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The Emergency Medical Services Safety Champions

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Abstract

The overarching mission of prehospital Emergency Medical Services (EMS) is to deliver life-saving care for people when their needs are greatest. Fulfilling this mission is challenged by threats to patient and provider safety. The EMS setting is high-risk because care is delivered rapidly in the out-of-hospital setting where patient-benefiting resources are limited. There is growing evidence that safety culture varies widely across EMS agencies. A poor safety culture may manifest as error in medication, back injuries, and other poor outcomes for patient and provider. Recently, federal and national leaders of EMS (i.e., the National Highway Traffic Safety Administration) have made improving EMS safety culture a national priority. Unfortunately, there are few initiatives that can help local EMS leaders achieve that priority. We describe the successful EMS Champs Fellowship program supported by the Jewish Healthcare Foundation (JHF) designed to train EMS leaders to improve safety for patients and providers.

Keywords

EMS; Safety; Fellowship; Training

BACKGROUND

Emergency Medical Services (EMS) is an important provider of out-of-hospital emergency and non-emergent health care. The need or demand for EMS is unplanned and patients may present with a complex trauma or medical emergencies susceptible to an error or adverse event (AE). Annually, EMS will see 36 million patients and transport 28 million to a hospital or other facility.¹ Every minute in the U.S., paramedics and Emergency Medical Technicians (EMTs) transport 35 patients to the Emergency Department (ED).²

The magnitude of errors and AEs in EMS is unknown and the causes of errors poorly understood.³ Some commonly identified errors and AEs include: poor management of patient airways,⁴⁻⁶ unspecified deviation from protocol,⁷ medication errors,⁸ mishandling of patients,⁹ extended pauses during cardiac resuscitation (i.e., not pushing on chest during CPR),¹⁰ and failure to manage pain.³

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Paramedics and EMTs are at an increased risk of poor safety outcomes. One study calculated the incidence of occupational fatality among EMS workers is 2.5 times greater than the general working public.¹¹ Sprains and strains due to lifting and moving patients are common and a leading cause of injury in EMS.¹² Paramedics and EMTs are often exposed to blood and blood-borne pathogens,^{13,14} and reports of violence against EMS workers is increasing, posing safety risks for patients and providers.^{15,16}

Poor teamwork behaviors have been linked to negative patient outcomes in a variety of healthcare settings.¹⁷⁻²⁰ Teamwork is vitally important for EMS where the delivery of care is based on teams of two (a dyad) outside of the hospital. Partners must work well together under pressure to recognize threats and overcome obstacles while separated from clinician colleagues such as physicians, respiratory technicians, nurses, and other providers with an expanded scope of practice. Unfortunately, there is evidence that not all EMS dyads work well together. Paramedics and EMTs can be judgmental of their teammate's integrity, patient empathy, and skills.²¹ Many fail to develop positive teamwork behaviors such as trust, back-up behavior, and closed-loop communication because of an inability to maintain the dyad due to absences, sick leave, and turnover. The average EMS worker accumulates more than 19 different partners annually, with some having more than 50 different partners in one year.²² Lack of familiarity between EMS clinician partners may lead to poor team performance and poorer safety outcomes for patient and provider.^{23,24} Additional threats to safety that have received limited attention include the common lack of exposure that paramedics and EMTs have to their assigned medical control physician,^{25,26} lack of highly trained EMS leaders, poor sleep, fatigue,^{27,28} and ambulance crashes.²⁹

Efforts to address these threats and safety in EMS in general have been limited. The EMS industry is a decade behind the rest of medicine and health care in taking action against preventable error and AE. Outside of EMS, many efforts to improve safety begin with improving an understanding of safety culture.³⁰ An association between safety culture and poor safety outcomes was recently identified in a sample of EMS agencies, as was wide variation in safety culture scores across EMS agencies.³¹⁻³³ In response, several organizations have supported efforts to improve EMS patient and provider safety. In 2010, the National Highway Traffic Safety Administration's (NHTSA) Office of EMS contracted with the American College of Emergency Physicians (ACEP) to embark on a 3-year project and develop a national strategy for improving EMS safety culture nationwide (see: www.EMScultureofsafety.org). In that same year, the Jewish Healthcare Foundation (JHF) funded 18 paramedics, emergency physicians, and prehospital registered nurses to complete a 12-month fellowship program designed to teach, guide, and support champions for safety improvement in EMS. In this article, we describe the JHF EMS Safety/Quality Champions Fellowship (JHF EMS Champs), highlight the curriculum and summarize lessons learned from this experience in engaging EMS leaders in other communities for safety improvement.

The JHF EMS Champions Fellowship Program

The JHF is a public charity supporting research, education, and a grant program that aims to advance the safety and quality of clinical care and health of populations. To accomplish these aims, the JHF created the Pittsburgh Regional Health Initiative (PRHI) in 1998, Health

Careers Futures (HCF) in 2003, and the Center for Healthcare Quality and Payment Reform (CHQPR) in 2008. The JHF is also a founding member of the Network for Regional Healthcare Improvement (NRHI), an organization that aims to improve the value and lower the cost of health care through support of regional collaboratives.

In 2001, the JHF developed a program to support the education and training of emerging leaders in healthcare. Known as the JHF Health Sciences Fellowship Program, it was designed to fill gaps in professional training and help prepare trainees to reform the way care is delivered through an intensive exposure to problems and barriers identified in the literature and by leaders in medicine. The JHF wanted the program to provide trainees with tools and resources for solving problems identified at the local level by the trainees in their respective units, floors, departments, or organizations. The JHF program has since grown into two separate fellowship tracks known now as the Patient Safety Fellowship and the Jonas Salk Fellowship.

The JHF has established numerous partnerships to grow and improve its fellowships. Partnerships have been established with the Robert Wood Johnson Foundation, the National Library of Medicine, the Carnegie Library of Pittsburgh, and other foundations. The partnerships have facilitated growth in JHF programs and impacted care through continued training and education of clinicians of all types and roles as well as non-clinicians. Over time, the JHF has established new programs specific to the needs and unique roles of different clinicians and other healthcare personnel. These programs include the Nurse Navigators program, the Physician Champions program, the Librarian Fellowship program, and the Pharmacy Agents for Change program.

As previously described, the EMS setting is high risk and high reward for patients and providers. Staff at the JHF acknowledged the presence of risks in the EMS setting, including a great deal of uncertainty, stress, and other threats to patient and provider safety. Staff recognized the rewards, including the safe delivery of the critically ill or injured patient. The JHF EMS Safety/Quality Champions Fellowship program was born through a series of meetings between JHF and EMS leaders in Pittsburgh, Pennsylvania. The Pittsburgh area is home to more than 50 individual EMS companies, a leading authority in EMS education and training – the Center for Emergency Medicine (CEM), and the University of Pittsburgh's School of Medicine Department of Emergency Medicine – a national leader in research on safety in the EMS environment. The program fellowship was created after leaders from EMS and JHF recognized a lack of any known program for training EMS leaders and clinicians and equipping these leaders with tools and resources for improving safety and quality of care. Leaders agreed the program's creation was needed given the scope of EMS in the U.S. and its impact on 36 million patients annually.¹

The curriculum for the JHF EMS Champions Fellowship includes training fellows in Perfecting Patient CareSM (PPC); a course developed by the JHF for process improvement in healthcare. Program parameters were inspired by the work of Edwards Deming, an American engineer and mathematician recognized for improving manufacturing in Japan following World War II. Deming's principles were applied to the Toyota Production System and later to the popular Lean methodology.³⁴ The JHF EMS Champions Fellowship

includes seminars that highlight principles adapted from Lean, including entrusting frontline personnel to solve problems, improve quality, reduce costs, and create a culture of support.

Fellowship staff felt the PPC method was ideal for EMS fellows because it would assist trainees in addressing problems prevalent in high-risk settings where systems of care are not well defined, lack standardization, are potentially rife with work-arounds and deviations from protocol, and experience high employee turnover. Key characteristics of the PPC method implemented in the fellowship include short training and education sessions on how to define, identify, and apply techniques in the following:

- Problem identification
- Rapid root cause analysis
- Organized work areas
- Concise communication
- Active involvement of managers to observe the work being performed
- Respect for employees through ensuring they have what they need when they need it in order to succeed
- Teamwork

The PPC method emphasizes identification and elimination of errors, inefficiency, and waste in complex systems through process improvement and standardization. Instructors emphasize that all processes must consider the needs, wants, and safety of the customer (i.e. the patient). The EMS frontline clinicians are encouraged to work in clinical teams, apply problem solving, and aim to engage co-workers in quality improvement research and process improvement at the front line. Further, the PPC method and instruction places great importance on sharing discoveries with colleagues and gaining buy-in from organizational leadership to take responsibility for supporting these efforts for the long-term.

The EMS fellows received PPC training via a unique and dynamic online resource known as Tomorrow's HealthCare™ (THC). The resource provides online education and training, a document warehouse/library, and a forum for sharing experiences and stories. The THC resource provided flexibility for trainees who were often too busy to attend multiple face-to-face meetings during the fellowship. Each fellow was provided access to THC, which allowed for drawing “process maps” and annotating the maps with known or suspected threats to safety or quality outcomes. Fellows were instructed via telephone, online chats, message boards, and in face-to-face meetings to apply these process maps. Here, apply refers to instructing fellows to be meticulous in their approach to addressing the safety issues. Specifically, fellows were instructed to use their process maps as an aid in 1) affirming the existing practices and activities outlined in process maps that may inhibit or threaten safety, and 2) aid in identification of potential solutions. The key benefit of THC was enabling fellows to lead development of improvement programs tailored to threats and rewards unique to the fellow's organization.

Using tools learned from PPC training, fellows proposed a variety of projects on which they subsequently worked on in teams (Table 1). Fellows were instructed to focus their projects on a fellow-identified problem from within their organization that compromised the safety or quality of patient care or worker health and safety. Fellows began by developing process maps with annotation including known or suspected threats to creating a safe environment for patients and providers. Program leaders instructed fellows to use these process maps as a guide for their work and method/tool for evaluating progress. The projects chosen by fellows varied and addressed both patient and provider safety. See Figure 1 for a sample process maps developed by fellows as initial steps for addressing safety within their respective organizations. The map highlights the mental step-by-step processes and thinking of fellows while problem solving.

Lessons Learned

The overarching goal of the JHF EMS Champs Fellowship program was to educate, train, and foster a cadre of safety-conscious EMS professionals. The fellowship's leadership felt training frontline EMS professionals was ideal and may provide the desired impact in EMS agencies: improving safety culture. This approach was not without its challenges.

First, officials met numerous challenges with training fellows in PPC using the THC online resource. Overall use of the online THC resource was limited which was attributed to the THC resource being in its infancy. Even though the tool was new, the JHF EMS Champs maximized opportunities to populate the EMS Community with appropriate wide-ranging EMS safety and quality content. This content survives the fellowship and will benefit a larger audience of EMS providers moving forward. The program may be improved with further testing and adjustment following an evaluation of its use in other cohorts.

Second, fellows met several challenges while attempting to identify and define problems germane to safety within their organizations. In most cases, fellows were attempting to address a problem that was considered “too big and too complicated.” These improvement opportunities are often referred to as “world peace” problems. For example, two fellows sought to improve teamwork organization-wide. Fellows were frustrated with a lack of research conducted in EMS on the topic of teamwork. They were disappointed with the absence of a prescription, lessons learned, or best practices for improving teamwork for EMS clinicians within EMS organizations. Fellows perceived this lack of research specific to EMS as a barrier to moving forward. Solutions for these fellows were identified through multiple sessions with coaches and fellowship officials. Coaches instructed the fellows to “take a step back” and recognize that their frustration was part of the learning process. Fellows and coaches worked together to identify a feasible solution that could be accomplished during the one-year fellowship program. Coaches emphasized a key goal of the fellowship was to instill and support the fellows’ motivation to make improvements and become actors of change within their organizations.

Despite these challenges, the fellows praised the face-to-face interactions described above as helpful towards reinforcing key concepts and as beneficial for clarifying next steps. Fellows indicated a desire to have more face-to-face meetings, but recognized the time constraints by all as a limiting factor.

Conclusions

Prior to the EMS Champs program, the RAND corporation provided a third-party evaluation of the JHF Champions program and PPC training and concluded that fellows trained as JHF Champions achieved a higher level of quality improvement success than non-trained individuals in similar positions. Their evaluation was funded by the Robert Wood Johnson Foundation and included structured interviews with PPC fellows from 30 organizations. RAND investigators used a standardized process to code respondent interview data and quantified dosage of participant PPC training and organizational progress post fellowship. Findings showed variation in training opportunities with some fellows receiving additional training and coaching post fellowship from within their respective organizations. Organizations with multiple fellows experienced a greater number of projects initiated and completed than organizations with fewer fellow trainees. Qualitative findings from interviewed fellows highlight trainees crediting their fellowship with providing them a framework for developing, testing, implementing, and completing quality and safety programs. The RAND study concluded that training alone did not equip a fellow with the expertise needed to lead and complete an organizational quality and safety program. Training combined with coaching assisted fellows in overcoming obstacles and acquiring the skills, knowledge, and introductory level of expertise needed to support fellow-driven pursuits of improving quality and safety. A future evaluation focused on the EMS Champs program is needed to determine if similar successes are achievable in this unique population of healthcare workers.

The JHF Champions program is not the first to train clinicians and non-clinicians to be leaders and advocates of safety and quality in healthcare organizations. Since 2002, the Health Research Education Trust (HRET) has supported training and education of new leaders in safety and quality. The HRET Patient Safety Leadership Program is supported by numerous safety-focused organizations, including the National Patient Safety Foundation. The Emergency Medicine Patient Safety Foundation (EMPSF) is but one foundation that provides financial support for emergency medicine clinicians to attend the HRET program and become leaders in safety.

Like the HRET program, the JHF Champions program aims to improve the delivery of health care to be safer and of higher quality through training and education of healthcare's next generation of leaders. The JHF Champions program is unique in that it is the first to provide targeted support and training to a cohort of EMS clinicians. The JHF EMS Champs Fellowship program may serve as a model for other foundations across the U.S. that seek to improve the quality and safety of prehospital EMS care.

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Conflicts of Interest:

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REFERENCES

1. FICEMS, NHTSA, NASEMSO. National EMS Assessment. Funded by the National Highway Traffic Safety Administration; Washington, DC: 2011.
2. Pitts SR, Niska RW, Xu J, Burt CW. National Hospital Ambulatory Medical Care Survey: 2006 emergency department summary. *Natl Health Stat Report*. 2008; 6(7):1–38. [PubMed: 18839799]
3. Patterson PD, Weaver MD, Abebe K, et al. Identification of adverse events in ground transport Emergency Medical Services. *Am J Med Qual*. 2011; 00(00):000–000.
4. Katz SH, Falk JL. Misplaced endotracheal tubes by paramedics in an urban emergency medical services system. *Ann Emerg Med*. 2001; 37(1):32–37. [PubMed: 11145768]
5. Dunford JV, Davis DP, Ochs M, Doney M, Hoyt DB. Incidence of transient hypoxia and pulse rate reactivity during paramedic rapid sequence intubation. *Ann Emerg Med*. 2003; 42(6):721–728. [PubMed: 14634593]
6. Wang HE, Lave JR, Sirio CA, Yealy DM. Paramedic intubation errors: isolated events or symptoms of larger problems? *Health Aff (Millwood)*. Mar-Apr;2006 25(2):501–509. [PubMed: 16522604]
7. Rittenberger JC, Beck PW, Paris PM. Errors of omission in the treatment of prehospital chest pain patients. *Prehosp Emerg Care*. 2005; 9(1):2–7. [PubMed: 16036820]
8. Vilke GM, Tornabene SV, Stepanski B, et al. Paramedic self-reported medication errors. *Prehosp Emerg Care*. 2007; 11(1):80–84. [PubMed: 17169883]
9. Wang HE, Weaver MD, Abo BN, Kaliappan R, Fairbanks RJ. Ambulance stretcher adverse events. *Qual Saf Health Care*. 2009; 18(3):213–216. [PubMed: 19468005]
10. Wang HE, Simeone SJ, Weaver MD, Callaway CW. Interruptions in cardiopulmonary resuscitation from paramedic endotracheal intubations. *Ann Emerg Med*. 2009; 54(5):645–652. [PubMed: 19573949]
11. Maguire BJ, Hunting KL, Smith GS, Levick NR. Occupational fatalities in emergency medical services: a hidden crisis. *Ann Emerg Med*. 2002; 40(6):625–632. [PubMed: 12447340]
12. Reichard AA, Jackson LL. Occupational injuries among emergency responders. *Am J Ind Med*. 2010; 53(1):1–11. [PubMed: 19894221]
13. Boal WL, Leiss JK, Ratcliffe JM, et al. The national study to prevent blood exposure in paramedics: rates of exposure to blood. *Int Arch Occup Environ Health*. 2010; 83(2):191–199. [PubMed: 19437031]
14. Boal WL, Hales T, Ross CS. Blood-borne pathogens among firefighters and emergency medical technicians. *Prehosp Emerg Care*. 2005; 9(2):236–237. [PubMed: 16036853]
15. Grange JT, Corbett SW. Violence against emergency medical services personnel. *Prehosp Emerg Care*. 2002; 6(2):186–190. [PubMed: 11962565]
16. Corbett SW, Grange JT, Thomas TL. Exposure of prehospital care providers to violence. *Prehosp Emerg Care*. 1998; 2(2):127–131. [PubMed: 9709332]
17. Wheelan SA, Burchill CN, Tilin F. The link between teamwork and patients' outcomes in intensive care units. *Am J Crit Care*. 2003; 12(6):8.
18. Williams AL, Lasky RE, Dannemiller JL, Andrei AM, Thomas EJ. Teamwork behaviors and errors during neonatal resuscitation. *Qual Saf Health Care*. 2010; 19(1):60–64. [PubMed: 20172885]
19. Morey JC, Simon R, Jay GD, et al. Error reduction and performance improvement in the emergency department through formal teamwork training: evaluation results of the MedTeams project. *Health Serv Res*. 2002; 37(6):1553–1581. [PubMed: 12546286]
20. Thomas EJ, Williams AL, Reichman EF, Lasky RE, Crandell S, Taggart WR. Team training in neonatal resuscitation program for interns: teamwork and quality of resuscitations. *Pediatrics*. 2010
21. Brown WE, Margolis G, Levine R. Peer evaluation of the professional behaviors of emergency medical technicians. *Prehosp Disaster Med*. 2005; 20(2):107–114. [PubMed: 15898490]
22. Patterson PD, Arnold RM, Abebe K, et al. Variation in Emergency Medical Technician partner familiarity. *Health Serv Res*. 2011; 46(4):1319–1331. [PubMed: 21306367]
23. Huckman RS, Staats BR, Upton DM. Team familiarity, role experience, and performance: Evidence from Indian software services. *Manage Sci*. 2009; 55(1):85–100.

24. Harrison DA, Mohammed S, McGrath JE, Florey AT, Vanderstoep SW. Time matters in team performance: effects of member familiarity, entrainment, and task discontinuity on speed and quality. *Personnel Psychology*. 2003; 56(3):633–669.
25. Studnek JR, Fernandez AR, Margolis G, O'Conner RE. Physician medical oversight in emergency medical services: where are we? *Prehosp Emerg Care*. 2009; 13(1):53–58. [PubMed: 19145525]
26. Slifkin RT, Freeman VA, Patterson PD. Designated medical directors for emergency medical services: recruitment and roles. *J Rural Health*. 2009; 25(4):392–398. [PubMed: 19780921]
27. Patterson PD, Weaver MD, Frank R, et al. Association between sleep, fatigue, and safety outcomes in Emergency Medical Services providers. *Prehosp Emerg Care*. 2012; 16(1):86–97. [PubMed: 22023164]
28. Patterson PD, Suffoletto BP, Kupas DF, Weaver MD, Hostler D. Sleep quality and fatigue among prehospital providers. *Prehosp Emerg Care*. 2010; 14(2):187–193. [PubMed: 20199233]
29. Ray AM, Kupas DF. Comparison of rural and urban ambulance crashes in pennsylvania. *Prehosp Emerg Care*. 2007; 11(4):416–420. [PubMed: 17907026]
30. Halligan M, Zecevic A. Safety culture in healthcare: a review of concepts, dimensions, measures and progress. *BMJ Qual Saf*. 2011; 20(4):338–343.
31. Weaver MD, Wang HE, Fairbanks RJ, Patterson PD. Association between EMS workplace safety culture and safety outcomes. *Prehosp Emerg Care*. 2012; 16(1):43–52. [PubMed: 21950463]
32. Patterson PD, Huang DT, Fairbanks RJ, Wang HE. The emergency medical services safety attitudes questionnaire. *Am J Med Qual*. 2010; 25(2):109–115. [PubMed: 20133519]
33. Patterson PD, Huang DT, Fairbanks RJ, Simeone SJ, Weaver MD, Wang HE. Variation in emergency medical services workplace safety culture. *Prehosp Emerg Care*. 2010; 14(4):448–460. [PubMed: 20809688]
34. Womack, JP.; Jones, DT. *Lean Thinking: Banish Waste and Create Wealth in Your Corporation*. 2nd ed. Simon & Schuster, Inc.; 2003.

Title of Fellow's Project: Health and Wellness and How it Relates to Safety

This figure illustrates a process map of the fellow-identified problem that threatens safety and quality. The fellow illustrates the problem of patient lifting and moving without adequate physical fitness and sleep hygiene to prevent injury. The map was used to aid the fellow in identifying potential time-blocks for permitting crewmembers to exercise and rest.

Figure 1.
Example process map developed by fellow focused on provider safety

Table 1

Emergency Medical Services Safety Champions Projects

Title of Fellow Project	Position & Title of Fellow
Evaluation of Pre-hospital Oligoanalgesia: Why does pain go untreated?	Flight paramedic
Mass Casualty Incident Command Kits: A Regional Approach	Paramedic & ground-based EMS agency director
Redirecting Those Frequent Flyers	Two Fellows: 1: Paramedic & EMS agency crew chief 2: Paramedic & EMS student educator
2011 Flu Vaccination Campaign	Flight paramedic and station crew chief
EMS Patient Contacts and Refusals: Why do so many not get transported to the hospital?	State regional EMS educator
Airway Safety: The Checklist	Paramedic
Using Aviation Safety Strategies to Increase Patient Safety in the Pre-hospital Setting	Nurse, flight paramedic crew chief and station quality assurance officer
Improving EMS Equipment Readiness	Paramedic educator and EMS agency liaison for hospital
Physiological Based Airway Management for Cardiac Arrest	Crew chief and paramedic
Improving the Handoff Process between EMS and Emergency Department Staff	Paramedic & hospital-based EMS liaison
A Data Analysis Tool for EMS Quality Improvement	Paramedic & hospital-based EMS liaison
Improving Pre-hospital Care of the STEMI Patient through Improved 12 Lead Usage and Transmission	Paramedic & hospital-based EMS liaison
Developing a Culture of Safety Curriculum for Paramedic Students	Paramedic & EMS educator program official
Driving Safety in EMS	Hospital-based EMS liaison for air-medical system
EMS and Disaster Preparedness: The Israeli Model	EMS trained emergency physician
Health and Wellness and How it Relates to Safety	Flight paramedic