. The lower value of the paramedics' mean reflected an average response of neutral.

Figure 16

Means for Role SS across EMS Certifications



The correlations between the two variables, years of EMS provider experience and Role SS scores, revealed the trend toward significance among paramedics (EMTs $r(117) = 0.07$, $p = .450$, $r^2 < 1\%$; AEMTs $r(36) = -0.12$, $p = .458$, $r^2 = 1\%$, and paramedics $r(237) = 0.12$, $p = .059$, $r^2 = 1\%$). Therefore, an ANCOVA was run, using years of EMS provider experience as the covariate. Results of the ANCOVA test for the Role SS scores in Table 23 showed a statistical trend toward a significant effect of experience; however, the covariate null hypothesis was retained. Differences in role definition between participants across EMS certifications were statistically significant (Table 23). The Mean Comparisons null hypothesis was rejected. EMTs and AEMTs reported an average stance between neutrality and agreement that their agencies had defined roles of EMS to prepare for, respond to, mitigate, and recover from pandemics and bioterrorist attacks. In contrast, compared to EMTs and AEMTs, paramedics disagreed that their agencies had clearly defined roles so that EMS providers were prepared for, ready to mitigate, and ready to respond to pandemics.

Table 23

ANOVA and ANCOVA Summary Table for Administration, Public Safety Answering Points, and Integration into Disaster Planning (Constructs 5, 7, and 8)

Variable	Covariate: Experience	Group	Direction
C5 Role SS	Retain: $F(1, 392) = 2.88$, $p = .090$, $p\eta^2 = .007$	Reject: $F(2, 393) = 4.66$, $p = .010$, $p\eta^2 = .023$	EMTs & AEMTs > Paramedics
C5 Treatment Protocol SS	Retain: $F(1, 392) = 1.82$, $p = .178$, $p\eta^2 = .005$	Reject: $F(2, 393) = 3.47$, $p = .032$, $p\eta^2 = .017$	EMTs & AEMTs > Paramedics
C5 Resource Allocation SS	NA	Reject: $F(2, 393) = 4.57$, $p = .011$, $p\eta^2 = .020$	EMTs > Paramedics

C5 Best Practices SS	NA	Reject: $F(2, 393) = 5.72$, $p = .004$, $p\eta^2 = .027$	EMTs > Paramedics
C7 Public Safety Answering Points SS	NA	Reject: $F(2, 393) = 7.95$, $p < .001$, $p\eta^2 = .037$	EMTs > Paramedics
C8 Integration SS	NA	Reject: $F(2, 393) = 11.97$, $p < .001$, $p\eta^2 = .057$	EMTs > Paramedics
C8 Disruption SS	NA	Reject: $F(2, 393) = 3.61$, $p = .020$, $p\eta^2 = .020$	EMTs > Paramedics

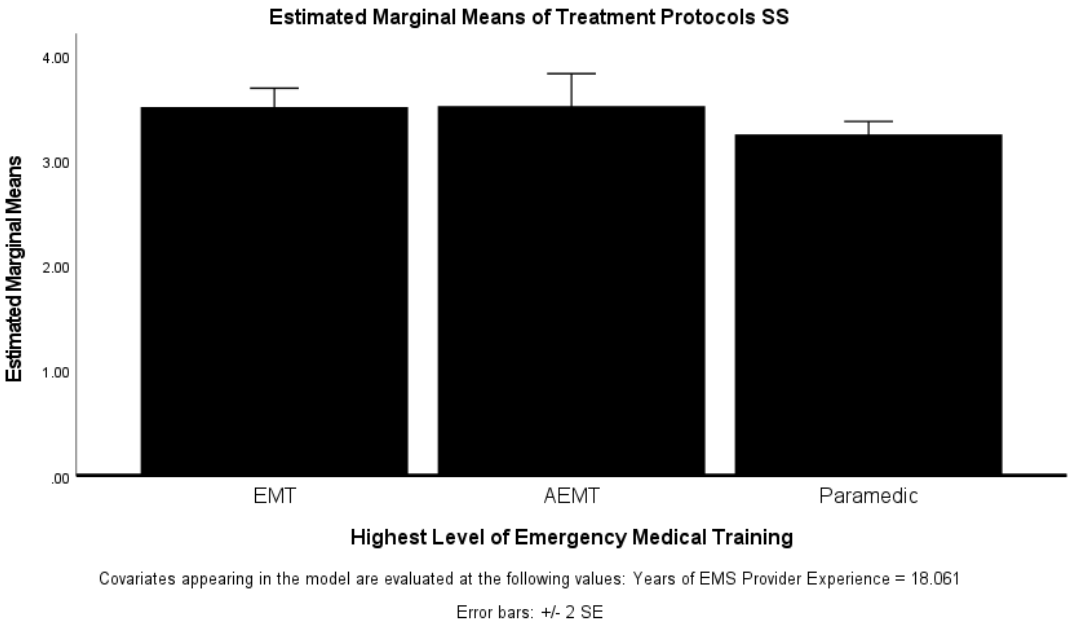
Note. C# = construct #. Covariate: Experience = Years of EMS Provider Experience, covariate NA = negligible correlations contra-indicated ANCOVA in favor of ANOVA tests. Direction: > represents greater agreement.

Administrative subcategory: treatment protocols. A sixth subcategory pertained to treatment protocols, measured with two survey items. The first item was specific (item 33: my agency has developed mechanisms for rapid development, adoption, or modification of prehospital clinical standards and triage and treatment protocols before or during a pandemic or bioterrorist attack based on the most recent scientific information). The second item was general (item 34: I know of protocols and guidelines that can be implemented during a pandemic or bioterrorist attack).

These items were combined into the Treatment Protocol SS by calculating the mean of the numeric values of the two survey items for each participant. Figure 17 illustrates the Treatment Protocol SS means across the three EMS certifications (EMTs $M = 3.48$, $SD = 0.89$; AEMTs $M = 3.54$, $SD = 0.90$; paramedics $M = 3.02$, $SD = 0.98$). Again, the means for the EMTs and AEMTs fell between neutrality and agreement, whereas the lower paramedics' mean reflected neutrality.

Figure 17

Means for Treatment Protocol SS across EMS Certifications



The correlations between the two variables, years of EMS provider experience and Treatment Protocol SS scores, included a significant correlation among the paramedics (EMTs $r(117) = -0.04$, $p = .676$, $r^2 < 1\%$; AEMTs $r(36) = -0.01$, $p = .997$, $r^2 < 1\%$, and paramedics $r(237) = 0.13$, $p = .043$, $r^2 = 1\%$). Therefore, an ANCOVA was run, including using years of EMS provider experience as the covariate. However, ANCOVA results (Table 23) showed that years of experience was not a significant covariate; the covariate null hypothesis was retained. However, the differences in perspective about treatment roles were significant. The Mean Comparisons null hypothesis was rejected. Again, EMTs and AEMTs reported an average stance between neutrality and agreement. In contrast, compared to EMTs and AEMTs, paramedics

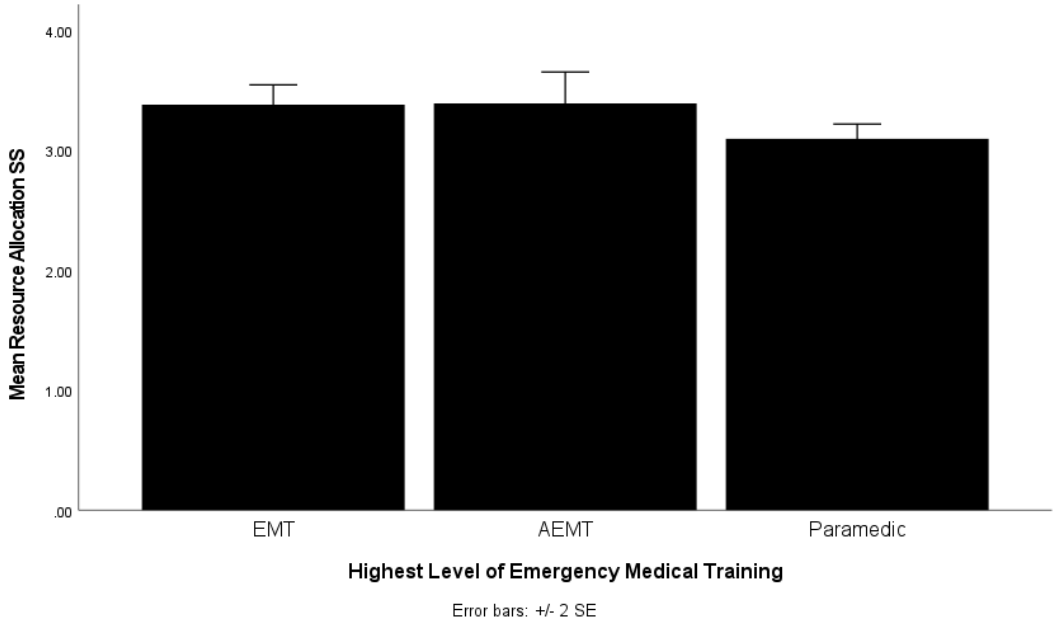
disagreed to a statistically significant extent that their agencies had defined general and specific treatment roles in response to pandemics.

Administrative subcategory: resource allocation. A seventh subcategory pertained to resource allocation. It was measured with three survey items (item 35: my agency has allocated adequate resources toward the National Incident Management System (NIMS) to employ it during a pandemic or bioterrorist attack. Item 36: my agency has an approved method to allocate scarce resources (e.g., PPE, medical supplies, medical providers) ethically during a pandemic or bioterrorist attack. Item 37: my agency has established a method for developing and distributing pandemic information, including clinical standards, treatment protocols, and just-in-time training to local EMS medical directors and EMS agencies.)

These items were combined into the Resource Allocation SS by calculating the mean of the numeric values of the survey items for each participant. Figure 18 illustrates the means for the Resource Allocation SS across the three EMS certifications (EMTs M = 3.37, SD = 0.90; AEMTs M = 3.39, SD = 0.81; and paramedics M = 3.00, SD = 0.94).

Figure 18

Means for Resource Allocation SS across EMS Certifications



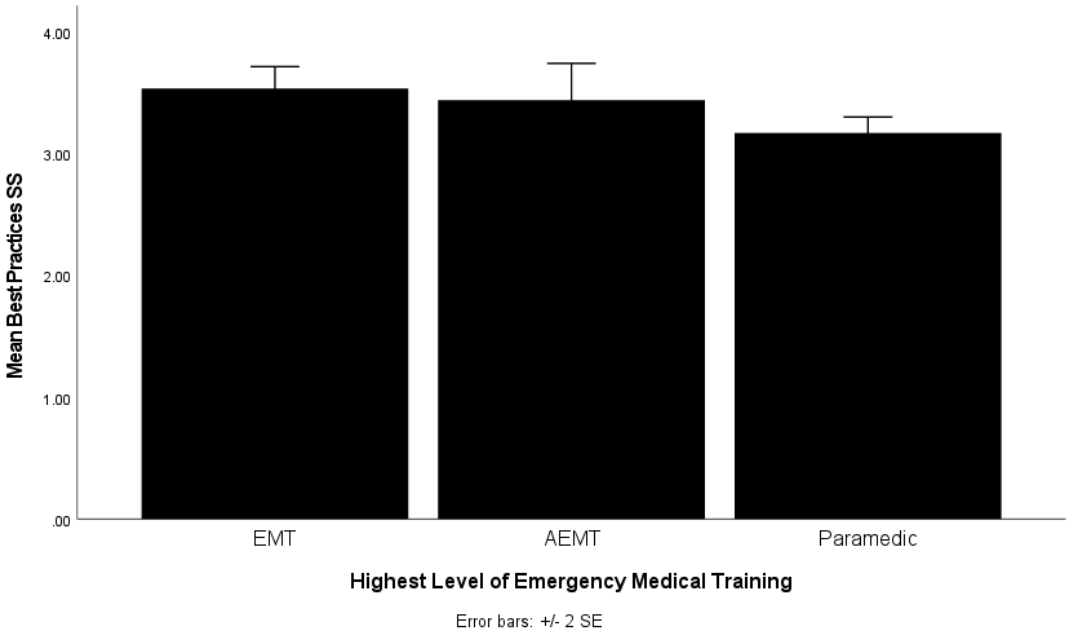
The correlations between the two variables, years of EMS provider experience and Resource Allocation SS scores, were all small and non-significant (EMTs $r(117) = -0.01$, $p = .925$, $r^2 < 1\%$; AEMTs $r(36) = -0.13$, $p = .436$, $r^2 = 1$; paramedics $r(237) = 0.11$, $p = .088$, $r^2 = 1\%$). Therefore, an ANOVA was run. Results showed that the differences in perspective about resource allocation were significant (Table 23). The Mean Comparisons null hypothesis was rejected. Again, EMTs and AEMTs reported an average stance between neutrality and agreement. In contrast, paramedics disagreed that agencies had allocated adequate resources and had approved allocation and distribution methods.

Administrative subcategory: best practices. The eighth and final subcategory pertained to integrating best practices, which were measured with two survey items (item

39: there is a plan in place to vaccinate EMS providers during a pandemic or bioterrorist attack. Item 41: my agency has established methods to integrate best practices or lessons learned during the previous pandemic wave into EMS system operations and to issue an after-action report). These items were combined into the Best Practice SS. Figure 19 illustrates the means for Best Practice SS across the three EMS certifications (EMTs M = 3.53, SD = 0.98; AEMTs M = 3.43, SD = 0.93; and paramedics M = 3.16, SD = 1.01).

Figure 19

Means for Best Practices SS across EMS Certifications



The correlations between the two variables, years of EMS provider experience and Best Practices SS scores, were all small and non-significant (EMTs $r(117) = -0.08$, $p < .403$, $r^2 < 1\%$; AEMTs $r(36) = -0.20$, $p = .228$, $r^2 = 4\%$; paramedics $r(237) = 0.07$, $p = .261$, $r^2 < 1\%$). Therefore, an ANOVA was run. Results showed that perspectives about incorporating best practices were significantly different (Table 23). The Mean

Comparisons null hypothesis was rejected. Again, EMTs and AEMTs reported an average stance between neutrality and agreement. Paramedics disagreed compared to EMTs that their agencies incorporated best practices in terms of providing vaccines and best practices learned from previous pandemics.

Construct 6 – Financial Preparedness

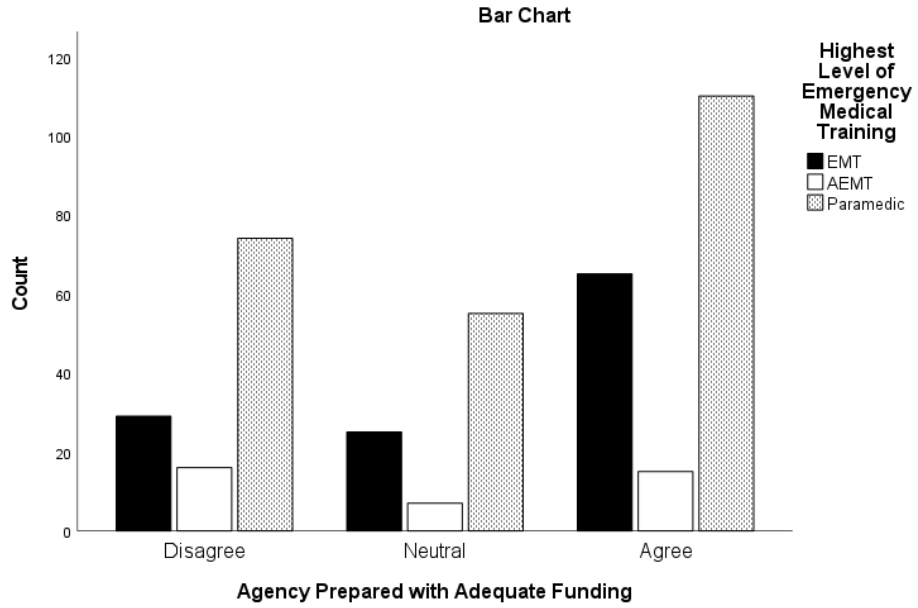
Comparing Responses: Chi-Square Goodness of Fit Tests

Financial Preparedness was measured with one item: My agency has adequate funding to maintain operations during a pandemic or bioterrorist attack. The responses were distributed unevenly, with nearly half agreeing (48%), a third disagreeing (30%), and a quarter who reported neutrality (22%). The results of a goodness of fit test ($X^2(2, N = 396) = 16.87, p < .001$) showed that this distribution differed from chance expectations, with fewer EMS providers who disagreed. With respect to financial preparedness for pandemics and bioterrorist attacks, the answer to RQ1 (is the EMS community in the United States to respond to a pandemic or bioterrorist attack) went in the direction of well-prepared, based on significantly fewer EMS providers who disagreed with the item.

To determine if there were group differences in perspectives on adequate funding across the EMS certifications, a chi-square test of independence was run. Figure 20 shows the crosstabulation. The results of the test of independence revealed a non-significant association between responses about funding and EMS certifications (X^2 (4, $N = 396) = 5.42, p = .246$). The null hypothesis was retained.

Figure 20

Crosstabulation of Adequate Agency Pandemic Funding by EMS Certifications



Construct 7 – Public Safety Answering Points

Comparing Responses: Chi-Square Goodness of Fit Tests

Three survey items measured public safety, primarily in terms of reliable communications systems. Table 24 lists the items along with results of goodness of fit tests and the distributions of responses. All three goodness of fit tests were statistically significant; the null hypotheses were all rejected. With respect to public safety answering points, the answer to RQ1 (is the EMS community in the United States to respond to a pandemic or bioterrorist attack) was divided but trended more in the direction of well-prepared than ill-prepared. Features of public safety answering points that were well-prepared were based on significantly fewer EMS providers who disagreed about preparedness in PSASP/EOC (Public Safety 45), and fewer disagree responses with more

agree responses about reliable communications across agencies (Public Safety 46). The feature of public safety answering points that was ill-prepared was adequate COOP planning & surge capacities (Public Safety 47), which reflected in more neutral responses and fewer agreements than expected.

Table 24

Percentage Agreement with Construct 7 – Public Safety Answering Points Survey Items (df = 2)

Item #	Survey Item	X^2	%D	%N	%A
45	My jurisdiction's Public Safety Answering Point (PSAP) / Emergency Operations Center (EOC) is prepared to respond during a pandemic or bioterrorist attack.	29.73**	28% ↓	29%	43%
46	My agency has an effective, reliable, interoperable communications system among EMS, 9-1-1, emergency management, public safety, public health, and health care agencies.	61.44**	24% ↓	18%	59% ↑
47	There is an adequate Continuity of Operations (COOP) planning and surge capacity within the EMS and 9-1-1 systems.	21.99**	37%	29% ↑	34%↓

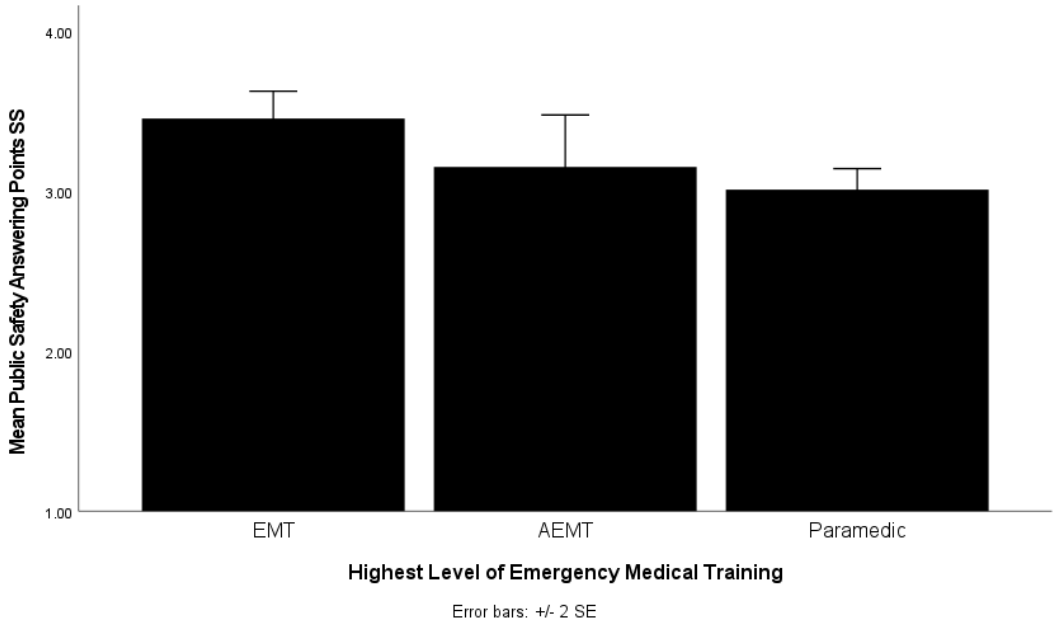
Note. X^2 = chi-square statistic value. *Significant at α = .050 level. **Significant at α = .001 level. %D = percentage of participants who disagreed or strongly disagreed. %N = percentage of participants who reported neutrality. %A = percentage of participants who agreed or strongly agreed. ↓ observed count significantly lower than expected. ↑ observed count significantly higher than expected.

Comparing EMS Groups: ANOVA and ANCOVA Tests

Comparing EMSs Groups. The three public safety items were collapsed into a Public Safety Answering Point SS to compare the groups. The means, illustrated in Figure 21, differed in value across EMS certifications. On average, EMTs reflected a response between neutral and agree (EMTs $M = 3.45$, $SD = 0.93$) whereas AEMTs and paramedics reported averages of neutral (AEMTs $M = 3.15$, $SD = 1.00$; paramedics $M = 3.01$, $SD = 1.02$).

Figure 21

Public Safety Answering Point SS Means by EMS Certifications



Correlations between years of EMS provider experience and Public Safety Answering Point SS scores were generated and inspected to decide whether to compare the groups with an ANOVA or an ANCOVA test. The correlations were small and non-significant (EMTs $r(117) = -0.10$, $p = .276$, $r^2 = 1\%$; AEMTs $r(36) = -.23$, $p = .447$, , $r^2 =$

5%); paramedics ($r(237) = .02$, $p = .796$, $r^2 < 1\%$). Therefore, the groups were compared with an ANOVA test. Results in Table 23 showed that differences across participant groups on the Public Safety Answering Point SS means were statistically significant. The Mean Comparisons null hypothesis was rejected. Paramedics reported significantly less public safety answering point preparedness compared to EMTs. Paramedics felt the least prepared of the three groups in terms of public safety answering points.

Construct 8 – EMS Integration into Disaster Planning

Comparing Responses: Chi-Square Goodness of Fit Tests

Seven survey items measured EMS integration into disaster planning. They are listed in Table 25 with the results of goodness of fit tests and percentages of responses. All of the tests were significant, and the null hypothesis was rejected for all of them. With respect to pandemic preparedness involving EMS integration into disaster planning, the answer to RQ1 (is the EMS community in the United States to respond to a pandemic or bioterrorist attack) was that integration elements were divided between well-prepared and ill-prepared. Features of EMS integration into disaster planning that were well-prepared included significantly fewer EMS providers who disagreed and significantly more who agreed that there was ample medical oversight (Integration 49), agencies had plans to support hospital diversion and bed capacity (Integration 53) and had consistent system-wide procedures for rapid distribution of pre-hospital treatment protocols (Integration 54).

The feature of EMS integration into disaster planning that most strongly implicated ill-preparedness was Integration 51, with significantly more EMS providers

disagreeing and fewer providers agreeing that there was adequate room for surging. Further features of ill-preparedness were reflected in the following. There were more EMS providers who were neutral on the notion that EMS was integrated into more extensive government preparedness planning (Integration 50). More providers were neutral, and fewer agreed that their agencies had plans to address disruptions (Integration 52). Finally, fewer providers disagreed, and more were neutral on whether EMS strategies were integrated into the community (Integration 48).

Table 25

Percentage Agreement with Construct 8 – EMS Integration into Disaster Planning Survey Items (df = 2)

Item #	Survey Item	X^2	%D	%N	%A
48	My EMS system is integrated with pandemic mitigation strategies within the community.	34.52**	31% ↓	31% ↑	38%
49	There is ample medical oversight of my EMS and 9-1-1 systems.	97.80**	18% ↓	20%	62% ↑
50	EMS is integrated into more extensive government pandemic preparedness planning in my EMS system.	33.36**	35%	32% ↑	33%
51	There is adequate room for surging in the current EMS system to meet a pandemic or bioterrorist attack demand.	91.65**	62% ↑	19%	19% ↓
52	My agency has backup plans to address disruptions in the availability of EMS equipment, supplies, and services.	20.87**	45%	26% ↑	29% ↓
53	My agency has a communications plan, including communications equipment and a radio frequency plan to	53.13**	24% ↓	18%	57% ↑

	support common hospital diversion and bed capacity situational awareness at the local, state, and regional levels.				
54	My agency has defined consistent, system-wide procedures for rapidly distributing new or modified prehospital EMS treatment and triage protocols before or during a pandemic or bioterrorist attack.	32.45**	26% ↓	22%	51% ↑

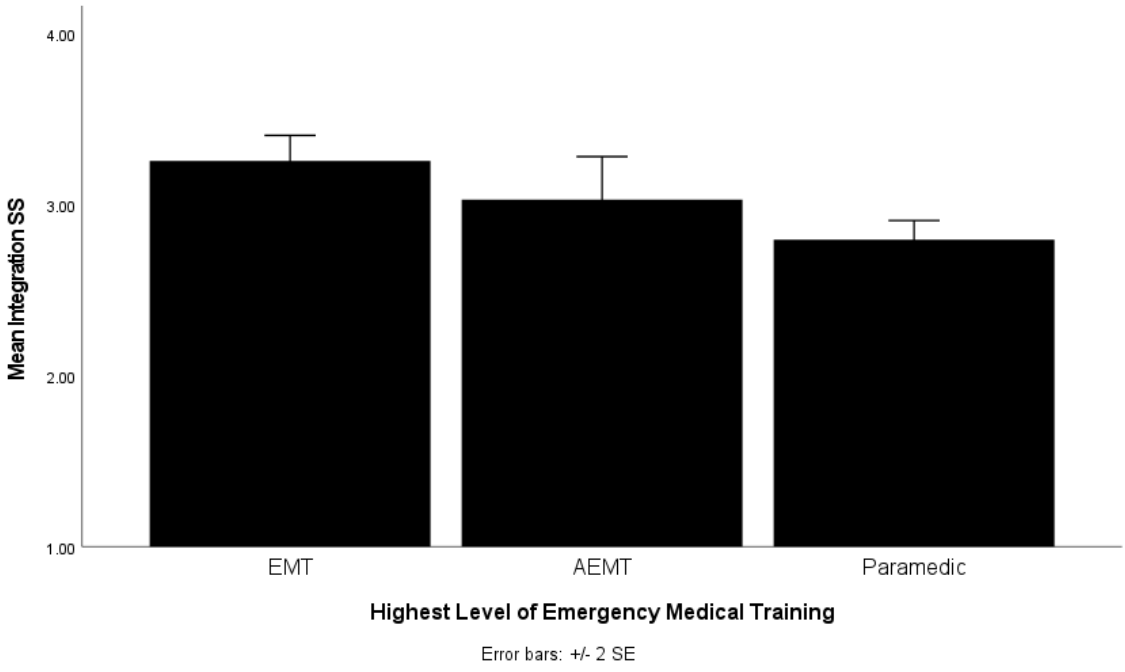
Note. X^2 = chi-square statistic value. *Significant at α = .050 level. **Significant at α = .001 level. %D = percentage of participants who disagreed or strongly disagreed. %N = percentage of participants who reported neutrality. %A = percentage of participants who agreed or strongly agreed. ↓ observed count significantly lower than expected. ↑ observed count significantly higher than expected.

Comparing EMS Groups: ANOVA and ANCOVA Tests

To see if EMTs, AEMTs, and paramedics differed on elements of integration, two SSs were generated and examined for group differences.

Comparing EMS Groups on Integration SS. The four survey items of Integration 48, 49, 50, and 51 (Table 25) were collapsed into an Integration SS to examine group differences across EMS certifications. The means are illustrated in Figure 22. On average, EMTs reflected a response between neutral and agree (EMTs *M* = 3.23, *SD* = 0.81). AEMTs reported an average of neutral (AEMTs *M* = 3.02, *SD* = 0.77). Paramedics' mean was between disagree and neutral (*M* = 2.79, *SD* = 0.87).

Figure 22: Integration SS Means by EMS Certifications



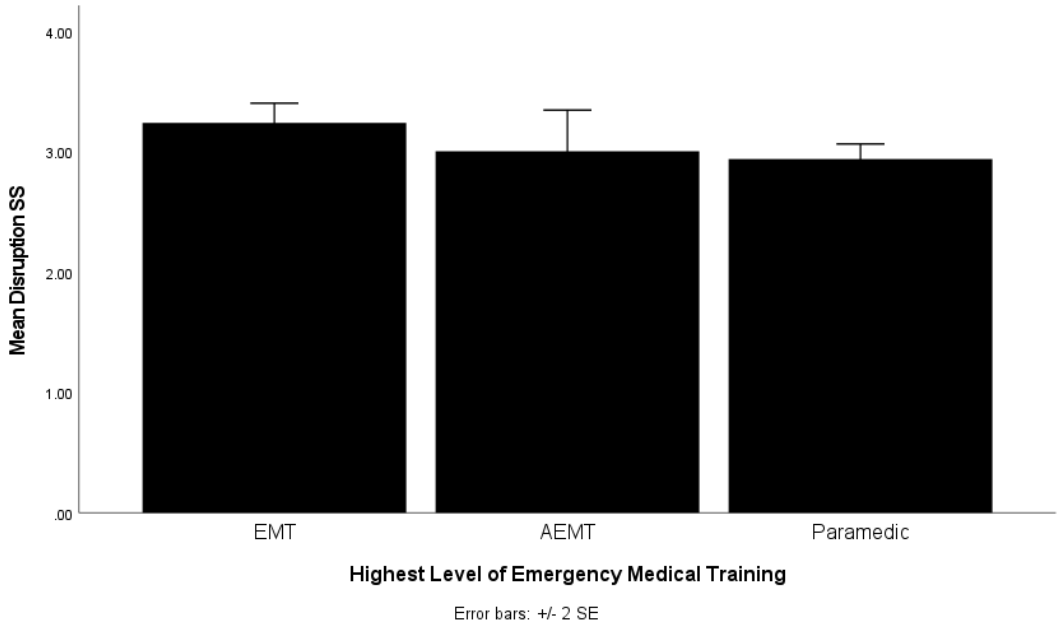
Correlations between years of EMS provider experience and Integration SS scores were generated and inspected to decide whether to compare the groups with an ANOVA or an ANCOVA test. The correlations were small and non-significant (EMTs $r(117) = -0.10$, $p = .260$, $r^2 = 1\%$; AEMTs $r(36) = -.20$, $p = .234$, , $r^2 = 4\%$); paramedics ($r(237) = 0.09$, $p = .164$, $r^2 < 1\%$) so the groups were compared with an ANOVA test. Results on Table 23 showed that differences across participant groups on the Integration SS scores means were statistically significant. The Mean Comparisons null hypothesis was rejected. Paramedics reported significantly less integration preparedness compared to EMTs.

Comparing EMS Groups on Disruption SS. The two integration survey items of Integration 52 and 53 (Table 25) were collapsed into a Disruption SS to see if the groups differed. The means are illustrated in Figure 23. On average, EMTs reflected a

response between neutral and agree (EMTs *M* = 3.24, *SD* = 0.89) whereas AEMTs and paramedics reported averages of neutral (AEMTs *M* = 3.00, *SD* = 1.05; paramedics *M* = 2.93, *SD* = 0.97). AEMTs and paramedics had means that reflected "neutral" compared to a slightly higher mean among EMTs.

Figure 23

Disruption SS Means by EMS Certifications



Correlations between years of EMS provider experience and Disruption SS scores were generated and inspected to determine whether to compare the groups with an ANOVA or an ANCOVA test. The correlations were small and non-significant (EMTs $r(117) = -0.02$, $p = .810$, $r^2 < 1\%$; AEMTs $r(36) = -0.18$, $p = .276$, $r^2 = 3\%$; paramedics ($r(237) = 0.05$, $p = .487$, $r^2 = 2\%$). Therefore, the groups were compared with an ANOVA test. Results in Table 23 showed that differences across participant groups on the Disruption SS scores means were statistically significant. The Mean Comparisons

null hypothesis was rejected. Paramedics reported significantly less agreement about plans in place to handle disruptions during pandemics compared to EMTs.

Results for RQ2

Construct 9 – Recommended Preparedness Improvements

This final section addresses RQ2 (What practices, procedures, or policies should be implemented to prepare the US EMS system for a pandemic or bioterrorist attack?). Results are presented in two parts. The first part presents highlights of the open-ended question on the survey about what EMS systems need. The second part presents responses to suggestions that were listed on the survey.

Open-ended Responses about What EMS Systems Need

The majority of participants provided responses. These are listed verbatim in Appendix E. Tables are divided by EMS certification. Three representative responses are presented below as block quotes.

> ***Paramedic Case 139:***
>
> We need the funding to allow for appropriate staffing ratios that don't leave our providers over worked [*sic*] and burnt out. EMS is a thankless job and is easily pushed to the side when it comes to staffing because we can scrape by with the bear [*sic*] minimum. We are over worked [*sic*], tired and getting worn down. The current EMS system in place is not sustainable and will reach a breaking point. There will be a time when nobody answers the call for help if we do not change things soon.

EMT Case 37:

The volunteer system was in decline prior to COVID. That decline has accelerated in the past two years. In our system, one station lost all EMS providers at the start of COVID-19 and the county is now funding paid staff for that station only. Two other stations are "operable" largely in name only. The remaining stations have been able to stay within response standards but have been burdened with responding more often outside their due to cover these declines. However, those remaining stations also have fewer responders and so this has been achieved on the backs of a very small group of people. It is unsustainable and it is starting to show. The county is about to launch a paid staff "fly car" to mitigate; I'm not confident that this will be sufficient.

As to preparedness -- if we had relied solely on official notifications from the state/fed government, we would have been in very bad shape. Because of skills from my former (non-medical) profession, I was able to discern what was coming in Dec 2019 and took actions to build PPE and medical supply inventories to avoid disruptions caused by supply chain problems later on. I took some heat for that initially.

I'm angry because if I was able to figure things out through strictly open-source methods, there were others working in bio-surveillance who knew (or should have known) and they either failed to warn, the warnings were unheeded, or there was panic about causing panic and so the information was withheld. I hope I live long enough to find out the truth of that matter.

The questions in this survey lead me to believe that you are focusing on training/exercises/preparedness. A key issue here is measuring the actions taken after such training. Post-9/11 funds were used to stock a trailer full of supplies which were then left untouched for years. Sometime around 2018/19, it was discovered that all this material had expired and would need to be re-stocked - at agency expense. The more effective approach would have been to integrate that excess stock into the regular inventory/supply system and replace it as consumed. This “lock it up in a trailer and forget about” approach seems to be more common than not. Without fixing this, we’re just wasting a tremendous amount of taxpayer dollars and not **actually** increasing preparedness.

Paramedic Case 65:

EMS as a whole is actively collapsing. We do not have enough players on the field for practice, let alone the Super Bowl. You can have all the equipment, training, and plans in the world but none of that matters when you don’t have personnel. Most agencies cannot keep pace with current call volume. Add in a bioweapon and you won’t have any EMS.

We ask people to go to school on their own time and on their own dime to become a Paramedic. Then tell them they will have very little promotional opportunities throughout their career. They will see shrinking benefits over the years and stagnant pay. State retirement has become a +35-year-long Ponzi scheme that only 2% of medics will see the benefits of. Agencies see 100% turnover in 5 years or less. Why become a medic and be asked to go into homes

filled with infection and run a cardiac arrest with an 18-year-old EMT when you can become a nurse, get paid twice as much, work in a clean healthcare facility surrounded by doctors? If you can get three years out of a new paramedic, consider yourself lucky.

A service cannot be prepared for a bioweapon terrorist attack when it is not staffed for a normal year's worth of calls.

Comparing Responses: Chi-Square Goodness of Fit Tests

Finally, survey items 55-59 listed several recommendations for improving pandemic preparedness and asked participants about the extent to which they agreed. Table 26 lists the items, results of chi-square goodness of fitness tests, and percentages of EMS providers by response type. All of the tests were statistically significant, and the null hypothesis was rejected for all. Of note, the percentages of EMS providers in the agree category are the largest of this study. The suggestions for improving the EMS system on the survey that met with strong approval were items 55-58. The exception was item 59, in which EMS providers were evenly divided in disagreeing, agreeing, or reporting neutrality on the suggestion that their agencies have a current plan to improve EMS preparedness to maintain operations during a pandemic or bioterrorist attack, based on more providers choosing neutrality than expected.

Table 26

Percentage Agreement with Construct 9 – Recommended Preparedness Improvement Survey Items (df = 2)

Item #	Survey Item	X^2	%D	%N	%A
55	The ability to be reimbursed for treat-in-place care would increase preparedness for a pandemic or bioterrorist attack.	149.17**	12% ↓	21%	67% ↑
56	More education on emergency preparedness would increase your EMS system's preparedness for a pandemic or bioterrorist attack.	345.07**	4% ↓	11% ↓	85% ↑
57	More drills/exercises on emergency preparedness would increase your EMS system's preparedness for a pandemic or bioterrorist attack.	378.13**	3% ↓	9% ↓	87% ↑
58	A straightforward template to respond to a pandemic or bioterrorist attack would increase your EMS system's preparedness for a pandemic or bioterrorist attack.	296.67**	6% ↓	12% ↓	82% ↑
59	My agency has a current plan to improve EMS preparedness to maintain operations during a pandemic or bioterrorist attack.	47.85**	35%	34% ↑	32%

Note. X^2 = chi-square statistic value. *Significant at α = .050 level. **Significant at α = .001 level. %D = percentage of participants who disagreed or strongly disagreed. %N = percentage of participants who reported neutrality. %A = percentage of participants who agreed or strongly agreed. ↓ observed count significantly lower than expected. ↑ observed count significantly higher than expected.

Answer to RQ2

The answer to RQ2 (What practices, procedures, or policies should be implemented to prepare the US EMS system for a pandemic or bioterrorist attack?) was a bleak prognosis: practices, procedures, and policies must rectify consistent lack of funding, organization, sufficient personnel and supervision, and poor pay for a demanding job.

Summary

The answers to RQ1 (is the EMS community in the United States to respond to a pandemic or bioterrorist attack) varied on the extent to which responses per construct reflected well-prepared versus ill-prepared features. On the Training construct, preparedness was divided; paramedics felt the least prepared of the three groups. On the Workforce construct, preparedness was skewed toward preparedness; paramedics felt the least prepared of the three groups. On the Personal Protective Equipment (PPE) construct, preparedness was strongly skewed toward preparedness. On the Mental Health construct, preparedness was strongly skewed toward ill-preparedness, and paramedics felt the least prepared of the three groups. On the Administration construct, preparedness was strongly skewed toward well-prepared. With respect to features in which the groups differed, paramedics felt the least prepared of the three groups. On the Financial Preparedness construct, preparedness was skewed in the direction of well-prepared. On the Public Safety Answering Points construct, preparedness was divided but trended more toward preparedness than ill-preparedness; paramedics reported significantly less public safety answering point preparedness compared to EMTs. On EMS Integration into Disaster Planning construct, preparedness was divided but in the direction of well-prepared. The

feature of EMS integration into disaster planning that was the most was strongly implicated in ill-preparedness related to inadequate room for surging. In addition, paramedics reported significantly less agreement about integration during pandemics compared to EMTs.

The answer to RQ2 (What practices, procedures, or policies should be implemented to prepare the US EMS system for a pandemic or bioterrorist attack?) was bleak: Practices, procedures, and policies must rectify consistent lack of funding, organization, sufficient personnel and supervision, and poor pay for a demanding job.

Chapter V: Summary, Conclusions, and Recommendations

Overview, Purpose, and Nature of the Study

The risk to EMS from a pandemic or bioterrorist attack has caused concerns for both policymakers and the public (Ejike, 2019). The breadth and depth of this concern ebbed and flowed along with the perceived risk level. The COVID-19 pandemic magnified both the significance and the visibility of American EMS' preparedness for pandemics and bioterrorist attacks. FICEMS determined that many EMS systems and PSAPs in the United States are "inadequately prepared" for a pandemic or bioterrorist attack (Federal Interagency Committee on EMS, 2009).

COVID-19 created a unique opportunity to test EMS systems' existing preparedness and implement practices and procedures that improve pandemic and bioterrorism preparedness. The preparedness practices and evaluations after the COVID-19 pandemic can be compared with the data collected after previous pandemics (e.g., H3N2, H1N1, Ebola, etc.). These results will indicate preparedness improvements and gaps over time.

This study's purpose was to obtain information on the preparedness level of EMS systems in America for a pandemic or a bioterrorist attack. The COVID-19 pandemic identified multiple gaps in readiness and shortfalls in planning and practices for pandemics and bioterrorist attacks. Once this study bridges the identified gap, improvements in preparedness can be implemented and obtained.

This study captured quantitative data well over one year into the COVID-19 pandemic. These data were collected from currently credentialed EMS providers in

America 18 years of age and older. This sample population was selected because of their insider's perspective of the preparedness of the EMS systems in which they work.

Data collection was done through an online survey tool. The survey questions were only accessible after the survey participant responded to eligibility questions and answered affirmatively to the consent questions, as approved by Liberty University's Institutional Review Board. Data were aggregated automatically after participant data entry occurred. The data collected were then exported in the form of a data workbook, and a standardized inferential statistical analysis was conducted. This method was selected to eliminate the potential for data entry and aggregation errors. Data analysis identified nine constructs into which the data could be grouped.

Summary of the Findings

There seemed to be a significant distinction between the trend and tone of quantitative data versus that of the trends and tones in the limited qualitative data collected. The quantitative data pointed to a picture of American EMS systems with a high level of preparedness for a future pandemic or bioterrorist attack. The qualitative data pointed towards a noticeably lower level of readiness, in American EMS systems, for responding to a pandemic or bioterrorist attack.

A comprehensive analysis of covariants was conducted on how years of experience in EMS impacted individuals' responses. This factor proved to have a minimal impact on the population's responses. However, the level of EMS certification (EMT, AEMT, or paramedics) did significantly impact the degree to which the EMS providers feel prepared to respond to a pandemic or bioterrorist attack. It is relevant to note that EMTs generally had a significantly shorter EMS career than paramedics.

Cronbach's α was used to evaluate the internal consistency or reliability of the survey instrument. Since a minimum of two questions are required to run this test, it could not be calculated for Construct 6 since there was only one associated question in that construct. Five of the remaining eight constructs had a Crohnbach's α of over 0.70, indicating a relatively high degree of reliability. Construct 1 – training, Construct 2 – workforce, and Construct 8 – EMS integration into disaster planning had the lowest internal consistency or reliability.

Construct 1 - Training

Construct 1 – Training consisted of eight separate questions that were analyzed in aggregate based upon their collective correlation to a pandemic and bioterrorist training implications. All of this construct's survey questions were significant to an α value of .050, with six of the eight survey questions statistically significant to an α value of .001.

However, the weight of the observed data was split based on the individual question within this construct. Training features that were well-prepared were based on more EMS providers than expected by chance, which worked for agencies that provided task-specific training (Train 6), decontamination training (Train 7), training and education to respond effectively (Train 11) and had confidence in their ability to respond to a pandemic or bioterrorist attack (Train 12). Training features that were ill-prepared were based on more EMS providers than expected who had *not* participated in pre-pandemic training (Train 5), previews and simulations (Train 8), or multi-agency attack exercises (Train 9).

Furthermore, this construct is the only instance where the respondent's EMS experience created a statistically significant impact on the response pattern. An

ANCOVA demonstrated that the years of experience that the respondent had in EMS was statistically significant when respondents were asked whether the breadth and depth of their training were adequate to prepare them to respond to a pandemic or bioterrorist attack. The greater the experience, the less confident that the respondent was in the adequacy of their training.

Construct 2 - Workforce

Construct 2 – Workforce consisted of 10 separate questions that were analyzed in aggregate based upon their collective correlation to a pandemic and bioterrorist workforce implications. All of this construct's survey questions, but for Workforce 21, were significant to an α value of .001. Workforce 21 was not statistically significant at an α value of .050.

The workforce construct responses were skewed in the direction of better workforce preparedness. Features of the workforce that were well-prepared were based on more participants who would work during a pandemics if asked, required, and even if it could put their families at risk through contagion (Workforce 13-15); who worked for agencies that had strategies to assist local EMS agencies (Workforce 17); who worked for agencies that had system-wide processes for providing vaccines (Workforce 18); and who worked for agencies that had identified mechanisms for addressing isolation issues associated with quarantining (Workforce 21). Features of the workforce that were ill-prepared were based on more participants who were neutral on the need for better infectious disease management (Workforce 16) and more participants whose agencies *lacked* multi-agency training (Workforce 19), lacked backup plans to augment local EMS

workforces (Workforce 20), and lacked an adequate workforce during a pandemic (Workforce 22).

Results for Construct 2 – Workforce in terms of differences across the EMS certifications can be summarized as follows. For commitment levels, 87% and 91% of the EMS providers indicated they would work a pandemic if asked or required. However, only 70% would do so if concurrent risks of spreading the disease put their family at risk. For perspectives on better infectious disease management, most EMS providers agreed that more of their EMS colleagues would work during a pandemic or bioterrorist attack if they were better trained or educated in infectious disease management. For workforce protection, EMS providers with different EMS certifications saw the level of workforce protection similarly. The consensus was neutral that agencies had taken the necessary steps to protect the EMS workforce in terms of vaccines and quarantines during pandemics or bioterrorist attacks; this reflected inconsistency in that participants were as likely to report disagreement, neutrality, and agreement.

Concerning multi-agency pre-pandemic training programs, EMS providers with different certifications also saw the level of pre-pandemic preparedness similarly. Their consensus was essentially a disagreement that EMS agencies had established a multi-agency program of pre-pandemic training and exercising that prepared EMS providers to prepare for, respond to, mitigate, and recover from a pandemic or bioterrorist attack.

Finally, regarding plans to augment the workforce, most participants reported disagreement. Compared to EMTs and AEMTs, paramedics disagreed that agencies had plans to produce an adequate workforce or had backup plans to augment the local EMS workforce if needed during a pandemic or bioterrorist attack.

Construct 3 – Personal Protective Equipment

Construct 3 – PPE consisted of six separate questions that were analyzed in aggregate based upon their collective correlation to a pandemic and bioterrorist PPE implications. This construct's survey questions were significant to an α value of .001.

The PPE construct was strongly skewed in the direction of preparedness. Responses to all of the PPE survey items reflected well-prepared features based on significantly more participants who agreed and significantly fewer participants who disagreed that agencies had accumulated and provided adequate PPE supplies, guides for use, handling limited supplies, and provided the necessary training for effective PPE use that extended to instructions on basic infection control procedures.

Construct 4 – Mental Health

Construct 4 – Mental Health consisted of two separate questions that were analyzed in aggregate based upon their collective correlation to a pandemic and bioterrorist mental health implications. This construct's survey questions were significant to an α value of .050.

The responses in this construct were strongly skewed in the direction of ill-preparedness. Features of mental health support that were ill-prepared were based on more EMS providers who disagreed and fewer who agreed than expected that their agencies provide sufficient resources to maintain EMS providers' mental health or have defined processes to supplement local EMS agencies in offering mental health services to EMS personnel and their families during a pandemic or bioterrorist attack.

On average, EMTs and AEMTs were neutral regarding whether their agencies had provided sufficient resources to maintain EMS providers' mental health and had defined

processes to supplement local EMS agencies' support services to families during a pandemic or bioterrorist attack if needed. In contrast, paramedics disagreed, reporting that agency provisions for EMS providers' mental health were inadequate. The difference between EMTs/AEMTs and paramedics was statistically significant.

Construct 5 - Administration

Construct 5 – Administration consisted of 13 separate questions that were analyzed in aggregate based upon their collective correlation to a pandemic and bioterrorist administrative implications. This construct's survey questions, except Administration 38 and Administration 42, were significant to an α value of .001. Administration 38 and Administration 42 were not statistically significant.

The responses in this construct were strongly skewed toward being well-prepared. Features of EMS administrations that were well-prepared were based on all but two items (addressed below) about which fewer EMS providers disagreed than expected or fewer disagreed combined with more who agreed than expected (Table 20). The two exceptional features of EMS administrations that were ill-prepared presented in two ways. One was the failure to integrate best practices (Administration 41) based on more than expected neutral responses. The other was a disagreement that administrations had established procedures for involving EMS agencies in ongoing disease surveillance (Administration 42); this was based on the distribution of responses that did not differ from chance. Disagreement among the participants emerged from equal proportions who agreed and disagreed.

There was some deviation from respondents' expectations in the subcategory of messaging the public during a pandemic or bioterrorist attack. Still, this discrepancy

between observed and expected did not rise to the level of statistical significance. In the subcategory of ongoing disease surveillance during a pandemic or bioterrorist attack, adjusted residuals revealed significantly fewer EMTs disagreed. More EMTs agreed that there was continuous disease surveillance. In contrast, more paramedics disagreed that there was ongoing disease surveillance, leaving significantly fewer paramedics who agreed. Significantly fewer AEMTs were neutral about continuous disease surveillance than expected by chance. The subcategory of the EMS agency's preparedness to maintain operations during a pandemic or bioterrorist attack was not statistically significant.

In the subcategory of being able to deviate medical practices during a pandemic or bioterrorist attack legally, significantly fewer EMTs disagreed, and more EMTs reported neutrality than expected by chance. In contrast, more paramedics disagreed or agreed, and significantly fewer expressed neutrality than expected by chance.

In the subcategory of being required to allocate resources during a pandemic or bioterrorist attack ethically, EMTs and AEMTs reported an average stance between neutrality and agreement. In contrast, paramedics disagreed that agencies had allocated adequate resources and had approved allocation and distribution methods.

In the subcategory of defining the role of EMS providers during a pandemic or bioterrorist attack, EMTs and AEMTs reported an average stance between neutrality and agreement that their agencies had defined roles of EMS to prepare for, respond to, mitigate, and recover from pandemics and bioterrorist attacks. In contrast, paramedics disagreed that their agencies had clearly defined roles compared to EMTs and AEMTs, and EMS providers were prepared for and ready to mitigate and respond to pandemics.

In the subcategory of developing, adopting, and modifying treatment protocols during a pandemic or bioterrorist attack, EMTs and AEMTs reported an average stance between neutrality and agreement. In contrast, compared to EMTs and AEMTs, paramedics disagreed to a statistically significant extent that their agencies had defined general and specific treatment roles in response to pandemics.

In the subcategory of being able to integrate best practices during a pandemic or bioterrorist attack, EMTs and AEMTs reported an average stance between neutrality and agreement. Paramedics disagreed with EMTs that their agencies incorporated best practices in providing vaccines and best practices learned from previous pandemics.

Construct 6 – Financial Preparedness

Construct 6 – Financial Preparedness consisted of one question examined in aggregate based upon their collective correlation to a pandemic and bioterrorist financial preparedness implications. The response as to whether a provider's EMS agency is funded sufficiently to respond throughout a pandemic or bioterrorist attack was skewed towards being well-prepared, based on significantly fewer EMS providers who disagreed with the item. An analysis determined that there was no statistically significant correlation between the response to an agency's financial solvency and the EMS certification of the respondent.

Construct 7 – Public Safety Answering Points (PSAPs)

Construct 7 – Public Safety Answering Point (PSAPs) consisted of three separate questions that were analyzed in aggregate based upon their collective correlation to a pandemic and bioterrorist PSAP implications. This construct's survey questions were significant to an α value of .001. Paramedics reported significantly less public safety

answering point preparedness compared to EMTs, and Paramedics felt the least prepared of the three groups in terms of public safety answering points.

Construct 8 – EMS Integration into Disaster Planning

Construct 8 – EMS Integration into Disaster Planning consisted of seven separate questions that were analyzed in aggregate based upon their collective correlation to a pandemic and bioterrorist EMS integration in disaster planning implications. This construct's survey questions were significant to an α value of .001.

The responses in this construct were that integration elements were divided between well-prepared and ill-prepared. Features of EMS integration into disaster planning that were well-prepared included significantly fewer EMS providers who disagreed and substantially more who agreed that there was ample medical oversight (Integration 49). Aggression agencies had plans to support hospital diversion and bed capacity (Integration 53). They had consistent system-wide procedures for rapid distribution of pre-hospital treatment protocols (Integration 54).

The feature of EMS integration into disaster planning that most strongly implicated ill-preparedness was Integration 51, with significantly more EMS providers disagreeing and fewer providers agreeing that there was adequate room for surging. Further features of ill-preparedness were reflected in the following. More EMS providers were neutral on the notion that EMS was integrated into more extensive government preparedness planning (Integration 50). More providers were neutral, and fewer agreed that their agencies had plans to address disruptions (Integration 52). Finally, fewer providers disagreed, and more were neutral on whether EMS strategies were integrated into the community (Integration 48).

Construct 9 – Recommended Preparedness Improvements

Construct 9 – Recommended Preparedness Improvements consisted of five separate questions that were analyzed in aggregate based upon their collective correlation to a pandemic and bioterrorist recommended preparedness improvement implications. This construct's survey questions were significant to an α value of .001.

The majority of participants responded to these open-ended questions. These are listed verbatim in Appendix E. Tables are divided by EMS certification.

Finally, survey items 55-59 listed several recommendations for improving pandemic preparedness and asked participants about the extent to which they agreed. Table 26 lists the items, results of chi-square goodness of fitness tests, and percentages of EMS providers by response type. All of the tests were statistically significant, and the null hypothesis was rejected for all. The portions of EMS providers in the agree category are the largest in this study. The suggestions for improving the EMS system on the survey met with solid approval were items 55-58. The exception was item 59, in which EMS providers were evenly divided in disagreeing, agreeing, or reporting neutrality on the suggestion that their agencies have a current plan to improve EMS preparedness to maintain operations during a pandemic or bioterrorist attack, based on more providers choosing neutrality than expected.

Interpretation of the Findings

Compared with the paramedic respondents, the decreased years of experience in respondents who were certified as EMTs is believed to result from career paths for the various levels of certifications. EMS around the nation is hospital-based in some regions, fire-based in other areas, and standalone in other areas. A large proportion of EMS

providers in the country are volunteers. These critical and well-intentioned providers tend to make less of an investment in their training and therefore have a higher transition rate than their counterparts who have made a greater investment in EMS. For example, paramedics make a significant investment in time and expense to gain their certification and tend to stay in EMS as a career or long-term volunteer. It is relevant to note that paramedics are almost exclusively EMTs first, so those who continue to paramedicine have EMS experience and a better understanding of the options for their future in EMS.

There was one female respondent for every 1.8 male respondents. This is not a significant discrepancy when compared with the gender balance of EMS providers across the nation. The analysis focused more on the level of EMS certification than on gender as independent variables because of the increased likelihood that the level of certification would have more impact on the respondent's perception of preparedness for a pandemic or bioterrorist attack than their gender would.

Construct 1 - Training

The data set collected from respondents has indicated a significantly higher feeling of preparedness for a pandemic or bioterrorist attack across all respondents than was anticipated by the researcher. From this, the conclusion can be drawn that over the past two years of an ongoing pandemic, there has been a substantial amount of topical and "just in time" training conducted on this topic that resulted in more confident and better prepared EMS providers than existed at the beginning of the COVID-19 pandemic.

There is a significant discrepancy between the perception of comprehensiveness of training based upon both provider level of training and provider's experience. The lower-level providers are significantly more confident that they have adequate training to

meet the demands of EMS responses during a pandemic or bioterrorist attack. The more experienced a provider is, the less convinced they are in the adequacy of their training. A reasonable conclusion that can be drawn from this is that experience in EMS opens the eyes of EMS providers to possible situations and challenges that were previously unknown to them. During challenging times, experience in EMS response brings truth to the proverb “you don’t know what you don’t know.”

Another conclusion that may be drawn from the data is that the EMTs and AEMTs have a lower responsibility for patient care than paramedics. EMTs and AEMTs are trained to call for advanced providers when they encounter medical conditions and problems outside their knowledge and skillset. Paramedics can consult with physicians, but there is no higher prehospital provider they can call out in the field to handle challenges they are not trained or experienced to handle. From this, it can be concluded that EMTs and AEMTs believe that they do have sufficient pandemic and bioterrorist training to fill the role that they will be expected to play and are comfortable with the concept of simply calling in a more high-level provider when they meet the limits of their knowledge and capabilities. Paramedics are aware that they will not have any higher-level providers to come and support them in the same situation, so they are more hesitant to feel that they have all the necessary training to handle any pandemic or bioterrorist attack.

Construct 2 - Workforce

The category of the workforce was broken down into five subcategories. These subcategories are work commitment, perspectives on infectious disease management, protecting the workforce, multi-agency pre-pandemic training, and augmenting the workforce.

In the subcategory of workforce commitment, there was no difference between the level of certifications regarding a respondent's willingness to come to work during a pandemic or a bioterrorist attack. Regardless of the level of certification, 90% of EMS providers would respond during a pandemic or bioterrorist attack if they were asked or ordered to. This indicates that all EMS providers take their duty to the public extremely seriously, even if they know that it poses an increased risk to them and their health. However, the number of EMS responders willing to respond drops to 70% when their continued EMS responses pose an increased risk to the well-being and health of the provider's family. The natural conclusion is that most EMS providers are willing to risk themselves to save others. Fewer are willing to allow their loved ones to be placed in greater danger because of the EMS provider's own higher-risk actions. More EMS responders would respond during pandemics and bioterrorist attacks if they were confident that their response would not jeopardize their families.

In the subcategory of perspectives on infectious disease management, there was no difference between the level of certifications regarding their willingness to come to work during a pandemic or a bioterrorist attack. The respondents believed that more EMS providers would be willing to respond during a pandemic or bioterrorist attack if they had better pandemic or bioterrorist response training. The majority of all respondents believed

that this was the case. The conclusion drawn from this is that better and more frequent training in pandemic and bioterrorist response in EMS training would result in a larger workforce during these events.

In the subcategory of protecting the workforce, there was no difference between the level of certifications regarding their view of whether their EMS agency had adequate procedures in place to protect the workforce during a pandemic or a bioterrorist attack. The conclusion that can be drawn from this is that the diversity and disparity of agencies in which EMS providers operate are highly inconsistent. There were almost equal respondents who believed that there were adequate protections in place, were neutral on the topic, and disagreed.

In the subcategory of multi-agency pre-pandemic planning, there was a significant difference in response between paramedics and respondents holding other EMS certifications. Paramedics, much more so than other licensed EMS providers, believed that there was inadequate multi-agency pre-pandemic planning. Increasing multi-agency pre-pandemic and bioterrorist planning would increase the confidence and presence of the workforce during a pandemic or bioterrorist attack.

There was a significant difference in response between paramedics and respondents holding other EMS certifications in the subcategory of augmenting the workforce. While most respondents disagreed that their EMS agencies had an adequate plan to expand the EMS workforce during a pandemic or bioterrorist attack, paramedics were much more consistent with this belief. EMS agencies must have better and more realistic plans to augment the EMS workforce during a pandemic or bioterrorist attack.

Construct 3 – Personal Protective Equipment

The category of PPE was segregated into two subcategories. These subcategories are PPE availability and adequate PPE training. In the subcategory of PPE availability, there was no difference between the level of certifications regarding the EMS provider's access to PPE during a pandemic or a bioterrorist attack. An adequate supply of PPE was currently available. The data skew towards sufficiency of PPE was a function of the data being collected well after the critical PPE shortage when supply lines and production systems were reestablished. When it comes to the subcategory of the adequacy of PPE training, there was no difference between the level of certifications regarding respondents' views of whether EMS agencies had adequately trained them on PPE. Providers at all levels believe that they have been sufficiently trained on PPE. Again, this indicates that EMS agencies effectively rolled out additional "just in time" training during the pandemic to augment possibly inadequate PPE training.

Construct 4 – Mental Health

There was a discrepancy between respondents' views of the adequacy of mental health resources provided to EMS personnel based on their level of certification. While EMTs and AEMTs were neutral on whether they were provided with adequate mental health resources, paramedics were much more likely to disagree with this perception. Clearly, paramedics, who have the least resources to transfer care to in the field and are most accountable for patient care, need more mental health resources.

Construct 5 - Administration

The category of the administration was broken down into eight subcategories. These subcategories are legal deviation, messaging the public, ongoing disease surveillance, the agency's preparedness to maintain operations during a pandemic, EMS roles, treatment protocols, resource allocation, and best practices.

There was a significant difference in response between paramedics and respondents holding other EMS certifications in the subcategory of legal deviation. While most respondents were neutral that their EMS agencies had authorization to legally deviate from usual standards of care during a pandemic or bioterrorist attack, paramedics had stronger opinions on both sides of the topic. This result further supports the previous belief that the inconsistency of EMS systems does require a greater unanimity in the ability to legal deviate care protocols in a pandemic or bioterrorist attack.

In the subcategory of messaging the public, there was no difference between the level of certifications regarding an agency's ability to message the public during a pandemic or a bioterrorist attack. More respondents of all certification levels believed that they could message the public. This result further supports the previous belief that the inconsistency of EMS systems does require a greater unanimity in the ability to message the public in a pandemic or bioterrorist attack.

There was a significant difference in response between paramedics and respondents holding other EMS certifications in the subcategory of ongoing disease surveillance. While most EMTs and AEMTS believed that their EMS agencies had an ongoing disease surveillance program during a pandemic or bioterrorist attack, most paramedics indicated that they did not think that continuous disease surveillance is

employed during a pandemic or bioterrorist attack. An ongoing disease surveillance program should be refined and explained to providers during a pandemic or bioterrorist attack.

In the subcategory of agency preparedness to maintain operations during a pandemic, there was no difference between the level of certifications regarding an agency's ability to message the public during a pandemic or a bioterrorist attack. More respondents of all certification levels believed that their agency would be able to maintain operations during a pandemic. In the post-COVID-19 pandemic world, current EMS providers work for agencies that continue operations throughout the pandemic.

There was a significant difference in response between paramedics and respondents holding other EMS certifications in the subcategory of EMS roles. While most EMTs and AEMTS believed that their EMS agencies had clearly defined EMS roles during a pandemic or bioterrorist attack, paramedics were split between agreeing and disagreeing on whether EMS roles were clearly defined during a pandemic or bioterrorist attack. Greater clarity of EMS roles during a pandemic or bioterrorist attack is needed consistently across American EMS agencies.

There was a significant difference in response between paramedics and respondents holding other EMS certifications in the subcategory of treatment protocols. While most EMTs and AEMTS believed that their EMS agencies could rapidly deploy EMS protocols during a pandemic or bioterrorist attack, paramedics were split between agreeing and disagreeing. Additional options for rapid treatment protocol deployment during a pandemic or bioterrorist attack are needed consistently across American EMS agencies.

There was a significant difference in response between paramedics and respondents holding other EMS certifications in the subcategory of resource allocation. While most EMTs and AEMTS believed that their EMS agencies had allocated adequate resources for a response during a pandemic or bioterrorist attack, most paramedics indicated that they did not think that a sufficient quantity of resources had been allocated for pandemics or bioterrorist attacks. Additional resources should be universally adopted across EMS agencies to ensure adequate capabilities to respond to pandemics and bioterrorist attacks.

There was a significant difference in response between paramedics and respondents holding other EMS certifications in the subcategory of best practices. While most EMTs and AEMTS believed that their EMS agencies have the flexibility to implement best practices during a pandemic or bioterrorist attack, most paramedics indicated that they did not think that such flexibility exists. More flexibility must be universally adopted for paramedics to respond effectively during a pandemic or bioterrorist attack.

Construct 6 – Financial Preparedness

This category has the most significant apparent discrepancy between the qualitative and quantitative data. The quantitative data was consistent among all three levels of EMS certification. Most respondents reported that they agreed that their EMS agency had adequate financial resources to continue operations. However, when reading the open answer questions, a substantial volume of responses directly indicated that their EMS agencies did not have adequate financial resources. EMS agencies across America had sufficient financial resources to avoid insolvency from a pandemic or bioterrorist

attack, but the agencies and their participating providers certainly felt substantial economic stress.

Construct 7 – Public Safety Answering Points (PSAPs)

There is no significant difference between EMS certification levels on their perception of the preparedness of PSAPs to handle a pandemic or bioterrorist attack. PSAPs are seen by EMS providers as being prepared for pandemics or bioterrorist attacks and have a reliable infrastructure to support their response. There is significantly less confidence in the adequacy of the PSAP's COOP plan. PSAPs have the infrastructure and are prepared to respond to a pandemic or bioterrorist attack but have inadequate COOP plans.

Construct 8 – EMS Integration into Disaster Planning

In the category of EMS integration into disaster planning, the majority of all respondents concur that there are adequate medical oversight and robust communication plans integrated into disaster planning. There was a significant difference in response between paramedics and respondents holding other EMS certifications. Much more so than other licensed EMS providers, paramedics believed that there was inadequate EMS integration into disaster planning.

Construct 9 – Recommended Preparedness Improvements

This section was broken up into recommendations posed by the researchers and recommendations posed by the respondents. The recommendations posted by respondents were provided through a short answer format. There was a significant sampling of original content submitted by the respondents, but below are selected and specific recommendations endorsed by the researcher. Most open resource recommendations

centered around staffing shortages, a lack of full-scale disaster exercises, insufficient training, inadequate funding, a lack of appropriate equipment, political challenges, and inconsistency/inadequacy of oversight. The following recommendations are offered to bridge the identified gaps in an EMS agency's ability to respond to a pandemic or bioterrorist attack.

- A genuinely national EMS licensure agreement, similar to that in nursing – to allow for ease of licensure and movement between and among jurisdictions to allow providers access to a larger hiring pool. This has been conceptualized by the Interstate Commission for EMS Personnel Practice (2022) as an EMS Compact but has not gained the ideal size and support at the time of the writing of this research study.
- A portion of the EMS provider's salary as federally non-taxable – to allow EMS providers to receive a more competitive wage at no additional cost to the employers.
- Generation of a national EMS job board – to allow for open competition between credentialed providers, increased recruitment by EMS agencies, and increased wage competition.
- The creation of a streamlined collection of templates for practices, policy guides, COOP plans, medical oversight, and medical/legal rules that can be distributed throughout the nation – to decrease the individual agency's burden to increase preparedness while allowing for proactive discussions and EMS integration into disaster planning.

- Update Medicare law/policy to allow for treat-in-place reimbursement by EMS – to allow EMS to be reimbursed during pandemics and bioterrorist attacks for the significant personnel, fuel, and PPE that they use to respond to the "worried well" and other community members where transport to a 911 receiving facility is inappropriate and potentially dangerous.
- Provide education subsidies to volunteer EMS providers and education loan reimbursement for those pursuing advanced EMS certification with a requirement that they continue to be an active member of an emergency response EMS agency for a specific time or are required to pay back the subsidy/loan – to increase both recruitment and retention to help tackle the workforce problem.
- Fund a federal "exercise support team" that can travel to jurisdictions upon request and support a full-scale exercise or drill of a bioterrorist attack – to enact the already-in-place template for a federally funded traveling disaster preparedness training team in the National Domestics Preparedness Consortium.

By resounding majority, EMS providers of all certification levels believe that their agency's preparedness for a pandemic or bioterrorist attack would significantly improve if 1) EMS agencies were reimbursed for treat-in-place care provided, 2) there was more education on emergency preparedness, 3) more drills/exercises on emergency preparedness were conducted, and 4) there was a straightforward template for a pandemic or bioterrorist attack response that EMS agencies could adopt across the nation.

Limitations of the Study

One limitation of this study is that the sample population was limited to currently licensed and credentialed EMS providers in America. This group excludes many public safety personnel who directly or indirectly support American EMS systems because they do so at the first aid or CPR level. It also excludes medical practitioners such as nurses, nurse practitioners, physician assistants, and physicians who might participate in or oversee EMS systems.

Another limitation of this study was the availability of COVID-19 response data. While data on this topic is analyzed and released on a continuing basis, there are still data sources that continue to compile information related to the response. A third limitation was the technological tools utilized to advertise, solicit, and collect data. This technical limitation truncated the target audience and sample group members who are not technologically savvy or do not have access to internet-enabled devices.

One last limitation of this study was the geographic disbursement of the sample population, and the inclusion criteria were limited to American EMS providers. While there are similarities between American and foreign EMS systems, this research focuses on EMS systems in the United States.

Recommendations for Future Study

This quantitative research study was designed to evaluate and potentially improve the preparedness of American EMS systems to respond to pandemics and bioterrorist attacks. As a result, data collection was purposely limited to a sample population of credentialed American EMS providers. This study recommends that future studies be conducted with multiple different sample populations, and these future studies should

collect data from EMS providers in numerous countries. Another sample population for a recommended future study includes all personnel who participate in any American EMS system, regardless of whether they are currently credentialed as an EMR, EMT, AEMT, or Paramedic.

Furthermore, this study recommends refinement of the survey instrument utilized to increase internal consistency, allowing for more robust support for the conclusions drawn due to the research. Cronbach's α can be used to demonstrate internal consistency as a statistical measure of association (Kashyap & Singh, 2017). Input provided by highly skilled professionals, such as a statistician and a psychometrician, could be of great value in refining the survey instrument.

Implications for Change

The potential positive change that this study is designed to bring about is empirical and cultural. The study results create recognition of preparedness shortfalls by EMS providers and a motivation to take preventative steps during pandemics and possible bioterrorist attacks. Recognition of the shortfalls will motivate and mobilize American EMS providers to seek solutions to fortify their pandemic and bioterrorism preparedness.

Secondly, identifying and sharing best practices to increase preparedness will allow for a more organized, systematic, and standardized approach to preparedness that crosses jurisdictional boundaries. These shared best practices will lower the resource commitment required of smaller jurisdictions to establish and implement tested practices and procedures that improve preparedness within and around the EMS system.

Finally, improvements in the preparedness of EMS systems to respond to pandemics and bioterrorist attacks will also trigger a positive externality of policy improvements and disaster planning that creates positive social change. According to Ejike (2019), this is likely to increase preparedness spending and increase the community's awareness of disaster response capabilities. An increased correlation between public safety capabilities and planning public health coordination and education campaigns are the best thing for the community in which an EMS system operates. Integration of EMS into public health and disaster planning creates a layered approach to disaster preparedness and response upon which a seamless preparedness posture can be designed.

Summary

Over the past two years of an ongoing pandemic, there has been a substantial amount of topical and "just in time" training conducted on this topic that resulted in more confident and better prepared EMS providers than existed at the beginning of the COVID-19 pandemic. Increasing multi-agency pre-pandemic and bioterrorist planning would increase the confidence and presence of the workforce during a pandemic or bioterrorist attack.

The higher level of EMS certification and the more experience an EMS provider had, the less confident that provider was that they were adequately trained to respond to a pandemic or bioterrorist attack. Experience in EMS opens the eyes of EMS providers to possible situations and challenges that were previously unknown to them. During challenging times, experience in EMS response brings truth to the proverb "you don't know what you don't know."

EMS providers see the duty to respond to EMS calls as sacred and are willing to do so, even at an increased risk. More EMS responders would respond during pandemics and bioterrorist attacks if they were confident that their response would not jeopardize their families. Approximately 20% of EMS providers would not respond during a pandemic or bioterrorist attack if it significantly increased the danger to their family members. Better and more frequent training in pandemic and bioterrorist response in EMS training would result in an increased workforce during these events.

The diversity and disparity of agencies in which EMS providers operate are highly inconsistent, resulting in an equal number of EMS providers feeling that they do and do not have adequate workforce protections in place during pandemics and bioterrorist attacks. EMS agencies must have better and more realistic plans to augment the EMS workforce during a pandemic or bioterrorist attack.

When it came to PPE, data were collected both on EMS providers' access to PPE and the adequacy of PPE training. An adequate supply of PPE was currently available. The data skew toward adequacy and availability of PPE was a function of the data collected well after the critical PPE shortage when supply lines and production systems were reestablished. In terms of adequacy of training, EMS agencies effectively rolled out additional “just in time” training during the pandemic to augment previously possibly inadequate PPE training.

Paramedics, who have the least resources to transfer care to in the field and are most accountable for patient care, need more mental health resources. A greater unanimity in the ability to legal deviate care protocols in a pandemic or bioterrorist attack is necessary across all American EMS systems. EMS systems require a greater consensus

in their ability to message the public in a pandemic or bioterrorist attack. During a pandemic or bioterrorist attack, an ongoing disease surveillance program should be refined and explained to providers. Greater clarity of EMS roles during a pandemic or bioterrorist attack is needed consistently across American EMS agencies. More options for rapid treatment protocol deployment during a pandemic or bioterrorist attack are needed consistently across American EMS agencies.

Additional resources should be universally adopted across EMS agencies to ensure adequate capabilities to respond to pandemics and bioterrorist attacks. More flexibility must be widely adopted for paramedics to effectively respond during a pandemic or bioterrorist attack. EMS agencies across America had sufficient financial resources to avoid insolvency from a pandemic or bioterrorist attack, but the agencies and their participating providers certainly felt substantial economic stress. PSAPs have the infrastructure and are prepared to respond to a pandemic or bioterrorist attack but have inadequate COOP plans.

By resounding majority, EMS providers of all certification levels believe that their agency's preparedness to respond to a pandemic or bioterrorist attack would be improved under four conditions. These two conditions are 1) EMS agencies could be reimbursed for treat-in-place care provided, 2) there was more education on emergency preparedness, 3) more drills/exercises on emergency preparedness were conducted, and 4) there was a straightforward template for a pandemic or bioterrorist attack response that EMS agencies could adopt across the nation.

Some further recommendations for preparedness improvement that were drawn from issues brought up by respondents in the short answer section of their survey include:

- A truly national EMS licensure agreement, similar to that in nursing.
- A portion of the EMS provider's salary is federally non-taxable.
- Generation of a national EMS job board.
- Creation of a streamlined collection of templates for practices, policy guides, COOP plans, medical oversight, and medical/legal rules that can be distributed throughout the nation.
- Update Medicare law/policy to allow for treat-in-place reimbursement by EMS.
- Provide education subsidies to volunteer EMS providers and education loan reimbursement for those pursuing advanced EMS certification. They must continue to be active members of an emergency response EMS agency for a specific time or are required to pay back the subsidy/loan.
- Fund a federal "exercise support team" that can travel to jurisdictions upon request and support a full-scale exercise or drill of a bioterrorist attack.

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Appendix A: Pandemic Preparedness Survey

1. Highest Level of EMS Certification

   EMR

   EMT

   AEMT

   Paramedic

2. I provided EMS during the COVID-19 pandemic.

   Yes

   No

3. What do you like most about your work in EMS? _____

4. In your line of work as an EMS provider, to what extent did you feel *prepared* to deal with the medical challenges of COVID?

   Very Prepared

   Mostly Prepared

   Prepared

   Mostly Unprepared

   Very Unprepared

   The following questions are all answered with the 5-pt Likert scale of agreement:

   1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, 5 = strongly agree.

Training Questions 5-12

5. My agency participates in a program of pre-pandemic training and exercising to prepare EMS personnel for their role in preparing for, mitigating, and responding to pandemics and bioterrorist attacks.
6. My agency is able to provide all EMS providers with job and task-specific training and education specific to the pandemic threat.
7. My agency is able to ensure that those who decontaminate medical equipment are trained and knowledgeable in decontamination practices that will kill the pathogen causing the pandemic or bioterrorist attack.
8. I have participated in previews, simulations, or situation-based scenarios of a pandemic or bioterrorist attack over the past two years.
9. I have participated in a multi-agency pandemic or bioterrorist attack exercise over the past two years.
10. My agency has defined a process for providing just-in-time training for EMS agencies, EMS providers, EMS medical directors, and PSAPs.
11. I am both trained and educated to respond effectively to pandemics and bioterrorist attacks.
12. I have confidence in my ability to respond to a pandemic or bioterrorist attack.

Workforce Questions 13-22

13. I would work as an EMS provider during a pandemic or bioterrorist attack if asked.
14. I would work as an EMS provider during a pandemic or bioterrorist attack if required.

15. I would work as an EMS provider during a pandemic or bioterrorist attack even if there is a risk that the disease could spread to my family.
16. More EMS providers would work during a pandemic or bioterrorist attack if they were better trained or educated in infectious disease management.
17. My agency has identified strategies to assist local EMS agencies with protecting the EMS and 9-1-1 workforce and their families during a pandemic or bioterrorist attack.
18. My agency has system-wide processes for providing vaccines and anti-viral medication to EMS personnel.
19. My agency has established a multi-agency program of pre-pandemic training and exercising to prepare EMS personnel for their role in preparing for, mitigating, and responding to a pandemic or bioterrorist attack.
20. My agency has backup plans to augment the local EMS workforce if needed.
21. My agency and public health agencies have identified mechanisms to address issues associated with the isolation and quarantine of EMS personnel.
22. My agency will have an adequate workforce during a pandemic or bioterrorist attack.

Personal Protective Equipment (PPE) Questions 23-28

23. My agency has an adequate supply of PPE for EMS providers during a pandemic or bioterrorist attack.
24. My agency is able to provide a guide for donning and doffing PPE specific to a pandemic or Bioterrorist pathogen.

25. My agency has policies in place to extend the use of PPE if supply becomes limited.
26. My agency is able to ensure that EMS providers are trained and practiced in using PPE.
27. My agency has requirements or recommendations for EMS agencies for basic infection control procedures.
28. My agency is able to provide adequate PPE to EMS providers to carry out their responsibilities.

Mental Health Questions 29-39

29. My agency provides sufficient resources to maintain EMS provider mental health during a pandemic or bioterrorist attack.
30. My agency has defined processes to supplement local EMS agencies in offering support services, including mental health services, to EMS personnel and their families during a pandemic or bioterrorist attack.

Administration Questions 31-43

31. My agency has established procedures for EMS providers to deviate legally from their established treatment procedures to support mitigation of and response to pandemics, bioterrorist attacks, and other public health emergencies while still assuring appropriate education, medical oversight, and quality assurance.
32. My agency has defined the role of EMS providers in “treating and releasing” patients without transporting them to a healthcare facility.
33. My agency has developed mechanisms for rapid development, adoption, or modification of prehospital clinical standards and triage/ treatment protocols

before or during a pandemic or bioterrorist attack based on the most recent scientific information.

34. I know of protocols and guidelines that can be implemented during a pandemic or bioterrorist attack.
35. My agency has allocated adequate resources toward the National Incident Management System (NIMS) to utilize the system during a pandemic or bioterrorist attack.
36. My agency has an approved method to allocate scarce resources, like practices, policies, procedures, and plans, ethically during a pandemic or bioterrorist attack.
37. My agency has established a method for developing and distributing pandemic influenza information, including clinical standards, treatment protocols, and just-in-time training to local EMS medical directors and EMS agencies.
38. My agency has a plan for messaging the public, as needed, during a pandemic or bioterrorist attack.
39. There is a plan in place to vaccinate EMS providers during a pandemic or bioterrorist attack.
40. My agency has adopted EMS pandemic and bioterrorism plans and operational procedures that define the role of EMS in preparing for, mitigating, and responding to pandemics and bioterrorist attacks.
41. My agency has established methods to integrate best practices or lessons learned during the previous pandemic wave into EMS system operations and to issue an after-action report.

42. My agency has established procedures for involving EMS agencies in ongoing disease surveillance, like practices, policies, procedures, and plans.
43. My agency has adequate administrative preparedness (policies, plans, practices, agreements) to maintain operations during a pandemic or bioterrorist attack.

Financial Preparedness Question 44

44. My agency has adequate funding to maintain operations during a pandemic or bioterrorist attack.

Public Safety Answering Point Questions 45-47

45. My jurisdiction's Public Safety Answering Point (PSAP) / Emergency Operations Center (EOC) is prepared to respond during a pandemic or bioterrorist attack.
46. My agency has an effective, reliable, interoperable communications system among EMS, 9-1-1, emergency management, public safety, public health, and health care agencies.
47. There is adequate Continuity of Operations (COOP) planning and surge capacity within the EMS and 9-1-1 systems.

EMS Integration into Disaster Planning Questions 48-54

48. My EMS system is integrated with pandemic mitigation strategies within the community.
49. There is ample medical oversight of my EMS and 9-1-1 systems.
50. EMS is integrated into more extensive government pandemic preparedness planning in my EMS system.
51. There is adequate room for surging in the current EMS system to meet a pandemic or bioterrorist attack demand.

52. My agency has backup plans to address disruptions in the availability of EMS equipment, supplies, and services.
53. My agency has a communications plan, including communications equipment and a radio frequency plan to support common hospital diversion and bed capacity situational awareness at the local, state, and regional levels.
54. My agency has defined consistent, system-wide procedures for rapidly distributing new or modified prehospital EMS treatment and triage protocols before or during a pandemic or bioterrorist attack.

Recommended Preparedness Improvements Questions 55-60

55. The ability to be reimbursed for treat-in-place care would increase preparedness for a pandemic or bioterrorist attack.
56. More education on emergency preparedness would increase your EMS system's preparedness for a pandemic or bioterrorist attack.
57. More drills/exercises on emergency preparedness would increase your EMS system's preparedness for a pandemic or bioterrorist attack.
58. A straightforward template to respond to a pandemic or bioterrorist attack would increase your EMS system's preparedness for a pandemic or bioterrorist attack.
59. My agency has a current plan to improve EMS preparedness to maintain operations during a pandemic or bioterrorist attack.
60. Other needed improvements _____

Demographics

61. Gender

    Male

Female

62. Years of EMS provider experience _____

63. Employment Status within EMS

Full Time Paid

Part Time Paid / Per Diem / PRN

Volunteer

64. Primary Response Type

Emergency Response (911)

Transport

65. Employer

Government (Federal, State, Local, Tribal and Territorial)

Non-Governmental

66. Primary state in which you provide EMS _____

67. Your EMS System is

Fire Based

Hospital-Based

Stand-alone EMS

68. Supported Area

Rural

Suburban

Urban

Appendix B: Informed Consent Form

Title of the Project: EMS Preparedness for a Pandemic or Bioterrorist Attack

Principal Investigator: Douglas Schneider, NRP, Ph.D. candidate, Liberty University

Invitation to be Part of a Research Study

You are invited to participate in a research study. To participate, you must be 18 years of age or older and have a prehospital medicine license (EMR, EMT, AEMT, or Paramedic) from either the National Registry of Emergency Medical Technicians or a state, local, tribal, or territorial department of health (or equivalent). Taking part in this research project is voluntary.

Please take time to read this entire form and ask questions before deciding whether to take part in this research.

What is the study about and why is it being done?

The purpose of the study is to evaluate the preparedness level of the EMS system in the US to respond to a pandemic or bioterrorist attack.

What will happen if you take part in this study?

If you agree to be in this study, I will ask you to do the following things:

1. Complete an online anonymous survey that will take approximately 20 minutes.

How could you or others benefit from this study?

Participants should not expect to receive a direct benefit from taking part in this study.

Benefits to society include an increased awareness of gaps in preparedness for a pandemic or bioterrorist attack by EMS providers, increased integration of EMS into

disaster planning, and the generation of recommendations to increase preparedness of the EMS systems across America.

What risks might you experience from being in this study?

The risks involved in this study are minimal, which means they are equal to the risks you would encounter in everyday life.

How will personal information be protected?

The records of this study will be kept private. Research records will be stored securely, and only the researcher will have access to the records.

- Participant responses will be anonymous.
- Data will be stored on a password-locked computer and may be used in future presentations. After three years, all electronic records will be deleted.

Is study participation voluntary?

Participation in this study is voluntary. Your decision whether or not to participate will not affect your current or future relations with Liberty University. If you decide to participate, you are free to not answer any question or withdraw at any time prior to submitting the survey without affecting those relationships.

What should you do if you decide to withdraw from the study?

If you choose to withdraw from the study, please exit the survey and close your internet browser. Your responses will not be recorded or included in the study.

Whom do you contact if you have questions or concerns about the study?

The researcher conducting this study is Douglas H. Schneider. You may ask any questions you have now. If you have questions later, **you are encouraged** to contact him

at [Email redacted]. You may also contact the researcher's faculty sponsor, Dr. Sharon Mullane, at [Email redacted].

Whom do you contact if you have questions about your rights as a research participant?

If you have any questions or concerns regarding this study and would like to talk to someone other than the researcher, **you are encouraged** to contact the Institutional Review Board, 1971 University Blvd., Green Hall Ste. 2845, Lynchburg, VA 24515, or email at irb@liberty.edu.

Disclaimer: The Institutional Review Board (IRB) is tasked with ensuring that human subjects research will be conducted in an ethical manner as defined and required by federal regulations. The topics covered and viewpoints expressed or alluded to by student and faculty researchers are those of the researchers and do not necessarily reflect the official policies or positions of Liberty University.

Your Consent

Before agreeing to be part of the research, please be sure that you understand what the study is about. You can print a copy of the document for your records. If you have any questions about the study later, you can contact the researcher using the information provided above.

Appendix C: Invitation to Participate

Dear EMS Provider,

As a graduate student in the School of Government at Liberty University, I am conducting research as part of the requirements for a Ph.D. degree. The title of my research project is EMS Preparedness for a Pandemic or Bioterrorist Attack, and the purpose of my research is to evaluate how prepared EMS providers are to respond to a pandemic or bioterrorist attack.

I am writing to request your permission to contact members of your organization to invite them to participate in my research study.

Participants will be asked to complete the attached survey anonymously. Participants will be presented with informed consent information prior to participating. Taking part in this study is completely voluntary, and participants are welcome to discontinue participation at any time.

Thank you for considering my request. If you choose to grant permission, respond by email to [Email Redacted].

Sincerely,

Douglas Howard Schneider

Ph.D. Candidate

Appendix D: Attractive Features of EMS Careers

Case	EMS	What do you like most about your work in EMS?
3	EMT	Making a difference
4	EMT	I enjoy the unexpected that EMS brings, a normal day can turn into chaos, and the seemingly most basic of calls can quickly take a turn for the worst and require lifesaving interventions.
6	EMT	Helping people in times of need
14	EMT	Helping people and gaining experience to continue my growth as a healthcare worker
15	EMT	Patient care
20	EMT	Meeting all different people
23	EMT	1% of calls that matter
24	EMT	Saving lives in my community
25	EMT	Helping others in need
30	EMT	Teamwork, Creative problem solving
32	EMT	Helping others, job fulfillment
36	EMT	Taken care of people
39	EMT	The patients and various challenges it has.
43	EMT	Having a job
44	EMT	All
45	EMT	Working with people
46	EMT	Encounter different situations
47	EMT	Volume and variety of call types
50	EMT	The care for patients
51	EMT	Helping others in need
54	EMT	Helping people
63	EMT	Being able to help others in need.
68	EMT	Providing care for those in need
69	EMT	The ability to help someone when they feel they are at their worst.

80	EMT	Helping people who are in need.
84	EMT	I am able to provide care to those who are in need
91	EMT	Helping people in need, the thrills, the friends I have made, and teaching new EMT's
92	EMT	Feeling of helping others
93	EMT	The opportunity to be a servant leader. To serve my community first, and lead second.
95	EMT	Giving back to my community. Working with friends.
97	EMT	Feeling of helping people
102	EMT	Community service
103	EMT	Helping people in need
106	EMT	Helping others
109	EMT	Interacting with public
112	EMT	Overall it's a fun job.
119	EMT	Every day is different
120	EMT	The family aspect of your crews
121	EMT	Simple solution for complex issues. Deep humanity experienced during the shift.
122	EMT	Adrenaline Rush
123	EMT	My interactions with patients and meeting different people.
128	EMT	Helping others
129	EMT	Service to others
137	EMT	Helping others
138	EMT	Simply being able to help people when they are unable to help themselves
142	EMT	The chance to keep someone alive who would otherwise die (but who is not ready to).
148	EMT	I love helping people in their biggest time of need.
153	EMT	Working with people, helping people, trouble shooting the issues
156	EMT	Patient Care
165	EMT	Helping others
171	EMT	The people and giving back to the community
176	EMT	Helping others

178	EMT	Helping people in need
182	EMT	Being of aid in a time a place where immediate help is needed. Exercising years of learning and knowledge.
184	EMT	Providing care for someone in their time of need and vulnerability. I want to be the person I wish to have had/have if/when the time arises.
185	EMT	Just helping people in need
189	EMT	Even if I'm not out "saving lives" every day, I still have the potential to make someone's worst day even a little bit better just by being kind to them when they call for help.
198	EMT	I like that I am the first one to see the patient and am able to build rapport with them before anyone else.
212	EMT	Autonomous care
214	EMT	Medicine...the intellectual stimulation and fun of it...and helping and working with people of course
222	EMT	Having even the slightest positive impact on someone possibly having the worst day of their lives
223	EMT	Ability to help and teach others about Fire/ EMS
226	EMT	Unpredictability; helping people
227	EMT	I am ready to serve on a rescue squad if necessary. I am also a member of the VA MRC.
230	EMT	Taking care of the different patients that are in need
231	EMT	Helping those who TRULY need help.
235	EMT	Helping
237	EMT	Helping others
238	EMT	Patient care
242	EMT	Assisting the people in my city
246	EMT	Taking care of the patients
253	EMT	I am able to help others in there time of need
257	EMT	The genuine smiles or thanks a patient or patient's family gives
258	EMT	Helping my community
259	EMT	I like fielding emergency calls and helping people when they need it.
263	EMT	Caring for others

273	EMT	The fact that I am able to be the first response to helping someone
275	EMT	Serving the community
284	EMT	I have always wanted to be an EMT since 9/11. I love helping people.
285	EMT	Learning skills and helping people
289	EMT	Helping others
293	EMT	Excitement, able to help my community, good relationships
294	EMT	Volunteering, Community Outreach
297	EMT	Helping people who need help
302	EMT	Solving problems and getting to know my patients, knowing that I ran a call smoothly and efficiently while providing good patient care.
306	EMT	A new and dynamic environment every day, every shift, every call.
313	EMT	Being there for people during Hard times
319	EMT	The connection with our patients
321	EMT	Helping others and providing service to the community.
325	EMT	Giving back to the community.
326	EMT	Working with my crew helping the public in my community
328	EMT	The patients
330	EMT	I love helping complete strangers in need of help no matter the problem they have. Just giving an ear is the best medicine.
337	EMT	For medical calls, I enjoy working through the differentials, particularly when I can provide pertinent information to physicians to more rapidly reach a diagnosis of the overarching problem (e.g., a fall that is a symptom of a previously undiagnosed systemic problem.) For trauma (and I am no trauma hound), I am most proud of my ability to prioritize treatments, act quickly and effectively to stabilize a patient while managing the overall scene.
343	EMT	I enjoy knowing that every day is going to be something new and unexpected. Always working with new patients provides a dynamic work environment that most professions outside of healthcare never get to experience. Every call is different, therefore, creating a need to stay on top of many necessary skills and a drive to be the best in this field that I can possibly be.

344	EMT	I like helping people when they need it the most.
348	EMT	I like the feeling I get from helping the community.
349	EMT	Teamwork
353	EMT	Learning on the job
359	EMT	Serving a need in my community and in my work field.
361	EMT	Getting folks to the care they need at some of their worst moments
369	EMT	Helping others
370	EMT	Caring others and helping my community
371	EMT	Helping the community in their time of need
378	EMT	Being part of a close nit family in and out the department, while being able to serve the community.
381	EMT	Helping others in time of need and taking charge of emergencies
382	EMT	Helping others
383	EMT	Helping people in emergent situations
386	EMT	Honestly, I just like being able to say I am trying to help change the current climate. Recently, with the short staffing on top of the increasing numbers and my supervisors not wanting to change our volume of calls at work (private medical transport), I have almost reached burning out recently.
390	EMT	Giving back to the community that I live in.
397	EMT	Not knowing what the day will bring. Interaction with those less fortunate than myself. Helping people in their difficult hours.
239	EMR	Not much. It is a requirement of my fire dept.
266	EMR	Working with students

Case	EMS	What do you like most about your work in EMS?
35	AEMT	The ability to make a difference on people's medical calls.
37	AEMT	Helping people
55	AEMT	That feeling when I make a difference/feeling of being in the right place at the right time
90	AEMT	Helping people in need
98	AEMT	Uncovering mystery of what is wrong medically. Have ability to use experience to decide directions of care/diagnosing beyond basic cookie flowcharts.
101	AEMT	Being able to help people
134	AEMT	Helping people
141	AEMT	I get to serve my community and feel like I have a positive impact.
143	AEMT	Working only 2 days a week which includes overtime.
152	AEMT	As a volunteer, doing my part to provide in a positive manner for the community
154	AEMT	Care
160	AEMT	Everything
164	AEMT	I get to train in many areas. I get to help people in need. I get skills that benefit myself and my family. I get a paycheck. I get to interact with multiple agencies and/or disciplines. I get to instruct. I get to have an occasional adrenaline enhancement to keep me in shape mentally and physically.
166	AEMT	Helping others
172	AEMT	The patients
175	AEMT	Helping others
179	AEMT	Its constantly changing.
180	AEMT	Helping people
188	AEMT	Giving back to the community.
195	AEMT	Helping people in my community and the comraderie [*sic*] with my peers
199	AEMT	Serving those in need
206	AEMT	Being able to provide medical, trauma, and supportive mental health care to those needing it.

210	AEMT	Being able to assist those during their worst moments
217	AEMT	Helping others
218	AEMT	Helping Others
233	AEMT	Community involvement
254	AEMT	Helping people in distress
276	AEMT	Helping those in need
283	AEMT	Helping people in their time of need
288	AEMT	I like the diversity of work and the interactions I get to have to people.
292	AEMT	Providing care to patients who truly need help
310	AEMT	Social interactions with the community.
315	AEMT	The sense of being part of something bigger than myself.
329	AEMT	Benefit the rural community where I live
332	AEMT	Helping People
346	AEMT	Hands on field
375	AEMT	Helping my community.

Case	EMS	What do you like most about your work in EMS?
1	Paramedic	The sense of helping a community
2	Paramedic	Helping people in need.
5	Paramedic	Teaching.
7	Paramedic	Caring for patients
8	Paramedic	Coworkers
9	Paramedic	Ability to work in a dynamic yet structured environment
10	Paramedic	Helping people during critical calls
11	Paramedic	Service to others, sense of community/friends/family
12	Paramedic	My coworkers
13	Paramedic	Helping people
16	Paramedic	The opportunities it has created outside of direct patient care roles
17	Paramedic	Fast paced and flexible schedules
18	Paramedic	Being able to practice medicine in unique environments
19	Paramedic	Helping the critically ill
21	Paramedic	The freedom to assess and treat patients as I see fit
22	Paramedic	Good teamwork
26	Paramedic	The fact that each day holds a different experience.
27	Paramedic	Satisfaction in providing the highest level and quality of care to the sick and injured; being part of the solution to my patient's problems
28	Paramedic	Actually having a positive effect on my community.
29	Paramedic	Rosc [Return of Spontaneous Circulation]
31	Paramedic	Helping others in need
33	Paramedic	The challenge of unpredictability
34	Paramedic	Autonomy
38	Paramedic	The people I have work with throughout the years
40	Paramedic	The ever-changing environment, the unexpected, and the ability to constantly learn

41	Paramedic	The ability to provide help to someone in virtually any situation that arises, medically, physically and / or emotionally.
48	Paramedic	Windshield scenery and multiple short-term patient interactions
49	Paramedic	Helping others.
56	Paramedic	Helping People in a meaningful way
57	Paramedic	I enjoy figuring out what's wrong with the patient, solving problems
58	Paramedic	Challenging environment
59	Paramedic	Fire based, Steady career, good benefits, lifetime retirement, working with quality individuals
60	Paramedic	Helping those in need and making a difference
61	Paramedic	Helping those in need during their worst times
62	Paramedic	Assisting others and feeling a sense of worth, accomplishment, and need
64	Paramedic	Ability to help people, every day is different
65	Paramedic	Job Security
66	Paramedic	Solving medical problems
67	Paramedic	Solving medical problems
70	Paramedic	I no longer like my work
71	Paramedic	Helping the ones that actually need and benefit from our services.
72	Paramedic	Making an impact on patients and families lives.
73	Paramedic	I like the challenge some calls present.
76	Paramedic	Being able to make a difference for others.
79	Paramedic	Shifts off during the week
81	Paramedic	Providing high-acuity medical care that leads to positive outcomes
82	Paramedic	Helping people
83	Paramedic	Helping those in need
85	Paramedic	Co-workers
86	Paramedic	Challenges
87	Paramedic	Helping the ill
88	Paramedic	Ability to work independently and as a team at the same time

89	Paramedic	The opportunity to positively affect the outcome of patients in crisis.
94	Paramedic	Truly helping the rare patient that needs it.
96	Paramedic	Ability to help those who need it
99	Paramedic	Autonomy
100	Paramedic	Patient care
104	Paramedic	Helping people
105	Paramedic	To be able to help
107	Paramedic	Being able to impact other people's lives.
108	Paramedic	Helping people in a time of need no matter the task big or small
110	Paramedic	The ability to help people
111	Paramedic	Autonomy
114	Paramedic	Affecting outcomes
115	Paramedic	Helping people/solving problems
116	Paramedic	Being able to help and talk to my patients
117	Paramedic	Challenges with different situations.
118	Paramedic	Helping people
124	Paramedic	Providing actual patient care for those in need.
125	Paramedic	Helping people on their worst day
126	Paramedic	Actually getting to perform skills that make a difference in people’s care.
127	Paramedic	Gratification from helping someone .
130	Paramedic	Performing lifesaving procedures that make a noticeable difference in the patient outcome.
131	Paramedic	Expect the unexpected
132	Paramedic	Bonding with coworkers
133	Paramedic	Prestige
135	Paramedic	Challenges of providing high quality care in difficult situations
136	Paramedic	Helping others...certainly not the hours or the pay!
139	Paramedic	Caring for patients who need it
140	Paramedic	The ability to serve in a broad capacity in public safety

144	Paramedic	Being able to make a difference when one is needed.
145	Paramedic	Trauma & complex medical issues
146	Paramedic	Applying medical knowledge to help my community.
147	Paramedic	The hours and schedule.
149	Paramedic	Bridging the gap between emergency and in hospital care
150	Paramedic	Helping patients in need.
151	Paramedic	Diverse work environment
155	Paramedic	911 service
157	Paramedic	Ability to help people in their worst days; constant challenges of the mind; investigative aspect
158	Paramedic	Brotherhood/support by coworkers
159	Paramedic	The ability to help my community during difficult times
161	Paramedic	Having an impact on positive patient outcomes.
162	Paramedic	The satisfaction of helping others and giving something back.
163	Paramedic	Immediate Impact on patient outcome
167	Paramedic	Teamwork, Feeling of helping sick people
168	Paramedic	Taking care of Sick and injured people
169	Paramedic	Treating patients
170	Paramedic	The challenge of having to react to a set of circumstances that are not scripted.
174	Paramedic	Educating fellow providers and the public along with assisting those in need.
177	Paramedic	Skills - training- helping people - knowing you make a difference
181	Paramedic	Personal challenge
183	Paramedic	Helping those in need; seeing a improvement to patients during their care.
186	Paramedic	It's an incredibly rewarding way to give back to the community and feel good about myself. Also, I love learning every call.
187	Paramedic	Challenges with complex disease processes
190	Paramedic	Patient Interaction
191	Paramedic	Providing emergency medical care to those in need; job security

192	Paramedic	Helping those in need
193	Paramedic	Helping people
196	Paramedic	The patient care and helping people.
197	Paramedic	Different calls every day.
200	Paramedic	Helping the different types of emergencies
201	Paramedic	Serving the public safety of my community
202	Paramedic	Helping others
203	Paramedic	Taking care of patients and working in a fast paced, ever changing environment
204	Paramedic	You never know what the day will be like
205	Paramedic	Helping patients
207	Paramedic	Meeting people, medicine in general
208	Paramedic	Being able to make a difference on some calls
209	Paramedic	Helping People and Variety Of Different Situations
211	Paramedic	Teaching
213	Paramedic	I enjoy the autonomy afforded me as a Paramedic which is what has prevented me from taking nursing. I also enjoy the idea of EMS Participating and/or working to strengthen the Community Based Healthcare Teams.
215	Paramedic	Freedom to practice to scope of practice
216	Paramedic	I love the autonomy of EMS. It is such a unique career that allows me to be able to critically think and help my patients
219	Paramedic	Unpredictability
220	Paramedic	Helping people
221	Paramedic	The ability to provide comfort to those who are sick and injured that is encompassed with teamwork and brotherhood.
224	Paramedic	Assisting the Public
225	Paramedic	The days off
229	Paramedic	Interaction with people and the ability to make a positive difference in their lives
232	Paramedic	The hours and the random nature of it

234	Paramedic	I truly enjoy the ability to help others
236	Paramedic	I mean it's lit. It's unpredictable; I thrive on stress even when it tries to kill me. You get to see the worst and best that life has to offer from the passenger seat of a Ford E350 with a bad misfire, you're the catch-all problem solver for social problems. Plus I get the honor of being the medical equivalent of a screaming bum at 7/11, nobody takes me seriously but I told you MK Ultra was real before the CIA declassified it.
240	Paramedic	Something different everyday
241	Paramedic	The variety of cases and helping people
243	Paramedic	I always have to think on my feet. No patient is the same and no scene is the same. Overcoming challenges to effectively treat patients is both a challenge and rewarding for skill development.
244	Paramedic	Enjoying any part of the job implies I derive joy from others' suffering
248	Paramedic	My co-workers creating a family and team to work together to reduce death and disability.
249	Paramedic	Autonomy in care of patients. Being able to make quick decisions under pressure to make a difference on a patient's worst day.
250	Paramedic	The variety, and the ease of translating decisions into actions
251	Paramedic	Dynamic environment- nothing is ever the same which allows for critical thinking and provider autonomy to make decisions.
252	Paramedic	Helping people
255	Paramedic	I truly enjoy helping those in need, specifically those of low income and difficult situations.
256	Paramedic	The satisfaction of the patient's experience and the thrill of doing a non-traditional job
260	Paramedic	Providing assistance to my community and helping those in need
261	Paramedic	Patient education
262	Paramedic	Being able to help the community
265	Paramedic	Never the same
267	Paramedic	Ability to help those in their times of greatest need
268	Paramedic	Fast paced, ever changing environment.

269	Paramedic	The immediate results - meaning emergent care given and seeing lifesaving interventions make a difference immediately
270	Paramedic	Variety of skills and situations that require a working knowledge of a large field of medicine
271	Paramedic	Ability to assist my community in times of need
272	Paramedic	The ability to make a difference
274	Paramedic	Rewarding work that keeps me interested.
277	Paramedic	Patient interaction
278	Paramedic	Variety
279	Paramedic	Taking care of sick and injured patients by using the skills and knowledge for the most part autonomously.
280	Paramedic	Variety and challenge
281	Paramedic	The fellow crewmembers and the variety of calls
282	Paramedic	Effecting a positive change on what would have been a poor outcome for a patient.
286	Paramedic	Helping others
287	Paramedic	Ability to help patients when in need.
290	Paramedic	Meeting people within my community
291	Paramedic	Helping others
295	Paramedic	Helping others during their greatest time of need.
296	Paramedic	I enjoy the fast-paced, dynamic environment where I am able to directly apply my skills and provide hands-on patient care.
298	Paramedic	Patient Interaction
299	Paramedic	Helping others.
301	Paramedic	Helping people when they when they are unable to help themselves...
303	Paramedic	How the work varies day to day and the direct patient care
304	Paramedic	Helping people
305	Paramedic	Helping the community
307	Paramedic	Challenges the profession brings

308	Paramedic	The ability to touch the fabric of my community. Complex medical cases scratch an itch. It's also one of the few things I'm good at.
309	Paramedic	Providing care to people in need
311	Paramedic	Adeline rush
312	Paramedic	Learning about different presentations illnesses and what signs and symptoms are seen
314	Paramedic	I enjoy helping those in need and making connections with new folks.
316	Paramedic	Being able to give a helping hand to my community, even if its not a EMS call.
317	Paramedic	Connections made
320	Paramedic	Dynamic working environment
322	Paramedic	The challenges I find therein
323	Paramedic	Being able to use my clinical skills in my community.
327	Paramedic	Helping people in need
331	Paramedic	It's never the same thing day to day & we get to change the outcome for some patients.
334	Paramedic	Patient care
335	Paramedic	I enjoy the endless variety of the calls
336	Paramedic	Working for a local government and not private EMS agency
338	Paramedic	Assisting people
339	Paramedic	Making a difference when it matters
340	Paramedic	Helping the ill and injured
341	Paramedic	The constant change, no two calls are the same
342	Paramedic	The satisfaction of seeing my interventions make a difference in someone's life.
345	Paramedic	Making a difference for the community - one patient at a time (in most cases).
347	Paramedic	Interacting with patients.
350	Paramedic	Adrenaline of waiting for the calls to help the public in need.
351	Paramedic	Helping people in need
352	Paramedic	Being able to contribute (volunteer) in a meaningful way, being at the point of friction.
354	Paramedic	It allows you to serve people at the worst moment sin their lives.
356	Paramedic	Helping people and educating new providers.

357	Paramedic	Problem solving, helping those in need
358	Paramedic	Being able to use the training I've learned to impact someone's life in a positive way.
360	Paramedic	Family like environment
362	Paramedic	Direct patient contact and care
363	Paramedic	Being able to pay my bills
364	Paramedic	Being the voice for people when they cannot speak for themselves
365	Paramedic	Helping Others
366	Paramedic	Practicing provides help within my community.
367	Paramedic	I like having the ability to provide assistance to patients experiencing an emergency to the general public
368	Paramedic	Helping people
372	Paramedic	Giving back to the community
373	Paramedic	Every day is different
374	Paramedic	Helping people
376	Paramedic	Providing services to people who are truly in need and seeing their benefit from them.
377	Paramedic	Variety of calls, exciting experiences, ability to assist the public
379	Paramedic	Ability to help folks at their greatest point of need
380	Paramedic	Interactions with people
384	Paramedic	Operating under pressure/ high acuity
385	Paramedic	The ability to help those in my community
387	Paramedic	Assisting members of my community
388	Paramedic	Challenging Dynamic Profession
389	Paramedic	Each day brings unpredictable work.
391	Paramedic	Helping others
392	Paramedic	Satisfaction of making a difference and knowing few can do what I can do
393	Paramedic	Making a difference, both physically and mentally
394	Paramedic	Dynamic and unpredictable situations, taking care of people in need
395	Paramedic	Thinking quickly to provide the correct care

398	Paramedic	Making the difference between life and death.

Appendix E: Open-ended Recommendations for EMS System Improvements

Case	EMS	What do you like most about your work in EMS?
Case	EMS	Improvements My EMS System Needs
23	EMT	Merge with county resources better medical oversight.
32	EMT	More training and communication
39	EMT	Need a person to include private services too
44	EMT	Not much
63	EMT	It all comes down to funding. Knowing the best course of action is irrelevant if the system can't / won't afford it.
69	EMT	Staffing
75	EMT	Proactive vs reactive planning plagues emergency services.
91	EMT	Training for the above. Agencies must make it mandatory to attend,
106	EMT	Preplanning, education, Willingness to listen
112	EMT	Better pay to get more competent providers. Most on the street now don't care how badly they're doing their job.
119	EMT	Communication and education, respectful cooperation from other 911 services
128	EMT	Staffing and pay
129	EMT	Accountability within a larger system to account for compliance and implementation of larger strategies and plans.
142	EMT	Most agencies are short staffed. More young people need to see the value of service in EMS, and enter the field.
148	EMT	More Field operation support including financial and mental support.
153	EMT	We need more people, we are giving up out here
178	EMT	Better planning
212	EMT	Clear, legal and concise Pt education guidelines as to appropriateness and necessity of 911 calls, preventing needless transport ie) [*sic*] patients using EMS for a ride across county

		with false symptoms or no symptoms when there are tier 1 calls holding or crews driving 20 miles coding due to EMS being tied up with non-emergent calls.
226	EMT	We need better leadership and more qualified personnel
230	EMT	The hospitals
231	EMT	My greatest concern in the current system is staffing levels across the board in our area.
237	EMT	Training
238	EMT	Wages
239	EMR	We have multiple private Ambulance co in the county. The county has over site but in large it is a political free for all
246	EMT	Pay is huge factor for so many. No money, no risk.
258	EMT	I feel personally prepared because I am a nurse but as a volunteer EMTs, the people I work with are just winging it. Young uneducated and not informed… just heroes.
259	EMT	A method to ensure that PPE and decontamination protocols are actually being followed.
263	EMT	More personnel
275	EMT	Staffing and solution for extreme burnout across the board
289	EMT	I know the AGENCY has plans, but I feel like I don't know what they are. This does not breed confidence in my own abilities to handle a bio-terrorism attack
293	EMT	Balance of funds provided to small and large agencies. Allowance of membership in multiple agencies, as volunteers, to help with the decline of volunteer personnel.
302	EMT	Working together with private and public ambulance services in order to provide more care as pandemics surge.
319	EMT	Free education and training
325	EMT	Ideally, every provider would be given their own complete set of PPE including a self-contained respiratory system with extra filter replacements. We are not prepared for respiratory illnesses. By the time we are aware of an attack or illness, many of our providers could already be impacted. We also do not have enough staff to back up stations. We rely heavily on volunteers to back fill areas.
326	EMT	Equipment provided to EMS services

330	EMT	Need to have mock runs of things to prepare for pandemics, MCI, etc..
337	EMT	The volunteer system was in decline prior to COVID. That decline has accelerated in the past two years. In our system, one station lost all EMS providers at the start of COVID-19 and the county is now funding paid staff for that station only. Two other stations are "operable" largely in name only. The remaining stations have been able to stay within response standards, but have been burdened with responding more often outside their due to cover these declines. However, those remaining stations also have fewer responders and so this has been achieved on the backs of a very small group of people It is unsustainable and it is starting to show. The county is about to launch a paid staff "fly car" to mitigate; I'm not confident that this will be sufficient. As to preparedness -- if we had relied solely on official notifications from the state/fed government, we would have been in very bad shape. Because of skills from my former (non-medical) profession, I was able to discern what was coming in Dec 2019 and took actions to build PPE and medical supply inventories to avoid disruptions caused by supply chain problems later on. I took some heat for that initially. I'm angry because if I was able to figure things out through strictly open-source methods, there were others actually working in bio-surveillance who knew (or should have known) and they either failed to warn, the warnings were unheeded, or there was panic about causing panic and so the information was withheld. I hope I live long enough to find out the truth of that matter. The questions in this survey lead me to believe that you are focusing on training/exercises/preparedness. A key issue here is measuring the actions taken after such training. Post-9/11 funds were used to stock a trailer full of supplies which were then left untouched for years. Sometime around 2018/19, it was discovered that all this material had expired and would need to be re-stocked - at agency expense. The more effective approach would have been to integrate that excess stock into the regular inventory/supply system and replace it as consumed. This "lock it up in a trailer and forget about" approach seems to be more common than not. Without fixing this, we're just wasting a tremendous amount of taxpayer dollars and not **actually** increasing preparedness.

343	EMT	An increase in staffing would greatly improve our ability to handle the huge surge of 911 calls associated with the current COVID-19 pandemic
369	EMT	Not sure if we are really prepared for bioterrorism.
370	EMT	Some ways tp [*sic*] increase communication skills
378	EMT	A more reliable radio system, and true funding beginning at the local level.
390	EMT	More providers and ambulances

Case	EMS	Improvements My EMS System Needs
101	AEMT	Regular training with ease up on basic EMT guidelines
141	AEMT	More staffing across our region.
143	AEMT	HIGHER PAY FOR PROVIDERS. SERIOUSLY! I MAKE MORE AT MCDONALD'S AND WALMART THEN I DO PROVIDING ALS CARE. Also no experimental vaccine mandates and staffing wouldn't be a problem.
160	AEMT	Training
164	AEMT	I work in a very rural area with limited resources. I believe all that can be done has and will be done. The answers I included here that were lower, were all in the areas that come to supply and money, not foresight, planning, and or/communicating. For example the PSAP question, we have no PSAP, only a small one person maybe two if it gets busy dispatch center that coordinates all county resources from EMS to law to fire. We all do the best we can, it comes down to money, supply and personnel that are issues more than anything else. I know we are not alone in this, this is a nationwide problem.
166	AEMT	N/A
175	AEMT	Recruiting and retention. Making training easier to get for volunteers
179	AEMT	None. I feel they have done a great job and stay ahead of the curve.
206	AEMT	More personnel and providers in the EMS system to overcome the current manpower shortage both career and volunteer. Also, consolidation of EMS response operations in localities.
210	AEMT	Better funding methods, more aggressive treatment protocols to improve patient outcomes, lack of disparity between private and public funded EMS systems
218	AEMT	Staffing of ALS
288	AEMT	Expand treat and release ability including allowing providers to determine if a person really needs transport.

346	AEMT	More preparedness and utilizing lessons learned. Many agencies thought they were prepared but never tested it or let materials expire. Ebola should have been a when we recognized the opportunities. Additionally pivoting with the change in science and understanding. Changing disinfection methods and masking requirements are examples of not following evidence.
375	AEMT	A better understanding of the importance of volunteers EMS providers.

Case	EMS	Improvements My EMS System Needs
7	Paramedic	Communication and clearly defined roles for all levels of providers. Provide the proper PPE (ie [*sic*] papers) to allow proper advanced care (nebulizers and ventilators) to those patients in need. During the pandemic we didn't do normal treatments due to aerosolized possibilities.
9	Paramedic	Resilience training
10	Paramedic	Staffing
12	Paramedic	Too numerous to list
13	Paramedic	More in-person training instead of computer-based training, would be highly beneficial.
16	Paramedic	Increased accountability and compliance with pandemic protocols within my agency as well as standard of care.
17	Paramedic	Treating staff better. Staff members are so burnt out from COVID 19 that it is hard to retain them. More pay may help initially but with poor working conditions that will only help so long.
21	Paramedic	Better oversight and communication of best care practices as they evolve
26	Paramedic	Paramedic Supervisor
27	Paramedic	A systemic cultural change from the reliance on reimbursement from insurance or Medicare/Medicaid to a tax based system of support of EMS is necessary to ensure continuity of operations. The reliance upon private ambulance companies to provide basic 911 response, treatment and transport needs to cease as soon as practicable.
28	Paramedic	Adequate staffing despite pandemic or bio terrorist attacks
29	Paramedic	Dispatchers need more common sense and training/or more experienced people who've been in the streets
33	Paramedic	More physician involvement and elimination of punitive measures for medical mistakes/ issues
38	Paramedic	Better communications between voluntaries and the city. And the city units should be held to the same standards they implement on the voluntaries.

48	Paramedic	Stop AMR from trying to create a "one EMS For everyone, everywhere, no matter what the community says"
49	Paramedic	Funding, more personnel
57	Paramedic	Funding, staffing, training (that's our biggest deficit). We currently train them just enough to get onto ambulances, we tell them the answer as opposed to teaching them how to extrapolate information for themselves
58	Paramedic	Among the government agencies that ultimately oversee this sort of thing, EMS remains an afterthought, if it's thought of at all.
61	Paramedic	Faster process to approve new equipment and protocols. Due to red tape and bureaucracy the process is extremely slow and inadequate.
65	Paramedic	EMS as a whole is actively collapsing. We do not have enough players on the field for practice let alone the Super Bowl. You can have all the equipment, training, and plans in the world but none of that matters when you don't have personnel. Most agencies can not keep pace with current call volume add in a bioweapon you won't have any EMS. We ask people to go to school on their own time and on their own dime to become a Paramedic. Then tell them they will have very little promotional opportunities throughout their career. They will see shrinking benefits over the years and stagnant pay. State retirement has become a 35+ year long ponzi scheme that only 2% of medics will see the benefits of. Agencies see 100% turnover in 5 years or less. Why become a medic and be asked to go into homes filled with infected and run a Cardiac arrest with an 18 year old EMT when you can become a nurse, get paid twice as much, work in a clean Healthcare facility surrounded by Doctors? If you can get three years out of a new paramedic consider yourself lucky. A service can not be prepared for a bioweapon terrorist attack when it is not staffed for a normal year's worth of calls.
70	Paramedic	Mental health / more money 😂
71	Paramedic	Retention improvement, leaving politics aside, elimination of stagnant processes and reducing workplace toxicity.

73	Paramedic	Better medical control, better educational requirements, and improved all around training.
76	Paramedic	Pay
81	Paramedic	Funding, PPE, staffing
85	Paramedic	Hospital ERs holding crews 'hostage' for hours before giving bed assignments needs to stop so that the few ambulances that are on duty can respond to emergencies as needed
88	Paramedic	Cheat sheets with updated information
89	Paramedic	Unrealistic wait times at hospital eds for ambulances transporting patients.
96	Paramedic	Any planning or preparing is Always best
100	Paramedic	Wages and mental health
104	Paramedic	Staffing and pay
105	Paramedic	Better funding
107	Paramedic	911 Call triage, misuse of resources (specifically ALS resources), lack of experience due to attrition, inadequate pay for EMTs, a mostly useless CFR program involving firefighters that largely don't want to do EMS. No accountability for said CFR program.
108	Paramedic	Progression in up to date treatment protocols. Tidewater EMS System is out dated and needs to be more progressive allowing providers to act in what their are capable with their certifications. Other areas have more extensive and written out plans.
110	Paramedic	Daily oversight
116	Paramedic	The ability to refuse transport to a minor illness patient to a hospital during pandemics due to overcrowding of emergency rooms
117	Paramedic	More funding, equipment, and personnel.
118	Paramedic	MCI training, plans for extended wait for bed in hospital
124	Paramedic	Better communication between other governments entities.
125	Paramedic	Better real education
126	Paramedic	Better pay
131	Paramedic	Equal funding for private EMS that meet certain being the EMS provider of a major metro city
133	Paramedic	NA

139	Paramedic	We need the funding to allow for appropriate staffing ratios that don't leave our providers over worked and burnt out. EMS is a thankless job and is easily pushed to the side when it comes to staffing because we can scrape by with the bear minimum. We are over worked, tired and getting worn down. The current EMS system in place is not sustainable and will reach a breaking point. There will be a time when nobody answers the call for help if we do not change things soon.
140	Paramedic	A whole new system and new medical direction from the top down.
146	Paramedic	Funding to support full time salaries in a manner that would mitigate the county's hemorrhaging loss of qualified providers.
150	Paramedic	Training and Planning are needed across the EMS system
161	Paramedic	Higher reimbursement rates for all categories of EMS responses are needed to help bolster education and equipment needed for disaster, pandemic and bioterrorism responses.
162	Paramedic	Leadership that is concerned about more than how important they are
170	Paramedic	More staff
174	Paramedic	Establishing clear guidelines for quarantine, treatment, and return to duty of personnel with qualified and educated providers instead of HR personnel attempting to decide exactly what the CDC and state government guidelines require.
177	Paramedic	Funding - understanding pandemic and endemic issues and bio-attack- expendable populations- utilitarianism- more f/u support- tracking - cookie cutter plans do not survive 1st contact - our did not. I am affiliated with military that is where I received all my biohaz. Training
181	Paramedic	Treat and release protocol
183	Paramedic	There was a total disconnect between the administration and the field personnel at my agency over the last 2 years. Recommendations from the field for durable/reusable masks and gowns were met with silence, and continued reliance on reusing disposable PPE. Fit testing of masks was non-existent with the excuse of "We cannot guarantee that we'll always have the same masks available for personnel to wear." To ensure my safety I relied on purchasing my own durable mask(s) and P100 filters. My recommendations to fire

		departments are to purchase the commercial adapters for their SCBA masks that allow attachment of 40mm filters. That enables respiratory protection with integrated eye protection and ensures fit testing of masks has occurred. EMS systems need to consider ending reliance disposable PPE, and look towards more durable options like hospitals have.
187	Paramedic	Leadership
201	Paramedic	Ambulance staffing, hospital staffing
202	Paramedic	Funding; clear, reliable, non political, honest information about the disease, its prevention and treatment
204	Paramedic	Staff, Insurance companies, State government and the federal government recognize EMS as a profession and stop denying payment for services. Or have a actual fact based reimbursement plan.
207	Paramedic	Consistent and accurate information and communication
208	Paramedic	90% of these questions are inappropriate for an EMS provider! This needs to be asked of administrators, not providers. Most of this data is UNRELIABLE!
209	Paramedic	None At This Time
213	Paramedic	Increased support and participation of the local, state, and federal government in the preparatory phase of Disaster Management is needed. Most authorities do not want to allocate funds to drills, exercises, and practical application practice of the plans they have in place. Primarily, when they participate and or develop a policy or plan, it is to check a box for funding which requires a plan, however, the efficacy of that plan is rarely tested until it is actually implemented and fails. An example being the cdcs [*sic*] original recommendation during the COVID Pandemic of using hand sanitizer. It is my personal opinion that this recommendation is directly responsible for the fast spread of COVID. We wiped out all of our natural ability to protect ourselves by wiping out the subtle exposure and immune response. Those that have consistently stuck to handwashing have been exposed over and over to COVID and short of being immunocompromised already, had been able to function and have minimal side effects of the virus.
219	Paramedic	Where to begin…

221	Paramedic	Move within HHS and provide transparent patient centered data to the public like Cardiac Arrest outcomes with good neurological survival.
224	Paramedic	Acute plans, Stronger understanding and implementation of NIMS, Strong hierarchy, competent leadership
229	Paramedic	The system I work in cannot even handle normal daily call volume on a regular basis (pre pandemic) , the staffing and deployment of the system is laughable. They need to first improve on that before moving on to anything new or complicated
232	Paramedic	N/A
236	Paramedic	I dunno man. When you have people out here that refuse to put on PPE to go to covid calls because they claim that COVID-19 is just a ploy by congressional democrats to attack truck owners, I have absolutely little faith that education is going to fix anything. We need support like we had back when the Ebola crisis was going on. Only one or less than five people came to the US with Ebola for treatment. And every agency from BFE Nowheresville to the big cities got PPE for Ebola. Man, I had to do my own research into covid, I had to make my own practices, I had to initially buy my own PPE (though I was working two EMS jobs and it was really for my other one). Ain't nobody take it seriously, and ain't nobody think that we can make the situation better. And no one wants to pay us, and no one wants to help us. Literally... Pay me more. I'm society's garbage man. Raise wages and you don't have to put up with morons that believe a public health crisis is a government conspiracy, and even if it was think it's a political issue to respond to it.
240	Paramedic	More training and more time to do it but due to shortage we can't take the people off the streets to teach
243	Paramedic	More familiarity with CBRN treatment. I have long thought of a specialized HAZMAT team in my county lead by my agency to respond to any said incident. Michigan has the Chempack program with stashes of CBRN relevant mass medications (2pam, etc) but few know where it is located nor the basic identification of exposed patients to indicate activation of such protocols.

244	Paramedic	Staffing levels need help, mandatory overtime is so common people pay 100 bucks not to work. If I didn't have a traditional pension I'd be gone already
245	Paramedic	Basic education standards, discipline, equipment, and oversight are lacking.
248	Paramedic	We continuously crisis plan . We are a reactive agency and not a proactive agency. We wait for a fire to start and then we figure out how to put it out. We make decisions without consideration of the impact of those decisions on our staff. We are a hospital based EMS provider dispatched by a county/ governmental PSAP with zero medical oversight that serves at the political will and does not meet the needs of EMS, our hospitals , or the public we serve. Major disconnect!
249	Paramedic	Funding is always a great answer but what we really need in our area is more PR generating interest in EMS and healthcare as a career field. There just aren't enough young high school/college aged kids interested in EMS coming into the field to replace the retiring and burning out veterans of the field.
251	Paramedic	Not only do we need access to more preparedness resources, but as the local career department we are always leading decision making and planning- which in theory should be a positive thing, but at the end of the day we are delegated that responsibility as a scape goat for the volunteer agencies, who will then show up on scene with inappropriate PPE and no knowledge of what they are expected to do because they do not implement the resources and guidance that we provide to them. So another interesting aspect to your research could be the unique Fire/EMS culture between career and volunteer agencies, but specifically the education and preparedness gap between career and volunteer agencies.
261	Paramedic	Wow. What a question- the EMS system needs to nationalize and be funded through DHHS, not states. This is so that all aspects of EMS can improve and align with medical care and preparedness alongside hospitals rather than being a separate bolt-on entity as it is now.
262	Paramedic	Better training in southwest portion of the state. The lower portion of the state west of Blacksburg since we are forgotten about on this end of the state
265	Paramedic	N/a

267	Paramedic	Data collection and utilization for better planning
269	Paramedic	Personnel shortages: cover additional call volume and replace exposed providers
272	Paramedic	Better trained dispatchers
295	Paramedic	Staffing and a hard look at how EMS is delivered to include more interagency cooperability.
296	Paramedic	1. Acknowledgement of SARS-cov-2 (COVID-19) as a potential bioweapon and the credible evidence of its man-made or artificially derived origins. 2. Understanding the clinical and social implications of classifying COVID-19 as a possible bioweapon or synthetic pathogen. 3. Recognizing how bioweapons or biological agents may not follow expected symptomology or response to traditional treatments compared to similar diseases. This includes COVID-19`s novel presentation and wide range of symptoms and severity across populations. 4. Focus on early treatment and therapeutics, specifically HYDROXYCHLOROQUINE, IVERMECTIN, monoclonal antibodies, Vitamin D3, Vitamin C, Zinc, Quercetin, and others. 5. Modify pre-hospital protocols to manage both minor and acute cases, incorporating the aforementioned medications into treatment guidelines as appropriate. 6. Communicating potential bioweapon or biological attacks with the public and developing guidelines to mitigate undue panic or fear. 7. Full and complete disclosure of the potential risks, benefits, and legal standing/liability of any treatment, therapeutics, or vaccine. No mandates from private or public institutions, requiring any person or employee to receive a treatment, therapeutic, vaccine or medication that is under Emergency Use Authorization.
298	Paramedic	Eliminating Political influence over sound EMS practice. Adopt training/education from progressive regional emergency preparedness coalition
299	Paramedic	Free education, training and licensing for EMS would bring more people into the service.
303	Paramedic	More cohesiveness and collaboration across agencies , both private and county based.

304	Paramedic	Funding
308	Paramedic	My particular EMS system is one hospital for 6 counties. It is a critical access hospital. All other severe problems need to be flown out or ambulance taken out of service for multiple hours to get the patient somewhere needed. I have limited ability to refer patients to their PCP as all PCP's are booked full for weeks. This is due to only a small handful of PCP's in the area. This is even worse as you go more rural, I'm on the lucky end. This same hospital has been swamped with ICU holds and psych holds, resulting in several days worth where there were only three beds for the entire ER. Ambulances from every county were "holding the wall" for hours. This results in entire counties being hamstrung as their only ambulance is out, requiring additional crews to be called in or the limited volunteers to pick up the slack. Crews are adapting by "selling their patient" and having to do a really detailed job of physical assessment. Unfortunately, even the best physical assessment is limited by lack of labs, x-rays, and CTS. This also results in novice providers or sub-par providers who haven't adapted to be holding the wall even longer or resulting in patients who are inadequately triaged to the waiting room.
309	Paramedic	N/a
312	Paramedic	Additional funding, better training, more driven providers to learn and participate in training
314	Paramedic	Increased staffing levels and increased pay for EMS providers.
316	Paramedic	Streamline system, to include all agencies to operate as a system not as individuals
320	Paramedic	Communication between our primary receiving facility and our EMS agency. Surge planning and mitigation of burdensome transports continue to be an issue.
322	Paramedic	Funding, Funding, Funding
323	Paramedic	Improved public health education!
327	Paramedic	Radio system is old so there is some issues with communications. All of the local fire departments are volunteer so there is an issue with how well each station is trained.
331	Paramedic	Better interoperability and training between commercial EMS providers & DERA's

335	Paramedic	Incentives beyond compensation to give EMTs and paramedics a reason to stay involved in EMS, or for that matter in healthcare. My teammates are leaving EMS and leaving healthcare altogether...it used to be you ascended to RN and RRT if money or satisfaction became big issues
338	Paramedic	More staffed ambulances.
340	Paramedic	More qualified personal
342	Paramedic	Support of local establishments for volunteer activity during pandemic or bioterrorist training. I.e. Develop training and implement with the support of your employer without losing pay. Small cost in the grand scheme of things
352	Paramedic	More joint/interagency coordination, publishing of plans, better use of FEMA/ICS.
354	Paramedic	I don't think there is a one size fits all solution to this problem. I think if you have a baseline preparedness and providers know how to properly use PEE, then they can handle anything within reason. It also depends on your location, financial stability, and provider experience.
362	Paramedic	N/A
363	Paramedic	Virginia EMS system is flawed from the state level down. There just isn't any funding to help us. Everyone is working from budgets that have been ripped apart over the years.
364	Paramedic	Keeping the standards consistent; no reactionary to what admin wants. Keep us safe.
376	Paramedic	As some areas have begun to do is allow their providers to do "refusal of transport" for patients that do not need care in an ED this would drastically reduce the hospitals becoming inundated with patients
377	Paramedic	Pre-published information regarding the current plans that are in place. The ability to adjust treat and release protocols on an ongoing basis. Do this based on current hospital surges and case counts; effectively tell patients who are not the highest risk, "sorry but we are unable to transport you to the hospital, our services are required elsewhere"
379	Paramedic	More paid positions
384	Paramedic	Consistent messaging and information from the CDC, so the EMS system can adapt

385	Paramedic	More ALS providers, that or let EMT A's work in their scope of practice. In my area we need more ALS providers and the solution to the problem is not cranking our more EMT A's we need more ALS either they need to let an Advanced do more or bring back a level between Paramedic and Advanced.
389	Paramedic	Logistics support, mechanical issues with Ambulances severely impacts response capabilities. Mechanics and parts became issues with Covid
392	Paramedic	PPE availability on equal footing of hospitals.
394	Paramedic	More in person training for these topics