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# International Journal of Paramedicine

*An Official Journal of the National EMS Management Association (USA)*



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EDITORIAL

# PUBLICATION AS A CATALYST FOR PROFESSIONAL DIALOGUE

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I love it when the moderator opens the microphone up to the audience after a lecture or oral abstract presentation at a scientific conference. Someone may ask a question or make a comment that challenges the methods or conclusions of work. They may ask for deeper explanations. Why was a particular statistical tool used? How were cases excluded? Was a different interpretation of the results considered? This sort of scholarly discussion is very healthy. It helps to advance the science and increases our understanding. I wish there was more of it.

Peer-reviewed journals provide another opportunity for scholarly exchange. They have correspondence sections where a letter to the editor can provide the start of interactions similar to those at scientific conferences. Unfortunately, few take advantage of this opportunity. Again, I wish that there was more of it. The publication of a scholarly paper should trigger well-mannered, well-reasoned conversations that probe into the paper's topic, premises, hypotheses, methods, analyses, results, discussion, conclusions, implications, and applications.

Now there are other places where these types of discussions are often taking place. Rather than in the letters to the editor sections, many professionals read and comment on research papers and other scholarly works on social media channels. It's great that these discussions are taking place, but it could be even better if the journal that published the article facilitated inclusion of the authors and invited all of the journal's readers to participate.



In an effort to foster these types of conversations about content published in the *International Journal of Paramedicine (IJOP)*, we will be taking a different approach to the traditional journal correspondence section. *IJOP* will be launching the Dialogue section with our next issue. It will still publish traditional letters to the editor but will also re-publish posts about *IJOP* content curated from select social media channels.

We plan to initiate these discussions with each new *IJOP* article announcement. We will be making those announcements on the National EMS Management Association's (NEMSMA) LinkedIn, Facebook, Instagram, and Twitter accounts along with new social media channels being created specifically for *IJOP* on YouTube and elsewhere. We will also be starting a new e-mail discussion group for *IJOP*, separate from the popular NEMSMA discussion group. Featured papers from *IJOP* will each have their own thread on the new listserv.

These publication announcements and other types of content posts will get the conversations started. Authors will be invited to directly respond to the comments, questions, and discussions that follow. Readers will be encouraged to participate.

To help establish and maintain a professional and constructive decorum in these conversations, the message traffic will be moderated. That will allow *IJOP's* social media editors to screen posts before becoming publicly visible. Everyone participating in these discussions will be asked to include their names and location or professional affiliation. Posts without identification or having an unconstructive or otherwise unprofessional tone will be sent back to the submitter for revision. We want authors and members of the professional community to feel safe to participate, comment, and ask questions without fear of unbecoming exchanges.

We anticipate that some experimentation and adjustment of these policies and procedures will be needed as we move forward, but we hope that the benefits will strongly outweigh the hassles and risks. We want innovation in the design of scholarly journals. We want to reach and engage more of our colleagues in scholarly discourse regarding the art and science of paramedicine. We hope that the Dialogue section and its approach will help accomplish that.

Watch for announcements about the Dialogue section as *IJOP's* social media activities begin to ramp up. In the meantime, please use e-mail to submit comments or questions to be considered for publication in the Dialogue section. For now, send them to [mic.gunderson@internationaljournalofparamedicine.com](mailto:mic.gunderson@internationaljournalofparamedicine.com). I'm looking forward to your comments and questions to advance our science, understanding, and application.

ORIGINAL RESEARCH

# A MATCHED COHORT STUDY OF OPEN THORACOSTOMIES PERFORMED BY GROUND MEDICS

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## ABSTRACT

**Background:** Tension pneumothorax resulting from chest trauma is a rapidly fatal condition that requires prompt treatment. Prehospital open thoracostomy (POT) is a potentially lifesaving intervention that can be performed in the field to treat tension pneumothorax. However, the results from POT performed by ground EMS providers have not been well-studied. The objective of this study was to compare outcomes for patients with chest trauma who underwent POT performed by ground EMS providers with a matched cohort who did not undergo this procedure in the field.

**Methods:** A retrospective chart review of consecutive adult patients presenting to a Level I trauma center with chest trauma were analyzed from 2017-2020. Outcomes were compared to a patient cohort who did not undergo POT matched by severity of injury and prehospital CPR.

**Results:** A total of 14 POT patients were identified. Majority of POT were bilateral (n=11/14, 78.6%) and all of these patients (n=14/14) had prehospital cardiac arrest. Return of spontaneous circulation was obtained in 2 patients with penetrating injuries (14.3%). There was no difference in total and scene EMS time compared to the matched cohort without POT (p>0.05).

**Conclusions:** This study demonstrated that open thoracostomies could be performed by ground EMS units without increasing prehospital time for severely injured trauma patients and greater achievement of ROSC. Larger, prospective, multi-institutional analyses are needed to further evaluate outcomes.

## INTRODUCTION

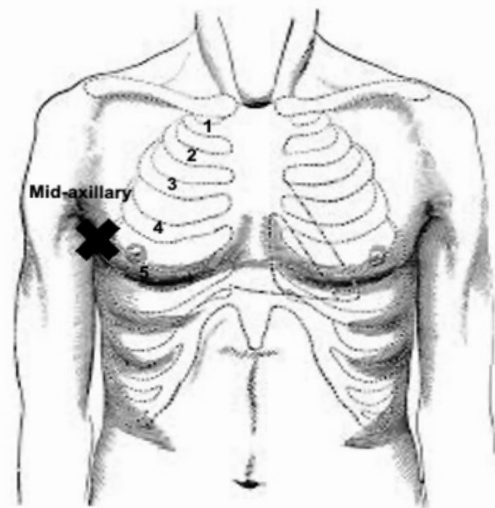
Tension pneumothorax (tPTX) is a rapidly progressive condition resulting in significant mortality from obstructive shock and cardiac arrest if left untreated. Identification and treatment of tPTX in the prehospital setting can be a life-saving measure for patients prior to definitive management. Performance of nee-

dle thoracostomy (NT) in the prehospital setting by medics is one approach to relieve tPTX. However, the efficacy of this procedure has recently been brought into question (Robitaille-Fortin, 2021; Axtman, 2019; Martin, 2012; Kaserer, 2017). The ability of NT to deliver successful and reliable decompression of the thoracic cavity in patients with suspected tPTX remains unclear (Robitaille-Fortin, 2021). Previous studies have shown a relatively high failure rate of NT to relieve tPTX (Axtman, 2019; Martin, 2012; Kaserer, 2017). NT has also been shown to have lower rate of successful intra-thoracic placement due to variety of reasons which include catheter kinking, misplacement, and blockage of the catheter during placement.

In 2017, the Tactical Combat Casualty Care (TCCC) guidelines recommended an aggressive approach to treat tPTX based upon mechanism of injury and respiratory distress (Butler, 2018). Open thoracostomy (OT) is identified as an additional treatment option for suspected tension pneumothorax after two unsuccessful NT attempts. The medical provider must have the necessary training and the patient have clinical signs of shock. Despite the emergence of OT in the prehospital setting, few previous studies have evaluated its outcomes (Chesters, 2016; Dickson, 2018; Massarutti, 2016; Hannon, 2020; High, 2016; Jodie, 2017; Mistry, 2009; Jodie, 2017). Two recent systematic reviews found varying success with OT and several reported complications (Robitaille-Fortin, 2021; Sharrock, 2021). The objective of this study was to measure clinical outcomes for patients with chest trauma who underwent prehospital open thoracostomy (POT) by ground EMS units and also to determine if POT increased prehospital EMS time. We hypothesized that patients with chest trauma and signs of tPTX could efficiently undergo POT in the field by prehospital ground EMS providers.

## METHODS

A retrospective chart review of consecutive adult patients with chest trauma who presented to University Hospital in San Antonio from January 1, 2017- May 31, 2020 was performed. Subjects under 18 years of age, prisoners, and pregnant women were excluded. Institutional Review Board approval from obtained from the University of Texas Health Science Center at San Antonio. A Health Insurance Portability and Accountability Act (HIPAA) waiver of informed consent was obtained.



*Figure 1* – Anatomic landmarks for performance of prehospital open thoracostomy using finger or Kelly clamp.

Data were also obtained from San Antonio Fire Department (SAFD) to further identify patients who underwent open thoracostomies in the field. San Antonio Fire Department responds to all major trauma incidences with a dual paramedic staffed mobile intensive care unit, and a four personnel fire department first responder unit, and an EMS medical supervisor. All paramedics receive annual continuing education in performance of POT (San Antonio Fire Department,

2022). Training includes both didactic and psychomotor skills in a cadaveric based training. Entry into the pleural cavity is performed with either the medic's gloved finger or a Kelly clamp at the 5th intercostal space, between the anterior axillary and midaxillary line as demonstrated in Figure 1. Pre-hospital triggers for open thoracostomy are shown in Figure 2. SAFD is the only prehospital agency in San Antonio currently performing POT.

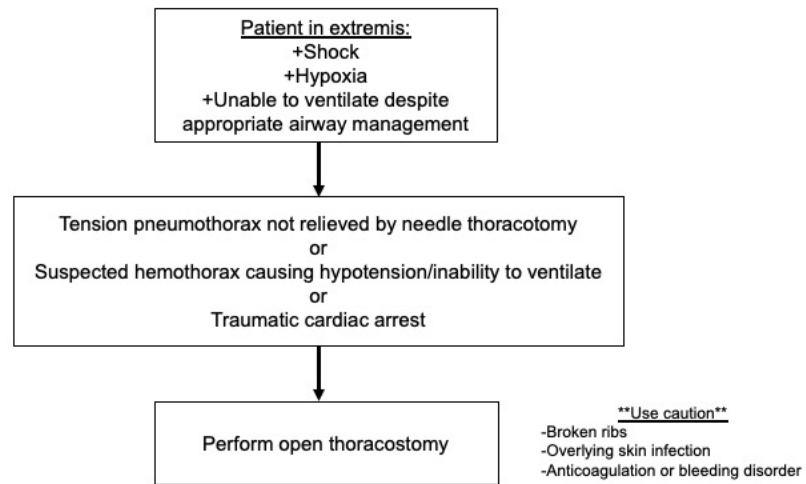


Figure 2 – Criteria for open thoracostomy in the prehospital setting.

Patient demographics (age, co-morbid conditions, gender, race, mechanism of injury), EMS scene time, total EMS time (defined as the sum of dispatch to scene, scene time, and scene to hospital transport time), prehospital interventions (needle thoracostomies, open thoracostomies, CPR, intubation), procedures in the ED (chest tube, ED thoracotomy, intubation, CPR), operative intervention, return of spontaneous circulation (ROSC), and mortality were recorded. Outcomes from patients who had open thoracostomies in the field were compared to a matched cohort who did not have these interventions in the field. A historical cohort of patients with chest trauma using ICD 9/ICD 10 codes from the Trauma Registry was used to create a matched group. The two cohorts were matched 1:1 based upon age, gender, mechanism of injury, injury severity score (ISS), and abbreviated injury scale (AIS) of the chest.

Statistical analysis was performed with continuous variables compared using the Mann Whitney U test. Fisher's exact test were used to compare categorical variables. Mean and standard error of mean (SEM) or median and interquartile range (IQR) were calculated where appropriate. Categorical data were calculated as percentages. Prehospital vital signs (i.e., heart rate, systolic blood pressure, respiratory rate) and Glasgow Coma Scores (GCS) were reported as median values with ranges. Data were analyzed using GraphPad software (version 5, La Jolla, CA) and IBM SPSS (version 27, Armonk, NY). Statistical significance was defined as  $p \leq 0.05$ .

## RESULTS

### PATIENT DEMOGRAPHICS AND INJURY MECHANISM

A total of 1281 patients with chest trauma were reviewed and 14 (1.1%) prehospital open thoracostomies were performed by ground EMS. For patients with POT, the average age was 38.4 +/- 5.7 years and 71.4% were men (n=10/14). The average BMI was 29.3 +/- 2.5. Penetrating mechanism was the cause of injury in 42.9% (n=6/14) with average ISS 33.5 +/- 5.7 and average chest AIS 3.7 +/- 0.4.

Patients were compared to a matched cohort of similar injury patterns in patients who sustained chest trauma and did not have POT. Subjects were well matched in terms of age, gender, BMI, ISS, AIS chest, and incidence of penetrating mechanism of chest trauma ( $p>0.05$ ). These results are summarized in Table 1.

<b>Baseline Demographics</b>	POT (n = 14)	No POT (n = 12)	p value
Age, yrs (SEM)	38.4 (5.7)	45.3 (18.7)	0.32
Male gender, n (%)	10 (71.4)	10 (83.3)	0.65
BMI, avg (SEM)	29.3 (2.5)	28.7 (6.7)	0.71
Injury severity score, avg (SEM)	33.5 (5.7)	39.1 (4.8)	0.37
Abbreviated injury scale, chest, avg (SEM)	3.7 (0.4)	3.5 (1.1)	0.71
Penetrating mechanism, n (%)	6 (42.9)	3 (25.0)	0.43

*Table 1* – Baseline patient demographics and mechanism of injury for trauma patients who underwent a prehospital open thoracostomy (POT) compared to a matched cohort of patients who did not undergo POT.

### PREHOSPITAL CHARACTERISTICS

Average EMS scene time in the POT cohort was 12.7 +/- 1.1 minutes and 15.8 +/- 3.0 minutes in the non-POT group, ( $p = 0.86$ ). The total time from alert of emergency services to arrival to the ED was 37.6 +/- 4.9 minutes in the OT group and 36.9 +/- 4.2 minutes in the non-OT ( $p = 0.86$ ). In the POT group, 85.7% of patients ( $n=12/14$ ) were intubated prehospital, while 83.3% ( $n=10/12$ ) from the non-OT group were intubated prehospital ( $p = 1.0$ ). There was a significant difference in the number of patients receiving prehospital blood between the OT ( $n = 8/14$ , 57.1%) and non-OT ( $n = 2/12$ , 16.7%) groups ( $p=0.05$ ). All patients in the POT group ( $n=14/14$ , 100%) and non-POT group ( $12/12$ , 100%,  $p = 1.0$ ) had traumatic prehospital cardiac arrest. Table 2.

<b>Scene Characteristics</b>	POT (n = 14)	No POT (n = 12)	p value
EMS Time scene, min, avg (SEM)	12.7 (1.1)	15.8 (3.0)	0.86
Total EMS time, min, avg (SEM)	37.6 (4.9)	36.9 (4.2)	0.86
Intubated in the field, n (%)	12 (85.7)	10 (83.3)	1.0
Prehospital cardiac arrest, n (%)	14 (100)	12 (100)	1.0
Prehospital blood, n (%)	8 (57.1)	2 (16.7)	0.05
<b>Open Thoracostomies</b>			
Needle thoracostomy, n (%)	6 (42.9)	5 (41.7)	1.0
Bilateral needle thoracostomy, n (%)	5 (35.7)	2 (16.7)	0.39
Intrathoracic NT, n (%)	2 (33.3)	2 (16.7)	1.0
<b>In-Hospital Care</b>			
ED Glasgow coma scale, median (IQR)	3 (3-3)	3 (3-3)	0.53
Resuscitative thoracotomy, n (%)	6 (42.9)	2 (16.7)	0.22
Chest tube, n (%)	7 (50.0)	12 (100)	0.006
Operative Thoracotomy, n (%)	1 (7.1)	8 (66.7)	0.003
Return of spontaneous circulation, n (%)	2 (14.3)	10 (83.3)	0.001
Mortality, n (%)	12 (85.7)	12 (100)	0.48

*Table 2* – Prehospital information and in-hospital care for trauma patients who underwent a prehospital open thoracostomy (POT) compared to a matched cohort of patients who did not undergo POT.

### PREHOSPITAL OPEN THORACOSTOMIES

Among patients in the POT group, 78.6% (n=11/14) had bilateral open thoracostomies performed in the prehospital setting. No injuries to providers were reported by EMS agencies who performed POT in these patients.

### PREHOSPITAL OPEN THORACOSTOMIES AND NEEDLE DECOMPRESSION

A total of 11 patients in both groups had prehospital NT with 42.9% (n=6/14) in the POT group undergoing NT prior to OT. Compared to the performance of NT in the non-POT group (n=5/12, 41.7%), this was not found to be statistically different (p=1.0). There was also no difference in the rate of bilateral NT between the two groups (p=0.39). Due to hemodynamic instability, chest radiograph and computed tomography of the chest were not performed in all patients. Imaging was performed in 42.9% (n = 6/14) in POT group and 50.0% (n=6/12) in non-POT group. There were 33.3% of patients (n=2/6) in the POT and non-POT groups (n=2/6) who had radiographically confirmed successful intrathoracic placement of needle thoracostomy, which was not statistically difference between the two groups (p=1.0).

### IN-HOSPITAL PROCEDURES, ROSC, AND MORTALITY

Median GCS score on ED arrival was the same for the POT and non-POT groups (p=0.53). In the POT group, 50.0% of patients (n=7/14) underwent tube thoracostomy placement through a different chest access site after arrival to the emergency department compared to 100.0% (n=12/12) patients in the non-OT group (p=0.006). Resuscitative thoracotomy was performed in 42.9% (n=6/14) in the POT group and 13.3% (n=2/12) in the non-OT group (p=0.08). Only one patient (7.1%) of the POT group went on to have a formal operative thoracotomy compared to 10 patients (66.7%) in the non-POT group (p=0.003).

The POT group had lower overall mortality compared to the non-POT group but this was not statistically significant (n=12/14, 85.7% vs n=12/12, 100.0%, p=0.17). In the POT group, there were two patients who survived pre-hospital cardiac arrest to obtain ROSC and ultimately survived to hospital discharge (n=2/14, 14.3%). While the non-POT group had a higher incidence of ROSC, there were no survivors to discharge (n=0/12) in the non-POT group (p=0.48).

### DISCUSSION

In this study, there was no difference in both EMS scene time or total time to definitive care. This observation suggests that concerns over delay in presentation to definitive care to perform finger thoracostomy were not supported. Similarly, a study by Fok and colleagues investigating factors that prolong scene EMS time found that POT did not significantly increase scene time to the hospital (Fok, 2019).

Due to the significant mortality associated with tPTX, the need for rapid and effective treatment is needed. OT is emerging as an alternative treatment in the prehospital

setting. Based on the data presented in this study and previous literature supporting the use of OT in the prehospital setting, OT has been demonstrated as a safe treatment option for suspected tPTX (Chesters, 2016; Dickson, 2018; Massarutti, 2016; Hannon, 2020; High, 2016). This study presents one of the first initial analyses of this procedure performed by ground EMS providers.

All patients in this study who underwent POT were in prehospital cardiac arrest with a survival rate of 14.3% with two patients obtaining ROSC. This observation suggests appropriate selection of patients by ground EMS medics. Prior studies have shown that tPTX-induced cardiac arrest swine models had a high rate of failure to restore perfusion when only NT was performed, which suggests that particularly in this subgroup of individuals in traumatic arrest that OT is a suitable alternative or adjunct to NT in attempts to restore perfusion. In addition, several studies have questioned whether NT is being performed correctly by EMS in the prehospital setting. POT may provide better outcomes for successful decompression of the chest (Aylwin, 2008; Shapey, 2012; Kaserer, 2017; Weichenthal, 2018).

There was no difference in rates of resuscitative thoracotomies or tube thoracostomy placement among the two groups upon arrival to the hospital. This outcome is expected given both the severity and mechanism of the traumatic injuries sustained by the two groups as well as the high mortality rate. Additionally, OT and NT are not intended to be performed as definitive procedures for chest decompression, thus a majority of patients who had OT or NT would likely have additional interventions upon arrival to the hospital performed by physicians such as resuscitative thoracotomies, tube thoracostomy, and formal operative thoracotomy. The rate of operative thoracotomy was significantly higher in the non-OT group. Based on the high rate of mortality in the OT group, these patients likely expired prior to operative intervention.

Questions regarding the safety of this procedure have raised some concerns for performing OT in the prehospital setting to both providers and patients. In this study, there were no reported injuries to the prehospital providers after performing OT, suggesting these procedures are safe to perform for providers when properly trained. There were no reported complications directly related to prehospital performance of OT. Although, given the various other interventions (e.g., tube thoracostomy, resuscitative thoracotomy, central venous catheterization) that are performed in patients with similar injury severity and patterns, concluding an association of complications directly related to the finger thoracostomy procedure would be challenging. This analysis is limited due to the relatively high mortality rate of subjects in this investigation. One study by Massarutti et al. showed that in 55 consecutive severely injured patients with suspected PTX who underwent OT, there were no cases of major bleeding, lung laceration, or pleural infection (Massarutti, 2006). Other studies have had comparable outcomes in complications related to OT including empyema rate and major bleeding which suggests that there are minimal complications associated with performing OT.

This study has several notable limitations which merit further discussion. First, the retrospective nature of this study may have introduced a selection bias. The study is also limited by a relatively small sample size and the evaluation of a single center. This

study did not evaluate competency in prehospital providers in performance of POT. However, a recent study by Fairley and colleagues of SAFD determined that almost 80% of medics correctly identified the anatomic locations for NT and POT (Fairley, 2021).

Prehospital cardiac arrest was the main indication for performance of POT. As more experience is gained with this procedure, other criteria need to be evaluated as indications such as the presence of tension pneumothorax since these patients could also possibly benefit from POT. Additional prospective, multi-institutional studies would need to be performed to evaluate competency measures, and to assess whether it has any measurable impact on traumatic outcomes.

## CONCLUSIONS

This study demonstrated that FT can be performed by ground EMS units without increasing prehospital time or added morbidity for severely injured trauma patients. The results from this study add to the growing body of literature to support the prehospital utilization of finger thoracostomies. Continued education of EMS providers on this procedure and proper patient selection is essential to the wider adoption of this practice. Larger, prospective, multi-institutional analyses are needed to further evaluate outcomes in order to definitively provide evidence to the superiority of FT over NT.

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REVIEW

# SAFE PEDIATRIC GROUND AMBULANCE TRANSPORT: A SYSTEMATIC REVIEW

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## ABSTRACT

**Background:** Child injury or death in ambulance crashes may be preventable using proper restraints. This systematic review assesses aspects relevant to the proper use of pediatric restraints: EMS professionals' resources and training, knowledge, attitudes, and behaviors. It also identifies barriers to using restraints.

**Methods:** PubMed and Web of Science were searched using free-text search terms between 2000 and 2020. Inclusion criteria included human research, pediatric population, ambulance as the mode of transportation, peer-reviewed journals, and English full-texts. After initial screening and inclusion, a snowball methodology was used to identify potentially relevant articles. Two independent reviewers carried out the methodology.

**Results:** The original search yielded 80 publications after de-duplication between databases, and two additional articles were identified independently of the search through snowball sampling. Four publications met inclusion criteria for final analysis. Two studies were survey-based among EMS personnel aiming to identify knowledge, behaviors, and barriers to child transport. One study used qualitative data collection through interviews with ambulance personnel. The final study was a combination of survey and observational data. Of note, there were no studies that evaluated an intervention.

**Conclusion:** Based on this review, there is a lack of research in the realm of safe pediatric ambulance transport. There is a need for quality improvement studies to address the barriers that were identified by previous literature and to improve the overall safety and compliance of applying pediatric safety restraints during transportation to the hospital.

## INTRODUCTION

Unintentional injuries, including motor vehicle accidents, are the leading cause of death among children in the United States, and many of these deaths are preventable (Heron, 2019). One motor vehicle that is often overlooked is the ground ambulance.

Traffic-related fatalities are 2.5 to 4.8 times higher for those operating emergency vehicles compared to all other occupations (Maguire, 2002). In the U.S., approximately 1.6 million pediatric patients ages 0-13 are transported to the hospital using ground ambulances annually, representing 13% of all EMS transports (National Association of State Emergency Medical Services Officials, 2020, Shah 2008). According to 20 years of data analysis by the National Highway Traffic Safety Administration (NHTSA), there are about 4,500 traffic crashes involving ambulances per year, with 34% of those resulting in injury (National Highway Traffic Safety Administration, 2014). Although no published data shows how many ambulance crashes involve pediatric patients, it can be inferred using the previously stated estimates that approximately 600 ambulance crashes could involve pediatric patients each year.

A key feature of ambulances that make them particularly dangerous to children in a crash is the ambulance stretcher, designed for an adult patient and incompatible with child transport without additional equipment. To address this limitation, the National Highway Traffic Safety Association has issued best-practice recommendations, providing options that address different scenarios for pediatric patients (U.S. Department of Transportation, 2012). Based on these recommendations, the first choice should be a pediatric device fitted onto the stretcher; such devices are for children ranging from 4 to 100 lbs depending on the brand (U.S. Department of Transportation, 2012, National Association of State Emergency Medical Services Officials, 2012). However, small children (i.e., under 40 lbs) can safely be transported via their convertible car seat when installed appropriately onto the stretcher; this recommendation does not apply to rear-facing only car seats (U.S. Department of Health and Human Services Health Resources and Services Administration, undated). When a car seat is unavailable or not indicated (i.e., children weighing between 40 and 100 lbs.), there is a high potential for that child to be ejected from the four-point adult harness of the stretcher in a crash. In these cases, a special pediatric restraint is indicated that minimizes dead space between the stretcher straps and the child, as well as providing a fifth strap between the legs for additional security that is essential for pediatric patients.

There is no national, universally adopted standard for safe pediatric transport in U.S. ground ambulances. In 1999, the Emergency Medical Services for Children program issued preliminary guidance on pediatric transport, as proper pediatric restraint systems had yet to be developed (U.S. Department of Health and Human Services Health Resources and Services Administration, undated). Then, in 2012, NHTSA issued Best-Practice recommendations for pediatric ground ambulance transport, indicating scenarios under which pediatric restraints or car seats should be used (U.S. Department of Transportation, 2012). However, despite this guidance, only 21 states require a pediatric-specific safe transport device to be carried on ambulances (National Association of State Emergency Medical Services Officials, 2020).

Our first objective was to systematically assess the literature pertaining to EMS knowledge, attitudes, and behaviors regarding pediatric restraints in the absence of the universal adoption of a pediatric device requirement for patients. Our second objective was to identify barriers to transporting pediatric patients through the proper use of pediatric restraints and evidence-based interventions to address these barriers. This study aims to identify the gap in research on safe ambulance transport for pediatric patients.

## METHODS

### SEARCH METHODS

A search strategy was devised in consultation with a medical librarian to identify literature regarding child restraints in ground ambulances. PubMed and Web of Science Core Collection were searched. The search was initially built in PubMed using a combination of Medical Subject Headings [MeSH] and keyword terms for child restraints, patient transportation, and traffic accidents. Boolean logic and truncation were employed to return a comprehensive set of relevant results.

The search was then translated for the Web of Science Core Collection database. Web of Science does not use subject headings, so the search was conducted using the topic search, which only searches title, abstract, and author keywords. Both searches were limited to English, with publication dates between 2000-2020. This timeframe was chosen based on changes to the guideline and regulatory landscape occurring in the mid-1990s and early 2000s that emphasized the importance of a child's age and size when determining the proper restraint (Bae, 2014). The final searches can be found in Table 1.

The searches were run on March 31, 2021. The results were uploaded to Excel for screening purposes. Additional references were identified from the full text articles that met inclusion criteria through the snowballing method in which citing articles were screened for possible inclusion.

PubMed	Web of Science
(((“Seat Belts”[Mesh]) OR “Child Restraint Systems”[Mesh] OR seat belt* OR child safety seat* OR child restraint*) AND (((“Ambulances”[Mesh]) OR “Transportation of Patients”[Mesh]) OR “Emergency Medical Technicians”[Mesh] OR ambulance* OR patient transportation OR EMTS OR emergency medical technician* OR paramedic*)) AND (“Accidents, Traffic”[Mesh] OR traffic accident* OR traffic crash* OR traffic collision* OR injury prevention)	(seat belt* OR child* restraint* OR child safety seat*) AND (ambulance* OR patient transport* OR emts OR emergency medical technician* OR paramedic*) AND (traffic accident* OR traffic crash* OR traffic collision* OR spinal immobilization)

Table 1 – Final search terms.

### REVIEW PROCESS

Screening was conducted independently by two reviewers first at the title/abstract level and then at the full text level in April 2021. Conflicts were resolved by a third reviewer with discussion. The inclusion and exclusion criteria can be found in Table 2. The search methodology is summarized in a PRISMA diagram (see Figure 1).

### CODING

Once the list of included papers was finalized, two reviewers, one with a Ph.D. in health

Inclusion	Exclusion
Pediatric population (<18 years old)	Not a pediatric population
Human research	Not human research
Ambulance transportation	Not ground ambulances
English language	Not safe transport
	Published before 2000

Table 2 – Inclusion and exclusion criteria applied during the review process.

services research and one with professional experience as an EMT and current MD/MPH candidate, independently coded the articles and reached a consensus where disagreements arose. The reviewers noted the methods employed to address each article’s

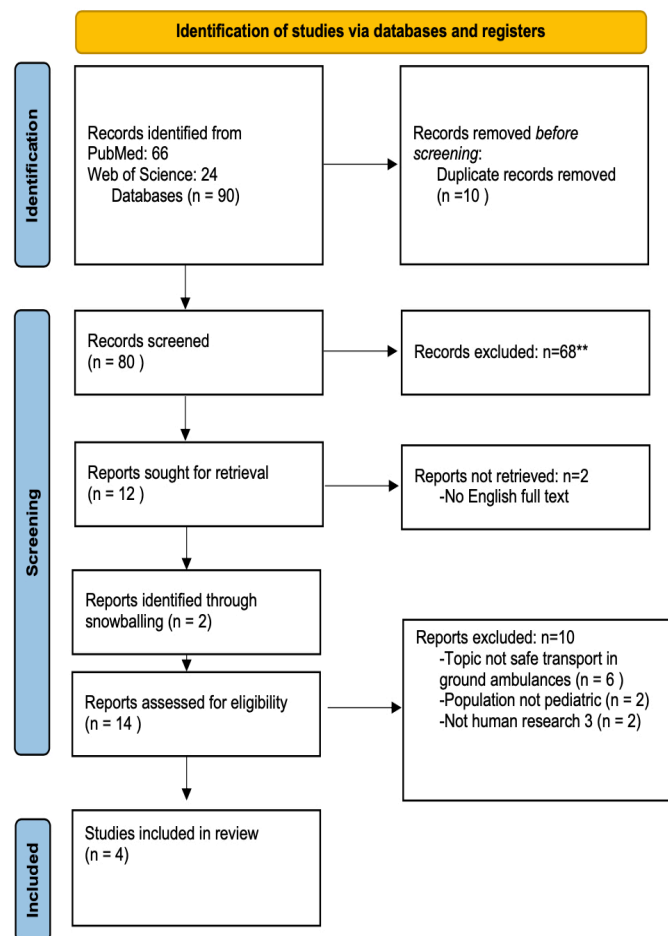


Figure 1 – PRISMA diagram details the databases searched, abstracts screened, and full-texts reviewed; four publications were included for final analysis.

\*\*see Appendix for reasoning.

pediatric restraint research objectives. The reviewers also identified the topical focus of each article. If applicable, they assessed the extent to which EMS professionals indicated they properly employ pediatric safe transport practices by tracking the safe transport outcomes in each article. To identify factors that affected the uptake of pediatric restraints in ground ambulances, the study team adapted the Consolidated Framework for Implementation Research (CFIR), a well-established framework to examine the implementation of guidelines and recommendations within health systems (Damschroder, 2009). The CFIR framework includes the individual, organizational (“inner setting”), and societal (“outer setting”) characteristics that may affect implementation. The study team chose the following main themes as relevant to safe pediatric transport in ground ambulances:

- Regulatory incentives: the article contextualizes the findings in terms of organization or governmental regulations [CFIR = Outer setting – External and Policy Incentives]
- Patient volume: the article describes the role of pediatric patient volume or demand for EMS [CFIR = Outer setting – Patient Needs]
- Culture: the article describes prevailing norms and values as they pertain to safe transport [CFIR = Inner setting – Culture]
- Resources: the article describes the training/education/time/devices available to

professionals [CFIR = Inner Setting – Readiness for Implementation – Available Resources]

- Knowledge and Beliefs: the article describes EMS professionals' knowledge and beliefs regarding safe transport [CFIR = Characteristics of Individuals – Knowledge & Beliefs about the Intervention]
- Self-efficacy: the article describes EMS professionals' belief in their ability to carry out safe transport [CFIR = Characteristics of Individuals – Self-efficacy]
- Crash experiences: the article describes EMS professionals' personal experiences with crashes [CFIR = Characteristics of Individuals – Other Personal Attributes]
- Interventions: the article describes and/or tests a pediatric safe transport intervention [CFIR = Intervention Characteristics]

Finally, the reviewers independently examined each article for the presence and evaluation of interventions to improve the use of appropriate pediatric transport methods in ground ambulances. Each article was assigned a ranking to each of the previously-mentioned themes to assess their extent and strength of their focus. A single minus sign (“-”) indicated no mention of the theme. Positive signs were used to grade the strength of the presence of the theme: “+” for limited, “++” for moderate, and “+++” for the strongest presence. Reviewers then met and, where rankings differed, came to final consensus on a ranking.

## RESULTS

The initial search yielded 80 publications following de-duplication between databases. Following title and abstract review, 12 articles were identified for full-text review, which yielded two articles for inclusion. Reviewers then examined articles that cited the two initially-included articles and identified two additional articles for inclusion. In total, four publications met inclusion criteria for final analysis.

Studies differed in terms of their methods. Johnson et al. (2006) used a written survey from 302 EMS providers, with a return rate of 67.7%. O’Neil et al. (2014) utilized a child passenger safety technician to observe transports and survey EMS providers; 40 children were observed, and 63 EMS personnel were surveyed. Oberg et al. (2015) held twelve semi-structured interviews with individuals staffing the ambulances, including three EMTs, four registered nurses, and five prehospital emergency nurses; this study originated in Sweden and was the only study included not taking place in the USA. Lastly, Fidacaro et al. (2018) utilized an online survey of EMS providers resulting in 114 responses, a 60% response rate.

In contrast, there was close alignment regarding the foci of the four studies. All four articles focused on safe child transportation. Safe provider transport, including seatbelts in the front and/or back of the ambulance, was also a self-reported focus included in Johnson et al. (2006) and O’Neil et al. (2014). Any safe transport outcome, including quantitative data related to the correctness of restraint use and the correct choice of restraint, was reported in three of the four articles. O’Neil et al. (2014) was the only article to report a quantitative safe transport outcome: the percentage of correct/appropriate EMS transport in pediatric devices. The extent to which EMS transported a child in a

car seat was reported in both Johnson et al. (2006) and O’Neil et al. (2014). Johnson et al. (2006), O’Neil et al. (2014), and Fidacaro et al. (2020) included outcomes related to the EMS transportation of children inappropriately, such as placing the child on a parent’s lap. EMS seatbelt usage was reported by Johnson et al. (2006) and O’Neil et al. (2014). Lastly, Johnson et al. (2006) was the only article to include outcomes related to private vehicle habits of EMS personnel.

Based on the study foci, included studies examined barriers and facilitators that may affect the uptake of safe pediatric transport within ground ambulances. The CFIR framework constructs and their inclusion in the study are summarized in Table 3 (n=4). Overall, the studies mainly focused on the individual characteristics of those imple-

Article Description			CFIR: Outer Setting		CFIR: Inner Setting		CFIR: Individual			CFIR: Intervention
Author (Year)	Title	Methods	Regulatory Incentives	Patient Volume	Culture	Resources	Knowledge and Beliefs	Self-Efficacy	Crash Experiences	Intervention Tested
Johnson et al. (2006)	Child and Provider Restraints in Ambulances: Knowledge, Opinions, and Behaviors of Emergency Medical Services Providers	Survey	+	+	+	++	+++	++	+	-
O’Neil et al. (2014)	Ambulance Transport of Noncritical Children: EMS Providers’ Knowledge, Opinions, and Practice	Survey, Observation	+	+	+	++	+++	++	-	-
Oberg et al. (2015)	The EMS Personnel’s perception of the transportation of young children	Interview	+	-	+	-	-	+++	-	-
Fidacaro et al. (2018)	Pediatric Transport Practices Among Prehospital Providers	Survey	+	+	-	++	+++	+++	-	-

Table 3 – Analysis of included publications (n=4).

Key: “-”: not mentioned, “+”: present but limited, “++”: moderately present, “+++”: strongly present

menting safe transport and less on organizational and societal characteristics that may affect implementation. Notably, knowledge and beliefs were examined in depth by three of the four studies. Self-efficacy—referring to EMS professionals’ confidence in their ability to transport pediatric patients safely—was the next most-examined theme within the individual construct. The regulatory incentives were very weakly included in all four studies. The recurring issues throughout the studies include the general lack of training or comfortability in installing pediatric restraints. The basis of knowledge was also inconsistent and indicates that EMS providers face challenges when deciding which



method of pediatric restraint to use. There is a general disconnect between perceived knowledge and the application of knowledge when presented with scenarios involving pediatric patients of varying acuity. Although the barriers to safe pediatric transport have been identified in the research, including low frequency of pediatric calls, lack of training, and the emotional and social factors present during a call, there has been no intervention to improve or address these barriers. None of the studies evaluated an intervention to improve the adoption of or adherence to pediatric safe transport guidelines or recommendations.

## DISCUSSION

In summary, the included articles focused most strongly on assessing provider challenges at the individual level: the knowledge, beliefs, and self-efficacy barriers to safe pediatric patient transportation in EMS. This was expected considering the self-reported survey method that was used in three of four of the studies. The outer setting, consisting of regulatory incentives and patient needs (i.e., pediatric patient volume), was reported in very little detail. This corresponds to the need for more data reporting pediatric call volume and involvement in ambulance crashes. Most notably, this systematic review found no pre/post-implementation studies in the literature that address the knowledge, use, and barriers related to pediatric restraints in ground ambulances for pediatric patients.

Many factors could contribute to pediatric patient safety challenges in ambulances, including low call volume, EMS provider experience, heightened emotional environment, and preparedness for the proper equipment to safely transport pediatric patients. This literature review demonstrates a great need for more unified standards for transporting pediatric patients. Both federal and state standards can be considered for expansion. With only 21 states currently requiring pediatric transport equipment to be installed on the ambulance, action at both the federal and state levels to encourage and adopt policies requiring this equipment should be among the early steps in improving the safety of pediatric patients riding in ambulances. The next step would be allocating funding for equipment and training to complement these requirements.

At the state level, there is a need for regulatory guidelines, policies, or recommendations, with the understanding that differences may emerge depending on region, patient volume, and resources. State requirements for certification and recertification of EMS licensure are an opportunity to ensure that pediatric transportation is taught and tested. For example, the New York State recertification requirements for the EMT-Basic and EMT-Paramedic levels include 1 hour of safe transportation of pediatric patients (New York State Department of Health, 2020). In comparison, the state of Indiana accepts the recertification standards as per the National Continued Competency Program (NCCP), which requires 0.5 hours of safe pediatric transport to be documented in the continuing education of an EMT (Distance CME, 2022). Agency-specific requirements and in-service, hands-on training can further support this knowledge. Lastly, there is a significant role that hospitals and other receiving facilities can play in the quality improvement and development of recommendations or policies.

While considering the need for further policy and recommendations, it is essential to

recognize the gap between the goal and the reality of what EMS personnel face in the pre-hospital setting. For example, ambulance safety risks should be addressed when formulating new guidelines. EMS personnel are known to be at much greater risk of mortality due to the nature of their job. A recent study showed that the crash rate when transporting a patient without lights and sirens was 7.0 per 100,000 transports and increased to 16.5 per 100,000 transports when using lights and sirens (Watanabe, 2017). The national occupational-related mortality average per 100,000 workers is 5.0. However, the risk of occupational-related mortality to EMS personnel is much greater (12.7 per 100,000) (Maguire, 2002). This number exceeds that of other first responders, including police and firefighters. Exploring these barriers and addressing how best to overcome safety challenges for passengers and EMS personnel is an avenue for future research.

Some limitations exist in this study. The search strategy and terms were unlikely to capture every article published on safe transportation fully. It is possible that searching additional databases would have captured more relevant articles. Grey literature was not searched, and it is possible that articles in languages other than English may be relevant. Studies that did not explicitly mention the restraint of children could have been missed. The snowball method was used to capture additional articles and minimize the potential for missed articles. Another limitation of this study is the subjectivity of the reviewing process in determining the presence and strength of the selected constructs and themes. Two independent reviewers determined the extent to which each theme was present, and discrepancies were discussed to come to conclusions; however, the subjectivity of this review remains a limitation in the qualitative analysis.

## CONCLUSION

In conclusion, there is an extensive research gap in the realm of safe pediatric patient ambulance transport. First, there is a need for data collection to define patient volume and the significance of the issue. Second, federal or state policy should be set to ensure the safety of pediatric patients riding in ground ambulances. Ambulance design and safety in the patient compartment, including the security of the pediatric patient, ought to be the responsibility of organizations guiding the practice of Emergency Medical Services nationally. Finally, there is a need for quality improvement studies to address the barriers identified by previous literature and improve the overall safety and compliance of using pediatric safety restraints during patient transportation to the hospital.

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## APPENDIX

Exclusion Reason	Excluded (n=68)
Not safe transport	32
Not ambulance transportation	29
Not pediatric	4
Not peer-reviewed	3

*Appendix* – Excluded articles from original search with reasoning.



LITERATURE SURVEILLANCE

## PARAMEDICINE LITERATURE SEARCH: DECEMBER 2022 - FEBRUARY 2023

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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 (<https://pubmed.ncbi.nlm.nih.gov>). These search results include articles from journals that many paramedicine professionals may already be familiar with, but also includes articles from journals they may not be monitoring, such as ones about paramedic care for cancer patients that might appear in oncology journals.

The formatting of the *Paramedicine Literature Search* is designed to allow 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 section editors 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 includes

articles with electronic and print publication dates listed in the specified publication 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 March 29, 2023 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 December 1, 2022 to February 28, 2023.

Results: 1,218 articles

- Effects of heatwave features on machine-learning-based heat-related ambulance calls prediction models in Japan. Ke D. *Sci Total Environ*. 2023 May 15;873:162283. doi: 10.1016/j.scitotenv.2023.162283. Epub 2023 Feb 19. <http://10.1016/j.scitotenv.2023.162283>
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## GUIDELINES FOR AUTHORS

The *International Journal of Paramedicine (IJOP)* is a 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 *Pre-hospital Emergency Care*. In continuation of that relationship, *IJOP* and *PEC* have established a collaborative relationship that will 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.
- The *IJOP* accepts submissions in the following categories:
  - Case Studies ( $\leq 2,000$  words)
  - Concepts ( $\leq 3,000$  words)
  - Correspondence / Commentary ( $\leq 1,000$  words)
  - Education ( $\leq 3,000$  words)
  - Empirical Investigations / Original Research ( $\leq 4,500$  words)
  - Methodology ( $\leq 2,000$  words)
  - Quality Improvement Project Reports ( $\approx 3,000$  words)
  - Reviews / Synthesis ( $\leq 4,000$  words)
  - Special Reports ( $\leq 2,000$  words)
  - Toolbox ( $\leq 1,500$  words)

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.
- Contributions that explore non-clinical topics such as leadership, operations, education, professional practice, and the culture of paramedicine are strongly encouraged.
- Based on the international scope of the *IJOP*, contributions should provide a degree of generalizability and transferability to global settings and should have relevance to the *IJOP*'s broad readership.
- *IJOP* discourages multiple publications derived from a single study.

- All original research submissions must have received approval from an Institutional Research Board (IRB) or Research Ethics Board (REB).
- Once a submission has been assessed for suitability by the editorial team, it will undergo a double-blind peer-review by independent, anonymized reviewers.

As part of the submission process, authors will be required to confirm that their submission complies with all of the items below. Submissions may be returned that do not adhere to these guidelines:

- The submission cannot be previously published or in the submission process of another publication (or an explanation has been provided a cover letter to the Editor).
- The Author and Funding File and the Main Submission File are both in Microsoft Word document file format.
- An ICMJE Form for Disclosure of Potential Conflicts of Interest is submitted for each author.
- All illustrations, figures, and tables should be placed within the text at the appropriate points AND submitted as a separate file in a high resolution format.
- Supplemental media files (e.g., spreadsheets, slides, audio or video files) may be included for reader access. The file should be hosted by the authors unless other arrangements have been made with the Editor.
- Where available, URLs for each reference has been provided.
- The text is double-spaced; uses a 12-point font; employs italics, rather than underlining (except with URL addresses).
- Page numbers and line numbering is used for both the 'Author and Funding File' and the 'Main Submission File'
- The text adheres to the stylistic and bibliographic requirements outlined.
- Authors are strongly encouraged to follow any EQUATOR (Enhancing the QUALity and Transparency Of health Research) Guidelines that apply to their type of research. These include, but are not limited to:
  - Randomized trials
    - CONSORT and its extensions
      - <https://www.equator-network.org/reporting-guidelines/consort/>
  - Observational studies
    - STROBE and its extensions
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  - Study protocols
    - SPIRIT and the PRISMA-P extension
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  - Diagnostic/prognostic studies
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Note that there is a section in EQUATOR with guidelines specific to emergency medicine that may also be applicable to studies in paramedicine.

### SUBMISSION FILES

The following describes the ‘standard’ submission files that should be uploaded via the *Journal* submission website for each manuscript. Please refer to the specific submission guidelines for each submission category for more specific instructions that may apply.

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- All authors of a manuscript should provide their full name with up to four post-nominals and up to two organizational affiliations and titles – exactly as they should appear in the publication.
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lished in abstract form, identify the name of the event, location, format, and date of presentation.

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- Please ensure that everyone who meets the International Committee of Medical Journal Editors (ICMJE) requirements for authorship is included as an author (<http://www.icmje.org/recommendations/browse/roles-and-responsibilities/defining-the-role-of-authors-and-contributors.html>).

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#### **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 identities of the reviewers are not revealed to the authors.
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#### **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, DISCLOSURES / CONFLICTS, PRESENTATIONS, AND ACKNOWLEDGEMENTS PAGE**

- Unless exempted or described differently in the directions for a specific submission category, limit abstracts to 300 words or less.
- 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. Keywords of 'paramedicine' and 'emergency medical services' will be added by default and will not count towards the keyword count requirements.
- State any disclosures or conflicts for each author. This will be in addition to com-

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- 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.
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- 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.
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- 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/>).

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- 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.

### **Dialogues (≤1,000 words)**

- The Dialogues section will publish comments and questions 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 previously, 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 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 include elements as called for 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 in which 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 it utilized. Along with other standard submission file elements, the primary manuscript body pages file for Methodology papers should contain appropriate elements from the EQUATOR guidelines, as described earlier.

### **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; how-

ever, 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 determination 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 con-

- text 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.
- 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 *IJOP* submission categories. 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.