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Emergency medical service personnel injury and fatality in the United States

Anastasia Miller *

University of Texas Health Science Center at Tyler, United States

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ABSTRACT

Introduction: Emergency Medical Services (EMS) personnel comprise an intricate part of the public safety net in the US. The purpose of this study was to synthesize data sources to understand the major workplace dangers facing EMS providers.
Methods: This study examined four data sources: The BLS Census of Fatal Occupational Injuries (CFOI), BLS Survey of Occupational Injuries and Illnesses (SOII), Firefighter Fatalities and Statistics from USFA, and the EMS Voluntary Event Notification Tool (E.V.E.N.T.). Characteristics of the most common causes of injury and fatalities were described and compared.
Results: SOII reports covered 13 years and 64,780 nonfatal reported cases. CFOI covered 12 years and 149 fatalities. 111 fatalities from the USFA dataset who had been identified as EMS in some manner in their rank between 2003-2016 were inspected. 21 cases where a firefighter died in the course of providing EMS/patient care were also identified and discussed. All events submitted to E.V.E.N.T. were read and categorized. 214 events were identified as near-miss EMS provider injuries and included in the study.
Conclusion: The biggest mortal threat to private EMS personnel is vehicular incidents. Among firefighters/EMTs Heart Attacks was the most common nature of death. The biggest nonfatal concerns are violence, slips, trips, and falls, and overexertion in addition to vehicular incidents. Most violent events were the result of a patient with a Temporarily Altered Mental Status. There is clearly a need for further research to develop evidence-based methods and policies to reduce injury and death in EMS personnel from an agency level.

Key Words: Emergency medical services, Occupational injury, Fatality, Emergency medical technician

1. INTRODUCTION

Although danger is present in all aspects of life, some careers expose people to more danger than others. It has been established that emergency responders are prone to more professional injuries and fatalities than the national average,[1] there is still a dearth of information on the biggest challenges facing Emergency Medical Services (EMS) personnel in terms of workplace safety. Out of the approximately 248,000 EMS personnel employed in the United States,[2] thousands are injured in the line of work every year and unfortunately multiple deaths occur, yet there is still an unclear picture regarding what factors are associated with it and which policies agencies can implement to reduce this annual human and financial toll.

Among the studies which exclusively examined injuries in EMS personnel, most recently a study came out where they conducted follow-up phone interviews after identifying EMS workers who had been treated in the National Electronic Injury Surveillance System-Work (NEISS-Work) sample hospitals between July 2010 - June 2014. It found that most

* **Correspondence:** Anastasia Miller; Email: Anastasia.Miller@uthct.edu; Address: University of Texas Health Science Center at Tyler, United States.

nonfatal injuries in EMS personnel were in full-time career EMS personnel and were body motion injuries and harmful exposures.[3] A qualitative study looking at the National Fire Fighter Near-Miss Reporting System found the most commonly reported mechanism of near miss injury to providers were assaults, followed closely by struck-by motor vehicle, and motor vehicle collision.[4] A study of two urban EMS only (not cross-trained with Fire) where the agencies reported all the workplace injuries between 1998 and 2002, found that the injury rate was actually higher than the rate reported by BLS, which was already the highest injury rate in the private industry at the time of the study.[5]

When examining Worker's Compensations claims between 2005-2007 EMS personnel had higher rates of missed work and medical evaluation claims than either fire and law enforcement.[6] However, another study comparing these three fields but utilizing the NEISS-Work as their data source for the years of 2000-2001 found that EMS personnel visited the EMS less often than Fire or law enforcement.[7] A study was also conducted using the data gathered during the Longitudinal Emergency Medical Technician Attributes and Demographics Study (LEADS), and found that 8.1 out of every 100 Emergency Medical Technicians (EMTs) experienced a work related injury or illness that resulted in time away from work, with those working with higher call volumes and those in urban locations also experiencing more missed work.[8] A survey study of EMS personnel found that 64% of EMTs had reported an injury in the prior 12 months, with 29% reporting multiple injuries. It also showed that after controlling for age and gender, career EMTs experienced almost twice as many injuries, and were significantly more likely to have been assaulted or have a back injury.[9]

Assaults are a common finding of concern for EMS personnel in the literature. Among fire department-based EMS systems, intentional and unintentional assaults were not particularly common, however paramedics are much more likely to be assaulted than firefighters.[10] One study of southern California EMTs found that 61% reported assault on the job, with 25% of them reporting injury from the assault.[11] There is evidence that this holds true internationally as well. A study found that up to 87.5% of Australian paramedics are exposed to workplace violence.[12] A Swedish study found that 67% of paramedics had been the victims of physical violence.[13] A full 75% of Canadian paramedics reported experiencing violence in the prior 12 months.[14]

Among the studies which included EMS fatalities, there was one which used three separate data sources to estimate fatalities: the Census of Fatal Occupational Injuries (CFOI) covering the years of 1992 to 1997, the National EMS Memorial Service also for the years 1992 to 1997, and the National Highway Traffic Safety Administration's Fatality Analysis Reporting System for 1994 to 1997. This study estimated 12.7 fatalities per 100,000 EMTs annually, making it comparable with fire and law enforcement.[15] Another study using the Bureau of Labor Statistics (BLS) data examined injuries and fatalities, with the finding that the rate of injury among EMTs was three times the national average, with female EMTs disproportionally susceptible to injury and that transportation related incidents were the leading cause of fatalities.[1] A similar study using both the CFOI and the NEISS-Work datasets for the years of 2003-2007 found that EMTs had the highest fatality rate of all workers, with most of them being transportation related as well.[16] A study examining these transportation related injuries and fatalities specifically found that the transportation-related injury for EMTs in the US was approximately five times higher than the national average, with females comprising 53% of the cases despite females EMTs accounting for approximately 27% of the work force in the occupation.[17]

The purpose of this study is to explore the most commonly reported causes of injuries and fatalities in EMS personnel. It will be easier to identify across the multiple data sources which injuries are of concern to EMS personnel in the various situations. It also provides an easier example to see what gaps exist in these secondary data sources and what direction future research should take. This descriptive study will determine if over a decade's worth of data from four different data sources can paint a picture of the biggest threats to EMT's safety and well-being.

2. METHODS

2.1 Study design

This retrospective study utilized four sources of pre-existing and public data. These data sources were: The Census of Fatal Occupational Injuries (CFOI) and Survey of Occupational Injuries and Illnesses (SOII), both collected and maintained by the U.S. Department of Labor, Bureau of Labor Statistics (BLS). The Firefighter Fatalities and Statistics collected and maintained by the United States Fire Administration (USFA) and The EMS Voluntary Event Notification Tool (E.V.E.N.T.) maintained by the Center for Leadership, Innovation and Research in EMS (CLIR) were also used. All data was downloaded into Excel 2013 spreadsheets and collected in November 2017. How the data was handled from each source is discussed below.

2.2 Human subject committee review

Because all of the data was publicly available, de-identified aggregate data, this study did not require IRB approval be-

cause it did not constitute human subject research as defined in 45 CFR 46.

2.3 Population & Setting

The BLS CFOI was accessed for the fatalities occurring among EMTs working in organizations of all ownerships in the years 2003-2015 while the agency's SOII was accessed for the nonfatal injuries documented in private industry EMTs in the years 2003-2016. It was not possible to go further back, because the BLS did not consider EMTs a unique occupational group prior to 2003. This required downloading the datasets for the years 2016-2011 & 2010-2003 from each respective database. There were some changes in variables reported between the 2010 & 2011 – so not all of the categories matched. Accordingly, categories that did not have continuity between sets were excluded, with the exceptions of the following within the SOII. In the years 2011-2016 BLS recorded data on "Falls, slips, trips" while there were the categories "Slips, trips", "Fall to lower level", and "Fall on same level" from 2003-2010. These were both combined to represent similar injuries in the newly created category "Slips, Trips, & Falls". The creation of this variable allowed for comparison of similar injuries across the entire 13 years of nonfatal injuries. The incident rates per 10,000 full-time EMT employees was available and included for the years 2011-2016. BLS data may not sum to totals because of rounding (they round findings to the nearest ten). Only EMS personnel employed in the private sector were used, because BLS had data for all of these years on the private sector. The single figure was made with SPSS 25 from IBM.

The USFA collects records on the fatalities of Firefighters in all states and territories in the United States. This data is available publicly for download. Once the dataset was obtained, those cases with a missing cause of death, activity, and duty type but had corresponding narratives which allowed those to be categorized were by the researcher. Otherwise the categorization done by USFA was left unchanged. This study was concerned with the years of 2003-2016 (1,435 cases). Two groups within the dataset were of interest for this study – those who were identified in any manner as EMS personnel in "rank" and those who died while engaged in the activity of "EMS/Patient". There were 111 individuals who had been identified as EMS in some manner in their rank between 2003-2016. "EMS/Patient" activity as cause of death resulted in 29 cases in the dataset, although this included deaths going back to the 1970s. Only the 21 cases which had incidents which occurred 2003-2016 were retained. There were 8 overlapping cases between these two categories of interest. Both were selected because it is impossible to discuss EMS personnel without discussing cross-trained individuals, and an analysis of the workplaces dangers faced by EMS personnel would be lacking if not at least mentioning the risks faced by these people. However, because the primary focus of this paper are the dangers faced within an EMS context, the fatalities experienced during EMS/Patient care were also isolated and discussed. This way specific dangers faced during EMS care are explicitly discussed.

E.V.E.N.T. is an online anonymous reporting tool for EMTs, similar to the system created in Pennsylvania.[18] E.V.E.N.T. works in a similar manner as the National Firefighter Near-Miss Reporting System works for firefighters, a place to report events which that had the potential to result in injury - but did not, due either to intervention or chance.[19] However, it is worth noting that sometimes reports of actual injuries did appear in the reports. E.V.E.N.T has three categories of cases which EMS providers can submit: Patient Safety Events, Practitioner Near Miss Events, and Provider Violence Events. This study was only concerned with Provider Violence Events as well as those in the Practitioner Near Miss Events which could have resulted in injury to EMS personnel. After requesting to join the Google Group wherein the individual reported events are kept, only cases involving provider injury were selected. Out of the cases which had been reported as of November 2017, all were read and only those related to injury near misses were included in this study, with a resulting inclusion of 214 events. This included all of the violence reports as well near miss events which could have directly resulted in injury to the EMTs (those which only resulted in damage or potential damage to equipment or vehicles were disregarded, as were all about near miss injuries to patients). They were then categorized according to the patterns and themes which appeared in the content.[20] The reports about the violence were the overwhelming majority of the cases, constituting 196 of the events, with the violence cases which were reported in the Practitioner Near Miss grouping being re-categorized for the purpose of this study. When doing content analysis, distinct themes appeared within the violence events and the near miss events reported.

Within the violence events, the following 6 categories were identified, based on the source of the violence the EMS personnel encountered. Intentional Physical Harm; these are cases portrayed in the narrative as patients who were mentally competent, with no probable underlying medical, psychological or chemical impairment, who decided to deliberately harm EMS personnel. Not Enough Information; events with no or exceedingly minimal narratives and therefore lacked clear indication for inclusion in other categories. Psychologically/Mentally Impaired Patients: These are patients which were known to the EMT to have a psychological or mental condition that might influence interpersonal interactions,

such as mental retardation, autism, previously known psychiatric patient, etc. Person Other Than Patient: a person other than the patient attempted to harm EMS personnel, most commonly a significant other or family member of the patient. Temporarily Altered Mental Status: A patient who has a temporarily altered mental status, either pharmacologically (most commonly alcohol) or medically (through acute conditions such as hypoglycemia, seizures, and probable traumatic brain injury). Finally, Verbal Assault; these are reported cases of exclusively verbal abuse (if there was reported verbal abuse in addition to actual physical violence, the event was placed in the corresponding physical harm category).

In the Near miss events, the following categories were created: Automotive Near Miss & Equipment Failure. Within the automotive category both ambulance driver and civilian errors appeared, but for the purpose of this study's general terms, they were all included in a single category.

2.4 Measurements

This study included data on the occupational injuries with lost work time or fatalities which were reported to the Department of Labor, the USFA, or the E.V.E.N.T. between 2003 – 2017 and were somehow related to EMS.

2.5 Analytical methods

This study is descriptive in nature. The incidences of injuries and fatalities were matched between the years and reported as they were seen in the datasets. The narratives found in the E.V.E.N.T. system were reviewed and coded based on inherently emergent themes in accordance with standard content analysis procedures.[20]

3. Results

3.1 Injuries

The combined and condensed data from the BLS SOII on EMS injuries can be found in Table 1. Over the 13 years, a total of 64,780 nonfatal cases were reported. Because of the sheer number of categories the BLS reports on, only the most populated and noteworthy categories will be reported here. For example, race was not included in Table 1 because the injuries, much like the field,[21] were overwhelmingly within the Caucasian population. Over the years, 56.9% of the injuries occurred within males. The age range which incurred the most injuries was 25-24-year olds, with 39.4% of the injuries, with the least injuries occurring in those 65 and over (0.3%). Only injuries from the three most common categories for events, nature of illness, and source of injury were reported for conciseness. The three most common injury events were Slips, Trips, & Falls (12.8% of all injuries), Overexertion (58.9%), and Transportation (8.1%). The most common nature of injuries were Sprains, Strains (63.4%), Soreness, Pain (15.3%), and Bruises, Contusions (4.6%). The most common sources of injury were Health Care Patient (37.4%), Vehicles (11.5%), and Worker Motion or Position (11%).

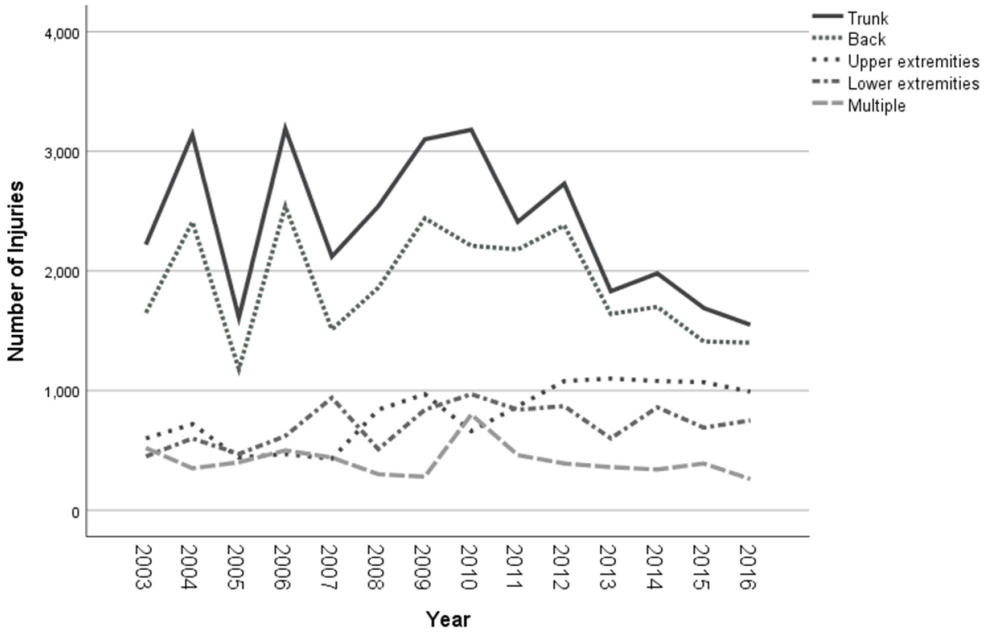

Figure 1. Number of injuries by most frequently injured body parts

Table 1. The combined and condensed data from the BLS SOII on EMS injuries

Year	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Total injuries	**4,040**	**5,170**	**3,050**	**5,070**	**4,360**	**4,560**	**5,440**	**5,860**	**4,870**	**5,500**	**4,220**	**4,650**	**4,160**	**3,830**
Sex														
Male	2,210	2,790	1,720	2,870	2,360	2,690	3,180	3,150	2,890	3,300	2,450	2,740	2,300	2,250
Female	1,840	2,380	1,330	2,200	1,990	1,860	2,250	2,710	1,990	2,200	1,770	1,910	1,860	1,580
Age														
16-19	60	80	0	20	50	30	20	20	20	40	0	40	40	30
20 -24	780	960	430	760	530	660	650	860	760	680	700	690	510	620
25-34	1,570	2,010	1,420	2,390	1,580	2,070	2,370	2,120	1,850	2,060	1,470	1,680	1,560	1,380
35-44	1,140	1,200	690	1,330	1,350	990	1,590	2,030	1,470	1,660	1,080	1,180	920	810
45-54	400	720	390	420	470	640	570	640	560	750	700	730	830	590
55-64	50	130	100	100	150	90	130	120	200	290	210	220	270	310
65+	0	0	20	20	0	20	70	0	0	0	20	50	20	20
Event														
Slips, Trips, & Falls	400	660	390	770	650	500	710	530	640	650	630	740	550	500
Overexertion	2,350	2,750	1,840	2,950	2,210	2,720	3,040	3,430	3,150	3,570	2,640	2,670	2,660	2,210
Transportation	320	580	280	430	330	290	260	540	370	410	290	350	340	480
Nature of Illness														
Sprains, strains	2,640	3,410	1,970	3,740	2,710	2,980	3,630	3,500	2,960	3,360	2,590	2,800	2,360	2,430
Soreness, Pain	370	690	360	610	630	690	430	1,030	930	1,040	820	790	860	700
Bruises, contusions	150	330	300	170	130	140	450	140	220	200	170	220	230	140
Source of injury, illness														
Health care patient	1,710	1,860	960	2,020	1,410	1,720	2,180	2,180	1,940	2,120	1,620	1,560	1,590	1,370
Vehicles	520	740	420	520	430	390	590	820	520	610	480	450	410	570
Worker motion or position	330	530	270	470	630	560	470	650	450	650	540	480	620	490

Figure 1 shows the trends in the 5 most commonly injured body parts impacted by injury in EMS personnel over the 13-year period of the study. For all years included in this study, the Trunk (which includes the Back) was the most injured body part, although there has been a noticeable decrease since 2012. There has been visible but slight increase in extremity injuries, although overall the level of injuries in the "upper extremities", "lower extremities", and "multiple" has not changed drastically over the course of this study.

In every reported year, the incident rate of injury was significantly higher for EMS personnel than it was for the private industry as a whole. Table 2 shows that EMS personnel had a peak of over 4 times as many injuries as the private industry as a whole in the year of 2012. The incident rate of both has gone down since then, as has the gap, but is still almost three times higher for EMS.

Table 2. EMS Injury Incident Rates

Year	2011	2012	2013	2014	2015	2016
Incident Rate per 10,000 full-time employees, privately employed EMS personnel	362.4	441.7	313.9	342.9	291.0	277.1
Incident Rate Private Industry per 10,000 full-time employees	104.3	101.9	99.9	97.8	93.9	91.7

Table 3. Content Analysis Categories from the EMS Voluntary Event Notification Tool

Year	Violence	Near Miss	Total
2012			
	Intentional Physical Harm: 1		
	Not enough information: 2		
	Psychologically/Mentally impaired patients: 0		
	Person other than patient: 1		
	Temporarily Altered Mental Status: 2		
	Verbal Assault: 0		
Total	6	0	6
2013			
	Intentional Physical Harm: 11		
	Not enough information: 3		
	Psychologically/Mentally impaired patients: 7		
	Person other than patient: 3		
	Temporarily Altered Mental Status: 22		
	Verbal Assault: 3		
Total	49	0	49
2014			
	Intentional Physical Harm: 5	Auto: 5	
	Not enough information: 2		
	Psychologically/Mentally impaired patients: 2		
	Person other than patient: 2		
	Temporarily Altered Mental Status: 13		
	Verbal Assault: 2		
Total	26	5	31
2015			
	Intentional Physical Harm: 4	Auto: 4	
	Not enough information: 3	Equipment: 1	
	Psychologically/Mentally impaired patients: 5		
	Person other than patient: 2		
	Temporarily Altered Mental Status: 25		
	Verbal Assault: 2		
Total	41	5	46
2016			
	Intentional Physical Harm: 6	Auto: 5	
	Not enough information: 1		
	Psychologically/Mentally impaired patients: 4		
	Person other than patient: 3		
	Temporarily Altered Mental Status: 11		
	Verbal Assault: 2		
Total	27	5	32
2017			
	Intentional Physical Harm: 9	Auto: 2	
	Not enough information: 5	Equipment: 1	
	Psychologically/Mentally impaired patients: 8		
	Person other than patient: 2		
	Temporarily Altered Mental Status: 21		
	Verbal Assault: 2		
Total	47	3	50
	196	18	214

The summary of the classification of the E.V.E.N.T. cases can be found in Table 3. Out of the 214 events included in this study, 196 were related to violence. Out of the categories which emerged from the analysis of the events, the most frequent category in all years was Temporarily Altered Mental Status. It accounted for 47.9% of all the reported violence events. Among these cases, the EMTs most frequently cited suspected or known alcohol consumption in the patient. There were not very many Near Miss events which had high potential to result in bodily harm to EMS personnel, but there were a total of 18 reported events which were included in analysis for this study. The majority of these were automotive related Near Misses. It is worth noting that in the automotive events caused by ambulance drivers, lack of sleep of the ambulance driver was identified as a contributing factor in the automotive near misses 6 times out of the total 16 cases (37.5%).

3.2 Fatalities

The COFI data from BLS covered 12 years and 149 fatalities. The truncated data can be found in Table 4. These fatalities occurred predominately in males (74.5%) and in transportation related incidents (77.8%). Most of the fatalities occurred in the age ranges of 25-34 (26.1%) and 35-44 (23.4%). There were no fatalities in the age ranges of 16-19 or 65 and older.

Table 4. Number of workplace fatalities in EMS Personnel

Year	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Total	**7**	**19**	**10**	**10**	**13**	**15**	**13**	**10**	**8**	**10**	**10**	**10**	**14**
Sex													
Men	5	13	7	8	9	9	11	5	6	8	9	9	12
Women	0	6	3	0	4	6	0	5	2	0	1	0	2
Age (years)													
20 -24	0	0	4	0	0	0	0	0	0	3	2	0	2
25-34	0	9	3	4	5	5	0	4	0	0	3	5	1
35-44	0	3	0	4	3	8	6	0	4	0	0	1	6
45-54	0	6	0	0	0	0	3	4	3	0	2	3	0
55-64	0	0	0	0	0	0	0	0	0	0	1	1	4
Event													
Transportation	6	17	9	8	11	11	8	8	4	9	9	6	10

Out of the 1,435 fatalities in the dataset during the years of interest, only 111 individuals (7.7%) were identified as also working in EMS in some manner, per their rank. A summary of these fatalities are shown in Table 5. The average age at death was 42.29 years old in this population. The majority of these were among career personnel, although a third of them were volunteers. The most common cause of death was Stress/Overexertion. In a related vein, the most common nature of death was heart attacks. There was no dominating category of activity among these individuals, with the most common one being "Advance Hose Lines/Fire Attack" (16.2%). The two most common property types where the incidents occurred were "Street/Road" (24.3%) and "Residential" (21.6%).

The 21 cases where a firefighter died in the course of providing EMS/patient care are summarized in Table 6. The average age for this group was 46.14 years old. A slight majority of the deaths occurred in volunteers (57.1%) with the rest being Career. Much like the cross-trained individuals above, the most common cause of death was Stress/Overexertion (47.6%) and the most common nature of death was Heart Attacks (47.6%). The most common property type was Street/Road (47.6%), although it was closely followed by Residential (33.3%).

4. DISCUSSION

This study confirms some previous studies as well as adds to the literature by adding further regarding injuries and fatalities in EMS personnel. The SOII data confirms that the injury incident rates for EMS are still significantly higher than the national average.[1, 15] It also confirmed that although there are more injuries in males, there are proportionally more injuries in females,[1] given that the EMS workforce is estimated to be primarily male (71.2% for EMT-Bs and 69% for Paramedics).[21]

The cases submitted to E.V.E.N.T. indicate that the perceptions of EMTs are most concerned with the workplace violence they experience, even if this isn't one of the top three sources of injuries according to the SOII. This is not particularly surprising that it is a serious concern for EMS, given that the currently existing literature indicates that a significant portion of EMTs worldwide are exposed to violence. De-

spite this, there is a significant lack of peer-reviewed research on interventions to protect EMS personnel.[22] Because of this concern and lack of data on the subject, a greater focus should be placed on assaults and the violence EMS personnel face, as well as policies which reduce this exposure to violence or alleviate the potential damage. This would include examining how efficacious trauma plates and bullet-proof vests are for EMS personnel. It is also interesting to note that E.V.E.N.T. allows submitters to make recommendations on what changes could have prevented this near miss. This may be a good starting point for researchers to examine possible prevention.

Table 5. Firefighter/EMS trained Fatalities 2003-2016

Age	Mean	Median	Minimum	Maximum
	42.29	41.50	22	74
	Fatalities		% of EMS trained fatalities	
Classification				
Career	62		55.9%	
Industrial	1		0.9%	
Paid-On-Call	4		3.6%	
Part-Time (Paid)	6		5.4%	
Volunteer	37		33.3%	
Cause of Death				
Caught or Trapped	16		14.4%	
Stress/Overexertion	51		45.9%	
Struck By	19		17.1%	
Vehicle Collision	8		7.2%	
All Other Categories	17		15.3%	
Nature of Death				
Asphyxiation	11		9.9%	
Burns	6		5.4%	
Heart Attack	49		44.1%	
Trauma	29		26.1%	
All Other Categories	16		14.4%	
Activity				
Advance Hose Lines/Fire Attack	18		16.2%	
EMS/Patient Care	8		7.2%	
Not on Scene	16		14.4%	
All Other Categories	69		62.1%	
Property Type				
Residential	24		21.6%	
Store/Office	20		18%	
Street/Road	27		24.3%	
All Other Categories	40		36%	

The USFA data showed that cross-trained individuals are not significantly different from singularly trained municipal firefighters; Heart attacks as the most common nature of death confirms previous data showing that cardiovascular disease is a major problem[23] and sudden cardiac death is the leading cause of death for firefighters in the US.[24] It would make sense that this would carry over to cross-trained individuals.

Table 6. Firefighter Fatalities while working on EMS cases 2003-2016

Age	Mean	Median	Minimum	Maximum
	46.14	45	22	74
	Fatalities		% of Fatalities during EMS case	
Classification				
Career	9		42.9%	
Volunteer	12		57.1%	
Cause of Death				
Assault	2		9.5%	
Exposure	1		4.8%	
Stress/ Overexertion	10		47.6%	
Struck By	5		23.8%	
Vehicle Collision	1		4.8%	
Other	2		9.5%	
Nature of Death				
Heart Attack	10		47.6%	
Trauma	5		23.8%	
Violence	3		14.3%	
Other	3		14.3%	
Property Type				
Residential	7		33.3%	
Street/Road	10		47.6%	
All Other	4		19%	

This study adds some depth to the current literature, but also shows that much information is still lacking. Future studies need to examine the causal factors which influence injuries and fatalities in EMS personnel as well as which interventions agencies can implement to mitigate these factors.

Limitations

There are several limitations to this study. The first is that it is descriptive only, and as such it cannot make any inferences. Another limitation is due to the nature of secondary data. There may be inconsistencies and incomplete data from the secondary sources. For example, although there were 7 fatalities in 2003 in the BLS data, no age ranges were reported among the decedents. There are potentially other inconsistencies in all the datasets. In addition, because it is standard practice for the DOL to round figure to the nearest ten, there may be missing cases. Due to a lack of data on EMS personnel for multiple years for government employed EMTs, the BLS data only reflected privately employed EMTs. It is possible that the pattern of injuries and fatalities in publicly employed EMTs differs from those in the private sector. A limitation of the USFA data is that it is it receives notifications of deaths from various sources, and it is possible that it is missing data. A limitation of the E.V.E.N.T. data is that it is a self-reported and unverified convenience

sample. Not only may these be incomplete or inaccurate, they are most likely only a small sub-set of the near miss injuries experienced by EMS personnel. Although volunteers were included in the USFA and E.V.E.N.T datasets, they are absent from the BLS datasets. This is an unfortunate gap in the data on injuries and fatalities in EMS personnel, because there is a significant percentage of volunteers working in the field. Up to 74% of rural area EMTs are volunteer,[25] and it is estimated that overall 49.8% of EMT-Bs and 21.8% of Paramedics are volunteers.[26]

5. Conclusion

This study examined over a decade's worth of EMS personnel injury and fatality data from four data sources. The goal of consolidating multiple data sources to paint a coherent picture in one place was done. By seeing the different resources in one area, it confirms which injuries which should be of the greatest concern, regardless of the data source. It confirmed findings of previous studies, which found among private EMS personnel that the most common injury type was overexertion and their most common source of fatal work-related incidents was transportation incidents. It also added to the literature by showing that among those cross trained as firefighters and firefighters working EMS calls, the most common cause of death was stress/overexertion. It also is unique for utilizing a portion of the E.V.E.N.T. tool, which found that most EMT-reported violent events were the result of a patient with a temporarily altered mental status. The E.V.E.N.T. tool is a data source which presents a valuable, largely untapped, resource for contextual insight to the other epidemiological data sources which exist. Given the self-selecting nature of reports to E.V.E.N.T., it would be beneficial for researchers to look at carrying out mixed methods, properly integrating both qualitative and quantitative data into a coherent and unique result.[27] This study highlights the need for evidence-based scientific research regarding what policies and interventions can help reduce violence against EMS personnel, transportation incidents, and overexertion.

Conflicts of Interest Disclosure

The authors declare that they have no competing interests.

References

[1] Maguire BJ, Smith S. Injuries and fatalities among emergency medical technicians and paramedics in the United States. Prehospital and Disaster Medicine. 2013; 28(4): 376-382. PMid:23659321. https://doi.org/10.1017/S1049023X13003555

[2] Bureau of Labor Statistics, 2017. EMTs and Paramedics. Occupational Outlook Handbook. Available from: https://www.bls.gov/ooh/healthcare/emts-and-paramedics.htm (Accessed November 15, 2017).

[3] Reichard AA, Marsh SM, Tonozzi TR, et al. Occupational injuries and exposures among emergency medical services workers. Prehospital Emergency Care. 2017; 21(4): 420-431. PMid:28121261. https://doi.org/10.1080/10903127.2016.1274350

[4] Taylor JA, Davis AL, Barnes B, et al. Injury risks of EMS responders: Evidence from the national fire fighter near-miss reporting system. BMJ open. 2015; 5(6): e007562. PMid:26068510. https://doi.org/10.1136/bmjopen-2014-007562

[5] Maguire BJ, Hunting KL, Guidotti TL, et al. Occupational injuries among emergency medical services personnel. Prehospital Emergency Care. 2005; 9(4): 405-411. PMid:16263673. https://doi.org/10.1080/10903120500255065

[6] Suyama J, Rittenberger JC, Patterson PD, et al. Comparison of public safety provider injury rates. Prehospital Emergency Care. 2009; 13(4): 451-455. PMid:19731156. https://doi.org/10.1080/10903120903144908

[7] Reichard AA, Jackson LL. Occupational injuries among emergency responders. American Journal of Industrial Medicine. 2010; 53(1): 1-11.

[8] Studnek JR, Ferketich A, Crawford JM. On the job illness and injury resulting in lost work time among a national cohort of emergency medical services professionals. American Journal of Industrial Medicine. 2007; 50(12): 921-931. PMid:17918231. https://doi.org/10.1002/ajim.20516

[9] Heick R, Young T, Peek-Asa C. Occupational injuries among emergency medical service providers in the United States. Journal of Occupational and Environmental Medicine. 2009; 51(8): 963-968. PMid:19620888. https://doi.org/10.1097/JOM.0b013e3181af6b76

[10] Mechem CC, Dickinson ET, Shofer FS, et al. Injuries from assaults on paramedics and firefighters in an urban emergency medical services system. Prehospital Emergency Care. 2002; 6(4): 396-401. https://doi.org/10.1080/10903120290938012

[11] Corbett SW, Grange JT, Thomas TL. Exposure of prehospital care providers to violence. Prehospital Emergency Care. 1998; 2(2): 127-131. https://doi.org/10.1080/10903129808958856

[12] Boyle M, Koritsas S, Coles J, et al. A pilot study of workplace violence towards paramedics. Emergency Medicine Journal. 2007; 24(11): 760-763. PMid:17954828. https://doi.org/10.1136/emj.2007.046789

[13] Suserud BO, Blomquist M, Johansson I. Experiences of threats and violence in the Swedish ambulance service. Accident and Emergency Nursing. 2002; 10(3): 127-135. PMid:12443033. https://doi.org/10.1054/aaen.2002.0361

[14] Bigham BL, Jensen JL, Tavares W, et al. Paramedic self-reported exposure to violence in the emergency medical services (EMS) workplace: a mixed-methods cross-sectional survey. Prehospital Emergency Care. 2014; 18(4): 489-494. PMid:24830544. https://doi.org/10.3109/10903127.2014.912703

[15] Maguire BJ, Hunting KL, Smith GS, et al. Occupational fatalities in emergency medical services: a hidden crisis. Annals of Emergency Medicine. 2002; 40(6): 625-632. https://doi.org/10.1067/mem.2002.128681

[16] Reichard AA, Marsh SM, Moore PH. Fatal and nonfatal injuries among emergency medical technicians and paramedics. Prehospital Emergency Care. 2011; 15(4): 511-517. PMid:21834620. https://doi.org/10.3109/10903127.2011.598610

[17] Maguire BJ. Transportation-related injuries and fatalities among Emergency Medical Technicans and Paramedics. Prehospital and Disaster Medicine. 2011; 26(5): 346-352. PMid:22336182. https://doi.org/10.1017/S1049023X11006601

[18] Gallagher JM, Kupas DF. Experience with an anonymous web-based state EMS safety incident reporting system. Prehospital Emergency Care. 2012; 16(1): 36-42. PMid:22128906. https://doi.org/10.3109/10903127.2011.626105

[19] Taylor JA, Lacovara AV, Smith GS, et al. Near-miss narratives from the fire service: a Bayesian analysis. Accident Analysis & Prevention. 2014; 62: 119-129. PMid:24144497. https://doi.org/10.1016/j.aap.2013.09.012

[20] Vaismoradi M, Turunen H, Bondas T. Content analysis and thematic analysis: Implications for conducting a qualitative descriptive study. Nursing & Health Sciences. 2013; 15(3): 398-405. PMid:23480423. https://doi.org/10.1111/nhs.12048

[21] EMS Workforce for the 21st Century: A National Assessment. (2008). Retrieved December 4, 2017. Available from: www.ems.gov/pdf/emsworkforcereport_june2008.pdf

[22] Maguire BJ, O'Meara P, O'Neill BJ, et al. Violence against emergency medical services personnel: A systematic review of the literature. American Journal of Industrial Medicine. 2018; 61(2): 167-180. PMid:29178541. https://doi.org/10.1002/ajim.22797

[23] Sen S, Palmieri T, Greenhalgh D. Cardiac fatalities in firefighters: an analysis of the US Fire Administration Database. Journal of Burn Care & Research. 2016; 37(3): 191-195. PMid:25501775. https://doi.org/10.1097/BCR.0000000000000225

[24] Smith DL, Barr DA, Kales SN. Extreme sacrifice: sudden cardiac death in the US Fire Service. Extreme Physiology & Medicine. 2013; 2(1): 6. PMid:23849605. https://doi.org/10.1186/2046-7648-2-6

[25] Mohr PE, Zhao L. Do We Need a Rural Payment Differential Under the Medicare Ambulance Fee Schedule? Bethesda, Maryland: Walsh Center for Rural Health Analysis. Hillsdale, NJ: Erlbaum. 2003.

[26] Dawson DE, Brown WE, Harwell TS. Assessment of nationally registered emergency medical technician certification training in the United States: the LEADS Project. Longitudinal Emergency Medical Technician Attributes Demographic Study. Prehospital Emergency Care. 2003; 7(1): 114-119.

[27] Guetterman TC, Fetters MD, Creswell JW. Integrating quantitative and qualitative results in health science mixed methods research through joint displays. The Annals of Family Medicine. 2015; 13(6): 554-561. PMid:26553895. https://doi.org/10.1370/afm.1865