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EDITORIAL

# A RESOURCE FOR PARAMEDICINE LEADERS

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The National EMS Management Association (NEMSMA) is proud to launch the *International Journal of Paramedicine (IJOP)*. This new journal is intended to be an outlet for paramedic scholarship while serving as a resource for leaders in the field of paramedicine.

Throughout the evolution of paramedicine, the United States has had a number of publications that can best be described as EMS media outlets or trade publications. This includes *JEMS*, *EMS World,* and *EMS1.com*. While we recognize the continued value of these outlets, we do not intend to compete with them.

We also recognize we are joining a distinguished list of peer-reviewed journals with focuses on quantitative clinical research: *Prehospital and Disaster Medicine,* the *Air Medical Journal,* and our most widely recognized journal, *Prehospital Emergency Care*. Likewise, our international colleagues have developed journals dedicated to paramedicine including the *Australasian Journal of Paramedicine*, the *British Paramedic Journal,* and the *Irish Journal of Paramedicine.*

To determine the aim and scope of this journal, we studied a variety of peer-reviewed scholarly publications that focus on diverse content in addition to quantitative research: *Harvard Business Review* for business administration; *Proceedings,* the U.S. Naval Institute publication concerning military leadership and doctrine; and *Health Affairs* for policy development and analysis.

Understanding the existence of this robust and diverse set of EMS publications, our goal is to fulfill a different niche. *IJOP* will neither focus on industry news nor be limited to publication of research. We intend to provide thoughtful, well-researched information that is useful to the paramedic leader. We will be a credible source of information that publishes scientific

research and other types of academically oriented papers. We further anticipate content on many areas of our practice, including but not limited to clinical care, process improvement, quality, safety, finance, legal issues, organization, system design, human resources, education, government relations and the culture of paramedicine. We want to present the high-quality work of our peers to build a broader base of scholarship for the current and future generations who will lead our field.

Building a new journal is no small task and NEMSMA is grateful to the large team of volunteers from across our profession who have stepped up to help us manage the many facets of this new endeavor. While our team is made up of many familiar names who have made substantial contributions to the advancement of Emergency Medical Services over their careers, we also look forward to welcoming a new generation of contributors who will help lead us for years to come through scholarship and diversity.

The *IJOP* will leverage the latest technologies in online publication. Our editorial team and reviewers are be located around the world. Our ability to accept, review, and publish articles will be continuous, and access to our publication will exist across a variety of platforms. Making this possible will be a large team of academics, working professionals, and distinguished retirees dedicating their time and talent to this important work. We are grateful to our diverse team of editors and reviewers who will bring international expertise from across our field. As with many projects begun during the worldwide COVID-19 pandemic, this project has been challenging and our reviewers and editors have yet to come together in person. Despite this challenge, I have no doubt our team will continue to refine the vision for this journal and help us accomplish great things.

Finally, we want to emphasize that a key objective of *IJOP* will be to serve as an outlet for paramedic-led scholarship. Historically in the United States, scholarship, and to a large extent clinical leadership, has been the domain of our physician colleagues. We are grateful to the many committed physician scientists and academics who have brought EMS to where we are today, as we could not have come this far without them. The next appropriate step, however, is for paramedics themselves to build and advance their own profession. What this requires is paramedic scholars, a community that we must develop through the proliferation of undergraduate and graduate programs in paramedicine and related fields. NEMSMA has been a strong and sometimes outspoken proponent of this important evolution. We hope our field of paramedicine will follow the fields of medicine and nursing, both of which have created robust models for this professional development.

While we do intend to prioritize the contributions of paramedics, we will also welcome contributions from other professionals across all medical disciplines. We also encourage contributions that focus on the inter-disciplinary collaboration needed to better serve our patients and our communities.

Thank you for joining us on the *IJOP* journey. Please reach out if you are interested in being part of the *IJOP* team, and do not hesitate to let us know how we are doing as the journal evolves.

International Journal of Paramedicine

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EDITORIAL

# A NEW PEER-REVIEWED ACADEMIC JOURNAL FOR PARAMEDICINE

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The peer-reviewed academic journal is the quintessential venue where professions build and develop their foundations and push their knowledge forward. The *International Journal of Paramedicine (IJOP)* is a new peer-reviewed journal for the rapidly evolving art and science of paramedicine. Emergency medical services (EMS), particularly those designed using the Anglo-American model (1) were originally conceived to meet the needs of those requesting out-of-hospital emergency care and transportation. Of the many changes experienced by the profession, it has become apparent that service delivery and the needs of the public are far more complex and broader than EMS systems were originally designed to deliver. Traditional EMS, now broadly described as paramedicine (2), has evolved in its conceptualization, delivery, models of governance, scope of practice, and provider needs.(3) Inherent in these growing complexities is a need to think broadly and in new ways about the discipline.

Paramedicine needs a common place to engage in scholarly and professional discourse for knowledge growth, evidence informed decision making, and progress in areas reaching far beyond just clinical research. Developments in paramedicine related regulations, funding, and scope of practice, coupled with the growing pace of research and improvement science in paramedicine, make it critically important to have an appropriate academic venue to share and synthesize evidence, provide insights, advance conceptual arguments, consider the implications of knowledge production, and discuss implementation. *IJOP* aims to meet these needs by addressing a broad range of infrequently covered topics such as public health and epidemiology;

social determinants of health; social equity and bias; mental and behavioral health; culture of safety and human factors science; quality improvement; integrated care; healthcare business and finance; leadership and management; and evidence-based practice; as well as other topics of study germane to paramedicine – including clinical care.

To that end, the National EMS Management Association (USA) (NEMSMA) has supported creation of the *IJOP*. NEMSMA is "a professional association of EMS leaders dedicated to the discovery, development, and promotion of excellence in leadership and management in EMS systems, regardless of EMS system model, organizational structure or agency affiliation."(4)

Reaching beyond the United States, a cadre of well over one hundred thirty volunteer paramedicine professionals from across the world have come together to provide structure, governance, strategic direction, peer-review and collaboration to support this vision for a high-quality journal for scholarly and professional discourse.

IJOP is differentiated from other related academic journals in the emergency care domain. It will be placing an emphasis on providing authors (and our readers) with a venue for a wide variety content and submission types. In recognizing the complex nature of paramedicine and the need for innovative approaches to knowledge production, all forms of research methodologies and theoretical frameworks are welcomed. Other forms of scholarly contributions such as performance improvement project reports, performance measure specifications, concept papers, tools and techniques, and detailed benchmarking studies are also encouraged.

We want to create more opportunities for professional dialogue that rigorously examines and challenges our thinking and strengthens the science on which the profession evolves. To accomplish this, we will update the traditional model of 'letters to the editor' to include invited commentary along with curated content taken from social media. This will help us complement the input of academics with that of front line clinicians, supervisors, managers, leaders, and educators as well as the support staff, administrators, medical directors, regulators, politicians, payers, and patients in these conversations.

NEMSMA is a longtime collaborator with National Association of EMS Physicians in support of *Prehospital Emergency Care (PEC)*. In continuation of that relationship, *IJOP* and *PEC* have established a collaborative relationship that will the facilitate the exchange of submissions in collaboration with the authors.

We appreciate the opportunity and support of NEMSMA and PCC leadership as well as all our paramedicine colleagues that have joined us in getting *IJOP* underway. We're all looking forward to the journey ahead.

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International Journal of Paramedicine

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REVIEW

# SIMULATION-BASED TRAINING AND ITS USE AMONGST PRACTICING PARAMEDICS AND EMERGENCY MEDICAL TECHNICIANS: AN EVIDENCE-BASED SYSTEMATIC REVIEW

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## ABSTRACT

***Objectives***: This systematic review (SR) describes how simulation-based training (SBT) is utilized by paramedics and emergency medical technicians (EMTs).
***Review methods:*** Data sources: PubMed, CINAHL, Cochrane CENTRAL, Scopus, Web of Science, and Google Scholar were searched from 2010 to 2021. Standard SR methodology was utilized according to PRISMA guidelines. Eligibility criteria included English studies conducted in the United States, or Canada published between 2010 and 2021. Study designs were heterogeneous and had quantitative, qualitative, and mixed-methods projects. The specific populations included paramedics and EMTs.
***Results***: 595 articles were initially identified and reviewed, 25 of which met our inclusion criteria. The most common SBT areas of focus documented in the literature were general assessment and treatment (7 studies) and airway management (7 studies). Most of the studies were conducted in a mobile simulation lab (6 studies), simulation centers (5 studies), and ambulances (5 studies). Many studies report simulations involving manikins alone and a combination of manikins and simulated patients. Overall, 21 studies documented the use of high-fidelity simulation. Sixteen studies involved paramedics only, 8 involved both paramedics and EMTs, and one study involved only EMTs. Most of the impact of SBT appeared to be on objective measures such as performance, procedural success, and ability to identify errors, as well as subjective metrics such as perceived improvement in knowledge and skill. The degree of sustained impact of SBT on skill retention was not frequently reported, and direct enhancement in patient outcomes such as length-of-stay or mortality was not documented in any of the studies.
***Conclusions***: Paramedics and EMTs provide critically important, often lifesaving, prehospital care. However, the opportunities to enhance their skills are limited by several factors, most notably their undergraduate and certificate educational requirements, which are much shorter than many other allied health professions. Hence, paramedics and EMTs appear to rely on SBT more than many other clinical disciplines in allied health. Despite the widespread usage in these two professions, there are still knowledge gaps related to SBT usage patterns and the impact on their practice.

## INTRODUCTION

Paramedics and emergency medical technicians (EMTs) are an essential part of Emergency Medical Services (EMS) and the

overall health care field. These two health care professions are critical components of prehospital care provided to patients. They are trained to provide basic life support (BLS) and advanced life support (ALS), which involves complex knowledge and skills that enable them to provide patient care and transportation. Their primary responsibility is to provide care for critical and emergent patients in all types of situations. At times, their practice entails providing high-acuity but low-frequency interventions. Therefore, the acquisition and retention of these potentially lifesaving procedures may be limited. "Postevent analyses suggest recurring failures that even very senior emergency responders commit despite years of experience and high levels of traditional training."(1) To deliver effective care, a paramedic or EMT must be able to rapidly but correctly assess the patient and determine which critical interventions are appropriate, all while handling a stressful and, at times, hazardous environment.(2) Errors that are made in prehospital care have potentially significant medical consequences.

The current didactic training opportunities for practicing and enhancing skills are offered through lectures, journals, tabletop exercises, and web-based training programs. However, often, book knowledge does not translate into practical competency. This concept was delineated by Edgar Dale in 1969, who created a model called Dale's "Cone of Experience." Fundamentally, Dale explains that learners retain more knowledge and information by doing instead of simply hearing, reading, and observing.(3) Although methods of hearing, reading, and observing are valuable, they may not be valuable on their own. Engagement in simulation allows participants to get in a psychological mindset that is as realistic as possible, so it is as if they are treating an actual patient in a life-like scenario, depending on the level of fidelity chosen by those instructing. Simulation-based training (SBT) uses resources to teach new skills, communication, and leadership, while also providing a methodology to maintain skills.

According to Bredmose, Habig(2), simulation exercises are essential to test response plans on local and national levels. Thus, the effectiveness of first responders, such as paramedics and EMTs, can be evaluated. Task trainers, manikins, and role-playing are all modalities of simulation used in the prehospital environment by EMS personnel to train for large-scale emergencies. Simulations are entirely scenario-dependent and may focus on an individual skill or multiple skills to develop critical thinking abilities to drive competent assessments and treatment processes. Paramedics and EMTs can utilize these simulation modalities to improve the ability to provide physical exams, assess airway ventilatory status, manage airways, provide ventilation, access vasculature, administer medications, and ultimately assess and treat their patients effectively.

Some accrediting agencies endorse the need for emergency response simulation. "Local ordinances, state and federal regulations may address the frequency and level of simulations that are required to evaluate emergency response plans."(2) It is noteworthy that the Committee on Accreditation of Educational Programs for the Emergency Medical Services Professions (CoAEMSP) has recently amended its standards to find alternative pathways to education due to Coronavirus disease 19 (COVID-19). As of recently, the CoAEMSP permits "the use of alternative evaluation methods to include scenarios, case studies, and simulation as well as the adjustment of minimum competencies to satisfy the requirements of these standards for paramedic educational programs."(4) COVID-19

has necessitated educational programs to embrace new educational approaches such as simulation to determine competency in areas such as didactic and clinical experience. It is evident that in the pre-and post-COVID-19 worlds, SBT will be an important element in helping ensure the clinical competency of allied health professionals, including paramedics and EMTs. The amendment by the CoAEMSP reinforces the need for simulation in training professionals. This systematic review (SR) aimed to examine the literature on SBT in the allied health professions (AHPs) of paramedics and EMTs, including usage trends and their potential impact on these professions and the patients they serve.

## MATERIALS AND METHODS

### Protocol

The review was conducted and reported following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 statement.(5) This study is registered with Research Registry, and the unique identifying number is researchregistry1296.(6)

### Eligibility Criteria

The authors selected the studies based on the predefined inclusion criteria: 1) studies conducted in the United States or Canada, 2) in the English language, 3) heterogeneous studies, 4) quantitative, qualitative, and/or mixed-methods projects; 5) study populations focusing on paramedics and EMTs, and 6) publication time from 2010 to 2021.

### Databases and Search Strategy

Databases searched for the project included PubMed, Cumulative Index to Nursing and Allied Health Literature (CINAHL), Cochrane Library, Scopus, and Web of Science, covering publication dates from 2010 – August 2021 when the literature searches were performed. Google Scholar was also searched to capture any gray literature such as doctoral dissertations not indexed on synthesized databases such as PubMed. Considering the search algorithm and ranking mechanism in Google Scholar are usually not transparent, and the search results are generally broad and large, the authors chose to select only the first 60 references, which tend to be more relevant. The search terms for the population concept are allied health personnel, emergency medical technicians, EMTs, and paramedics; the terms for the intervention category include simulation training, simulation-based training, SBT, interactive learning, and patient simulation; the terms for the outcomes are patient care, clinical competence, clinical skills, quality of health care, efficiency of care, hospital length of stay, patient safety, and patient satisfaction. Based on these major terms and examination of the test search results, the final search strategy used for PubMed is as follows:

> ("Allied Health Personnel"[Majr] OR "allied health personnel"[tiab] OR "Emergency Medical Technicians"[Mesh] OR "emergency medical technician"[tiab] OR "emergency medical technicians"[tiab] OR EMT [tiab] OR EMTs[tiab] OR Paramedic [tiab] OR Paramedics [tiab]) AND ("Simulation Training"[Mesh] OR

"Simulation training"[tiab] OR "Simulation-Based Training"[tiab] OR "SBT"[-tiab] OR "interactive learning"[tiab] OR "patient simulation"[tiab]) AND ("Patient Care"[Mesh] OR "patient care"[tiab] OR "Clinical Competence"[Mesh] OR "clinical competence"[tiab] OR "clinical skill"[tiab] OR "clinical skills"[tiab] OR "Quality of Health Care"[Mesh] OR "quality of health care"[tiab] OR "efficiency of care"[tiab] OR "Length of Stay"[Mesh] OR "hospital length of stay"[tiab] OR "Patient Safety"[Mesh] OR "patient safety"[tiab] OR "Patient Satisfaction"[Mesh] OR "Patient Satisfaction"[tiab])

### Study Selection

In total, 595 records were retrieved from the five databases and Google Scholar. All the references were exported into EndNote 20 for citation management and removing 204 duplicate references (n=204). Manual deduplication was also applied to ensure there were no duplicate records. The remaining 391 references were screened at the title and abstract level by two reviewers. 42 studies were evaluated at the full-text level. As a result, 22 articles were selected after full-text evaluation. Three additional references were included from a later updated search. In total, there were 25 articles included in the final set of selected studies for data extraction and analysis. The flowchart (Figure 1) below indicates the process of study selection.

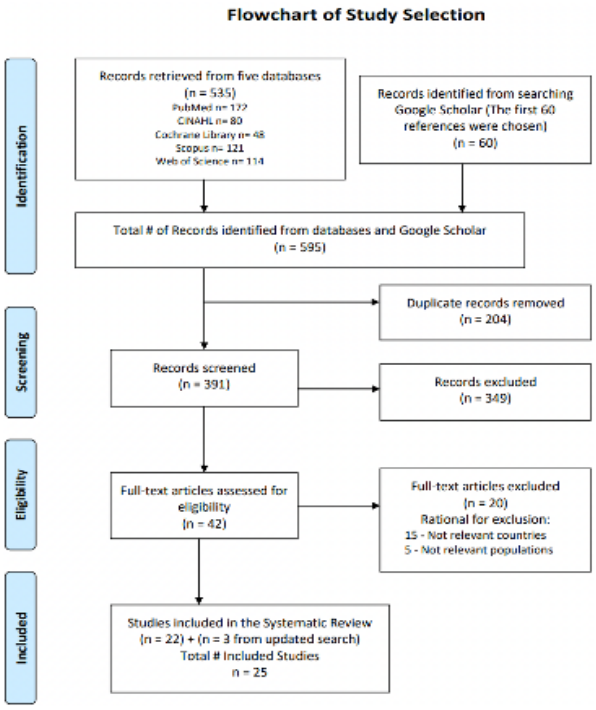


***Figure 1*** – Flow Diagram of the Searches, Screening, and Inclusion Process

### *Data Extraction Process*

Specific data was searched for and extracted from each article using Microsoft Excel and Word tables. The following information was extracted from all selected articles and documented in Table 1: author(s), publication date, study purpose, study population, study design, study intervention, skill assessed, study setting, primary results, and Cochrane risk of bias (RoB). The SBT area of focus is the primary activity or management being investigated in the articles selected. The study setting is defined as the environment where the simulation activity took place. All the information was extracted by one author and verified by at least one other author. Discrepancies were resolved by a consensus between the two authors. For article assessment and data extraction, specific terms were created, utilized, and defined. These terms included: subjective outcome (e.g., participant perception), objective outcome (e.g., clinical outcome), equipment (e.g., manikin or standardized patient), level of fidelity (e.g., high or low), study setting (e.g., simulation center or mobile simulation lab), recording tool (e.g., audio/visual), pre and post orientation or assessment, and SBT area of focus (e.g., airway management or general

management). Equipment, level of fidelity, study/practice setting, recording tool, pre/post orientation/assessment, and SBT area of focus were assessed and extracted from each article by all three authors. Discrepancies were resolved by consensus between all authors. Extraction of subjective and objective outcomes was determined by two authors, and discrepancies were resolved by consensus between all authors. The data that support the findings of this study are available from the corresponding author, JB, upon reasonable request. Per the PRISMA framework, a Risk of Bias (RoB) assessment for each study included was guided using the Cochrane RoB assessment tool. It is structured into several domains of bias, focusing on different parts of each study.

## RESULTS

The initial database search yielded 391 articles after removing duplicates and before the title and abstract screening. We were left with 42 articles for a full-text screen according to the eligibility criteria. A comprehensive review of all articles was completed by two

***Table 1 – Characteristics of included studies (n=25)***

SBT=Simulation-based training, HF=High-fidelity, LF=Low fidelity, MSL=Mobile simulation laboratory, MSU=Mobile simulation unit, SC=Simulation center, SE=Simulated environment, PH=Prehospital, ED=Emergency department, PediSTEPPs= Pediatric Simulation Training for Emergency Prehospital Providers, Lung Ultrasound (LUS) FD=Fire department, ICU=Intensive care unit, Risk of bias=RoB, *=Study completed in Canada, **=Cochrane tool was used to guide judgment.

| Author/ Date | Study Purpose | Study Population | Study Design | Study Interventions | Skill Assessed | Study Setting | Primary Results | Risk of Bias (RoB) Cochrane Tool** |
|---|---|---|---|---|---|---|---|---|
| Alphonso et al. [7] | Develop and validate a checklist to evaluate clinical performance when caring for a physically abused infant in simulation | N=28 Paramedic, EMT | Qualitative study | Development of a performance checklist to evaluate provider screening behaviors and validate checklist | General Assess and Treat | SE | - Simulation helped create a checklist to identify child abuse with strong content validity and substantial interrater reliability; - Checklist is important for training, continuing education, and research | Unclear; Delphi method used, and consensus of content experts was employed |
| Asselin et al. [8] | Examine subject exertion and effort through 1) physical and biochemical measures 2) self-reports of perceived workload during out-of-hospital cardiac arrest resuscitation | N=40 Paramedic, EMT | Randomized nonblinded, controlled, experimental study | 3 simulations: baseline simulation standard roles, repeat simulation standard roles, repeat simulation reverse roles | Resuscitation | SC | - Use of automating device appeared to reduce levels of physical exertion, and perceived workload in providers supplemented with just-in-time didactic, goal-directed algorithmic protocol, and resuscitation-assistive equipment | Unclear; Though the study was randomized and controlled, the study does not appear to have been blinded |
| Ayub et al. [9] | Identify attitudes, beliefs, and perceived barriers to providing patient and family-centered care (PFCC) and describe solutions to improve PFCC | N=122 Paramedic, EMT | Qualitative, Cross-sectional study | Study participants in the PediSTEPPS course | Other/Care Planning | PH | - Barriers to PFCC: limited manpower, multi-tasking medical care, and concern for interference with patient care; - Emotional support and effective communication are important to delivering PFCC | Unclear; Does not describe if participants were randomly selected |
| Bischof et al. [10] | Develop and validate a PH airway simulator and MSL that mimics care in an ambulance | N=18 Paramedic | Mixed-methods | Perform Endotracheal Tube Insertion (ETI) | Airway management | MSL | - MSL created a reproducible, HF learning environment; - MSL may allow trainers to test and identify knowledge deficits, derive future educational interventions, and standardize skill assessment | Unclear; Single site and participant selection process not described |

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| Byars et al. [11] | Determine if paramedics can be trained to use an alternative airway device and evaluate their skill retention | N=40Paramedic | Prospective observational, single-group, descriptive cohort, educational trial | Paramedics were trained to use the Intubating Laryngeal Mask Airway (I-LMA) in simulation and had repeat testing one year out | Airway Management | PH | - Paramedics were able to deploy the I-LMA with high rate of success with a high rate of skill retention one year out | High RoB; Non-experimental, single site, and participant selection method unclear |
| Choi et al. [12] | Studied an experimental automation-assisted, goal-directed Out of Hospital Cardiac Arrest management protocol on resuscitation performance | N=40 Paramedic, EMT-B, EMT-I, EMT-C | Randomized control experiment, non-blinded | 3 simulations: baseline simulation standard roles, repeat simulation standard roles, repeat simulation reverse roles | Resuscitation | Outpatient clinic | - Compared with traditionally trained EMS providers using standard equipment and protocols, EMS teams using the experimental algorithm and devices performed better pulmonary ventilation and medication administration | Unclear; Though the project is randomized and controlled, it was not blinded, and the participant selection method is unclear |
| Gable et al. [13] | Determine if a 3-hour educational course with simulation improves knowledge and confidence and examine experience with bariatric transport affected training outcomes | N=36 Paramedic | Mixed-methods | Participate in 1 of 2 simulations. Treat emergent traumatic and/or medical conditions, as well as extricate and transport bariatric patients | General Assess and Treat | FD | Simulation-based curriculum is an effective method of education; - Significant increase in knowledge and confidence with a 3-hour training session with simulation | Unclear; Study design was neither randomized, nor controlled, and was conducted at a single site |
| Hallihan et al. [14] | Evaluate safety and efficiency of an ambulance while providers delivered basic and advanced life support | N=106 Paramedic, EMT | Observational | Observe delivery of care to a simulated patient during an anaphylaxis scenario in a moving ambulance | Resuscitation | Ambulance* | Identified issues with patient compartment of the ambulance; - Safety was compromised by not wearing a seatbelt, standing with less than three points-of-contact, moving around cabling and tubing; - Efficiency of care was affected by lack of usable work surfaces, accessible storage and convenient sharps and garbage containers | Unclear; Study design was neither randomized, nor controlled and qualifications of expert evaluators unclear |
| Heiner and McArthur [15] | Examine ability to detect presence or absence of simulated fracture patterns with portable ultrasound | N=20 EMT | Observational | Simulation model with fractured turkey leg bone, evaluated with ultrasound | Imaging | PH | - Correctly detected the presence or absence of simulated long bone fractures with a high degree of sensitivity and specificity | Unclear; Study was neither randomized nor controlled, and convenience sample was used |
| Hoyle et al. [16] | Evaluate rate of medication errors before/after implementing a pediatric dosing reference (PDR) | N =65 Paramedic, EMT | Observational | 4 simulations: seizing, cardiac arrest, burn, anaphylactic shock | General Assess and Treat | MSU + SC | - After introducing PDR and training, medication errors decreased; - Incremental improvement in patient safety | Unclear; Study was neither randomized nor controlled |
| Joyce et al. [17] | Determine if simulation training was a feasible and reliable method to learn how to verify placement of endotracheal tube (ETT) using ultrasound | N=20 Critical Care Paramedic | Observational | Paramedics with no ultrasound experience volunteered for a 3-hour training session and 5 simulated case scenarios | Airway management | PH | - Ultrasound use can be effectively taught using SBT; - All paramedics "agreed" or "strongly agreed" SBT was useful; - Simulation provided realistic view of pathology during ETT placement | Unclear; Study was neither randomized nor controlled |

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| Lammers et al. [18] | Identify the most common causes of errors during simulated, pre-hospital pediatric emergency | N=90 Paramedic, EMT | Mixed-methods | Simulation of an infant with altered mental status, seizures, and respiratory arrest | Resuscitation | MSU | - Simulation valuable to discover errors and unrecognized error-producing conditions - Simulation, followed by debriefing, uncovered causes of active cognitive, procedural, affective, and teamwork errors, latent errors, and error-producing conditions | Unclear; Study was neither randomized nor controlled |
| Lammers et al. [19] | Identify causes of prehospital medication errors observed during simulated pediatric anaphylaxis | N=142 Paramedic, EMT | Mixed-methods | 20-minute simulation of a 5-year-old in respiratory distress and hypotension from anaphylaxis | Other/drug administration | MSU | - Simulation, followed by debriefing, identified multiple causes of medication errors | Unclear; Study was neither randomized nor controlled |
| Lammers et al. [20] | To compare the effectiveness of four training methods in management of pediatric emergencies for paramedics | N=147 Paramedic | Observational and Randomized | Three simulated pediatric emergencies using 1) HF, 2) LF, and 3) Lecture | Resuscitation | Classroom | - SBT of paramedics in the management of pediatric emergencies over the course of 2.5 years was associated with a significant improvement in some of the skills included in the training, as measured by performance-based assessment.; - A lecture/lab approach also produced an improvement; - No improvement was found in the group who used an online course.; - LF simulation training was more effective than HF simulation for this group of learners | Medium RoB, Study was randomized, convenience sampling was used |
| Leblanc et al. [21] | Examine acute stress responses and performance during simulated high-stress scenarios | N=22 Advanced Care Paramedic | Cross-over study | Participated in one 3-hour session that involved participating in both low stress and high stress scenarios | General Assess and Treat | Ambulance* | - Greater increases in anxiety/cortisol levels in high-stress compared to low-stress scenario; - Clinical performance and documentation are impacted due to acute stress; - Highlights importance to develop systems and training interventions | Low RoB because validated, objective measures of stress hormones used, and blinding employed |
| Maloney et al. [22] | To determine if various ambulance driving conditions (stationary, constant acceleration, serpentine, and start-stop) would impact paramedics' abilities to perform Lung Ultrasound (LUS) | N=17 Paramedic | Prospective interventional study | Received a 45-minute LUS lecture. They then performed 25 LUS exams on both SPs and using simulation software, in each case looking for lung sliding, A and B lines, and seashore or barcode signs | Imaging | Ambulance | - Paramedics can correctly acquire and interpret simulated LUS images during different ambulance driving conditions; - Simulation techniques better adapted to this unique work environment are needed | Medium RoB; block-randomized used along with small sample size |
| March et al. [23] | Determine whether ground-based paramedics can be taught and could retain skills necessary to perform wire-guided cricothyrotomy (WGC) | N=55 Paramedic | Retrospective study | Teach WGC update program with open-ended practice. Minimum of 5 successful simulations and retention assessed | Airway management | SE | During initial training 100% of paramedics were successful in performing all 16 steps of WGC; - 87.3% retained skills to perform WGC; - Paramedics can be taught and retain skills to perform simulated WGC | Unclear; Measures used in the retrospective study to minimize bias are not stated |

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|---|---|---|---|---|---|---|---|---|
| Mausz et al. [24] | Explore clinical performance in settings where "deliberate practice" and "feedback" are inconsistent or limited | N=30 Paramedic | Mixed methods | Two recorded simulation sessions involving airway management - Airway management | SC* | - Highly variable practice patterns, idiosyncratic decision paths, and schemas governed practice; - Deficiencies exist with situational awareness, decision making, and procedural skills; - Supports ongoing clinical competence | Unclear; Study was neither randomized, nor controlled and participant selection method is unclear | |
| Panchal et al. [25] | Assess comprehensive airway management practices during difficult airway simulation | N=198 Paramedic | Observational | Observation of airway management skills in active paramedics | Airway management | MSL | - 9% were prepared with backup plan and 63% successfully placed backup airway in 3 tries; - Comprehensive airway management challenged experienced paramedics; - There is a need to improve training and practice with simulations | Unclear; Study was neither randomized, controlled, nor blinded and convenience sample was used |
| Shah et al. [26] | Determine if PediSTEPPs enhances seizure protocol adherence for seizing children | N=250 Paramedic | Retrospective controlled study | Study transport of 0–18-year-old seizing patients. Management compared between EMS crews with at least one paramedic who attended PediSTEPPs and crews that had none | General Assess and Treat | FD | - Differences may exist in protocol adherence between paramedics with SBT and those without; - Odds of administering drugs was higher when PediSTEPPS trained ; - No differences in complications, ICU admission rate, or length of stay between patients exposed to trained and non-trained providers | Low RoB despite the retrospective nature, the study appears to have been controlled and objective measures of protocol adherence used |
| Smith et al. [27] | Study the cognitive strategies used by expert paramedics to understand how paramedics and the EMS system can adapt to new challenges | N=10 Paramedic | Observational | Conducted a "staged-world" cognitive task analysis to explore handling of 2 challenging simulation scenarios | General Assess and Treat | Conference | - Expert paramedics made more assessments, anchored less strongly to their initial impressions, and acted more strategically than those less experienced ; - Supports development of better exercises which facilitate the development and assessment of expertise | Unclear; Study was neither randomized, controlled, nor blinded |
| Stevens et al. [28] | Evaluate prefilled medication syringes | N=10 Paramedic | Prospective, block-randomized, crossover study | 2 simulated pediatric arrests using either prefilled, color-coded-syringes (intervention) or conventional ampoules (control) | Resuscitation | Ambulance | A novel color-coded, prefilled syringe decreased time to medication administration and significantly reduced critical dosing errors; - Implementing standardized systems may facilitate appropriate patient care and contribute to improved outcomes | Unclear; Despite the study being randomized and blinded, a convenience and small sample was employed |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Studnek et al. [29] | Assess association between performance of practicing paramedics on an exam and field performance assessed via simulation | N=107 Paramedic | Observational study | Participants randomly assigned to one of six simulations and after completed a national exam | General Assess and Treat | SC | - Results suggest that success on a valid and reliable certification exam correlates with a passing score on a single simulated patient encounter | Unclear; Convenience sample used |
| Tremblay et al. [30] | Investigate the influence of human factors associated with time pressure, patient-care intervention, and health status on the physiological responses of simulated emergency driving tasks | N=17 Paramedic | Quasi-experimental design | Performed 3 simulated driving tasks: 1) 1 non-urgent and 2) 2 urgent driving simulations (1 to the scene and 1 to the hospital). The 2nd urgent driving task was preceded by a patient-care simulation (unstable cardiac patient with cardiopulmonary resuscitation) | Other/ Transport | Ambulance simulator* | - Experienced paramedics manage the influence of time pressure and the impact of challenging patient-care well; - Paramedics with health conditions represent an elevated risk of collision | Unclear; convenience sample used, and a small sample size was employed |
| Way et al. [31] | Develop and derive an instrument to assess airway management proficiency | N=197 Paramedic | Observational study | Simulation of airway management was recorded and used to develop a performance assessment instrument | Airway management | MSL | - Created an airway management proficiency checklist, a performance assessment instrument which identified important tasks required for airway management; - Instrument contributes to improving training and measuring performance | Unclear; Study was neither randomized, controlled, nor blinded |

reviewers, which left 25 articles that met the inclusion criteria and which are included in Table 1. The reasons for exclusion are reported in Figure 1. 21 studies were completed in the United States, and four were completed in Canada. Overall, there was a wide range of themes populated from the selected articles. Many studies were described as observational, mixed methods, and designs other than randomized, controlled trials (RCTs).

Of the 25 articles selected, 16 of them focused on the paramedic population, 8 of the articles focused on both paramedics and EMTs, and 1 article only focused on EMTs, represented in Figure 2. In total, paramedics were involved in SBT in 24 of the articles and EMTs were involved 9 articles.

General assessment and treatment and airway management (i.e., field performance, adherence to protocol, adherence to checklists) were the most common SBT areas of focus by paramedics and EMTs, representing seven articles each as seen in Figure 3. Resuscitation management was the next most common area of focus of the manuscripts selected, representing six articles. The remaining areas of focus of SBT included two categories 1) other (i.e., care planning, drug administration, and transport), and 2) imaging. Direct enhancement in patient outcomes such as length-of-stay or mortality was not documented in any studies.

Table 2 addresses common themes within each selected article. The most used modalities of simulation included manikins ten times (40%) and a combination of manikins and simulated patient/actor eight times (32%), four times (16%) reported using other

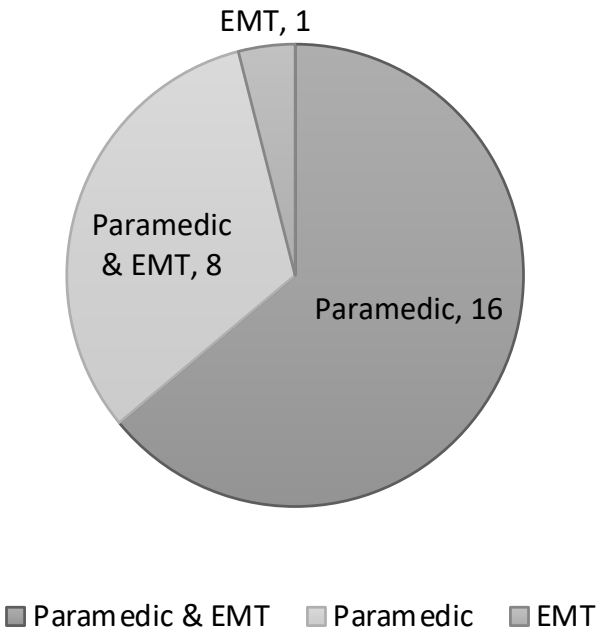


*Figure 2 – # of Articles by Profession (n = 25)*

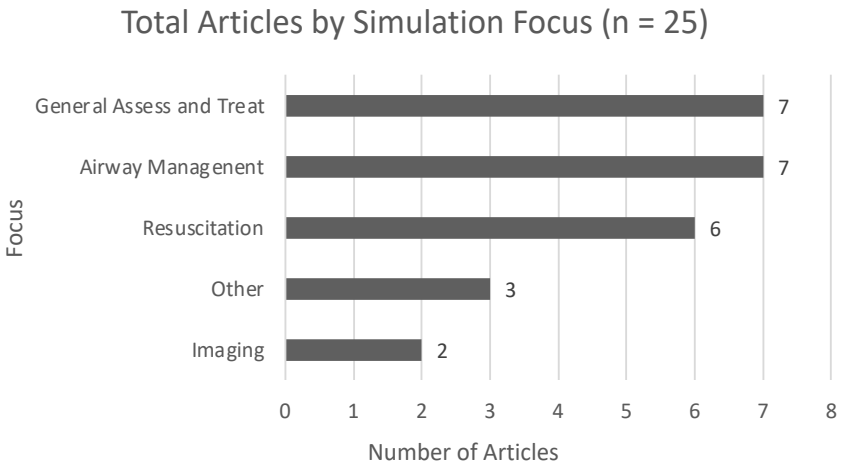


*Figure 3 – SBT Area of Focus (n=25)*

types of modalities (e.g., bone, images), and three times (12%) reported using simulated patient and actor. The majority of articles discussed the use of simulation modalities, which fall under high-fidelity simulation (HFS), 20 times (80%), compared to low-fidelity simulation (LFS), which appeared three times (12%), and mixed fidelity two times (8%). Nash, Joshi(32) describe HFS as a resource that utilizes higher degrees of realistic experiences and often utilizes technologies to imitate events or environments in which a real scenario may be experienced. In HFS, participants partake in scenarios with different medical equipment, which may exist in simulated settings or in-situ (real) settings, while simultaneously, the equipment may be connected to a simulated patient and/or computer interface. HF simulators are designed to have the ability to talk, breathe, blink and respond automatically or manually.(33) Low-fidelity simulation (LFS) requires less realism and fewer resources than HFS. Instead, during LFS, participants learn how to use and operate equipment in less stressful situations. As opposed to HF simulators, LF simulators are often stationary and even lack realism and situational context. The most common setting for performing SBT was mobile simulation labs and units, seen six times (24%) within the articles

| Feature | Articles | Percentages |
|---|---|---|
| **Modality** | | |
| Manikin | 10 | 40% |
| Both Manikin & Simulated Patient | 8 | 32% |
| Other | 4 | 16% |
| Simulated/Standardized Patient & Actor | 3 | 12% |
| **Fidelity** | | |
| High Fidelity | 20 | 80% |
| Low Fidelity | 3 | 12% |
| Mixed-Fidelity | 2 | 8% |
| **Study Setting** | | |
| Mobile Simulation Lab/Unit | 6 | 24% |
| Simulation Center/Lab | 5 | 20% |
| Ambulance | 5 | 20% |
| Prehospital | 4 | 16% |
| Other | 3 | 12% |
| Fire Department | 2 | 8% |
| **Type of Media** | | |
| Audio + Video | 15 | 60% |
| Unknown/Not Mentioned | 7 | 28% |
| Video | 3 | 12% |
| Audio | 0 | 0% |
| **Pre and Post Simulation Session** | | |
| Both Pre + Post | 16 | 64% |
| Pre | 6 | 24% |
| None | 2 | 8% |
| Post | 1 | 4% |

*Table 2* –Common Features of Articles (n=25)

selected. Simulation centers/labs and ambulances were described five times each (20%). The prehospital setting represented four articles (16%). Locations mentioned once and categorized within the other category included an outpatient clinic, conference room, and a classroom, representing three articles (12%). The use of a fire department as a study setting was described two times (8%). 15 articles (60%) describe using both audio and video recording, seven articles (28%) do not mention using any type of media, three articles (12%) described the use of only video media, and zero (0%) mentioned the use of only audio media in conjunction with SBT. 16 articles (64%) describe the use of some form of pre-and post-training, assessment, pre-brief/debrief, or orientation before engaging in SBT activity, six articles (24%) mentioned the use of pre-training, assessment, or orientation. In comparison, two articles (8%) did not mention the use of any pre or post interventions, one article (4%) mentioned utilizing post debriefings or assessments. In total, 22 articles included a form of pre-simulation orientation training, educational session, briefing session, questionnaire, or pre-test, and 17 articles included a post-simulation assessment, exam, or debriefing and post-assessment processes.

## DISCUSSION

Within the realm of SBT in allied health, Heuer, Bienstock(34) demonstrated that paramedics and EMTs are among the heaviest users. This article did speculate that such

relatively heavy reliance on SBT may be related to the confluence of high acuity and out-of-hospital practice setting, coupled with shorter academic curricula than other AHPs. However, Heuer, Bienstock(34) and the literature selected as a whole did not delve deeply into the specific clinical competencies emphasized by these two specific professions, the types of simulations, nor their potential impact on perceived or objectively measured competency, as explored in this project.

Not surprisingly, the most heavily emphasized competencies in these two professions were related to airway management, along with general assessment and treatment. The general assessment and treatment category is an ensemble of skills, which in some cases were diagnostic and therapeutic. General assessment and treatment (7 articles) and airway management (7 articles) account for a total of 14 of the 25 selected articles (56%) (Figure 3). In most states, paramedics and, in some cases, EMTs can perform endotracheal intubation and other forms of airway management. In an out-of-hospital setting, airway management is invariably emergent or urgent, often an essential aspect of cardiopulmonary resuscitation or trauma management that occurs in the field. Likewise, assessing and treating patients is foundational to the role of the paramedic and EMTs, possibly explaining the frequency of SBT in this area since this is the heart of the profession. With paramedics and EMTs performing such critically important procedures, SBT appears to be used in their training because it permits hands-on skill enhancement in a safe environment, which is also conducive to repetition and skill retention.

Because paramedics' education and training require additional course work, time, and certification, it makes sense that 16 of the 25 selected articles focused on the paramedic population only, whereas 8 of the articles focused on both paramedics and EMTs and 1 article only focused on EMTs (Figure 2). Thus, paramedics were involved in 24 of the 25 selected articles. Comparatively, EMTs were involved in 9 out of the 25 selected articles. This finding was contrary to the overwhelming higher prevalence of practicing EMTs, who outnumbered paramedics by 322,517 to 120,397.35 Though the reasons for this paradoxical result were not entirely clear, it may be related to a combination of a broader and more complex scope-of-practice, as well as a higher scholarly reporting of SBT usage by paramedics.

An examination of the features of the SBT for these two professions also demonstrated some interesting patterns. The use of high-fidelity simulation and specifically manikins and simulated patients, predominated. This finding was probably a function of the need to replicate realistic experiences to gain proficiency in the high-acuity procedures performed by these clinicians in resource-limited settings. It also may explain why most simulations employed both audio and visual features, which in some cases enhanced the fidelity. Simply put, paramedics and EMTs have limited educational requirements relative to other AHPs but often practice in high-acuity environments. Hence, high-fidelity simulations that often include audio-visual components may augment formal training and better enable these professions to perform life-sustaining procedures right the first time.

A similar rationale may explain their use of pre-post assessment of the SBT in these

professions. The high-stakes environment in which paramedics and EMTs function may encourage the need to determine if the SBT made a difference. This is supported by the notion that almost two-thirds of the manuscripts incorporated some form of assessment. Most of the articles selected (22 studies) included pre-simulation orientation training, educational session, briefing session, questionnaire, or pre-test. Similarly, many articles (17 studies) included a post-simulation assessment, exam, or debriefing. Only two articles did not include a pre and/or post-simulation briefing/debriefing educational process, demonstrating the importance of utilizing simulation in conjunction with formal pre-educational and post-assessment processes.

A surprising finding was the dearth of literature on virtual reality (VR) as a form of SBT in these two AHPs. Though the reasons for the lack of literature related to VR simulations were not entirely clear, it may be due to the relative newness of this form of simulation and the related point that the research and scholarship have not yet been completed and published. According to Saxena, Kyaw(36), "the advantage of learning in a VRE is that it provides new experiences that are not too costly to administer, and at the same time provides new experiences in circumstances that might not be feasible to implement in a real-world setting." Even though our SR did not uncover VR use, studies in VR for paramedics and EMTs represent an opportunity for future work in this area.

Another area worthy of further research is the impact of SBT on sustained clinical outcomes post engagement in SBT activities. Several studies included an evaluation of skill retention several months later. However, the assessment of skill retention was not commonly cited. Given the importance of long-term skill retention, this is also an area of focus that can be capitalized on in future studies involving practicing paramedics and EMTs and their use of SBT. Furthermore, most of the impact of SBT appeared to be predominantly on objective measures such as performance, procedural success, and ability to identify errors. Although some studies addressed subjective metrics such as perceived improved knowledge, skill, and confidence, this was done to a much lesser degree. Likewise, directly enhanced patient outcomes on aspects such as length-of-stay or mortality were not documented in any of the studies.

Like many projects of this sort, there were inherent limitations in this SR. These included excluding students from the sample population, which isolated information regarding the overall use of simulation amongst paramedics and EMTs' education and training. Utilizing this information might provide additional information surrounding more common and even unique and innovative applications of SBT within the profession. Instead, the decision to not include SBT, which involves students, presents an area of focus for a future SR. Another recognized limitation of this SR was that it was completed during COVID-19. As we were writing this SR, we speculate that many paramedics and EMTs were forced to utilize SBT to bridge training gaps while incorporating novel SBT methodologies and techniques during the COVID-19 pandemic. The amendment by the CoAEMSP due to COVID-19 reinforces the need for simulation, not only in educating students, but also in training practicing paramedics and EMTs. Future studies should evaluate the impact of COVID-19 on the use of SBT by paramedics and EMTs. Nevertheless, even with these considerations in mind, this project added to a growing body of knowledge related to SBT in the related fields of practicing paramedics and EMTs, some

of which may apply to other health professions as well.

## CONCLUSION

Paramedics and EMTs provide critically important, sometimes lifesaving, prehospital care. However, their opportunities to hone their skills are limited by undergraduate and certificate educational requirements, which are much shorter than many other AHPs. Hence, paramedics and EMTs appear to rely on SBT more than many other clinical disciplines in allied health. Despite the widespread usage in these two professions, there are still knowledge gaps related to SBT usage patterns and their impact on practice. While this project has provided some insights and contributes to a growing body of literature in this area, there is more work to be done to ensure that paramedics and EMTs, and more importantly, the patients they serve, receive the most benefit from this form of training.

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CASE REPORTS

# PRIVATE HEALTH INFORMATION LEGAL PROTECTIONS IN EMERGENCY MEDICAL SERVICES: A NEW JERSEY CASE STUDY THAT INFORMS UNITED STATES' PROTECTIONS

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## ABSTRACT

Recent communications between counsel for an Emergency Medical Service (EMS) provider in New Jersey and the state Department of Health (DOH), Office of Emergency Medical Services (OEMS), claimed that the DOH was providing illicit access to private health information (PHI) based within the providers electronic patient care report (ePCR). While the response from the DOH indicated that the information sharing was completed in accordance with all state and federal laws, the concerns raised by the law firm are not novel. EMS systems are often trusted by their patients to protect their PHI obtained as a necessity during their lifesaving operations. The collection and use of data from EMS systems nationwide are crucial to improving operations, provider safety, and patient care; however, there is a competing interest in protecting patients' privacy and respecting their Constitutionally protected rights. There are important legal and policy perspectives that should guide the prospect of personally identifiable EMS data sharing with law enforcement. With 64% of state health departments considering themselves hybrid entities, the concerns within New Jersey are likely shared throughout the United States. There are mechanisms that must remain in place to protect the rights and privacy of patients who need to trust these protections to engage with the system while also ensuring that the minimum necessary information to support the legitimate police powers of the state to protect health and safety is maintained.

## INTRODUCTION

In November of 2021, a New Jersey Emergency Medical Service (EMS) law firm sent correspondence to the state's Office of EMS (OEMS) claiming that OEMS provided administrator access to the state's Emergency Medical Record (EMR) system, ImageTrend, to the New Jersey State Police, Fatality Analysis Report System personnel, potentially in violation of numerous laws. While the response correspondence (1) from the Department of Health indicated that the information sharing was completed in accordance with all state and federal laws, the concerns raised by the law firm are not novel.

The same concerns about privacy and information sharing with law enforcement were raised when efforts were introduced to increase inter-agency data sharing as the nation responded to the opioid epidemic. The collection and use of data from EMS systems nationwide are crucial to improving operations, provider safety, and patient care. There are important legal and policy perspectives that should guide the prospect of personally identifiable EMS data sharing with law enforcement. This paper will review the New Jersey incident, applicable protections within the state, and the similarities between other entities throughout the United States that could yield similar concerns.

## NEW JERSEY'S HISTORY

In 2014, the state police's Drug Monitoring Initiative partnered with the state to combine data resources to combat the opioid epidemic in the state. The state's Attorney General's Office and the Department of Health Data Privacy Officer created a Data Use Agreement which allowed for the bi-directional data sharing of law enforcement and EMS data through the Department of Health (NJDOH) and the Department of Law and Public Safety (NJDLPS).(2) The data use agreement outlines the specific data that can be shared to respect patient privacy and ensure only the minimum data needed to accomplish the public health efforts is obtained.(3)

In January of 2018, to ensure better collection of public health data, New Jersey enacted an EMS Data Law(4) which mandates that all EMS agencies in the state, whether volunteer or licensed by OEMS, submit electronic patient care reports (ePCR) to the DOH in a format that is compliant with the National Emergency Medical Services Information System (NEMSIS). This service increases the amount of data and information available to the state for important public health measures and tracking, which also increases the vulnerabilities to widespread detrimental impacts from a breach or authorized access.

## LEGAL PERSPECTIVES

To protect the rights of individuals contacting the health system, certain laws have been established to protect the right to privacy of patients. These laws and statutes at the federal or state level are meant to provide a framework from which information sharing is permissible to support legitimate government interests while narrowly tailoring the sharing to ensure that privacy safeguards remain in place. This section will scope the various applicable federal and state standards that protect PHI and privacy, which would be implicated in personally identifiable EMS data sharing with law enforcement.

### Health Insurance Portability and Accountability Act

As the world moved to more electronic-based information systems, the Standards for Privacy of Individually Identifiable Health Information (Privacy Rule) under the Health Insurance Portability and Accountability Act of 1996 ("HIPAA") established, for the first time, a national set of standards for protecting certain health information. The standards defined the use and disclosure of an individual's health information or protected health information (PHI). Covered entities or organizations subject to the

Privacy Rule, including health care providers, regardless of size, who electronically transmit health information in connection with certain transactions,(5) were bound by these standards to ensure that through the risk of civil money penalties, PHI was properly protected while permitting the necessary flow of health information that supports the promotion of high-quality healthcare and protects the health and well-being of the general public. The goal of the Privacy Rule was to create a balance that permits the crucial uses of information while protecting the privacy of those in need of medical care and healing.

Permitted uses and disclosure of information without the authorization and permission of the individual include public health activities. Under the HIPAA Privacy Rule, HIPAA-covered entities, such as EMS providers, may disclose information to a public health authority such as a Department of Health. HIPAA allows these public health authorities to share information with other government agencies, which may include law enforcement entities that are collaborating with the public health authority for various public health purposes such as combating the opioid epidemic or any other purpose of preventing or controlling disease, injury, or disability.(6) The sharing of this PHI can be disclosed without authorization to the public health authorities authorized to receive this information.(7) Additional programs are included in the Fatality Analysis Reporting System (FARS), funded by the National Highway Traffic Safety Administration (NHTSA). Under FARS, EMS data repositories may be searched for federal reporting data. NHTSA can obtain individually identifiable information concerning the victims of motor vehicle crashes, which may be maintained in a state's EMS data repository, according to the Federal Office of Civil Rights. The Department of Health is a hybrid entity under HIPAA as defined by 45 CFR § 164.103. Meaning, the department is a single legal entity performing covered and non-covered functions. The public health branch of the Department of Health in New Jersey is not a HIPAA-covered portion of the Department of Health in which OEMS is housed.(1) A hybrid entity is permitted to designate its healthcare components as covered by HIPAA and its other non-health components as non-covered, which may include the state's EMS authority.

PHI can be shared where required by law.(8) Most states require their EMS to provide patient data to their OEMS; the provision of this data would be considered required by law. Additionally, OEMS will fall under the HIPAA permittance of EMS providers to disclose PHI to a health oversight agency for oversight activities authorized by law.(9) Under HIPAA's Privacy Rule, two de-identification methods can be used to ensure information shared cannot identify, or if there is no reasonable basis in which a covered entity can believe the shared information can identify an individual. HIPAA permits covered entities to use these standards to determine that information is not PHI. Under § 164.514(b)(1), expert determination, entities apply statistical or scientific principles when de-identifying information. A person with the knowledge of the generally applicable principles would "determine that the risk is very small that the information could be used, alone or in combination with other reasonably available information, by an anticipated recipient to identify an individual who is subject of the information."(10) This leads to a very small risk that the anticipated receiving entity could identify an individual. Under the Safe Harbor method, removing 18 types of identifiers leads to no actual knowledge that residual information can identify an individual.(11)

### Amendment IV

Under the 4th amendment, the Constitution provides the "right of the people to be secure in their persons, houses, papers, and effects, against unreasonable searches and seizures."(12) Under recent court decisions, the Supreme Court has held that the 4th amendment protects people from warrantless searches of historical cell-site location due to an individual's reasonable expectation of privacy despite information being in the possession of a third party. See *Carpenter v. United States*.(13) The similar arguments made in this case provide additional protections for the future searches of health information in private databases such as PHI within and ePCR created by an EMS entity. Law enforcement being granted full, unwarranted access to PHI within an ePCR platform could amount to a violation of amendment IV in the absence of permissions based on the various legally acceptable access that have been discussed.

### Amendment X

Due to the federalist structure of the United States Constitution under the 10th Amendment, "[t]he powers not delegated to the United States by the Constitution, nor prohibited by it to the States, are reserved to the States respectively, or to the people."(14) Under this amendment, the states have been recognized to have police powers, which provide them the authority to make laws for public safety and health. The exercises of police power must remain within the induvial rights guaranteed by the Constitution. The constitution does not provide an expressed right to privacy; however, various court decisions have interfered the broadly interpreted liberty guaranteed by the 14th amendment(15) to guarantee a fairly broad right of privacy that has come to encompass decisions about child rearing, procreation, marriage, and termination of medical treatment. Additionally, other amendments have included certain aspects of privacy such as the privacy of beliefs,(16) privacy against the quartering of soldiers,(17) privacy against unreasonable searches and seizures,(18) privilege against self-incrimination, providing protections for personal information,(19) and an enumeration of certain rights in the Bill of Rights which "shall not be construed to deny or disparage other rights retained by the people."(20) Outside of any infringements of these rights, the government has general deference to create laws to promote general health and safety. Even within these protections, the government can promote police powers, however, with a heightened level of scrutiny applied to ensure that the actions achieve a compelling government interest through narrowly tailored means to that interest and be the least restrictive means available. There is a general protection of privacy which inspires the other protections provided in this section, but the states do have a legitimate interest under their police powers to make and enforce all laws necessary to preserve public health, safety, and general welfare, which may include the collection of aggregated data which informs public health interventions even if this includes a collaboration with a law enforcement entity.

### Federal Computer Fraud and Abuse Act

The CFAA was enacted to prohibit intentionally accessing a computer without authorization or in excess of authorization. This law provides that either fines or imprisonment

are possible under violations of the act in which an actor intentionally accesses a computer without authorization or exceeds authorized access and thereby obtains protected information.(21) Any improper access to EMRs would constitute a violation of the CFAA in addition to the other laws discussed in this section.

### Title XIX of the Social Security Act

This federal law established the regulations for the Medicaid program. The law includes provisions that govern the acquisition, use, and disclosure of Medicaid enrollees' PHI.(22) EMS entities frequently assist patients with Medicaid and thus collect their PHI, which would be protected under Title XIX.

### State Law

**New Jersey State Constitution**: Under Article 1 § 7 of the state constitution, similar to the protections in Amendment IV of the United States' Constitution, "[t]he right of the people to be secure in their persons, houses, papers, and effects, against unreasonable searches and seizures, shall not be violated."(23)

**N.J.S.A. 56:8-164(a)**: This statute provides descriptions of prohibited actions relative to the display of social security numbers.(24) This statute prohibits a public entity from intentionally communicating a person's social security number. ePCRs frequently contain patient social security numbers as a means of identification.

**N.J.S.A. 56:8-163(a)**: This statute requires similar public entities that compile or maintain electronic records that include personal information such as PHI to disclose any breach in the data or access by an unauthorized person.(25)

**N.J.S.A. 2A:38(A)-3(c)**: Under this statute, anyone who is damaged as a result of the "purposeful or knowing, and unauthorized accessing or attempt to access any computer, computer system or computer network" "may sue the actor therefor in the Superior Court and may recover compensatory and punitive damages and the cost of the suit including a reasonable attorney's fee, costs of investigation and litigation."(26)

**Data Use Agreement**: Under the authority of N.J.S.A. 262H-1 the Department of Health can enter a DUA, which allows the DOH to collect patient data necessary to carry out the work of the DOH.(27) The DOH can collaborate with other state agencies on issues within the state that affect public health.(28) The state of New Jersey also has statutes that require EMS providers to report certain information to the DOH.(29,30) This information is meant to assist the DOH in recording and tracking data concerning the types of medical emergencies for which EMS is requested, response times of EMS entities, patterns in timing and location of the requests for EMS aid, the nature of services provided, and patterns in dispatch and response activities.

**Case Law**: The state of New Jersey has recognized a private right of action for the invasion of privacy, within HIPAA standards, due to the disclosure of medical records to an unauthorized third party. See Smith v. Datla, 451 N.J. Super. 82 (App. Div. 2017)(32).

This case found that "physicians were under a common law duty to maintain the confidentiality of patient records and information" and that liability could ensue from any breach.(32) Additionally, in State v. Donis, 157 N.J. 44 (1998), the courts maintained the need to protect privacy and prevent unreasonable searches and seizures.(33)

**Other States:** Many state EMS authorities are likely not covered under HIPAA(34) as they may not be a "covered entity."(35) Merely receiving PHI does not automatically turn an organization into a covered entity which could result in a gap of protections for health information.(34) Nearly all ambulance services within the United States are covered entities under HIPAA since they provide health care services in a direct treatment capacity and are engaged in HIPAA-standard electronic transactions where they bill insurers for services provided. This ensures that any information provided to EMS providers is protected. However, these EMS entities share information with EMS Authorities for trend tracking and public health needs, but the sharing of this information opens a gap in protection as EMS authorities do not "provide health care or function as a health plan or health care clearinghouse and are therefore not covered entities under HIPAA."(34) Even if there are states themselves that are covered entities, components of the state that do not function in any healthcare provider, plan, or clearing house role, can avoid HIPAA coverage if the state is a hybrid entity. Similar to New Jersey, the Texas Department of State Health Services designated itself a HIPAA hybrid entity.(36) The Texas DSHS indicated they have been "very careful to designate its covered and non-covered functions under HIPAA to ensure that its public health, regulatory and health oversight functions are not affected."(36) However, the voluntary compliance yields a potential avenue for misuse of data in the case of a bad actor. Research has found that thirty-two states (64%) classify themselves as hybrid entities, with 14 considering themselves covered (28%) and four (8%) saying they were neither covered nor hybrid.(37)

## Policy Perspectives

There is a great need for trust to be instilled in the public safety system. Any actions that could harm patients by releasing information to unauthorized persons, especially law enforcement, could erode trust and discourage healthcare access. Any undocumented migrants or patients with criminal records may be discouraged from contacting EMS if they know their information may be obtained by law enforcement entities. This places patients needing medical care in a position from which they may have to balance their health against other competing interests, creating a potential for a novel public health crisis for populations already at risk and discriminated against. EMS entities have a stated mission of treating all patients in need without discrimination based on any status. Using the information obtained during their lifesaving work makes EMS a potential pawn in practice for illicit access to PHI.

Greater inter-agency data sharing, however, is crucial to the awareness of certain public health crises such as the opioid epidemic. The dataset that is shared by NJDOH to NJDLPS is meant to "support situational awareness in order to lessen and prevent the threat to the public of overdoses due to the possible opioid use or abuse, identify those who are being disproportionately affected, as well as to administer emergency care."(1)

The various dashboards and analytics performed by the state of New Jersey with the public health data, partially obtained from EMS ePCRs, helps to create a more comprehensive picture of the impact of the opioid crisis within the state and to better inform strategies to combat the epidemic.

## RECOMMENDATIONS

The need to ensure privacy protections of PHI while also allowing appropriate aggregate data is available to fully understand the public health crises that exist is an increasingly difficult and novel challenge as the data becomes more electronic in nature. States must investigate new technical solutions which reduce the degree and risk of data exchanges necessary to make decisions with evidence-based data. Within the necessary legal frameworks associated with data protections and privacy rights of patients, technology can be adapted to ensure that access is tailored narrowly to the request from the state. General research and program evaluations have different data requirements than FARS, with varying levels of identifiable information that is necessary. Maintaining legal confidentiality and privacy requirements can be achieved through operational system frameworks that limit any permissible access.

Engaging the public is also an important part of the public health initiatives of the state. When an informed understanding of the basic privacy safeguards and purposes of the data sharing is provided to the public, including the EMS agencies from which the data is obtained, the public may become advocates for the initiatives rather than skeptical, unengaged participants. This is an important role for EMS providers, who are the main point of contact for patients when they enter the healthcare system. Educating on the purpose of data collection and the protections in place will ensure that EMS providers are trusted while caring for patients. EMS leadership should also remain diligent with their Electronic Health Record platforms to identify potential sources of concern, as was the case in New Jersey. Although, the incident was ultimately deemed to be valid access. As advocates for our patients, advocacy should also include protecting their health information from unwarranted intrusion.

The protection of patient information and requirements for providers also extends beyond HIPAA. On August 25, 2022, a jury in California awarded $31 million to family members of victims of a January 2020 helicopter crash.(38) This award was a result of the improper release of photos of the crash site and victims which were captured by first responders who responded to the scene. This case should serve as a reminder for EMS providers that patient privacy and confidentiality are paramount to the profession, alongside proper care provided and subsequent documentation. The family members of the crash victims brought a claim under emotional distress and invasion of privacy of the surviving family members.(38) The court found that although a majority of the photos were never publicly released, the sharing of photos to a select few who were not on scene and without any reason to view the photos was damage enough. This case should remind providers that they are responsible for all parts of patient privacy and not just HIPAA. Almost all states in the United States have several laws prohibiting invasion of privacy with potential compensatory and punitive damages that providers should be aware of.(38) This case brought about the ""Kobe Bryant Act" which makes it a misde-

meanor crime (punishable by up to a $1,000 fine) for first responders in California to share photos of a deceased person at a crime scene for any purpose other than official law enforcement purposes."(38) This mirrors closely the privacy rights permitted under HIPAA, but also extends non-HIPAA covered entities like general first responders including firefighters and police officers, plugging a gap in protection in relation to police, fire, and EMS "taking, sharing, and disseminating patient information of patients or victims of crimes."(38)

EMS agencies and providers need to be aware of any alleged improper conduct which must be investigated. While taking crime scene photos is permissible for law enforcement and even EMS if for legitimate patient treatment purposes, there are strict rules which govern how the pictures are taken and with whom they may be shared. Any dissemination of sensitive photos with anyone who is not in a "need to know" basis is inappropriate and possibly illegal.(38) Even non-"public" disclosures such as to social media and disclosures to even one person who has no right to see the confidential material is improper. While there is no private right of action under HIPAA, HIPAA regulations that generally favor patient privacy are instilled as the standard of care by which all EMS providers will be judged in a civil suit brought under state laws.(38) The best way for EMS providers to be protected is through policies and training which instill the ideals discussed that are highlighted in the Kobe Bryant case. The case should serve as an important lesson for EMS providers to recognize the complexities of patient privacy and the duties that extend beyond HIPAA.

## CONCLUSION

One of the major challenges within the legal field is balancing certain rights against certain legitimate governmental interests. The sharing of PHI has legitimate purposes for the government, which has an interest in understanding the public health crises to mitigate any threats to protect the life and safety of its citizens. However, the practice of sharing PHI can directly implicate certain privacy rights as conferred by the United States Constitution and other state Constitutions or supplemental statutes. There are mechanisms that must remain in place to protect the rights and privacy of patients who need to trust these protections in order to engage with the system while also ensuring that the minimum necessary information to support the legitimate police powers of the state to protect health and safety is maintained.

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POSITION STATEMENT

# JOINT STATEMENT ON LIGHTS & SIREN VEHICLE OPERATIONS ON EMERGENCY MEDICAL SERVICES (EMS) RESPONSES

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The National Association of EMS Physicians and the then National Association of State EMS Directors created a position statement on emergency medical vehicle use of lights and siren in 1994 (1). This document updates and replaces this previous statement and is now a joint position statement with the Academy of International Mobile Healthcare Integration, American Ambulance Association, American College of Emergency Physicians, Center for Patient Safety, International Academies of Emergency Dispatch, International Association of EMS Chiefs, International Association of Fire Chiefs, National Association of EMS Physicians, National Association of Emergency Medical Technicians, National Association of State EMS Officials, National EMS Management Association, National EMS Quality Alliance, National Volunteer Fire Council, and Paramedic Chiefs of Canada.

In 2009, there were 1,579 ambulance crash injuries (2) and most EMS vehicle crashes occur when driving with lights and siren

(L&S) (3). When compared with other similar-sized vehicles, ambulance crashes are more often at intersections, more often at traffic signals, and more often with multiple injuries, including 84% involving three or more people (4).

From 1996 to 2012, there were 137 civilian fatalities and 228 civilian injuries resulting from fire service vehicle incidents and 64 civilian fatalities and 217 civilian injuries resulting from ambulance incidents. According to the U.S. Fire Administration (USFA), 179 firefighters died as the result of vehicle crashes from 2004 to 2013 (5). The National EMS Memorial Service reports that approximately 97 EMS practitioners were killed in ambulance collisions from 1993 to 2010 in the United States (6).

Traffic-related fatality rates for law enforcement officers, firefighters, and EMS practitioners are estimated to be 2.5 to 4.8 times higher than the national average among all occupations (7). In a recent survey of 675 EMS practitioners, 7.7% reported being involved in an EMS vehicle crash, with 100% of those occurring in clear weather and while using L&S. 80% reported a broadside strike as the type of MVC (8). Additionally, one survey found approximately four "wake effect" collisions (defined as collisions caused by, but not involving the L&S operating emergency vehicle) for every crash involving an emergency vehicle (9).

For EMS, the purpose of using L&S is to improve patient outcomes by decreasing the time to care at the scene or to arrival at a hospital for additional care, but only a small percentage of medical emergencies have better outcomes from L&S use. Over a dozen studies show that the average time saved with L&S response or transport ranges from 42 seconds to 3.8 minutes. Alternatively, L&S response increases the chance of an EMS vehicle crash by 50% and almost triples the chance of crash during patient transport (11). Emergency vehicle crashes cause delays to care and injuries to patients, EMS practitioners, and the public. These crashes also increase emergency vehicle resource use through the need for additional vehicle responses, have long-lasting effects on the reputation of an emergency organization, and increases stress and anxiety among emergency services personnel.

Despite these alarming statistics, L&S continue to be used in 74% of EMS responses and 21.6% of EMS transports, with a wide variation in L&S use among agencies and among census districts in the United States (10).

Although L&S response is currently common to medical calls, few (6.9%) of these result in a potentially lifesaving intervention by emergency practitioners (12). Some agencies have used an evidence-based or quality improvement approach to reduce their use of L&S during responses to medical calls to 20-33%, without any discernable harmful effect on patient outcome. Additionally, many EMS agencies transport very few patients to the hospital with L&S.

Emergency medical dispatch (EMD) protocols have been proven to safely and effectively categorize requests for medical response by types of call and level of medical acuity and urgency. Emergency response agencies have successfully used these EMD categorizations to prioritize the calls that justify a L&S response. Physician medical oversight,

formal quality improvement programs, and collaboration with responding emergency services agencies to understand outcomes is essential to effective, safe, consistent, and high-quality EMD.

The sponsoring organizations of this statement believe that the following principles should guide L&S use during emergency vehicle response to medical calls and initiatives to safely decrease the use of L&S when appropriate:

- The primary mission of the EMS system is to provide out-of-hospital health care, saving lives and improving patient outcomes, when possible, while promoting safety and health in communities. In selected time-sensitive medical conditions, the difference in response time with L&S may improve the patient's outcome.
- EMS vehicle operations using L&S pose a significant risk to both EMS practitioners and the public. Therefore, during response to emergencies or transport of patients by EMS, L&S should only be used for situations where the time saved by L&S operations is anticipated to be clinically important to a patient's outcome. They should not be used when returning to station or posting on stand-by assignments.
- Communication centers should use EMD programs developed, maintained, and approved by national standard-setting organizations with structured call triage and call categorization to identify subsets of calls based upon response resources needed and medical urgency of the call. Active physician medical oversight is critical in developing response configurations and modes for these EMD protocols. These programs should be closely monitored by a formal quality assurance (QA) program for accurate use and response outcomes, with such QA programs being in collaboration with the EMS agency physician medical director.
- Responding emergency agencies should use response based EMD categories and other local policies to further identify and operationalize the situations where L&S response or transport are clinically justified. Response agencies should use these dispatch categories to prioritize expected L&S response modes. The EMS agency physician medical director and QA programs must be engaged in developing these agency operational policies/guidelines.
- Emergency response agency leaderships, including physician medical oversight and QA personnel, should monitor the rates of use, appropriateness, EMD protocol compliance, and medical outcomes related to L&S use during response and patient transport.
- Emergency response assignments based upon approved protocols should be developed at the local/department/agency level. A thorough community risk assessment, including risk reduction analysis, should be conducted, and used in conjunction with local physician medical oversight to develop and establish safe response policies.
- All emergency vehicle operators should successfully complete a robust initial emergency vehicle driver training program, and all operators should have required regular continuing education on emergency vehicle driving and appropriate L&S use.
- Municipal government leaders should be aware of the increased risk of crashes associated with L&S response to the public, emergency responders, and patients. Service agreements with emergency medical response agencies can mitigate this risk by using tiered response time expectations based upon EMD categorization of calls. Qual-

ity care metrics, rather than time metrics, should drive these contract agreements.
- Emergency vehicle crashes and near misses should trigger clinical and operational QA reviews. States and provinces should monitor and report on emergency medical vehicle crashes for better understanding of the use and risks of these warning devices.
- EMS and fire agency leaders should work to understand public perceptions and expectations regarding L&S use. These leaders should work toward improving public education about the risks of L&S use to create safer expectations of the public and government officials.

In most settings, L&S response or transport saves less than a few minutes during an emergency medical response, and there are few time-sensitive medical emergencies where an immediate intervention or treatment in those minutes is lifesaving. These time-sensitive emergencies can usually be identified through utilization of high-quality dispatcher call prioritization using approved EMD protocols. For many medical calls, a prompt response by EMS practitioners without L&S provides high-quality patient care without the risk of L&S-related crashes. EMS care is part of the much broader spectrum of acute health care, and efficiencies in the emergency department, operative, and hospital phases of care can compensate for any minutes lost with non-L&S response or transport.

## SPONSORING ORGANIZATIONS AND REPRESENTATIVES

Academy of International Mobile Healthcare Integration
American Ambulance Association
American College of Emergency Physicians
Center for Patient Safety
International Academies of Emergency Dispatch
International Association of EMS Chiefs
International Association of Fire Chiefs
National Association of EMS Physicians
National Association of Emergency Medical Technicians
National Association of State EMS Officials
National EMS Management Association
National EMS Quality Alliance
National Volunteer Fire Council

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REFLECTIONS

# ACCIDENTAL DEATH AND DISABILITY: THE NEGLECTED DISEASE OF MODERN SOCIETY

Prepared by the Committee on Trauma and Committee on Shock, Division of Medical Services, National Academy of Sciences, National Research Council

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### *About the REFLECTIONS Section*

*Welcome to the first installment of the International Journal of Paramedicine's section called "Reflections." Each of these will re-print a paper from our history— a piece of research, consensus document or other manuscript that helped shape paramedicine—that we think leaders and clinicians in our profession should read, or re-read, to understand where we came from and inform where we go from here.*

*Perhaps more important, though, we will also invite past, present and future paramedicine leaders to offer Invited Commentary. They will share their thoughts on what that paper meant when it was published, and what it means today. Some will be seminal research studies that still impact how we practice today, for better and for worse. We know we sometimes do things because we've always done them that way. We say it like those protocols or policies appeared magically out of the ether or were handed down at the top of a mountain. Yet in reality, they often came from a published study, white paper, or guidance document.*

*In this first "Reflections," we bring you Accidental Death and Disability: The Neglected Disease of Modern Society. It is accompanied by invited commentary from Dr. Jon Krohmer. Dr. Krohmer started in EMS at his local squad as an EMT before becoming an emergency and EMS physician, medical director, and eventually director of the National Highway Traffic Safety Administration's Office of EMS.*

*This 1966 publication from the Institute of Medicine has become such a critical piece of the origin story of EMS and paramedicine in the United States that we simply call it "The White Paper." But while now more than half a century old, this document still offers lessons for us today—not just about our history, but about how we should think about systems of care, and the silos that still prevent us providing seamless, patient-centered care today.*

*Section Editors: Michael S. Gerber, MPH, NRP; Scott A. Lancaster, Ph.D., MHA, NR-P*

*INVITED COMMENTARY ACCOMPIONIES THIS PAPER*

## Preface

During the past three years, Committees on Trauma, Shock, and Anesthesia, and special task forces of the Division of Medical Sciences, National Academy of Sciences–National Research Council, have reviewed with representatives of a large number of organizations the present status of initial care and emergency medical services afforded to the victims of accidental injury.

These studies include reviews of ambulance services, voice communication systems, emergency departments and intensive care units of hospitals; appraisal of current research in shock, trauma, and resuscitation; revision of the first aid textbook for the American National Red Cross; preparation of a formal statement on cardiopulmonary resuscitation; and participation in disaster survey studies. A summary of these deliberations and a number of recommendations designed to reduce accidental death and disability are assembled in this paper.

## INTRODUCTION

In 1965, 52 million accidental injuries killed 107,000, temporarily disabled over 10 million and permanently impaired 400,000 American citizens at a cost of approximately $18 billion. This neglected epidemic of modern society is the nation's most important environmental health problem. It is the leading cause of death in the first half of life's span.

Although 49,000 deaths in 1965 were due to motor-vehicle accidents, more than this number died from accidents at work, in the home, in other forms of transportation, in public buildings, in recreational activities, etc.

Public apathy to the mounting toll from accidents must be transformed into an action program under strong leadership. This can be accomplished by the methods employed to bring poliomyelitis and other epidemics under control, and to make frontal attacks to conquer cancer, heart disease, and mental disease. Federal and voluntary agencies have mobilized to prevent and treat birth defects, muscular dystrophy, sclerosis, and palsy. Such concerted attacks have been mounted by conduct of national conferences at the Executive level, appropriation of funds by the Congress, pooling of resources by lay and professional groups through voluntary health agencies, expansion of research, and implementation of programs at regional and community levels. Basic to this unified approach is identification of the individual citizen with a means by which he can satisfy the inherent desire to serve his fellow man. Accidental death and disability too, can be attacked by such concerted actions.

This report summarizes current practices and deficiencies at various levels of emergency care. Salient factors which require early solutions are:

- The general public is insensitive to the magnitude of the problem of accidental death and injury.
- Millions lack instruction in basic first aid.
- Few are adequately trained in the advanced techniques of cardiopulmonary resuscitation, childbirth, or other lifesaving measures, yet every ambulance and rescue squad attendant, policeman, fire-fighter, paramedical worker and worker in high-risk industry should be trained.
- Local political authorities have neglected their responsibility to provide optimal emergency medical services.
- Research on trauma has not been supported or identified at the National Institutes of Health on a level consistent with its importance as the fourth leading cause of

death and the primary cause of disability.
- Potentials of the U. S. Public Health Service programs in accident prevention and emergency medical services have not been fully exploited.
- Data are lacking on which to determine the number of individuals whose lives are lost or injuries are compounded by misguided attempts at rescue or first aid, absence of physicians at the scene of injury, unsuitable ambulances with inadequate equipment and untrained attendants, lack of traffic control, or the lack of voice communication facilities.
- Helicopter ambulances have not been adapted to civilian peacetime needs.
- Emergency departments of hospitals are overcrowded, some are archaic, and there are no systematic surveys on which to base requirements for space, equipment, or staffing for present, let alone future, needs.
- Fundamental research in shock and trauma is inadequately supported.
- Medical and health-related organizations have failed to join forces to apply knowledge already available to advance the treatment of trauma, or to educate the public and inform the Congress.

Specific recommendations follow discussions of the various levels of emergency care. Major steps toward a total national effort include:

## CONDUCT OF NATIONAL CONFERENCES ON EMERGENCY MEDICAL SERVICES

Under medical leadership, national forums should be conducted at the highest levels on all subjects important to total emergency care from the time of receipt of an injury through rehabilitation. The public must be aroused and fully informed of present practices, shortcomings in emergency services, and ways in which optimal care can be assured.

## ESTABLISHMENT OF A NATIONAL TRAUMA ASSOCIATION

Responsible professional and lay organizations should pool their efforts through a voluntary National Trauma Association as a means of stimulating public demand for accident prevention and emergency medical services and satisfying these needs through research, public and professional education, and community services.

## ORGANIZATION OF COMMUNITY COUNCILS ON EMERGENCY MEDICAL SERVICES

In each community, coordination of lay and professional responsibilities for emergency medical care should be centralized in a council on emergency services. A council would serve to coordinate teaching programs on basic and advanced first aid of the Red Cross, the Medical Self-Help Program of the Public Health Service, cardiopulmonary resuscitation of the American Heart Association, and others. It would bring together the resources of chapters of the Red Cross and the National Safety Council, committees on trauma of the American College of Surgeons, local and county medical societies of the American Medical Association, health departments, civic bodies, scouts, and others, to procure

equipment, construct facilities and ensure optimal emergency care on a day-to-day basis as well as in disaster or national emergency. Councils could serve as active units to implement measures and to share in the contributions and benefits of nationwide programs of a National Trauma Association and other voluntary health and allied agencies devoted to emergency medical services.

## FORMATION OF A NATIONAL COUNCIL ON ACCIDENT PREVENTION

This report is concerned primarily with emergency care indicated after receipt of an injury and deals only briefly with problems of accident prevention. All pertinent research in this field should be reviewed. An analysis is in order of the several safety acts pertaining to government departments with administrative responsibility in accident prevention. The newly established Department of Transportation deals not only with motor vehicles but also with aviation, railroads, and other forms of transport. Other departments deal with mining, industry, flammable clothing, foods, and drugs. There are many common denominators of human behavior, environment, and mechanization applicable to each of these areas and their identification is essential to a systematic attack on this vital problem.

## CREATION OF A NATIONAL INSTITUTE OF TRAUMA

Appropriated funds should be earmarked in support of the program of research in the therapy of trauma recently announced by the National Institute of General Medical Sciences. This would include processing of grant requests for research related to shock and trauma which are now considered by numerous Institutes. Training for academic careers and fellowships in traumatology should be supported. These combined activities call for establishment under the U. S. Public Health Service of a National Institute of Trauma.

## THE MAGNITUDE OF THE PROBLEM

### Deaths

Accidents are the leading cause of death among persons between the ages of 1 and 37; and they are the fourth leading cause of death at all ages. Among accidental deaths, those due to motor vehicles constitute the leading cause for all age groups under 75. Since 1903, when the "horseless carriage" toll assumed significance, there have been more than 6,500,000 deaths from accidents in this country, over 1,690,000 involving motor vehicles. In 1965, the accident death toll was approximately 107,000, including 49,000 from motor vehicles, 28,500 at home, and 14,100 at work. Deaths from traffic injuries have increased annually; 10,000 more were killed in 1965 than in 1955, and the increase from 1964 to 1965 was 3 percent. Seventy percent of the motor vehicle deaths occurred in rural areas and in communities with populations under 2500.(1)

Despite increasing mechanization, death rates from work accidents in manufacturing have decreased in the past 33 years, from approximately 37 accidental deaths per 100,000 workers in 1933 to a rate of 20 per 100,000 in 1965.(1) This reduction is due

largely to education, training, and surveillance of industrial workers, and elimination of hazardous machinery in industrial plants. Similar efforts should be directed to the increasing millions of drivers and to vehicles.

The tragedy of the high accidental death rate is that trauma kills thousands who otherwise could expect to live long and productive lives, whereas those afflicted with malignancy, heart disease, stroke, and many chronic diseases usually die late in life. Thus many more millions of productive man-years are lost owing to deaths from accidents than from chronic diseases among older persons.

The human suffering and financial loss from preventable accidental death constitute a public health problem second only to the ravages of ancient plagues or world wars. In one year alone vehicle accidents kill more than we lost in the Korean War, and in the past 60 years more Americans have died from accidents than from combat wounds in all of our wars.(1) In the 20-year period from 1945 through 1964, there were over 97,000 accidental deaths among military personnel, predominantly caused by motor vehicles. (2)

### Disability

The total number of nondisabling injuries treated at home, in doctors' offices, in outpatient clinics or in emergency departments is unknown. In 1965, *disabling* injuries numbered over 10,500,000, including 400,000 that resulted in some degree of permanent impairment.(1) It is estimated that the number of United States citizens now physically impaired by injuries is over 11 million, including nearly 200,000 persons who have lost a leg, a foot, an arm, or a hand and 500,000 with varying degrees of impaired vision.(3)

### Costs

In 1965, accident costs totaled about $18 billion, including wage losses of $5.3 billion, medical expenses of $1.8 billion, administrative and claim settlements of $3.6 billion, property loss in fires of $1.4 billion, property damage in motor-vehicle accidents of $3.1 billion, and indirect cost of work accidents of $2.8 billion.(1) The total approaches the current national annual appropriation for conducting the war in Vietnam.

### Medical Load

The care of accident cases imposes a staggering load on physicians, paramedical personnel, and hospitals. Approximately one of every four Americans suffers an accident of some degree each year. Of the more than 52,000,000 persons injured in 1965, although many were treated at home or at work, most received medical attention in physicians' offices or in outpatient or emergency departments of hospitals. It is estimated that in 1965 more than 2,000,000 victims of accidental injury were hospitalized; they occupied 65,000 hospital beds for 22,000,000 bed-days and received the services of 88,000 hospital personnel. This exceeds the number of bed-days required to care for the 4 million babies born each year or for all the heart patients and it is more than four times greater than that required for cancer patients. Approximately 1 of 8 beds in general hospitals in the

United States is occupied by an accident victim.(4)

### Accident Prevention

The long-term solution to the injury problem is prevention. The major responsibility for accident prevention rests not with the medical profession, but with educators, industrialists, engineers, public health officials, regulatory officials, and private citizens. Although the physician is concerned primarily with increasing survival and lessening disability of victims after accidents occur, there are many ways in which the medical profession can help to prevent accidents. These include the detection and reporting of health hazards introduced into the environment; calling attention to the relationship of design of vehicles, appliances, houses, and public buildings to types of accidents; and identifying the roles of human behavioral, physical, emotional, and mental defects, acute and chronic illness, alcohol, and drugs in accident liability.

One of the outstanding pieces of evidence of the value of accident prevention is in the improved safety record of employees in private industry as a result of the improved design of power machinery and the teaching of safety measures. Precise standards are followed in the construction of most buildings, equipment and appliances. Paradoxically, the hazards to the consumer in using these products of industry may go undetected or uncorrected. The introduction of a new drug receives close scrutiny and its untoward or "accidental" effects are reported until its use and limitations are well established, but there is little requirement that hazards or limitations of a new machine or an appliance be detected, reported, and corrected early in its use. There seems to be no explanation for the lack of national standards or codes with respect to motor vehicles or their equipment. Thirty states do not even require periodic automobile inspection;(5) they have become dumping-grounds for vehicles that fail to pass inspection in states that do require it. Federal imposition of proved safety standards and of periodic inspection, if applied as vigorously to vehicles engaged in interstate travel as are the regulations that preclude interstate commerce of drugs unapproved by the Food and Drug Administration, could greatly reduce the nation's annual traffic toll.

Prevention of accidents involves training in the home, in the schools, and at work, augmented by frequent pleas for safety in the news media; first aid courses and public meetings; and inspection and surveillance by regulatory agencies. Hazards involved in fabrication and utilization of vehicles, highways, appliances, farm implements, homes, and public buildings, or arising from participation in sports, or from fire, natural disaster, or national emergencies concern practically every segment of modern society. Of the nearly 52 million nonfatal accidental injuries in 1965, only 7 percent were caused by motor vehicles. Accident prevention must be directed to the 43 percent which occurred in the home, the 16 percent in industry and the 34 percent in public places, recreation, other forms of transportation, etc.(6)

There is need for an advisory agency in the form of a National Council on Accident Prevention, with representation from appropriate government agencies, industry, engineering, architecture, insurance, public health, education, the behavioral sciences, and medicine. Its major mission would be to ascertain the causes of accidental injury and to

recommend or initiate measures necessary for their control or elimination. It would coordinate the findings and regulations now prescribed by industry and by the numerous federal safety laws dealing with many industries and administered by government departments whose primary missions are directly or indirectly related to health. It would identify needs and enlist federal and private support of research and of programs in federal departments, states and communities, and specialized research laboratories in the epidemiology and prevention of accidents. Some of these needs and many of the problems and their solutions have been identified by the Division of Accident Prevention of the U. S. Public Health Service and by the National Safety Council. The National Traffic Safety Advisory Committee, as provided for in the Highway Safety Act of 1966, affords for the first time a means by which preventive measures and standards can be delineated for all transport vehicles, including not only highway vehicles but also railroad, aviation, and coast guard conveyances. More than half of the accidental deaths, disabilities, and costs are unrelated to transportation, and factors peculiar to highways, vehicles and drivers constitute but a part of the total accident prevention problem.

### Recommendation

- Formation of a National Council on Accident Prevention at the Executive level for coordination of information and advice on implementation of measures and regulations now vested in scattered private, industrial, and federal agencies, and for research, public education, and development of improved standards in accident prevention.

## EMERGENCY FIRST AID AND MEDICAL CARE

Successive steps in total emergency care involve local authorities and lay citizens for initial care and transportation, and medical and paramedical personnel under medical supervision for definitive treatment. With few exceptions, the role of the physician in the care of victims of accidental injury begins at the emergency department of the hospital. Only rarely is he available at the scene of injury.

One of the serious problems today in both the lay and the professional areas of responsibility for total care is the broad gap between knowledge and its application. Expert consultants returning from both Korea and Vietnam have publicly asserted that, if seriously wounded, their chances of survival would be better in the zone of combat than on the average city street. Excellence of initial first aid, efficiency of transportation, and energetic treatment of military casualties have proved to be major factors in the progressive decrease in death rates of battle casualties reaching medical facilities, from 8 percent in World War I, to 4.5 percent in World War II, to 2.5 percent in Korea, and to less than 2 percent in Vietman.(7)

Reduction of the time lag from receipt of injury to initiation of medical care is one of the important elements in prevention of death and permanent disability in the combat zone. Probably no American community can lay claim to maintenance of a model of first aid, sorting, communication, and transportation comparable to that of the Armed Services.

### First Aid

Beyond the fifth grade of elementary school, every American citizen should be trained in basic first aid. Since initiation of the American National Red Cross first aid training program in 1909, over 28,000,000 students have been certified by qualified instructors (who currently number over 73,000).(8) This course should be, but is not, universally required as a prerequisite to the more advanced training of lifeguards, rescue squad personnel, ambulance attendants, policemen, firemen, personnel in public health and industrial clinics, and attendants at sports events. The Medical Self-Help Program of the U. S. Public Health Service, designed to ensure care in a national emergency when the services of a psysician are not available, also provide basic first aid training. Only in the American National Red Cross training program and in the Medical Self-Help Program are nationally acceptable textbooks and standardized courses of instruction provided. There is need for equally acceptable textbooks and courses of instruction to meet the special requirements of rescue squad personnel and of ambulance attendants. A manual recently published by the Committee on Trauma of the American College of Surgeons provides guidance for uniformity in such training courses.(9)

#### *Recommendations*

- Extension of basic and advanced first aid training to greater numbers of the lay population.
- Preparation of nationally acceptable texts, training aids, and courses of instruction for rescue squad personnel, policemen, firemen, and ambulance attendants.

### Ambulance Services

A review of ambulance services in the United States indicates a paucity of information and a limited framework for the collection of data on and the evaluation of current ambulance services. Research aimed at improvement of these services is equally limited. The available information shows a diversity of standards, which are often low, frequent use of unnecessarily expensive and usually ill-designed equipment and generally inadequate supplies.

Adequate ambulance services are as much a municipal responsibility as firefighting and police services. If the community does not provide ambulance services directly, the quality of these services should be controlled by licensing procedures and by adequate surveillance of volunteer and commercial ambulance companies. Ambulance services should not only be adequate for local needs, but should also be integrated within cities and among neighboring communities to ensure efficient utilization in natural disasters or national emergencies.

Very few communities provide sufficient financial support for adequate ambulance services. Where they are provided, they are usually maintained by the fire or police department. Many volunteer, nonprofit rescue squads and local ambulance groups provide commendable service and in many small communities this system would seem to meet basic, but usually only minimal needs. Approximately 50 percent of the country's

ambulance services are provided by 12,000 morticians, mainly because their vehicles can accommodate transportation on litters. But in most instances, as in the case of many privately owned ambulances, the vehicles are unsuitable for active care during transportation, equipment and supplies are incomplete, and the attendants are not properly trained.

First class ambulance service exists in few cities. Some, such as Baltimore, employ highly trained full-time ambulance attendants with up-to-date vehicles and equipment as a separate mission of the fire department. Central screening and dispatching ensure open traffic lanes, communication en route, and distribution of casualties to assigned hospitals. In some cities, ambulance services are provided by the police department, some with ambulances and some with modified patrol station wagons.

In contrast to the days when an intern accompanied every ambulance on emergency call, the pendulum may have swung much too far toward total dependence on ambulance personnel. There is complete lack of information on the number who die at the site of injury or during transportation who might have been saved by professional attention. Calls for ambulance services should be screened by a responsible agent under medical supervision so that, when medical attendance is required, a physician can be dispatched and an ambulance properly equipped to his needs made available immediately. A number of foreign countries have demonstrated that these measures save many lives.

There are no generally accepted standards for the competence or training of ambulance attendants. Attendants range from unschooled apprentices lacking training even in elementary first aid to poorly paid employees, public-spirited volunteers, and specially trained full-time personnel of fire, police, or commercial ambulance companies. Certification or licensure of attendants is a rarity. In a recent survey, it was found that over 48 different courses of instruction are provided with at least a score of different books and brochures being used as texts. There is no standard or uniformity in these courses, though the standard and advanced Red Cross courses are prerequisites for most. There is need for delineation of a standard course of instruction, a more generally acceptable text, and training aids to ensure training beyond that of the Red Cross program in first aid.

No manufacturer produces from the assembly line a vehicle that can be termed an ambulance. The bodies and fixed equipment of ambulances and rescue vehicles are produced by conversion of passenger-type vehicles or are fabricated completely to fit assembly line chassis, and are usually expensive in outward appearance, but impractical for resuscitative care. Although the Committee on Trauma of the American College of Surgeons has published recommendations on ambulance equipment, there are no acceptable standards for vehicle design, and most ambulances used in this country are unsuitable, have incomplete fixed equipment, carry inadequate supplies, and are manned by untrained attendants.

Authority now exists under the National Traffic and Motor Safety Act of 1966 (P.L. 89-563) to set national standards for ambulance design and construction. Authority also now exists under the Highway Safety Act of 1966 (P.L. 89-564) for the establishment of

national standards for used motor vehicles, for motor vehicle inspection and for emergency services.

Through the efforts of the Joint Action Program of the American College of Surgeons, the American Association for the Surgery of Trauma, and the National Safety Council, a model ordinance has been developed for regulation of ambulance services. But in a recent survey of 16 state capitals, only seven were found to have ambulance ordinances. While most ambulance calls involve nonemergency cases, the justification for speeding, the use of sirens, and violation of local traffic regulations is debatable. It is the consensus of representatives of the Joint Action Program that more injuries and deaths are produced by improper control of ambulances than would be produced by delays occasioned by compliance with regulations. Helicopters have proved so successful as ambulances in combat theatres that they should be adopted for selected use in this country. They have proven to be necessary to move physicians and equipment to the accident site and to evacuate casualties from major highways, from remote areas, or from a community hospital to a more specialized center. Highway safety standards should include helicopter evacuation, which calls for landing pads at selected hospitals on a regional pattern.

*Recommendations*

- Implementation of recent traffic safety legislation, to ensure completely adequate standards for ambulance design and construction, for ambulance equipment and supplies, and for the qualifications and supervision of ambulance personnel.
- Adoption at the state level of general policies and regulations pertaining to ambulance services.
- Adoption at district, county, and municipal levels of ways and means of providing ambulance services applicable to the conditions of the locality, control and surveillance of ambulance services, and coordination of ambulance services with health departments, hospitals, traffic authorities, and communication services.
- Pilot programs to determine the efficacy of providing physician- staffed ambulances for care at the site of injury and during transportation.
- Initiation of pilot programs to evaluate automotive and helicopter ambulance services in sparsely populated areas and in regions where many communities lack hospital facilities adequate to care for seriously injured persons.

## Communication

Although it is possible to converse with the astronauts in outer space, communication is seldom possible between an ambulance and the emergency department that it is approaching.

It is important to recognize that major accidents, including disasters, provoke community response not only of first aid workers, ambulances, and hospital emergency departments but also authorities concerned with traffic, fire, security, utilities, civil defense, and others, and that communication facilities involve functions pertinent to each responding agency. Although these facilities must be designed for specific needs,

they must be sufficiently flexible to ensure rapid and efficient cross communication, with medical components necessary to emergency care. It would be a mistake, therefore, for those concerned with the medical aspects of the problem to plan strictly medical response systems in parallel with or in isolation from the transportation and communication networks upon which they should be based. Since these two basic systems are in most parts of the country just beginning to be developed, it is essential that provision for the medical components be incorporated.

A need exists for prompt voice communication between emergency departments and those at the site of an accident or disaster, not only to plan for the reception of casualties at the hospital but also to dispatch physicians, when needed at the site of the accident. Communication facilities are essential to mobilize rescue equipment, clear traffic lanes, advise ambulance attendants on the management of complications en route, notify hospitals of the number and types of patients to be expected, and distribute patients among hospitals in accordance with the adequacy of space, facilities, and personnel.

With rare exceptions, current ambulance radio installations provide communication only between dispatcher and drivers, with no provision for direct or tie-in contact with hospital emergency departments, traffic control authorities, or civil defense agencies. Moreover, many existing communication systems are reserved for use only in case of disaster or national emergency. Voice communication should be used for day-to-day needs; should be under medical supervision; and should provide direct communication between the accident site, ambulances, and hospitals, and access to police, traffic control, fire, and civil defense agencies.

Although the Federal Communications Commission has allotted an adequate number of radiofrequency channels for the health field and industry has provided appropriate telephone and radio equipment, these facilities are rarely used to ensure voice communication between the site of an accident, ambulances, hospital emergency departments, fire departments, traffic control officials, and civil defense authorities. Usually a hospital is notified of a disaster through local radio or television or by telephone communication from police, or by the walking wounded. Certainly, the seriously ill and the injured deserve centralized screening and dispatching communication facilities as efficient as those used by taxicabs and in the coordination of personnel and equipment in fire fighting, forestry service, or highway maintenance.

At present, experience with radio communication in emerg ency medical situations is inadequate to serve as a basis for guidance of communities that would install and operate such facilities. Although available standardized equipment may be suitable for most communities, the organizational needs of the local community, geographic problems in radio transmission, and the size of the area to be served dictate variations of design and installation. Ready solutions to most of these problems are available through the radio industry. There is need at the national level for the preparation of a manual delineating the available radiofrequency channels, types and costs of equipment, and modifications of installation necessitated by local conditions. This is a function which should be the responsibility of the new National Highway Safety Agency in cooperation with the Federal Communications Commission, industry, and related groups. This Agency is charged

with the responsibility for establishing standards for all aspects of state highway safety programs, of which communications is an essential element.

Under many circumstances, especially in remote areas or in the absence of telephones, delay and frustration are encountered in calling for an ambulance. It would seem feasible to designate a universal, easily remembered number for all dial telephones throughout the nation. Compared to European expressways, the scarcity of public telephones on our national highways represents a significant oversight in planning.

*Recommendations*

- Delineation of radiofrequency channels and of equipment suitable to provide voice communication between ambulances, emergency departments, and other health-related agencies at community, regional, and national levels.
- Pilot studies across the nation for evaluation of models of radio and telephone installations to ensure effectiveness of communication facilities.
- Day-to-day use of voice communication facilities by the agencies serving emergency medical needs.
- Active exploration of the feasibility of designating a single nationwide telephone number to summon an ambulance.

## EMERGENCY DEPARTMENTS

For decades the "emergency" facilities of most hospitals have consisted only of "accident rooms," poorly equipped, inadequately manned, and ordinarily used for limited numbers of seriously ill persons or for charity victims of disease or injury. Very few hospitals have met the needs imposed since World War II for the vast expansion of facilities, equipment, and personnel demanded by society, poor and rich, for routine off-hour treatment of nonemergency conditions and of the steadily increasing numbers of accidental injuries. Society now looks to the hospital emergency department as a community center for outpatient care. More than two-thirds of the 40,000,000 "emergency room" visits in 1966 cannot be classified as emergencies. Past and projected estimates of this increasing load are as follows:(10)

| YEAR | ESTIMATED TOTAL NUMBER OF HOSPITAL OUTPATIENT VISITS (in Millions) | ESTIMATED EMERGENCY ROOM VISITS (in Millions) |
|---|---|---|
| 1958 | 84.5 | 18.0 |
| 1960 | 91.9 | 23.0 |
| 1962 | 99.4 | 28.5 |
| 1968 | 121.6 | 44.1 |
| 1970 | 129.0 | 49.3 |

This social change has been paralleled by a decrease in the number of house calls and by more adherence to physicians' regular office hours.

Although over 90 percent of the more than 7000 accredited hospitals in the United States list emergency rooms, most such services operate at a financial loss. In contrast to staff coverage of the "accident room" by a hospital attendant and perhaps by an intern, minimal demands call for around-the-clock staffing by permanently assigned physicians and paramedical personnel trained in all aspects of the care of trauma. Wings need to be added to hospitals, highly specialized equipment is required, and additional personnel must be trained. Currently four national organizations are conducting "surveys" of emergency departments, with no evidence of pooling of their resources or knowledge, resulting in piecemeal approaches to problems that, if solved by concerted effort, would provide factual grounds for Hill-Burton funds for facilities and equipment.

New patterns of staff coverage of emergency departments are evolving. These include contractual relationships between the hospital and a group of physicians, usually general practitioners, who undertake all emergency care and staffing requirements for the emergency department. Some hospitals require that all medical personnel, regardless of specialty, share emergency department responsibility, including night coverage. No longer can responsibility be assigned to the least experienced member of the medical staff or solely to specialists who by the nature of their training and experience cannot render adequate care without the support of other staff members.

The number of physicians experienced in the treatment of multiple injuries is very limited. The need is now recognized for special training in immediate care and in the overall direction of emergency departments, of a calibre commensurate with that attained by only a few individuals in active military field units caring for combat casualties. Medical undergraduate and residency training programs are generally inadequate in traumatology and mass casualty care.

In recent years the Committee on Trauma of the American College of Surgeons has provided recommendations on architectural design and equipment of emergency departments and manuals on the treatment of fractures and soft- tissue injuries, the prevention of tetanus, and the initial management of burns. These commendable efforts of the medical profession are but a beginning. There remains a serious lag in application of the minimal standards, but of even greater importance is the dearth of basic research in resuscitation, shock, and other immediate and long-range problems in therapy.

### Accreditation and Categorization of Emergency Departments

The current dictum that an ambulance should deliver a patient to the nearest emergency unit is no longer acceptable. It is essential that road maps and roads signs, at appropriate locations, designate routes to hospitals and emergency departments. The patient must be transported to the emergency department best prepared for his particular problem. In the absence of a descriptive categorization of the level of care that might reasonably be expected at a facility, neither the patient nor the ambulance driver can judge which facility is adequate to the immediate need. It is usually taken for granted

by the general public that every emergency room can render full care for injuries of all magnitudes. There is the obligation to the severely injured patient as well as to the lone physician, to the small staffs of remote hospitals, and to institutions with minimal emergency department facilities, that the public be thoroughly informed of the extent of care that can be administered at emergency departments of varying levels of competence. A categorization of emergency departments would serve to indicate the level of care that a patient might reasonably expect. Current check lists used by the Joint Commission on Accreditation of Hospitals are not sufficiently comprehensive for this purpose.

In a given population, whether within a large city, a small community, or a sparsely settled area, the average number of patients requiring emergency care is generally stable, except under conditions of natural disaster or national emergency. Within a given region, it is uneconomical and impractical to expect that every emergency department deal with all degrees of severity of injury.

Hospital emergency departments should be surveyed in a number of differing geographical areas, to determine the numbers and types of emergency facilities necessary to provide optimal emergency treatment for the occupants of each region. Provision must be made for the expected doubling of population within a few decades. Once the required numbers and the types of treatment facilities have been determined, it may be necessary to lessen the requirements in some institutions, increase them in others, and even redistribute resources to support space, equipment, and personnel in the major emergency facilities. Until patient, ambulance driver, and hospital staff are in accord as to what the patient might reasonably expect and what the staff of an emergency facility can logically be expected to administer, and until effective transportation and adequate communication are provided to deliver casualties to proper facilities, our present levels of knowledge cannot be applied to optimal care and little reduction in mortality or lasting disability can be expected.

Emergency units might be categorized as follows:

***Type 1. The Advanced First Aid Facility***
Information now available indicates that most emergency departments across the country are in this category. They do not have a full-time physician staff, and frequently not even a full-time nursing staff. Only modest first aid equipment is available and, although minor conditions and emergency resuscitation might be satisfactorily handled in this setting, it would be unfair to the patient as well as to the staff to expect or demand adequate care of the critically injured.

***Type 2. The Limited Emergency Facility***
This type is found in many hospitals whose emergency departments function 24 hours daily, chiefly as outpatient clinics or first aid facilities, but are nevertheless often confronted with the need to render major emergency care beyond their capabilities. A nurse and perhaps a physician are available at all times. Because of limitations of equipment and facilities, problems of full-time physician coverage, and limited access to specialists, complete care cannot always be provided to the critically injured.

In sparsely populated areas and small communities and many urban hospitals, facilities of this type are essential, and, by proper sorting, large numbers of medical and surgical patients can be adequately handled and removed from the chain of evacuation. It is in the rural areas and the towns of fewer than 2500 people, however, that 70 percent of the traffic fatalities occur. The dedicated staffs of limited emergency departments recognize that the needs of the critically injured patients frequently exceed the capabilities of their facilities and personnel. To expect highly specialized care under these circumstances is unfair both to the patient and to the physician. Emphasis on resuscitation, expenditure of time and effort in thorough preparation before movement, and rapid and efficient transportation to major emergency facilities would lower morbidity and mortality rates. It is here that helicopter ambulances would be most effective. There have been no extensive surveys in either rural or urban areas to establish the number of either limited or major emergency facilities required or to define models of rapid transport.

*Type 3. The Major Emergency Facility*

The need for major emergency facilities adequate to render complete care to the severely injured or the seriously ill is well recognized. Few such facilities exist. Most emergency departments of large hospitals have not yet met the space or personnel needs of outpatient and nonemergency cases, and few have the funds to construct, equip, and man adequate facilities. To carry out their mission, the number and location of major emergency facilities must be in keeping with the numbers of patients to be treated from day to day, with provision for expansion in disaster. They must be so located as to serve precisely designated rural areas or districts in densely populated areas. Major emergency facilities require 24-hour staffing by highly competent medical and paramedical personnel trained in resuscitation and other lifesaving measures before transfer of the casualty to the operating room, intensive care unit, or hospital ward. Bloodbanks, complete resuscitative equipment, X-ray facilities (including those for angiography), constantly available well-developed clinical laboratory services, and ready accessibility to operating rooms are essential. The director of a unit of this type should be experienced in the overall care, triage, and determination of priorities of treatment of victims of severe trauma. Nursing, paramedical, and administrative personnel should be assigned to the emergency department permanently or at least for protracted periods. Specialized consultants must be available at all times. The need for ready availability of highly qualified specialists in all branches of medicine and surgery and of laboratories devoted to clinical support and research strongly supports the view that the major emergency facility should be an integral element of large hospitals and university medical centers, rather than an isolated facility devoted solely to emergency care. Such a clinic is essential to proper training in trauma.

*Type 4. The Emergency Facility Combined with a Trauma Research Unit*

This is designed to be the ultimate goal in combining the highest development of patient care with research facilities that permit investigation in support of therapy. These units are discussed in the section of this report on research in trauma.

*Recommendations*

- Initiation of surveys and pilot programs to establish patterns of and the numbers and types of emergency departments necessary for optimal care of emergency surgi-

cal and medical casualties in a selected number of cities, groups of small communities, and sparsely populated areas.
- Development of a mechanism for inspection, categorization, and accreditation of emergency rooms on a continuing basis.
- Federal fund support to design, construct, and, in part, operate model emergency facilities of each type.

### Interrelationships Between the Emergency Department and the Intensive Care Unit

In planning emergency facilities for the future and in redesigning current facilities, it would seem advantageous to transfer certain protracted functions of resuscitation out of the emergency rooms and integrate them closely into the operation of the intensive care unit. Recent developments have made the intensive care unit the focal point of nursing and medical care in many large hospitals. Concentrated in this area are resuscitation equipment, monitors, respirators, defibrillators, pacemakers, suction devices, and, above all, the highly trained personnel needed for the care of the severely ill medical case or the injured patient.

#### *Recommendation*

- Expansion of intensive care programs to ensure uninterrupted care beyond the immediate measures rendered in emergency departments.

## THE DEVELOPMENT OF TRAUMA REGISTRIES

Emergency case records are often inadequate. Sufficient thought has not been given to extracting information concerning the nature of the accident, the clinical condition during transportation and at the time of entry to the emergency department, the resuscitative measures used, the response of the patient, the initial laboratory and X-ray records, and, finally, the ultimate outcome with or without temporary or permanent disability. This information is vital on several scores. It is essential in recreating the circumstances of the accident and in relating the mechanism of trauma to accident prevention. It is necessary for clinical analysis, for improvement of therapy, and for appraisal of emergency facilities. Finally, it could provide a basis for determining the duration, nature and degree of disability and the long-term, natural history of specific injuries. An example of the need for long-term records of this type is that of a patient in whom the ultimate manifestation of damage to the femoral artery accompanying a fracture of the femur was not apparent until 34 years later when generalized arteriosclerosis developed, and thrombosis of the involved femoral artery necessitated amputation. Information of this type on a broad scale could be obtained by the development of trauma registries within the hospital, similar to those established and maintained for many years in the cancer field. The vast pool of information available from such registries might provide guidelines for more objective definition of degrees of disability on which to base judgment in compensation cases.

### Recommendations

- Establishment of trauma registries in selected hospitals as a mechanism for the continuing description of the natural history of the various forms of injuries.
- Subsequent consideration of establishment of a national computerized central registry.
- Studies on the feasibility of designating selected injuries to be incorporated with reportable diseases under Public Health Service control.

## HOSPITAL TRAUMA COMMITTEES

Trauma committees, as standing committees of hospital staffs, might serve several useful purposes. As multi-specialty groups, they would set the standards of care, supervise staffing and function of the emergency department, maintain the trauma registry, and conduct training programs for staff, paramedical and ambulance personnel in cardiopulmonary resuscitation and other advanced techniques. They should be prepared to coordinate research programs and to organize follow-up studies on the long-term effects of trauma as well as the treatment itself. An important function would be a continuing analysis of the physical status of patients on delivery to the emergency department, as a guide to correction of deficiencies in first aid and transportation, and of the extent to which physician care is indicated in advance of the hospital.

### Recommendation

- Formation of hospital trauma committees, on a pilot basis, in selected hospitals.

## CONVALESCENCE, DISABILITY, AND REHABILITATION

At a meeting of a local Committee on Trauma of the American College of Surgeons, a theoretical problem was presented to approximately 50 distinguished surgeons as to when a young man should resume heavy labor following specific injury. The estimates of duration of disability ranged from 2 weeks to a year, with little concentration of the estimates in between. There is little scientific basis on which to predict or measure convalescence or disability. Rehabilitation should begin immediately after injury and its goals should be to prevent disability or shorten its duration and degree and to return the patient to a useful economic status. Rehabilitation should not be reserved for those with established permanent disabilities.

### Recommendations

- Development of additional studies on the quantitation of degrees of disability and the stages of convalescence at which return to productive work is indicated.
- Development of studies on rehabilitation with emphasis on measures to be initiated in the earliest phases of treatment.

## MEDICOLEGAL PROBLEMS

The courtroom sequelae of accidents are often, perhaps generally, dealt with in a manner below the general standards of the medical and legal professions. The courts for

settlements of disability claims in some areas are provided with inadequate or inexpert evidence, and judgment may well reflect response to social, emotional, or political pressures, rather than to sound medical testimony. In this respect both lawyers and physicians for the claimants and for the defending insurance companies too often produce prejudiced medical testimony, diametrically and predictably contradictory. "Expert medical testimony" under these circumstances has commonly lacked clinical expertise. A system has been adopted by the judiciary in a number of localities to provide impartial evaluation of disability by a panel of physicians who are expert in their given fields and paid either by the court or jointly by the parties involved. This mechanism has proved to be of great value, and should be more universally employed. It is imperative that the physician's role be uninfluenced by socioeconomic pressures.

In the final analysis, compensation for disability is a drain on every citizen through federal taxation, withholdings from earnings, and the increasing upward spiral of premiums on disability insurance. All these costs could be reduced if the demonstrated fairness and objectivity in categorizing degrees of disability employed by the Armed Forces and the Veterans Administration were applied by the medical profession and the courts to persons disabled by accidental injury or disease. In the military services, processing begins at the time a member incurs an injury or disease that may be temporarily or permanently disabling. Findings are referred by a medical committee to a physical evaluation board and reviewed at the highest levels, with the benefit of counsel at all stages, providing an objective determination of degrees of disability to serve as a basis for compensation. Society concurs in the fairness of this system and the care with which the Veterans Administration and the Armed Forces protect the rights of the nearly 2,000,000 persons who receive service- connected disability compensation among the 21,800,000 veterans of military service.(11) The same objectivity and fairness can be applied to the rest of the population through optimal medical care to prevent disability, a hospital trauma committee to judge disability, and impartial medical panels to serve the courts. Systems for rapid and uniform processing and compensation of the injured with minimal recourse to the courts should be applied nationally.

Forensic medicine constitutes a medical specialty of high order and only when a sufficient number of specialized physicians are available to carry out this work will important information, now needed, become available. Unfortunately, most coroners in this country are political appointees, mostly laymen, frequently funeral directors; but this situation is being gradually corrected by establishment of medical examiner systems in several cities, some counties, and a few states. Progress in this area must be accompanied by the training of more pathologists in forensic medicine.

With the expansion of the role of the medical examiner, implementation of a uniform code for reporting accidents and accidental deaths, and mandatory autopsy of fatal cases, to include tests for alcohol and drugs, an opportunity exists to study effectively the specific causes and mechanisms of injury of all magnitudes and to establish base lines against which to measure the efficacy of control measures.

### Recommendations

- Judicial application of the principle of seeking impartial medical advice in the determination of disability.
- Replacement, on a national scale, of lay coroners by medical examiners who are not only physicians but also qualified pathologists experienced in medicolegal problems.

## AUTOPSY OF THE VICTIM

The exact cause of death in many of the injured can be learned only from complete autopsy examination. Especially in multiple injuries, priority of treatment may have been directed toward obvious, or overt, injuries, but covert injuries, such as laceration of major vessels, retroperitoneal hemorrhage, or fat embolism may have been the primary cause of death. Although it is the responsibility of the coroner to direct autopsy examination, this is not routinely performed. If this opportunity to ascertain the specific cause of death is to be grasped, complete autopsies must be performed routinely on those who have died as the result of injury. Furthermore, the findings in large numbers of autopsies must be critically analyzed in order to point the way to necessary changes in treatment. One such study, of 950 consecutive autopsies of accident cases, revealed an unexpected finding: in 38 percent of those who died in the hospital or after returning home following fracture of the hip, the primary cause was pulmonary embolism. Yet in a large number of similar patients who had not been autopsied, pulmonary embolism was the recorded cause of death in only 2 percent.(12) This is but one example of the value of careful autopsy examination. Such findings are important to alert emergency department staffs to the incidence of covert injuries that might well dictate first priority care, as well as the care and prophylactic measures that must be observed during definitive care and rehabilitation.

### Recommendation

- Routine performance and analysis of complete autopsies of accident victims.

## CARE OF CASUALTIES UNDER CONDITIONS OF NATURAL DISASTER

It is apparent that the problems of care of disaster victims differ from those of the care of individually injured persons in that they are concerned with unexpected expansion of first aid, rescue, communication, sorting, distribution, and medical care. No plan for emergency care in disaster is likely to succeed unless it provides for an orderly utilization of currently functioning facilities. For this reason, emphasis should be placed on employment of all elements of disaster services on a day-to-day basis so that they will be functioning smoothly when the load of casualties suddenly increases.

Because disasters occur repeatedly in this country and because progress has been slow in solving problems of caring for mass civilian casualties, medical problems encountered in disaster should be under continued study and analysis by multi-disciplinary groups. The need for integration of public resources in coping with material damage in disaster is apparent, but the community role in handling human casualties is less

well prescribed. The Disaster Research Group of the Division of Anthropology of the National Academy of Sciences-National Research Council, in its extensive studies from 1951 to 1963 for the Office of Civil Defense, and the Ohio State University Disaster Research Center, established in 1963, have both concentrated on responses of local, state, and federal agencies to the stresses imposed by unexpected disaster with emphasis on behavioral and sociological problems. Efforts of the American College of Surgeons to encourage members to report on casualty care in disasters have added little substantive information on which to improve results. The Committee on Disaster Medical Care of the American Medical Association has attempted to identify potentials for improved care, but no national action program has been implemented. An ad hoc Committee on Disaster Medical Care of the National Academy of Sciences-National Research Council finds no evidence of effort by these groups, or by independent workers or federal organizations, toward pooling of resources to assemble substantial data or to analyze medical management in a sufficient number of disasters of different types. In no single large disaster do we have precise information on the causes of death, the numbers and types of injuries of survivors, or the rewards of efficiency and the penalties of inefficiency in rescue, first aid, transportation, and medical care. A pattern exists in the organization and functions of the Office of Emergency Planning of the Executive Office of the President for gaining this type of information and for implementing improvements in management and care that would result from its analysis. Trained disaster specialists based at eight federal centers throughout the nation move out at first warning to areas imperiled by disaster. On the basis of their assessments, the President can declare a major disaster; under the direction of the Office of Emergency Planning 24 agencies would then be automatically authorized to provide assistance.(13) These are concerned mainly with supplies, equipment, and personnel to clear debris; provide food, medicine, and shelter; restore utilities; enforce law and order; and render financial assistance and welfare services. Many communities are unaware of the way to secure outside assistance in rescue, first aid, and medical help available through the American National Red Cross, the U. S. Public Health Service, civil defense agencies, and field units of the Armed Forces. Better utilization of these resources could be ensured if in each community or area a recognized committee or council on emergency medical services would assume the role of coordination of the efforts of these agencies. Physicians thoroughly familiar with the missions of the 24 federal agencies and versed in local medical problems in disaster should be included on the teams of trained disaster specialists of the eight federal centers.

### Recommendation

- Development of a center to document and analyze types and numbers of casualties in disasters, to identify by on-site medical observation problems encountered in caring for disaster victims, and to serve as a national educational and advisory body to the public and the medical profession in the orderly expansion of day-to-day emergency services to meet the needs imposed by disaster or national emergency

## RESEARCH IN TRAUMA

### Current Status of Research Support

Research in trauma has suffered from the lack of recognition of trauma as a major public health problem. This is, in part, due to the present practice of evaluation of research support requests by study sections or other advisory committees of granting agencies identified with "disease" entities, rather than those related to "accidents," "injuries," or "trauma." An analysis of grants in 1965 identifies only $5 million in support of research related to trauma by six of the Institutes of the National Institutes of Health and other bureaus of the U.S. Public Health Service. National expenditures for all medical research in 1964 were estimated to be $1675 million of which $1134 million was from Government, $395 million from industry, and $146 million from private sources.(14) On the basis of these vast sums, it is estimated that current research expenditures by the National Institutes of Health and the Division of Chronic Diseases of the U.S. Public Health Service for fiscal year 1963 were 50 cents for each of the 10 million persons disabled by accidental injury, $220 for each of the estimated 540,000 cancer cases, and $76 for each of the estimated 1,420,000 cardiovascular cases. The 1966 federal budgets for research on cancer and cardiovascular diseases alone are estimated to be in excess of $280 million. (15)

There remains no doubt that society is reaping dividends from investments devoted to research in disease, and that this effort deserves continued support and expansion. Lack of a proportionate degree of support in accident prevention and care of the victims of trauma cannot be ascribed to unwilling legislators or directors of voluntary and philanthropic organizations. The most obvious reason for current lack of emphasis on the kinds of research required and the ways and means of utilizing knowledge we already have is that there is no unified mechanism, federal or nonfederal, to present the full picture of needs, to identify and encourage necessary research, to enlist financial support, to serve as a clearinghouse for information, or to offer advice and consultation.

During the years of expansion of the National Institutes of Health and other federal agencies and voluntary organizations concerned with national health problems, emphasis has been properly focused on fundamental research. A charge of the President to his Commission on Heart Disease, Cancer, and Stroke was to recommend practical steps to reduce the heavy losses exacted by these diseases, not only through the development of new scientific knowledge, but also through the use of lifesaving medical knowledge we already possess but fail to bring to so many stricken American families. The dispatch with which the program was defined and was supported by Congress was due in large part to the knowledge gained in recent years through generous support of basic research and to the wealth of information and assistance available through the American Cancer Society and the American Heart Association, both of which recognized years ago the necessity of joint participation of professional and lay organizations and of the general public, and which have pioneered for decades in the support of health research, public education, training of physicians and allied personnel, and direct service to patients. The need for such organized effort in the field of trauma is apparent.

### Potentials in Fundamental and Clinical Research

To determine accurately the physiological changes produced by trauma alone, studies must be initiated promptly on persons who are otherwise healthy at the moment the stresses of trauma are imposed. Only by this approach can the hemodynamic, metabolic, ultrastructural, and other changes of diseases be compared with or differentiated from the hypoxia, collapse, and other effects of trauma as the sole etiological factor.

Relatively little has been done in fundamental studies on acutely injured subjects on wound healing; wound infection; hemodynamic, metabolic, cardiac, and respiratory changes following trauma; ultrastructural alterations in injury and shock; the effects of head, spinal cord, and nerve injuries; paralytic ileus; posttraumatic renal insufficiency; fracture healing; resuscitation, and many other areas of basic importance. To a limited extent these problems are now under investigation in laboratories devoted to studies on acute and chronic disease and malignancy, but rarely in relation to trauma specifically.

Many of the most important advances in surgery have evolved from discoveries at the war front. Wounds from high velocity missiles and the environmental factors that prevail in military combat areas produce changes that cannot be simulated in civilian life. Although contributions to the care of military casualties can be made through research in noncombat medical centers, there is as great a need for contributions that can be made only by sophisticated research in military front line medical installations. The opportunity should be fully grasped in Vietnam, as it was in Korea, to improve the care of the injured throughout the world by seeking, in an organized manner, improved ways of treating the critically injured person.

### Specialized Centers for Clinical Research in Shock and Trauma

In the very recent past, owing in large part to stimulation and encouragement of the Committee on Shock of the National Academy of Sciences-National Research Council and with the support of federal and private granting agencies, basic and clinical scientists have been installed in highly sophisticated laboratories devoted to studies in shock and trauma in human patients in a limited number of medical centers. It is a tribute to the profession that these pioneer groups of investigators willingly devote long hours to research in trauma, a disease predominantly of nights and weekends. These units are designed to combine the highest development of patient care with research facilities that enable investigation to proceed without hampering therapy. For example, in one institution the space previously occupied by three surgical wards has been converted to laboratories to support intensive care and study of not more than four patients at a time. In this and other units the basic scientists in physiology, microbiology, biochemistry, electronics, isotopes, engineering, etc., collaborate with clinicians in carrying out highly complex studies in man that were previously limited to animal studies. Repetitive observations are rapidly computed and relayed to the clinician, providing moment-to-moment hemodynamic and biochemical measurements. The improved therapy that results from these studies is gradually modifying previous concepts of irreversibility in those suffering from hemorrhage, burns, and sepsis.

Units of this type must be adapted to measure and treat the overall effects of trauma, sepsis, or critical nonsurgical conditions, but additional studies might take one of several directions, depending on patient load and local research interests and talent. For example, a 10- or 12-bed burn unit might embrace the whole panorama of the burn problem, from the time of injury through rehabilitation. Another unit might be geared toward early hemodynamic or metabolic changes, shifts in the various body fluid compartments, oxygen utilization, or energy production. Others might center on severe head injuries, or abdominal injuries, or fractures. To date, no unit of this type has been developed for research in head and neck injuries, and such units are vitally needed.(16)

Such facilities might include ancillary equipment for hemodynamic measurements in the emergency department, so that the earliest possible changes as well as the response to resuscitative fluids and other therapeutic agents could be measured. These observations would then be continued in the operating room, the intensive care unit, or the special research unit for uninterrupted study throughout all phases of response to injury and recovery. Research on the acutely injured requires numerous personnel of many disciplines. The critical nature of the illness is such that research must continue around the clock. Nursing and laboratory personnel requirements are costly.

Numerous studies now point convincingly to the conclusion that moment- to-moment hemodynamic and biochemical measurements in the acutely ill or severely injured patient offer the best available guidelines for improved therapy. Information gained by these units proves valuable guidance for the treatment of injured patients in other less specialized hospitals where research is not feasible.

These clinical research units involve very specialized facilities with unusual demands for staffing and equipment, and for parallel facilities for animal experimental studies. The survival of critical medical and surgical cases has been increased, and many useful techniques have been adopted in other areas of the hospital.

The most significant obstacle at present is the lack of long-term funding. Unpredictability of financial support hinders recruitment of competent scientists and technicians, retention of key personnel, and procurement of necessary equipment.

The few clinical research units for the study of the acutely injured have been supported mainly by the National Institute of General Medical Sciences, the Medical Research and Development Command of the Army, and the John A. Hartford Foundation. Very recently the National Institute of General Medical Sciences, recognizing a need for coordination and identification of research needs in trauma, conducted a workshop conference on the management of trauma, including hospital arrangements and training; the physiology of shock, considered from the systems and organ level; and study of trauma at the cellular and subcellular levels. This Institute has now appointed a director for development of a program of research in the therapy of trauma, and is encouraging expansion of support in this direction. The needs for research in resuscitation, shock, trauma, and emergency conditions related to acute and chronic illness, for academic career training and fellowships in traumatology, for improved facilities and equipment, and for experimental and clinical laboratories in direct support of emergency departments and in-

tensive care units warrant serious consideration of establishment of a National Institute devoted to trauma and emergency medical care.

### Recommendations

- Increased federal and voluntary financial support of basic and applied research in trauma.
- Long-term financial support of specialized centers for clinical research in shock and trauma.
- Expansion of clinical research in war wounds.
- Expansion within the U. S. Public Health Service of research in shock, trauma, and emergency medical conditions, with the goal of establishing a National Institute of Trauma.

## SPECIFIC RECOMMENDATIONS

### Accident Prevention

- Formation of a National Council on Accident Prevention at the Executive level for coordination of information and advice on implementation of measures and regulations now vested in scattered private, industrial, and federal agencies, and for research, public education, and development of improved standards in accident prevention.

### Emergency First Aid and Medical Care

*First Aid*

- Extension of basic and advanced first aid training to greater numbers of the lay population.
- Preparation of nationally acceptable texts, training aids, and courses of instruction for rescue squad personnel, policemen, firemen, and ambulance attendants.

*Ambulance Services*

- Implementation of recent traffic safety legislation to ensure completely adequate standards for ambulance design, and construction, for ambulance equipment and supplies, and for the qualifications and supervision of ambulance personnel.
- Adoption at the state level of general policies and regulations pertaining to ambulance services.
- Adoption at district, county, and municipal levels of ways and means of providing ambulance services applicable to the conditions of the locality, control and surveillance of ambulance services, and coordination of ambulance services with health departments, hospitals, traffic authorities, and communication services.
- Pilot programs to determine the efficacy of providing physician-staffed ambulances for care at the site of injury and during transportation.
- Initiation of pilot programs to evaluate automotive and helicopter ambulance services in sparsely populated areas and in regions where many communities lack hospital facilities adequate to care for seriously injured persons.

*Communication*

- Delineation of radiofrequency channels and of equipment suitable to provide voice communication between ambulances, emergency departments, and other health-related agences at community, regional, and national levels.
- Pilot studies across the nation for evaluation of models of radio and telephone installations to ensure effectiveness of communication facilities.
- Day-to-day use of voice communication facilities by the agencies serving emergency medical needs.
- Active exploration of the feasibility of designating a single nationwide telephone number to summon an ambulance.

*Emergency Departments*

- Initiation of surveys and pilot programs to establish patterns of and the numbers and types of emergency departments necessary for optimal care of emergency surgical and medical casualties in a selected number of cities, groups of small communities, and sparsely populated areas.
- Development of a mechanism for inspection, categorization, and accreditation of emergency rooms on a continuing basis.
- Federal fund support to design, construct, and, in part, operate model emergency facilities of each type.
- Interrelationships between the Emergency Department and the Intensive Care Unit
- Expansion of intensive care programs to ensure uninterrupted care beyond the immediate measures rendered in emergency departments.

*The Development of Trauma Registries*

- Establishment of trauma registries in selected hospitals as a mechanism for the continuing description of the natural history of the various forms of injuries.
- Subsequent consideration of establishment of a national computerized central registry.
- Studies on the feasibility of designating selected injuries to be incorporated with reportable diseases under Public Health Service control.

*Hospital Trauma Committees*

- Formation of hospital trauma committees, on a pilot basis, in selected hospitals.

*Convalescence, Dispability and Rehabilitation*

- Development of additional studies on the quantitation of degrees of disability and the stages of convalescence at which return to productive work is indicated.
- Development of studies on rehabilitation with emphasis on measures to be initiated in the earliest phases of treatment.

*Medicolegal Problems*

- Judicial application of the principle of seeking impartial medical advice in the determination of disability.
- Replacement, on a national scale, of lay coroners by medical examiners who are not only physicians but also qualified pathologists experienced in medicolegal problems.

*Autopsy of the Victim*

- Routine performance and analysis of complete autopsies of accident victims.

Care of Casualties Under Conditions of Natural Disaster

- Development of a center to document and analyze types and numbers of casualties in disasters, to identify by on-site medical observation problems encountered in caring for disaster victims, and to serve as a national educational and advisory body to the public and the medical profession in the orderly expansion of day-to-day emergency services to meet the needs imposed by disaster or national emergency.

Research In Trauma

- Increased federal and voluntary financial support of basic and applied research in trauma.
- Long-term financial support of specialized centers for clinical research in shock and trauma.
- Expansion of clinical research in war wounds.
- Expansion within the U. S. Public Health Service of research in shock, trauma, and emergency medical conditions, with the goal of establishing a National Institute of Trauma.

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INVITED COMMENTARY

# INVITED COMMENTARY: ACCIDENTAL DEATH AND DISABILITY: THE NEGLECTED DISEASE OF MODERN SOCIETY

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People have been helping their friends and strangers in need of medical care for centuries. Organized systems of care go back to the times of Napoleon's surgeon, Dominique-Jean Larrey, who developed the ambulance volantes ("Flying ambulances"). (1) In the United States, the Civil War saw the development by Dr. Jonathan Letterman of organized care of wounded in the field, transporting them from the field in ambulances to field hospitals.(2) Since the start of the 20th century, motorized vehicles and air ambulances have been used increasingly to care for those injured. The military medics, throughout World War I, World War II, the Korean War and the Vietnam war have demonstrated significant improvements in morbidity and mortality.

In spite of improvement in military care, similar advancements in the civilian response to injuries were limited. The publication of Accidental Death and Disability: The Neglected Disease of Modern Society by the National Academy of Sciences National Research Council in 1966 was prompted by those improvements in military care and a desire to translate those capabilities into the civilian community. This document was really the first time that we looked as a nation at care of the injured outside of the military setting. Although it focused on victims of motor vehicle crashes, the report also addressed injuries from other mechanisms, including the industrial setting. In addition to serving as a seminal document leading to improvements in EMS, the paper

also addressed systems of care issues, including care in emergency rooms (as limited as that care may have been); care in other areas of the hospital, including intensive care units, communications, funding and research needs; as well as training and education in both the pre-hospital and hospital environments. The paper also proposed equal status of police, fire and EMS in the community. This white paper, combined with other events, led directly to legislation establishing the Department of Transportation and the precursor agency to the National Highway Traffic Safety Administration (NHTSA) Office of EMS, tasked with issues such as educational resources and vehicle standards. The DOT has been steadfast in its support for EMS since that time.

Almost 40 years after the publication of the white paper, the National Academies revisited the critical issues presented in the white paper leading to the publication of three volumes addressing emergency care: Emergency Medical Services: At the Crossroads(3), Hospital-Based Emergency Care: At the Breaking Point(4), and Emergency Care for Children: Growing Pains.(5) These detailed reports described improvements in care which had occurred subsequent to the publication of the white paper but also reinforced issues that still needed to be addressed. The white paper was also instrumental in focusing discussions for multiple landmark national EMS documents supported by NHTSA and their federal partners, including the 1996 EMS Agenda for the Future and the EMS Agenda 2050 two decades later.

Emergency care activities have continued to improve over subsequent years, but we still have significant issues to address. Most recently, the DOT published the National Roadway Safety Strategy.(6) Using the Haddon Matrix as a model, this report identifies five goals leading to a society with zero preventable deaths, particularly for motor vehicle crashes. Those five pillars are: safer people, safer roads, safer vehicles, safer speeds and post-crash care. Including post-crash care is a visible recognition of the importance of what we do and offers potential grant funding sources for EMS.

It is important to understand that the recommendations in the white paper and subsequent reports depend on the entirety of the community to address these issues at local, state, regional and federal levels. In addition to the DOT, a number of federal executive branch agencies are critical to advancing these issues. Those agencies include several within the Department of Health and Human Services, especially the Administration for Strategic Preparedness and Response with its focus on preparedness and disaster issues; the Health Resources and Services Administration's Maternal Child Health Bureau, which houses the federal EMS for Children program; the Office of Rural Health Policy and its EMS flex grants; and the Centers for Medicare and Medicaid Services. The Department of Homeland Security (including the US Fire Administration within FEMA) provides great support for the fire-based EMS community, with many resources also available and relevant to non-fire-based EMS. Multiple other federal agencies house operational EMS programs that interface on a regular basis with civilian EMS agencies

While the white paper helped pave the way for modern EMS systems in communities across the nation, its focus on motor vehicle crashes has led to many misconceptions in EMS. For one, many throughout the EMS community wrongly assume that the reason

EMS is reimbursed as a transportation benefit—rather than actual medical care—stems from the white paper and subsequent creation of DOT and NHTSA. This is a myth. The white paper makes clear that its authors saw EMS not only as a means of rapid transportation, but also medical care. The inclusion of EMS at DOT and NHTSA was because that care, along with transport, is a vital piece of reducing death and disability from motor vehicle crashes. The white paper also explicitly stated that an EMS system must be capable of responding to all types of medical emergencies, not just traffic-related incidents or traumatic injuries—a belief that guides the thinking of DOT and the NHTSA Office of EMS to this day.

The basis for the transportation-based EMS reimbursement model does, in fact, date back to the same time period—but only because the legislation that created Medicare and Medicaid passed only a year prior to the white paper's publication. The authorities given to CMS's predecessor agency by Congress in the late 1960s meant Congress and CMS had the power to change federal health insurance reimbursement policy, in this case reimbursement based on patient transportation. That the model looks similar more than half a century later is a reflection of neither CMS nor Congress seeing a need to update it. Modernizing those policies to recognize the high-quality, evidence based medical care provided by EMS clinicians will require that the entire EMS community work in cooperation with both CMS and Congress to get those authorities updated. The EMS community must initiate that action and act with one voice.

As we all know, the pandemic has placed great stress on our nation's healthcare system, in the pre-hospital and hospital environment, as well as our public health system. It's incumbent on us all to revisit the white paper, as its systems approach and its recommendations still serve as a foundation for advancing EMS. It's not only a reminder of where we came from and what we have accomplished since its publication, but also a reminder of what we need to continue to do moving forward.

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ORIGINAL RESEARCH

# FEASIBILITY AND SAFETY OF A FIELD CARE CLINIC AS AN ALTERNATIVE AMBULANCE DESTINATION DURING THE COVID-19 PANDEMIC

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## ABSTRACT

***Background:*** Anticipating an increased utilization of healthcare facilities during the COVID-19 surge, the San Francisco Department of Public Health developed a plan to deploy neighborhood-based Field Care Clinics (FCCs) that would decompress emergency departments by serving patients with low acuity complaints. These clinics would receive patients directly from the Emergency Medical Services (EMS) system. Transports were initiated by a paramedic-driven protocol, originally by EMS crews and later by the Centralized Ambulance Destination Determination (CADDiE) System. In this study, we evaluated the outcomes of EMS patients who were transported to the FCC, specifically as to whether they required subsequent transfer to the emergency department.

***Methods:*** We performed a retrospective study of all patients transported to the Bayview-Hunters Point (BHP) neighborhood FCC by EMS between April 11th, 2020, and December 16th, 2020. Descriptive statistics and Chi-Square Tests were used to analyze patient data.

***Results:*** In total, 35 patients (20 men, 15 women, average age of 50.9 years) were transported to the FCC. Of these, 16 were Black/African American, 7 were White, 3 were Asian, with 9 identifying as of other races and 9 of Hispanic ethnicity. Twenty-three of these transports resulted from a CADDiE recommendation. Approximately half (n=20) of calls originated within the BHP neighborhood. The most frequent patient complaint was "Pain." Of patients transported to the FCC, 23 were treated and discharged. The 12 remaining patients required hospital transfer, with 3 being discharged after receiving treatment in the emergency department and 9 requiring hospital admission, psychiatric, or sobering services. The likelihood of hospital transfer did not significantly vary by sex (p=0.41), 9-1-1 call origination relative to BHP neighborhood (p=0.92), or CADDiE recommendation ($p$=0.51).

***Conclusion:*** Three-fourths of patients who required subsequent hospital transfer were admitted or required specialized services, suggesting that the FCC was viable for managing low acuity conditions. However, the underutilization of the FCC by EMS as a transport destination and a high hospital transfer rate indicates training and protocol refinement opportunities. Despite the small cohort size, this study demonstrates that an FCC alternative care site can act as a viable source for urgent and emergency care during a pandemic.

## BACKGROUND

The need for alternatives to transporting patients to traditional medical facilities and emergency departments (EDs), including out-of-hospital options when these facilities are overwhelmed in times of disaster, continues to be a challenge (Gregg et al., 2020). In an effort to reduce the impact on healthcare facilities during the anticipated COVID-19 surge in March 2020, the San Francisco Department of Public Health (SFDPH) developed a plan to deploy neighborhood-based Field Care Clinics (FCCs) that would receive patients meeting certain criteria from the Emergency Medical Services (EMS) system.

The San Francisco Field Care Clinic Program was modeled after the Disaster Medical Assistance Team (DMAT) response, which was developed by the National Disaster Medical System (NDMS) and has been utilized throughout the United States in disasters ranging from earthquakes and climate-related fires to hurricanes and floods. While these facilities can provide semi-controlled environments for patient care with temperature control, lighting, and stable treatment platforms and are adaptable in size and capabilities, they cannot fully replace the complex care provided by traditional emergency departments, trauma centers, and intensive care units. Whereas other COVID-19 alternative care sites were designed to provide ongoing care to decompress hospitals (Goei & Tiruchittampalam, 2020; Gregg et al., 2020), the goal of San Francisco's FCC was to decompress emergency departments and the EMS system by serving patients with low acuity complaints. This model differed from other sites as patients were received directly from EMS using a paramedic--driven protocol without an ED evaluation (Goei & Tiruchittampalam, 2020; Gregg et al., 2020). Recognizing that time and resources were limited to address the uncertain magnitude of the first surge in cases, SFDPH chose to pilot the program and selected the first site based on anticipated need and operational capability.

The first FCC was placed in a weatherized tent co-located at the Public Health Department's Southeast Health Center (SEHC), a county-run clinic in the Bayview-Hunters Point Neighborhood (BHP). The FCC was equipped to handle both confirmed and suspected COVID-19 patients and other non-COVID-19 related complaints. The BHP was selected as it has higher population densities of Asian, Black/African American, and Hispanic residents who were disproportionately affected by COVID-19 (Khanijahani et al., 2021; Magesh et al., 2021)especially in terms of morbidity and mortality. This study aimed to systematically review the evidence on the association of racial/ethnic and socioeconomic status (SES. Compared to San Francisco at large, the BHP has a higher rate of poverty and a greater proportion of residents on Medicaid or uninsured (Bayview & Hunters Point PUMA, CA | Data USA, n.d.), (Census Profile, n.d.). There is also, on average, a larger number of persons per household (Census Profile, n.d.)

In terms of employment, BHP residents are more likely to work in jobs in the service industry, transportation, or construction that require in-person attendance than occupations that could be performed remotely (Bayview & Hunters Point PUMA, CA | Data USA, n.d.). Over the course of the pandemic, the BHP also experienced the highest rate of COVID-19 infection in the city. As of May 2022, almost one-third of BHP resi-

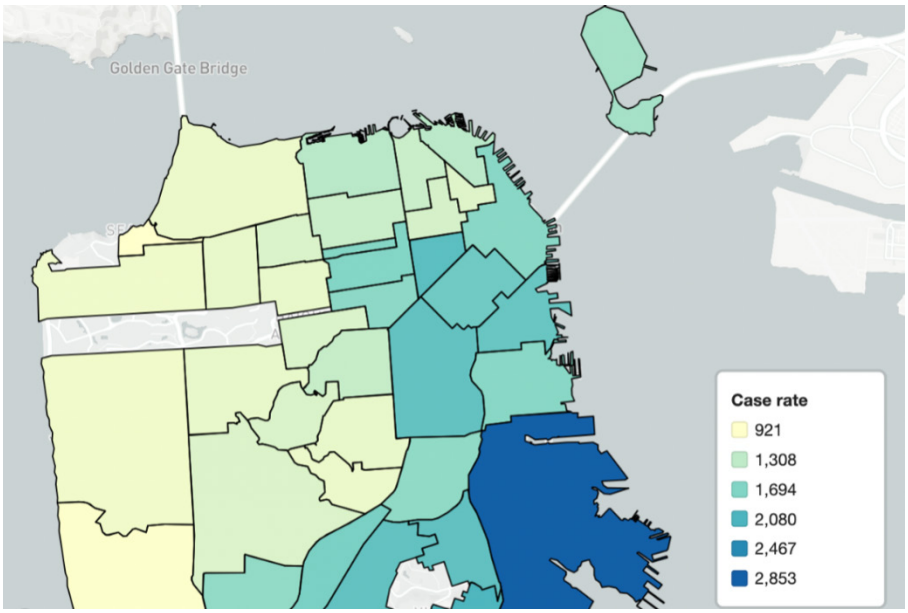


***Figure 1 – Cumulative Case Rates*** – Cumulative total COVID-19 case rate Cases per 10,000 residents. This map is publicly available at https://sf.gov/data/covid-19-case-maps#total-cases-map

dents had contracted COVID-19, a rate 30% higher than that of the next highest affected neighborhood in the city (City and County of San Francisco, n.d.). Cumulative case rates by neighborhood as of May 22, 2022, are shown in Figure 1.

Logistically, the nearest hospital is the county "safety-net" hospital, located 10 minutes north of the FCC site by car. A map of local receiving facilities in relation to the FCC is shown in Figure 2. This county hospital was also anticipated to be the most impacted by COVID-19. It was hoped that an FCC in the BHP could divert lower acuity patients from the county emergency department, reduce EMS travel time so units could return to service faster, and allow patients to receive care closer to their homes. In addition, the community trusted the existing SEHC, and theits staff had become more comfortable managing higher acuity patients compared to many primary care practices. In consideration of these factors, coupled with a focus on social justice and health equity, San Francisco opened the first Field Care Clinic in the BHP.

To determine which patients were eligible for care at the FCC, a paramedic-driven protocol was created. This protocol is shown in Figure 3.

Shortly after the FCC came online, another pilot project, the Centralized Ambulance Destination Determination (CADDiE) System, was introduced to help coordinate ambulance distribution to receiving hospitals. A CADDiE base station was staffed by either an Emergency Medicine physician, paramedic supervisor, or both, and equipped with real-time data on ambu-

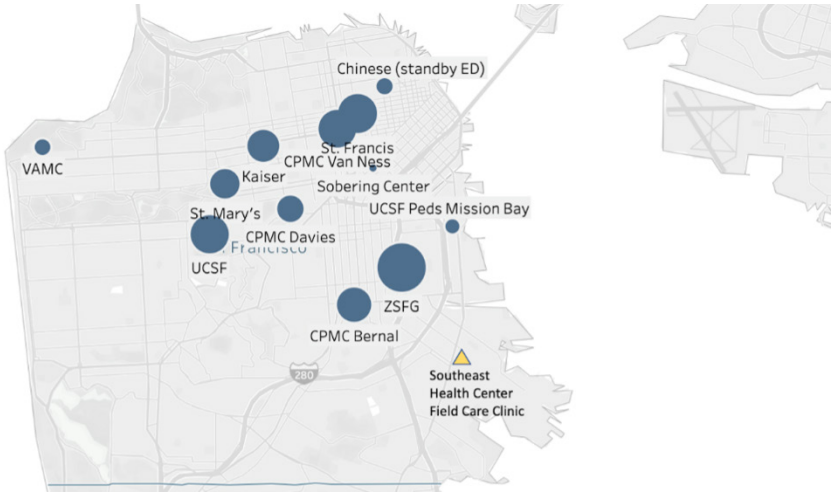


***Figure 2 – Base Hospital Map in Relation to FCC*** – San Franfrisco receiving hospitals. http://sfemergencymedicalresponse.weebly.com/ambulance-destinations.html

Heart rate of 55-120, respiratory rate of 12-24, and oxygen saturation >94% with or without intervention. Contraindications for FCC transport included patients that required specialty or critical care, were sedated or under a psychiatric hold, had uncontrolled bleeding, active seizures, or obvious infestations.

*Figure 3* – EMS Criteria for Field Care Clinic Transport

lance transport activity and diversion status for each hospital in the system. When paramedics in the field encountered a patient who was not in critical condition and did not require care at a specialty center, such as a trauma or burn center, they were required to contact the CADDiE base station via radio. CADDiE would consider multiple factors in recommending a destination, including geography, the patient's hospital preference, the current diversion status of hospitals, and recent EMS system destination selections. In addition to traditional hospital destinations, CADDiE could also recommend transport to the FCC for patients that met predetermined criteria.

In this pilot study, we evaluated the efficacy of using an FCC as an alternative destination for ambulances by investigating the dispositions of EMS patients who were transported to the FCC instead of the emergency department, with and without CADDiE recommendations.

## METHODS

We conducted a retrospective study of all patients transported via EMS to the FCC serving the Bayview-Hunters Point (BHP) neighborhood between April 11th, 2020, and December 16th, 2020. Prehospital chart data was extracted from a data aggregator (Biospatial, Research Triangle Park, USA), and FCC data was extracted from EPIC (EPIC Systems, Verona, USA). Data was manually entered into REDCap, a HIPAA-compliant web-based data collection tool. Data analysis was conducted in SPSS Statistics (IBM, Armonk, USA) using descriptive statistics and Chi-Square tests. Informal qualitative comments that program managers gathered via weekly EMS operations and quarterly EMS Advisory Council meetings, which included anonymous feedback from EMS Providers, FCC staff, and ED providers, were shared with the research team. These comments were collected in the context of an ongoing process and quality improvement of the alternative site during implementation, and they were utilized to help provide context to the study. However, provider feedback was beyond the scope of this study, and results were not tabulated or thematically coded. The study received approval from the University of California San Francisco's Institutional Review Board.

## RESULTS

Between April 16th, 2020, and December 16th, 2020, 35,615 calls from the field to CADDiE resulted in CADDiE recommending a destination hospital, representing 89.9% of the 39,606 CADDiE eligible transports. After excluding transports that occurred outside of the FCC's operating hours, 18,081 transports were potentially eligible for FCC care if they qualified for the protocol shown in **Figure 3**. However, the FCC was recommended as a destination only 48 times.

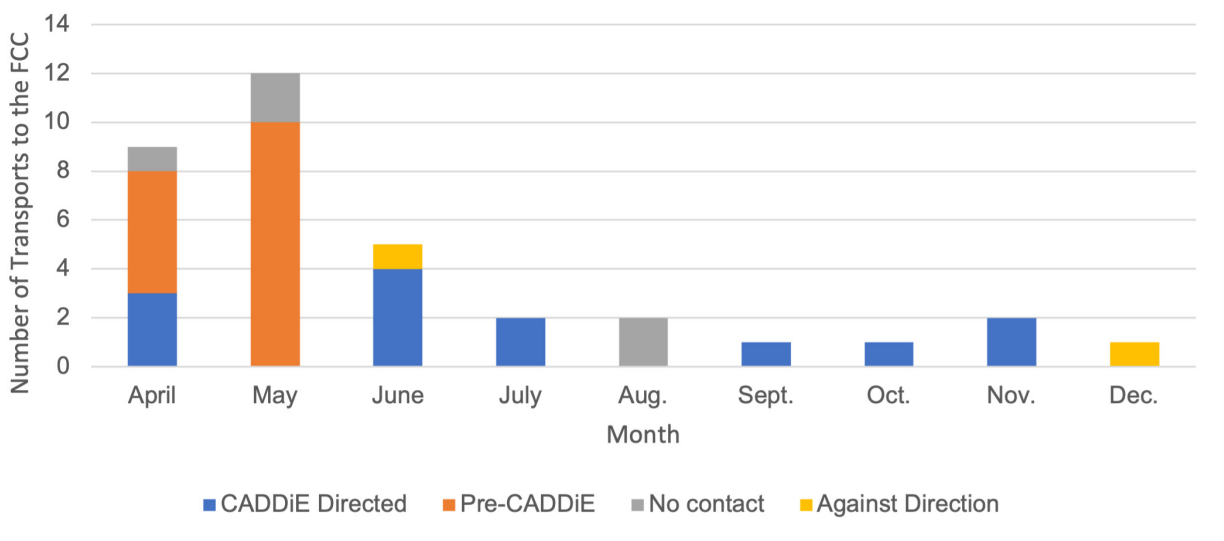


*Figure 4* – Number of Transports to the Field Care Clinic by Source

Out of the 48 CADDiE recommendations for FCC transport, only 23 patients (47.9%) were transported to the FCC, with 23 patients transported to traditional receiving hospitals instead. The remaining two transport destinations could not be determined due to missing records.

| Race | Patients | Percent |
|---|---|---|
| Black/African American | 15 | 42.9% |
| White | 7 | 20.0% |
| Asian | 3 | 8.6% |
| Native American | 1 | 2.9% |
| Other | 9 | 25.7% |
| **Ethnicity** | | |
| Hispanic | 9 | 25.7% |
| **Sex** | | |
| Assigned Male at Birth | 20 | 57.1% |
| Assigned Female at Birth | 15 | 42.9% |
| **Age** | | |
| 20-39 | 9 | 25.7% |
| 40-64 | 17 | 48.6% |
| 65+ | 9 | 25.7% |
| **Origin of Call** | | |
| Bayview-Hunter's Point | 20 | 57% |
| Non-Bayview-Hunter's Point | 15 | 43% |
| **Dispatch Level** | | |
| Code 2 (No Lights & Sirens) | 18 | 51% |
| Code 3 (Lights & Sirens) | 17 | 49% |
| **Service Level** | | |
| Advanced Life Support (ALS) | 35 | 100% |
| Basic Life Support (BLS) | 0 | 0% |
| **CADDiE-Directed** | | |
| CADDiE-Directed | 23 | 66% |
| Non-CADDiE Directed | 12 | 34% |
| **Arrival Time** | | |
| Arrival 8am-12pm | 17 | 49% |
| Arrival 12pm-5pm | 18 | 51% |
| **Protocol Vitals** | | |
| Criteria Followed | 33 | 94% |
| Criteria Violated | 2 | 6% |
| **Pain Related Complaint** | | |
| Pain Related (Medic Impression) | 12 | 34% |
| Pain Related (Discharge Diagnosis) | 8 | 23% |

*Table 1* – Demographic Characteristics of Field Care Clinic Patients

In addition to the 23 patients recommended by CADDiE for FCC care, two were transported to the FCC against a CADDiE recommendation for a different facility. In contrast, ten were transported to the FCC without CADDiE involvement. Thus, a total of 35 patients were transported to the FCC by EMS. Most transports to the FCC occurred in the first three months of operation, as shown in Figure 4.

Of the 35 patients transported to the FCC, 20 were men, 15 were women, and the average age was 50.9 years. Sixteen of these patients were Black/African American, 7 White, 3 Asian, and 9 self-identified

| Patient Complaints | | |
|---|---|---|
| **Complaint Category** | **Medic Impression** | **FCC Discharge Diagnosis** |
| Gastrointestinal Bleeding | 5 (14.3%) | 4 (11.4%) |
| Neurological/Altered Mental Status | 3 (8.6%) | 14.3% (5) |
| Other | 6 (17.1%) | 7 (20%) |
| Pain | 12 (34.3%) | 8 (22.9%) |
| Respiratory | 3 (8.6%) | 6 (17.1%) |
| Substance Use | 1 (2.9%) | 3 (8.6%) |
| Syncope | 1 (2.9%) | 2 (5.7%) |
| Weakness | 4 (11.4%) | 0 (0%) |

*Table 2* – Comparison of Patient Complaints by Paramedic Impression and FCC Discharge Diagnosis

as another race. Nine also identified as Hispanic. Almost two-thirds (n=20) of calls originated in the BHP neighborhood, with 88.6% (n=31) of patients transported by the San Francisco Fire Department and the remaining (n=4) by private EMS agencies. The most common category of patient complaints was "pain" (paramedic impression n=12; FCC discharge diagnosis: n=9). Demographics of transported patients and patient complaints are shown in Tables 1 and 2, respectively.

Among patients transported to the FCC, 65.7% (n=23) were treated and discharged, while 34.3% (n=12) required subsequent hospital transfer. Patient dispositions are shown in Figure 5.

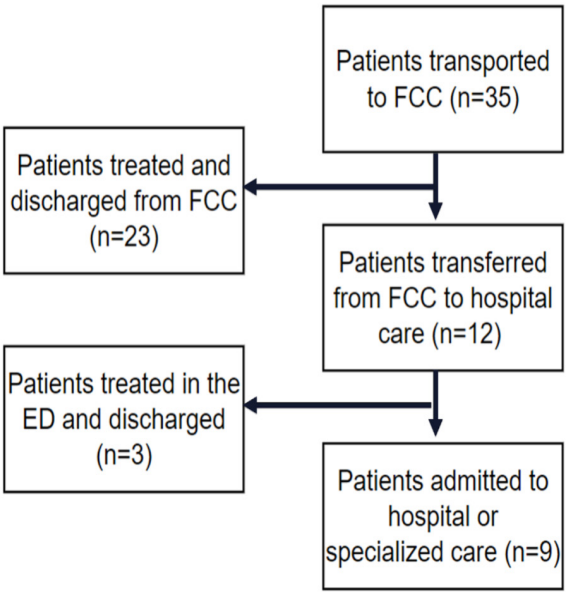


*Figure 5* – Field Care Clinic Patient Flowchart

The likelihood of hospital transfer did not significantly vary by sex ($p$=0.41), 9-1-1 dispatch level ($p$=0.55), arrival before noon ($p$=0.18), pain-related complaint (paramedic impression: $p$=0.51; discharge diagnosis: $p$=0.14), or 9-1-1 call origination within or outside of the BHP neighborhood ($p$=0.92). The use of CADDiE direction was not associated with a change in the likelihood of hospital transfer ($p$=0.51). In the two cases, when CADDiE recommendations against transporting to the FCC were not followed, one resulted in subsequent hospital transfer. Characteristics of patients transported to the FCC are shown in Table 3. The FCC eligibility protocol was followed in 100% of CADDiE directed transports (n=23) and 94.3% of overall transports (n=33) to the FCC. Patients in the remaining two transports had a heart rate greater than 120 beats per minute. CADDiE was not contacted for either of these transports, and only one of these cases resulted in subsequent hospital transfer.

| Episode Characteristics | Patients Transported to Hospital ( n / N ) (%) | Chi-square p-value |
|---|---|---|
| **Sex** | | |
| Male | 8 / 20 (40%) | 0.41 |
| Female | 4 / 15 (26.70%) | |
| **Age** | | |
| 20-39 | 2 / 9 (22.20%) | 0.61 |
| 40-64 | 6 / 17 (35.20%) | |
| 65+ | 4 / 9 (44.40%) | |
| **Origin of Call** | | |
| Bayview-Hunter's Point | 5 / 15 (33.30%) | 0.92 |
| Non-Bayview-Hunter's Point | 7 / 20 (35.00%) | |
| **Dispatch Level** | | |
| Code 2 | 7 / 18 (38.90%) | 0.55 |
| Code 3 | 5 / 17 (29.40%) | |
| **CADDiE-Directed** | | |
| CADDiE-directed | 5 / 12 (41.70%) | 0.51 |
| Non-CADDiE directed | 7 / 23 (30.40%) | |
| **Arrival Time** | | |
| Arrival 8am-12pm | 5 / 20 (25.00%) | 0.18 |
| Arrival 12pm-5pm | 7 / 15 (46.70%) | |
| **Vitals Protocol** | | |
| Criteria followed | 11/ 33 (33.30%) | -- |
| Criteria violated | 1 / 2 (50.00%) | |
| **Pain-Related Complaint** | | |
| **Based on Medic Impression** | | |
| Yes | 7 / 23 (30.40%) | 0.51 |
| No | 5 / 12 (41.70%) | |
| **Based on Discharge Diagnosis** | | |
| Yes | 11 / 27 (31.40%) | 0.14 |
| No | 1 / 8 (12.50%) | |

*Table 3* – Characteristics of Patients Transported from the FCC to the ED

Of the 12 patients transported from the FCC for additional care, 3 were treated in the emergency department and discharged, while the remaining 9 required hospital admission, psychiatric, or sobering services. Details of subsequent care are shown in Table 4.

Two of the 3 patients who were treated and discharged in the ED were referred due to concerns

| Reason for Transfer | Disposition |
|---|---|
| Concern for gastrointestinal bleeding, referred for imaging (n=2) | Discharged from ED |
| Low oxygen saturation, referred for ultrasound-guided intravenous line (n=1) | Discharged from ED |
| Alcohol intoxication (n=1) | Sobering center |
| Low oxygen saturation (n=1) | Admitted to hospital |
| Concern for pneumonia, possible sepsis (n=1) | Admitted to hospital |
| COVID+, low oxygen saturation (n=1) | Admitted to hospital |
| Agitation and required psychiatric evaluation (n=1) | Admitted to psychiatric facility |
| Referred to rule out pulmonary embolism and deep vein thrombosis (n=1) | Admitted to hospital for lower extremity cellulitis |
| Referred for additional evaluation of chest pain (n=1) | Expressed suicidal ideation, transferred from ED to psychiatric facility |
| Referred for MRI due to neurological deficits (n=1) | Received urgent surgery for lumbar stenosis and subsequent hospital admission |
| Referred for abdominal imaging (n=1) | Admitted to hospital for cellulitis and pyelonephritis |

***Table 4*** – Disposition of Patients Transferred to Higher Levels

about gastrointestinal bleeding. The third patient had a low oxygen saturation and required an ultrasound-guided intravenous line. Of the 9 patients admitted to the hospital, 3 were admitted for respiratory conditions, 1 was sent to the ED to rule out a deep vein thrombosis and was admitted for lower extremity cellulitis, and another was admitted for cellulitis and pyelonephritis. The sixth patient was referred to the ED for an MRI and received urgent surgery for lumbar stenosis. One additional patient was referred to the ED for a chest pain workup but expressed suicidal ideation and was transferred to a psychiatric center. The remaining eight and ninth patients were transported directly to a sobering center (n=1) or psychiatric emergency department (n=1).

## DISCUSSION

A significant challenge for the FCC was low utilization by EMS and the CADDiE system. Of the 35,615 calls to CADDiE that were initiated, 18,081 occurred during the FCC EMS receiving hours of 8 am to 5 pm. Although not all of these patients would have met the criteria for FCC transport, only 48 FCC transport recommendations were made. This represented 0.3% of all CADDiE directed transports.

This underutilization may have been in part due to lack of familiarity with the FCC by CADDiE physicians and paramedics. Based on informal feedback from CADDiE clinicians and insights from operations, the FCC may not have been routinely considered as a destination choice for patient care despite appropriate indications. Prior literature has identified the need for clear organizational communication to bolster employees' commitment to change (Harrison et al., 2022; Khaw et al., 2022). Dissemination of changes was limited as neither FCC leadership nor the Department of Public Health were able to communicate with EMS providers directly, instead having to rely on the leadership of each respective EMS entity to relay updates to their employees. This made it difficult

to convey updated information, such as the FCC's hours and capabilities, to EMS Clinicians.

Additionally, CADDiE and the FCC began operations during the same general time period. Many of the physicians and paramedics operating CADDiE worked primarily in clinical settings and were not involved in the planning and operation of the FCC itself. The EMS agencies also had limited experience using these types of alternate care sites.

Healthcare management literature has reported that employees' affective commitment to change depends on factors that include employee participation in change decisions and frequency of changes (Harrison et al., 2022). As COVID-19 prompted many leadership-initiated organizational changes in a short period of time, in addition to CADDiE and FCC implementation, it is possible that EMS providers and CADDiE clinicians who were familiar with the FCC chose not to utilize the FCC due to a lack of affective commitment to the change.

Furthermore, patients who met exclusion criteria, including those with unstable vitals as outlined in the protocol shown in Figure 3, non-critical trauma patients, patients in police custody, or transports to the San Francisco Sobering Center, would also not have been eligible for FCC care. Likely, many of the 18,081 CADDiE-directed transports potentially eligible for FCC care based on the time and classification of the call may have actually not been eligible based on the factors noted above. Therefore, it is likely that the true percentage of FCC-eligible patients who were transported to the FCC is higher than the 0.3% reported. Evaluating the efficacy of CADDiE or the protocol for FCC utilization was beyond the scope of this study.

In addition, although the FCC theoretically had fixed hours, EMS could only transport patients to the FCC if it was staffed with an emergency physician and nurse and logged into the city's Reddinet System (Hospital Association of Southern California, Los Angeles, USA). Hours of operation could vary, making it difficult for EMS clinicians to know if the FCC was open to receiving patients. Single-event experiences of clinicians also became important in the entire group's acceptance of the change. Rapid patient turnovers were challenging at times due to the novelty of the process for clinic personnel and EMS clinicians. Once these issues were resolved, it was difficult to counter the early narrative of patient offload delays at the clinic compared to the emergency departments. Since San Francisco's EDs never reached the saturation levels initially predicted, both due to the downturn of ED visits and stringent public health measures, EMS clinicians were never in a situation where an existing ED was not available to accept their patients, perpetuating the use of routine, rather than novel processes.

Of the 48 CADDiE FCC transport recommendations, only 23 resulted in transport to the FCC. Feedback from EMS field clinicians indicated that patients felt apprehensive about being taken to an alternative clinic site with which they were unfamiliar. Transportation to the FCC was never mandated, and these patients would often refuse the FCC in favor of a traditional emergency department. Field clinicians also reported that some patients declined the FCC based on its location and had concerns regarding transportation back to their neighborhood of residence following discharge.

These challenges demonstrate the importance of patient and clinician awareness of alternative destinations and their potential benefits. If 5% of CADDiE-eligible patients were directed to the FCC, this would have resulted in 904 transports to the site during the study period. If the percentage of subsequent hospital transfers remained consistent with the results of this study, it would be expected that 594 patients could have avoided the emergency department. However, this would also have resulted in 309 additional transports from the FCC to the hospital. Therefore, more accurate triage criteria to better determine the most appropriate transport destinations would be an essential step in growing such a program.

The challenge of accurately determining which patients can be treated in alternative settings is a common finding in the literature (Blodgett et al., 2021). One study found that paramedics under-triaged 9.6% of patients when compared to a physician (Pointer et al., 2001). In this study, 55% of the patients placed by paramedics in the lower acuity categories were found to be miscategorized, with 48.7% of misclassifications resulting from paramedics incorrectly applying the guidelines, inappropriately diverting 8.4% of patients away from the ED (Pointer et al., 2001). A literature review found similar results, reporting under-triaging by up to 32% (Morganti et al., 2014). However, not all studies found negative results. A study conducted in King County, WA found that emergency medical technicians (EMTs) were able to correctly identify low acuity patients eligible for alternative destinations 97% of the time. This success resulted in a 15% reduction in eligible patients transported to the ED (Schaefer et al., 2002). Paramedics have also been able to divert patients to acute psychiatric crisis centers successfully. In one study, ED transfers within four hours, considered to be the result of inappropriate destinations, occurred in only 4.5% of transports (Creed et al., 2018). In the studies that had defined inclusion criteria for which patients would be eligible for alternative care sites, under-triaging was often the result of paramedics and EMTs misapplying study guidelines (Morganti et al., 2014; Sawyer & Coburn, 2017). Of note, FCC eligibility guidelines were misapplied on only two occasions. It is possible that this relatively low instance of under-triage is a result of San Francisco EMS Agencies' previous experiences utilizing alternative destinations. A previous study conducted in San Francisco found that only 4.4% of patients transported to a sobering center required subsequent hospital transfer (Smith-Bernardin et al., 2019).

Of the patients who required subsequent hospital transport from the FCC, 75% were either admitted or required specialized care, such as psychiatric or sobering services. This high admission rate suggests that the FCC effectively managed low-acuity patients and accurately determined which patients needed admission or higher levels of care. Of the three who were transferred to, and subsequently discharged from, emergency departments, all were referred for imaging that was beyond the capabilities of the FCC. Thus, the main opportunities for improvement should involve EMS clinician and patient education regarding the capabilities of the site and further refinement of eligibility criteria. Sites such as the FCC have the potential to provide a viable alternative to the emergency department in appropriate situations.

Limitations of this study include the small sample size of patients, mainly due to under-utilization of the FCC by CADDiE, and the overall lower number of COVID-19

hospitalizations in the San Francisco Bay Area than were anticipated due to early and aggressive public health measures, including the shelter in place order. Although the paramedic supervisors who provided CADDiE determinations had access to emergency physicians as online medical direction, CADDiE did not record if the destination determination was made by a physician, paramedic supervisor, or both. As some studies have shown difficulty in EMS's ability to triage to alternative destinations (Morganti et al., 2014; Pointer et al., 2001)primary care clinics, mental health centers, dialysis centers, it is possible that the source of the CADDiE determination could have affected the likelihood that the patient was suitable for FCC care. Further studies should consider standardizing the process for utilizing an alternative destination.

As a retrospective cohort study, researchers were limited by the types of available data and the potential for unidentified confounders that may have affected the outcomes observed for this cohort compared to all other EMS patients during this study period. For example, researchers were only able to access EMS transport records to the FCC, clinical records from the FCC, and hospitalization records of those transported directly from the FCC to the affiliated public hospital. Therefore, it is possible that patients considered successfully treated at the FCC and discharged could have self-transported to the ED or called 9-1-1 again and received medical care from a facility not included in the study, potentially resulting in a higher number of patients considered successfully treated at the FCC than the true number. As other municipalities may lack the resources to implement a centralized ambulance destination program such as CADDiE, CADDiE use may further impact generalizability.

## CONCLUSION

As a pilot project, the FCC was successful in that most of its patients came from the neighborhood it intended to serve and did not require transfer to the ED. However, low utilization and a high rate of subsequent hospital transfer demonstrate the need to better communicate the resources of the FCC to both patients and clinicians and refine the protocol used to triage patients to the site.

Although the FCC was initiated because of the COVID-19 pandemic, this model could also be useful to reduce ED utilization in areas where limited access to care or geographical constraints result in extended transport times. Further research with a larger sample size and better integration with existing emergency medicine services is warranted to better characterize the appropriate use and efficacy of such programs.

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LITERATURE SURVEILLANCE

# PARAMEDICINE LITERATURE SEARCH: SEPTEMBER-NOVEMBER 2022

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To help paramedicine professionals maintain literature currency in our discipline, the *Paramedicine Literature Search* provides the results of a standardized search of the PubMed database. These search results will include articles from journals that many paramedicine professionals may already be familiar with, but it is also designed to include articles from journals they may not be monitoring, such an ones about paramedic care for cancer patients that might appear in oncology journals.

The formatting of the *Paramedicine Literature Search* is designed to alow the reader to scan the titles of articles out-dented in the listings. To access the articles or their landing pages, the web addresses to the publication sources are provided for some listings and may be copied into a browser. For other articles, the DOI (Digital Object Identifier) is provided and may be copied and pasted into a browser with the prefix "https://doi.org/" for access.

The authors have made a diligent effort in designing the search strategy to balance sensitivity (i.e., getting all relevant articles in paramedicine) with specificity (i.e., excluding articles not relevant to paramedicine). The balance is imperfect, so every relevant article is not included and some non-relevant articles are included.

The search results are filtered to limit to those articles published in the time frame listed below. This include articles with electronic and print publication dates listed in that date range. Some of the publication dates may fall outside of this range due to

how the article metadata was indexed by the publisher and processed by the National Library of Medicine.

The following results were obtained on December 30, 2022 from the PubMed website (https://pubmed.ncbi.nlm.nih.gov/) using the following search terms and Boolean logic:

Search Query: "paramedic"[Text Word] OR "paramedics"[Text Word] OR "prehospital"[Text Word] OR "pre-hospital"[Text Word] OR "emergency medical technician"[Text Word] OR "emergency medical technicians"[Text Word] OR "Ambulance"[Text Word] OR "emergency medical services"[Text Word] OR "fire-rescue"[Text Word] OR "fire-rescue"[Text Word] Filters: from 2022/9/1 - 2022/11/30 Sort by: Publication Date

Search Filter: Publication date range of September 1, 2022 to November 30, 2022.

Results: 1,161 articles

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# GUIDELINES FOR AUTHORS

The *International Journal of Paramedicine* (*IJOP*) is an international forum for scholarly contributions and state-of-the-art research relevant to patient care and the growth and advancement of paramedicine, including the areas of paramedic leadership, management, education, operations, culture, professional and clinical practice. The *IJOP* encourages exploration of paramedicine from diverse theoretical and practical views from all disciplines, including business and economics; the natural, basic, and applied sciences; and the humanities, social sciences, and arts. Priority will be given to submissions that use sound theoretical or conceptual frameworks, strong methodological design, and relevance to the international paramedic community. All methodologies such as quantitative, qualitative, mixed methods, and knowledge syntheses will be considered.

NEMSMA is a longtime collaborator with National Association of EMS Physicians in support of *Prehospital Emergency Care*. In continuation of that relationship, IJOP and PEC have established a collaborative relationship that will the facilitate the exchange of submissions in certain circumstances based in part on which journal may be the best fit for a particular manuscript.

## GENERAL GUIDELINES AND NOTES

- The IJOP only publishes material in English. Please use Academic English.
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The word limits noted above are guidelines for the various submission types. Authors are encouraged to adhere to these guidelines and to be concise in their submissions.

- Merriam-Webster's Collegiate Dictionary (11th ed.) should be consulted for spelling.
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- SRQR and the COREQ extension
  - https://www.equator-network.org/reporting-guidelines/srqr/
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- If a funding source was not involved, please confirm with a statement such as, "External funding was not used to support this work."

*Main Submission File*

- To provide a high level of objectivity in the peer-review process IJOP uses a double blind process. The identities of the authors and their institutions are not revealed to the reviewers and the identifies of the reviewers are not revealed to the authors.
- Due to the double blind review process, information about the authors and their institutions should not appear anywhere in the main submission file. This should include removal of identifying information in the 'properties' of the Microsoft Word (.doc or .docx) file that is submitted.
- Unless stated otherwise in the directions for a specific manuscript category described in this document, all submissions should include the following elements in the following order as a single document file with separation of pages where requested.

*Title page*

- Provide the suggested title for the published article. Please note that the title used for publication is subject to editorial team approval.
- Abstract, Keywords, Acknowledgements and Disclosures / Conflicts Page
- Unless exempted or described differently in the directions for a specific submission category, this page shall contain an abstract of not more than 300 words. The abstract shall summarize the paper for the convenience of the reader and for use in publication summaries.
- Unless exempted or described differently in the directions for a specific submission category, this page will also include between three (3) and six (6) keywords that will be used for title and search engine optimization.
- State any disclosures or conflicts for each author. This will be in addition to completion of the ICMJE Disclosure Form described below.

*Primary Manuscript Body Pages*

- The primary body of the manuscript will come next in the main submission file. The composition of the primary body of the manuscript may vary with the category of the manuscript. Refer to specific manuscript category descriptions for details.
- Tables should be used to summarize large amounts of information rather than

writing it out as a narrative. Tables may be created within the word processor or inserted from another program (i.e., Excel). If another program is used to create the table, please include the original source file as a supplementation media file submission. All tables should be inserted into this primary manuscript body file, must be labelled sequentially, and referred to in the text. Captions must include a the table number and a name for the table at a minimum. Additional descriptive text may be added to the caption as needed to complement the reference to the table in the main body of the paper.

- Figures shall be inserted directly into the text at the appropriate position. These may be lower resolution images to simply show their correct placement. Figures must be labelled sequentially and referred to in the text. Captions must be included with the figure number and a name for the figure at a minimum. Additional descriptive text may be added to the caption as needed to complement the reference to the figure in the main body of the paper. In addition to including figures in the text, submit each figure as a supplemental media files in high quality .jpeg, .tiff, or .png file formats, with a 300dpi minimum quality.

*Reference Pages*

- Where applicable, the references for the manuscript come next. Use endnotes rather than footnotes. They should use APA style reference formats in the body of the manuscript and in the endnotes.
- In each endnote, include hyperlink whenever possible to the referenced document. A DOI hyperlink is preferred, which will have a format of https://doi.org/XXXXX. If a DOI is not available, provide a link to the source journal, publisher website or similar source beginning with the words, "Accessed from: …"
- Authors are responsible for the accuracy of all references, links and in text citations.

*Appendices Pages*

- Where applicable, any appendices to the manuscript are inserted next.

### ICMJE Forms for Disclosure for Potential Conflicts of Interest

- One form per author should be submitted.
- The form is available at: https://icmje.org/disclosure-of-interest/

### Supplemental Media Files

- If the submission includes any supplemental media files (e.g., spreadsheets, slides, tables, figures, audio or video files), they would be each be uploaded individually.

## GUIDELINES FOR CATEGORY-SPECIFIC SUBMISSIONS

### Case Reports (≤2,000 words)

- These manuscripts share the experience of unusual clinical presentations, circumstances, or treatment approaches. Case reports should be structured as described in the Consensus-based Clinical Case Reporting Guideline (CARE; https://www.equator-network.org/reporting-guidelines/care/).

*Concepts (≤3,000 words)*

- These papers present one management or clinical concept, idea, or theory – and describes its practical application. If the paper presents a new concept, it may also suggest research, improvement projects, or pilot implementations of its application. Along with other standard submission file elements, the primary manuscript body pages file for Concept papers should contain:
  - Introduction - The introduction should describe the problem, issue, or circumstance that the concept is intended to address. Where applicable, address the current literature that demonstrates a gap and any pertinent background information.
  - Concept Description – Provide a description of the concept and how it can be applied. Where applicable, provide sufficient detail and clarity of any methods or procedures and the setting and population to which the concept applies.
  - Discussion - Authors are encouraged to include a critical review of related research and a fulsome discussion that highlights how the concept contributes to the field of paramedicine. Address any limitations of the concept.

**Correspondence (≤1,000 words)**

- The correspondence section of the *IJOP* will publish comments from readers related to previously published articles. Along with other standard submission file elements, the primary manuscript body pages file for correspondence should include:
  - Subject Paper Information - Provide the title, name of the first author, and the *IJOP* issue for the paper that is the subject of the correspondence.
  - The narrative of the correspondence.

**Editorials (≤2,000 words)**

- Editorials are a venue for the expression of opinion and perspective on topics relevant to the paramedicine community. They should make clear point(s) in a concise manner with a scholarly approach and tone. They should not be used for the presentation of data, findings, or research that has not been previously published.

**Educational Methods and Processes (≤3,000 words)**

- These submissions explore a specific educational process, approach, or method. The paper should also discuss any issues to consider in its practical application. Along with other standard submission file elements, the primary manuscript body pages file for Education papers should contain:
  - Introduction - The introduction should describe the problem, issue, or circumstance that the educational process, approach, or method is intended to address. Where applicable, address the current literature that demonstrates a gap and any pertinent background information.
  - Description – Provide a description of the educational process, approach, or method and how it can be applied. Where applicable, provide sufficient detail and clarity of any methods or procedures and the setting and population to which the process, approach or method applies.

- Discussion - Authors are encouraged to include a critical review of related research and a fulsome discussion that highlights how the concept contributes to the field of paramedicine. Address any limitations of the concept.

**Empirical Investigations / Original Research (≤4,500 words)**

- The submission of manuscripts for empirical investigations / original research may be clinical or non-clinical. Several of the EQUATOR guidelines, described above under '1.0 *General Guidelines and Notes'*, may apply to any given study in this category. Please apply them as appropriate to your particular investigation.
- NEMSMA is a longtime collaborator with National Association of EMS Physicians in support of Prehospital Emergency Care (PEC). In continuation of that relationship, IJOP and PEC have established a collaborative relationship that will the facilitate the exchange of submissions in certain circumstances based, in part, on which journal may be the best fit for a particular manuscript.
- Authors may provide, or editors may suggest, that some information be provided as a supplemental file so that the main paper remains concise. The supplemental content may include data sets, images, video clips, and in-depth details on methodology. Along with other standard submission file elements, the primary manuscript body pages file for empirical investigations / original research should elements are called in the applicable EQUATOR guidelines.

**Methodology (≤2,000 words)**

- This category of submissions provides deep explorations of methods used or may be used in research studies or improvement projects. These methods should be novel in some way that makes them of significant interest in their own right, separate from the studies they are utilized. These papers can also provide a more detailed description of the methods than appropriate in the primary research or improvement project manuscript. The primary paper's methods section may direct readers to a methodology paper for more detailed descriptions of the methods utilized in. Along with other standard submission file elements, the primary manuscript body pages file for Methodology papers should contain appropriate elements from the EQUATOR guidelines, described above under '1.0 *General Guidelines and Notes.'*

**Quality Improvement Project Reports (≤3,000 words)**

- *IJOP* acknowledges the importance of quality improvement activities to optimize EMS system performance and patient outcomes and welcomes manuscripts describing quality improvement projects.
- US Federal regulations do not require quality improvement activities to have Institutional Review Board (IRB) or Research Ethics Board (REB) approval; however, the distinction between quality improvement and research is not simple. Quality improvement projects can include facets that meet the definition of human subjects research. *IJOP* has a policy requiring researchers to obtain approval, exemption, or a determination of *not-human subjects research* from an IRB/REB or IRB/REB administrator for all research reported in manuscripts submitted to the *IJOP*. This policy applies equally to manuscripts reporting quality improvement activities. The methods section should note the approval, exemption, or deter-

mination of *not-human subjects* research. The *IJOP* shall reject manuscripts that appear to have framed an activity as quality improvement to circumvent research compliance, conduct, or reporting standards. Authors may contact the editorial office if they are uncertain whether their work should be submitted as a quality improvement or a research manuscript.

- Quality improvement project reports should adhere to the Standards for Quality Improvement Reporting Excellence (SQUIRE) guidelines (http://www.squire-statement.org). With permission of the Editorial Team, authors may submit manuscripts that use other generally accepted improvement project frameworks (e.g., IHI Model for Improvement; DMAIC). In general, quality improvement project reports should describe the baseline performance level, intervention(s), results, post-intervention performance level, confounding variables, balancing measures, and subsequent iterations as applicable.
- The manuscript discussions and conclusions should highlight what the external audience can learn from the reported experience, not just the activity's internal success or failure.
- Authors may provide, or editors may suggest, that some information be provided as a supplemental file so that the main paper remains concise. The supplemental content may include data sets, images, video clips, and in-depth details on methodology.

**Reviews / Synthesis (≤4,000 words)**

- *IJOP* invites the submission of reviews of all types, including those with and those without meta-analytic components. In addition to the guidelines for original research provided elsewhere in these guidelines, any submissions in this category should be consistent with the Prisma 2020 guidelines for reporting systematic reviews https://www.equator-network.org/reporting-guidelines/prisma/.

**Toolbox (≤3000 words)**

- These submissions will explain a tool or technique and describe its practical use. Where applicable, the articles may include a supplemental file or link that contains the tool and a data file where the reader may try out the tool.
- Along with other standard submission file elements, the primary manuscript body pages file for Toolbox papers should contain:
  - Introduction - The manuscript shall include an introduction that provides an overview of the type(s) of projects that the tool or technique could be used for or the specifics of the project that it was actually used in.
  - Description of the Tool / Technique – As the central focus on the paper, this section shall provide in an in-depth examination of the tool or technique and its mechanics. Describe how the tool or technique should be applied in context of a clinical, operational, or administrative setting.
  - Discussion – Discuss the underlying rationale for the tool or technique and why it may be favored over other options. Pro
  - Provide a critique of related methods. Also include discussion of any limitations of the tool or technique.
  - Exercise – Where applicable, describe how to use the tool or technique in conjunction with a sample data set or scenario.

**Special Reports**

- This submission category will be used for articles of a scholarly nature that do not fit into one of the other submission categories of the *IJOP*. These papers will be directed to the most appropriate associate or supervising editor. Authors are encouraged to use the guidelines described in this document that seem to be most applicable to their Special Report, but consultation with the Editorial Team before manuscript submission is strongly encouraged.