

## *Current emergency medical services workforce issues in the United States*

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### **INTRODUCTION**

Emergency medical services (EMS) providers are a vital component of our nation's healthcare workforce. EMS personnel care for millions of critically ill and injured patients every year, and many have recognized the need to help reduce injuries and illnesses in their communities<sup>1-4</sup> and to provide additional care at the patient's home.<sup>5</sup> EMS personnel are some of the first responders to disasters, and they may also help prepare their communities for possible disasters.<sup>6</sup> Since September 11, 2001, their responsibilities in this area have been dramatically increasing; these added responsibilities have been largely underfunded, and little effort has been made to determine how these changes will affect the EMS infrastructure.<sup>7</sup> Although the nation depends on EMS as never before, the future of the workforce is at considerable risk. This paper describes the major issues currently affecting the EMS workforce in the United States.

Historically, human resources have been recognized as a major area of concern for EMS.<sup>8,9</sup> In 1996, the National Highway Traffic Safety Administration (NHTSA) sponsored a taskforce to develop the EMS Agenda for the Future.<sup>10</sup> The Agenda proposed the development of 14 EMS attributes. Human resources was one of those 14 priority areas. The Human Resources section described six objectives, which included the need for adequate training, the importance of collaborative relationships with academic institutions, and the importance of occupational health research.<sup>11</sup>

### **METHODS**

#### *Call volume and patients treated*

No published reports were found documenting

the number of patients treated by EMS personnel each year in the United States. In order to estimate the national call volume, data were collected from the 2002 *EMS Magazine* "State and Province Survey."<sup>12</sup> Each state that listed both a population and a total EMS call volume was included. Call volume per year, per one million of population was then calculated for each location (Table 1). The state with the lowest call volume per million was North Dakota, with 48,589. Alabama was the state with the highest call volume, at 175,429 calls per one million of population. The average yearly call volume per one million of population was 109,356 (95 percent confidence interval, CI = 109,288 to 109,423). Extrapolating the data to the entire US population of 285 million in 2001,<sup>13</sup> we find a total yearly call volume of 31,166,337 (95 percent confidence interval, CI = 31,146,978 to 31,185,696).

Medline searches found no reports or data documenting the number of patients treated per call or the proportion of calls that resulted in patient contact, treatment, or transport. Therefore, we developed an estimate based on data acquired using a standard web search engine (Yahoo), which we used to search for the terms EMS, statistics, and transport. Six localities were found that provided data on both responses and transports. One state in the *EMS Magazine* survey included data on total call volume and number of patient transports; that state, Mississippi, is included. Table 2 illustrates that 2,530,834 calls resulted in 1,613,170 transports; an average of 64 percent of calls resulted in a patient transport. The Montgomery County web page (<http://www.montcopa.org/eoc/MCEMS/Statistics/emstat.htm>) also indicated that 9 percent of their total calls were for patients who were seen by the

**Table 1. State population, call volume per year and calls per year per one million population (n = 25)**

State	Population	Call volume	Calls per one million population
AL	3,990,221	700,000	175,429
CT*	3,300,000	450,000	136,364
DE†	666,200	77,400	116,181
FL	16,400,000	1,575,000	96,037
ID	1,293,953	75,889	58,649
IN	5,577,100	750,000	134,478
KS**	2,600,000	241,546	92,902
KY	3,900,000	625,000	160,256
ME	1,200,000	210,000	175,000
MA*	6,016,425	400,000	66,485
MN	4,919,479	390,000	79,277
MS	2,844,658	313,402	110,172
MO	5,233,857	433,000	82,731
NE***	1,700,000	109,172	64,219
NV	2,214,813	249,485	112,644
NH‡	1,200,000	98,000	81,667
ND	638,000	31,000	48,589
OK	3,200,000	366,444	114,514
PA	12,281,054	1,400,000	113,997
RI	990,000	132,792	134,133
SC	4,012,012	688,956	171,723
SD	696,004	48,000	68,965
VT	580,000	52,386	90,321
WI	5,100,000	500,000	98,039
WY	493,000	39,000	79,108
<b>Total</b>	<b>91,046,776</b>	<b>9,956,472</b>	<b>109,356</b>

\* estimated call volume; † Delaware estimated a 7 month call volume of 45,150; population estimate is from 1990; \*\* Kansas call volume estimate from 2000; \*\*\* Nebraska call volume from 1997; ‡ New Hampshire estimated calls at 95,000 to 100,000.

EMS crew but refused further medical aid. Based on these data, we estimate that 70 percent of EMS calls result in some level of treatment. Therefore, based on the available data, it is reasonable to estimate that EMS providers treat 22 million patients per year in the United States. If the state's statistics only reflect emergency or "911" ambulance calls, then adding routine and critical care transport via ambulance and air

would greatly increase the number of patients treated each year by EMS providers.

#### *Number of providers*

Estimates of the number of EMS providers in the United States have ranged from 150,000 to over 800,000.<sup>14-18</sup> Data from the *EMS Magazine* survey were analyzed to estimate the number of EMS providers in

**Table 2. Total calls, total patient transports and percent of calls transported, selected jurisdictions, 1991 to 2003 (n = 7)**

Service	Period	Total calls	Total patient transports	Percent transports
Montgomery County, PA (118)	2002	63,469	39,465	0.62
Iredell County, NC (119)	January to July 2003	5,667	4,261	0.75
Seattle - King County, WA (120)	2001	165,255	69,136	0.42
Hemphill County, TX (121)	1996 to 2000	1,844	1,311	0.71
Houston, TX (122)	1991 to 2001	1,833,930	1,132,750	0.62
Richmond, VA (123)	1999 to 2001	147,267	114,281	0.78
Mississippi (124)	2001	313,402	251,966	0.80
<b>Total</b>		<b>2,530,834</b>	<b>1,613,170</b>	<b>0.64</b>

the United States. Table 3 illustrates the number of EMS personnel per category (e.g., EMT, paramedic) and the total number of EMS personnel per state. All 50 states and the District of Columbia are included. The total number of EMS personnel is found to be 891,570. Of these, 154,187 (17 percent) are paramedics.

These data are limited in a number of ways. For example, it is not clear if the states counted individuals in more than one category, and it is possible that some individuals may be certified in multiple states. There is also the possibility that many people work on ambulances without EMS certification (e.g., drivers). The proportions of paid and volunteer personnel are unknown; the only report related to such proportions stated “in rural areas, approximately three-quarters of rural prehospital EMS providers are volunteers.”<sup>19</sup>

In 2003, the data indicate that there were approximately 900,000 EMS personnel in the United States. Of these, approximately 180,000 were full-time workers. Much like the growing demand for emergency medicine physicians,<sup>20</sup> the demand for EMS personnel is expected to increase. In fact, the Bureau of Labor Statistics predicts that “Employment is projected to grow faster than average, as paid emergency medical technician positions replace unpaid volunteers.”<sup>15</sup>

#### REVIEW OF THE LITERATURE

This section reviews the current literature on EMS workforce issues. Medline searches were conducted on all available years, using the term emergency medical services, along with workforce, occupational injuries, occupational fatalities, ambulance crashes, training, research, stress, and personnel. This section focuses on the findings in eight areas: demographics, occupational hazards, work hours, training requirements, salaries, stress, fire departments in EMS, and research.

##### *Demographics of the workforce*

Thompson published one study that specifically described the demographics of EMS personnel compared to their communities. In that study of rural EMS agencies and their communities, no significant difference was found between the EMS personnel and the community for race, sex, marital status, household size, home ownership, housing costs, and in-county employment.<sup>21</sup> Chng et al.<sup>22</sup> compared rural and urban EMS providers in Texas. They found that urban personnel were younger, more educated, were more likely to be compensated (i.e., to be paid EMS providers), and they reported a lower level of burnout. What little information is available related to gender, race, age, and marital status among EMS personnel

**Table 3. EMS personnel, 50 states and District of Columbia  
Data from 2002 EMS Magazine survey (n = 51)**

State	First responder	EMT	EMT-1	Paramedic	Other*	Total personnel
AL		5,756	2,297	2,495		10,548
AK		3,500	900	200		4,600
AZ		8,357	171	2,801		11,329
AR		5,580	339	1,387		7,306
CA		60,000	119	12,000		72,119
CO		13,361	997	3,454		17,812
CT						17,694
DE	600	850		132		1,582
DC		3,500	11	500		4,011
FL		25,063		14,910		39,973
GA	50	150	6,200	4,000		10,400
HI		471	344			815
ID	438	2,618	780	314		4,150
IL		19,934	1,500	6,000	500	27,934
IN	9,029	13,387	1,483	2,254		26,153
IA	2,504	6,135	1,203	1,805	2,698	14,345
KS	1,023	6,173	2,985			10,181
KY	2,740	11,251		1,396		15,387
LA	11,152	4,150	441	1,694		17,437
ME	200	2,660	750	725		4,335
MD	11,439	15,172	710	2,091		29,412
MA		17,170	536	1,923		19,629
MI	11,709	12,914	1,773	6,093		32,489
MN	16,609	9,606	307	1,752		28,274
MS		1,739	243	1,295		3,277
MO		7,000		3,000		10,000
MT	2,345	3,110	293	225		5,973
NE		7,243	227	533		8,003
NV	1,903	4,911	2,340	911		10,065
NH	365	2,199	900	528		3,992
NJ		20,900		13,000		33,900

\* Other does not include MDs, RNs, PAs, dispatchers, etc.

**Table 3. EMS personnel, 50 states and District of Columbia (continued)  
Data from 2002 EMS Magazine survey (n = 51)**

State	First responder	EMT	EMT-1	Paramedic	Other*	Total personnel
NM	648	3,104	1,077	893		5,722
NY	13,136	37,945	4,806	4,297		60,184
NC	2,803	11,692	1,795	3,734	6,873	26,897
ND		1,632	354	320		2,306
OH		20,729	3,407	10,863		34,999
OK	22,526	6,517	1,327	1,400		31,770
OR		3,946	1,286	2,258		7,490
PA	5,506	27,125		11,769		44,400
RI		2,145	1,890	225		4,260
SC		2,095	771	2,451		5,317
SD		2,896	276	283		3,455
TN	3,283	4,904	3,113	3,285	223	14,808
TX		26,107	4,044	15,242	5,273	50,666
UT		7,184	1,741	872	434	10,231
VT		1,390	833	81	814	3,118
VA	2,310	23,044		2,921	4,417	32,692
WA	2,014	13,020	790	1,522		17,346
WV	644	4,115		1,705	3,360	9,824
WI	2,900	12,500	2,047	2,566		20,013
WY		2,178	687	82		2,947
<b>Total</b>	<b>127,876</b>	<b>509,128</b>	<b>58,093</b>	<b>154,187</b>	<b>24,592</b>	<b>891,570</b>

\* Other does not include MDs, RNs, PAs, dispatchers, etc.

comes from a variety of sources. EMS personnel in the United States tend to be mostly male,<sup>23-25</sup> Caucasian,<sup>25</sup> 35 years of age, on average,<sup>25,26</sup> and most are married.<sup>25</sup> An Iowa study found that 81 percent of personnel at EMS-only agencies had some college or a college degree compared with 51 percent at Fire/EMS agencies and 49 percent at Fire-only agencies.<sup>24</sup> The study also found that 19 percent of the EMS-only personnel had a bachelor's degree compared with 7 percent of the EMS/Fire personnel.<sup>24</sup> Brown<sup>25</sup> found the median experience for EMTs was 2.17 years compared with 9.12 years for paramedics.

Approximately 4.5 percent of the EMS personnel in these two studies had graduate degrees.

#### *Occupational hazards*

The national rate for occupational injuries calculated by the Bureau of Labor Statistics for 2000 was 6.1 injuries per 100 full time workers, per year. In that same year, it found that the industry with the highest rate of occupational injuries and illnesses was "meat packing plants"; in that industry, there are approximately 25 injuries and illnesses for every 100 workers, per year.<sup>27</sup> Only two papers present data

that might be used to estimate the risks for EMS. Gershon et al.<sup>28</sup> found that there were 220 injury or illness cases among a population of 197 EMS workers in 1992, and Schwartz et al.<sup>26</sup> found that there were approximately 45 injury and illness cases per 100 full-time EMS workers in 1990. These data indicate that the problem is potentially very serious. One paper looked at occupational fatalities among EMS personnel and found that the rate of fatality per 100,000 EMS workers was 12.7 per year.<sup>29</sup> In comparison, the rate was 14.2 for police and 16.5 for firefighters; the national average for 1995 (a midpoint of the studies) was five.<sup>30</sup> Ambulance collisions have been found to be a significant hazard to EMS personnel,<sup>29,31-33</sup> as well as a major source of litigation.<sup>34-37</sup> Other occupational health hazards include: assaults,<sup>38-41</sup> infectious disease,<sup>42,43</sup> needlesticks,<sup>44,45</sup> back injuries,<sup>46</sup> and hearing loss.<sup>47</sup>

#### *Work hours*

Although work hours have been found to influence EMS job satisfaction,<sup>48</sup> a precise estimate of the number of hours worked by EMS personnel is not available. However, there are indications that employer-mandated hours may be excessive. Reports indicate that some employers, typically based in fire departments, have shifts of 24 straight hours or more.<sup>49-53</sup> Although such shifts may be acceptable for fire personnel, who may get called out on few occasions during a 24-hour shift, these long shifts may be much more problematic for EMS personnel, who may be assigned to many calls during a 24-hour period. NHTSA data suggest that approximately 100,000 crashes per year, including 1,357 fatal crashes and approximately 71,000 injury crashes, involved drowsiness.<sup>54</sup> It is reasonable to conclude that drowsiness from extended shift lengths increases the risk of ambulance crashes and occupational injuries for EMS personnel. This increased risk may also extend to citizens in the community, as well as off-duty personnel driving home after an extended shift.

In addition to the issues related to drowsiness and operational safety, there are concerns in the areas of medical competency and quality assurance. For example, medical errors have been found to be a significant problem in hospitals, which is a more controlled environment than the practice arena for EMS.

The effect of work hours on physician residents has been recognized by the Accreditation Council for Graduate Medical Education and resulted in new guidelines limiting the work hours of residents.<sup>55</sup> Other workers, such as pilots<sup>56</sup> and commercial drivers,<sup>57</sup> have legal limits on their work hours.

#### *Training requirements*

Although one study found that 55 percent of rural EMS volunteers quit because of training requirements,<sup>58</sup> EMS personnel generally embrace training, and many are believed to be interested in pursuing additional training, such as "expanded scope EMS."<sup>59</sup> This training allows providers to perform advanced clinical interventions, such as suturing and prescribing limited types of medications. Expanded scope personnel may, instead of taking a patient to a busy and expensive emergency department, perform some limited interventions, allowing the patient to arrange for follow-up care with a private physician or clinic at a convenient time.

#### *Salaries*

One study found that as of 2000, the average salary for a paramedic was approximately \$38,000.<sup>60</sup> However, the Bureau of Labor Statistics estimates the median EMT and paramedic salary in 2000 as \$22,460.<sup>61</sup> In comparison, Bureau figures for the same year report a median salary for firefighters between \$29,316 and \$39,477;<sup>62</sup> \$39,790<sup>63</sup> for police; \$44,840 for registered nurses;<sup>64</sup> and \$61,910 for physician assistants.<sup>65</sup> Brown et al.<sup>25</sup> found that EMTs had an average salary of \$23,350, while the average for paramedics was \$37,282. Monosky<sup>66</sup> found that the average starting paramedic salary among respondents to a 2002 national survey was \$32,420. One author concluded that only paramedics in the northwest and south central regions of the United States earn enough to afford a monthly mortgage payment for a 2,000 square foot home.<sup>67</sup> Another survey found that many EMS workers earn salaries near the poverty level and lack health insurance.<sup>68</sup>

#### *EMS and fire departments*

Although some fire departments have provided

ambulance services since at least the 1960s,<sup>69</sup> an increasing number of fire departments have taken over local EMS services in recent years. The International Association of Fire Chiefs recently published the results of a study that “demonstrate that a growing percentage of fire departments are providing ambulance transport, in addition to the more traditional first response services.”<sup>70</sup> Most remarkable was the finding that 94 percent of respondents were now providing some level of EMS in their communities.

Anecdotal reports from many fire departments that are providing EMS indicate that firefighters are often forced to work in EMS until openings become available on fire apparatus.<sup>71</sup> The lack of research leaves open the possibility that turnover is much higher among firefighters than among personnel in EMS-only agencies (i.e., a greater proportion of firefighters may choose not to recertify as EMS providers), and that fire departments may be more likely to staff advanced life-support units with personnel not trained to the full paramedic level.<sup>71</sup> If these initial findings are indicative of a larger trend, the future EMS workforce may be comprised largely of workers who have little interest in providing EMS, who have relatively little experience, and who have less training than current paramedics. Consolidation of EMS and fire departments may result in a decrease in personnel available for disasters. It could also cause a conflict in roles for such incidents, if the firefighters are needed for fire duties and are thus unavailable for patient care.

Finally, this fundamental transformation of a healthcare delivery system that treats 22 million Americans each year is being done in the absence of any published literature related to the involvement of local medical direction or the larger healthcare community. In addition, no studies have been found on the national health impact of this transformation to fire department-based service.

#### *New frontiers*

Harrawood et al.<sup>72</sup> demonstrated how EMS personnel were able to help cut the pediatric drowning rate by 50 percent in one community. There is an increased interest in primary injury prevention,<sup>1,2,73,74</sup>

and 17 states report having an EMS injury prevention program.<sup>75</sup> Finally, EMS personnel have an increasingly important role in monitoring the health of the community<sup>76-78</sup> and taking on other new roles.<sup>79-84</sup>

Research is an important component of addressing EMS problems<sup>85</sup> and developing new initiatives. This may be an ideal time to develop unique research models,<sup>86</sup> but the success of future EMS research depends on increased research quality.<sup>87-88</sup> It will also require dedicated researchers, funding, better information systems,<sup>89-91</sup> the development of research skills among EMS personnel, and a focus not only on clinical interventions but also on the evaluation of integrated EMS systems.<sup>92-94</sup>

### **DISCUSSION**

Emergency medical services personnel have developed a unique set of experiences and abilities related to patient care, and they have also demonstrated their abilities in community health initiatives. At the same time, low salaries and changing training and certification requirements, along with a risk of occupational hazards, threaten the future of EMS services.

EMS is evolving to take on a number of new roles. A logical extension of these findings is that EMS professionals can reduce the number of medical emergencies in the community, facilitate the availability of specialized care, play an important role in community health education, improve community health, and help reduce costs for healthcare in the United States. In addition to having a significant influence on healthcare, this evolution is a crucial next step in the maturation of the EMS profession.

### **CONCLUSION AND RECOMMENDATIONS**

Since September 11, 2001, communities have become increasingly reliant on EMS personnel, especially in areas such as disaster response and monitoring of disease outbreaks. In addition, EMS professionals have been increasingly involved in a variety of community health initiatives that may have helped reduce healthcare costs and improved the health of the community. At the same time, EMS personnel are under increasing pressure from the demands of their

work and the hazards associated with the occupation. Perhaps most significant is the increased willingness by public safety and local government administrators to move EMS operations under fire departments without consideration for the long-term effects of such a change. These long-term effects may, in fact, result in fundamental changes in EMS. These changes would come at the same time as baby boomers, managed care, and Homeland Security begin to place increasing demands on EMS services.

If EMS is to continue as a profession, changes must include increased financing for EMS agencies, higher salaries, significant job redesign, and recognition both by local government and the medical profession that EMS is a true profession and a partner in public health. The job redesign must provide opportunities for rotation through less stressful and less demanding work environments. The design must also recognize the role EMS personnel can have in community health initiatives. It must provide for a reasonable career ladder, with clearer pathways based on education and experience. These changes are necessary for those who want to perform expanded scope duties and critical care roles and those who want to become researchers, educators, managers, nurses, physician extenders, or physicians. EMS research must be supported, and planning must begin to insure adequate and properly funded EMS personnel, in both urban and rural areas. Now is the time for us to develop and enact a national strategy for the future of EMS.

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