



International Journal of **Paramedicine**

An Official Journal of the National EMS Management Association



Number 4 — October–December, 2023

<https://internationaljournalofparamedicine.com/index.php/ijop/issue/view/N4>

<https://doi.org/10.56068/ETQC3869>



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



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International Journal of Paramedicine (online ISSN 2831-6967) is an official journal of the National EMS Management Association. It is published quarterly by the National EMS Management Association, 2901 Williamsburg Terrace, Suite G, PO Box 472, Platte City, MO 64079. This journal is published exclusively online as an open-access resource at <https://internationaljournalofparamedicine.com>. Information on submissions is available at <https://internationaljournalofparamedicine.com/index.php/ijop/about/submissions>. Editorial query letters may be addressed to Mic Gunderson, Editor-In-Chief, at mic.gunderson@internationaljournalofparamedicine.com. For inquiries about sponsorships or advertising, please contact Pat Songer, Executive Director, National EMS Management Association; +01 816-858-6172; info@nemsma.org.

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RESEARCH REPORT

INVESTIGATION OF STRATEGIES TO PREVENT STRETCHER TRIPPING: A MECHANICAL SIMULATION STUDY

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Recommended Citation: Yasuda Y, Kurosaki H, Sakaguti E, Yamamoto K: (2023) Investigation of Strategies to Prevent Stretcher Tripping: A Mechanical Simulation Study. *International Journal of Paramedicine*, (4), 8-14. <https://doi.org/10.56068/CKFY9492>. Retrieved from: <https://internationaljournalofparamedicine.com/index.php/ijop/article/view/2648>

Keywords: stretcher, transportation of patients, emergency medical services, paramedicine

Received: January 29, 2023

Revised: July 27, 2023

Accepted: August 6, 2023

Published: October 12, 2023

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Funding Support: none

Competing Interests: none

ABSTRACT

Aim: Little is known about the risk factors associated with stretcher tipping. This study aimed to investigate whether the height of a stretcher is associated with the risk of tipping and to examine strategies to prevent the tipping of a stretcher during transportation.

Methods: This was a mechanical simulation study using Stryker's Power-PRO™ XT. The stretcher and manikin were placed on a board, and the board was inclined at a gradient of approximately 1 degree per second. Tipping was defined as the point at which the weight of the manikin caused one of the wheels to lift off the ground upon applying a specific angle. The tipping angles were measured and examined. The position of the stretcher was varied between supine, seated, high (96cm), middle (66cm), and low (36cm).

Results: In the supine position, the tipping angles were smaller in the order of high, middle, and low position, with a mean (degree) and 95% confidence intervals (CI) of 12.4 (12.2–12.6) for the high position, 18.4 (18.1–18.7) for the middle position, and 26.3 (25.9–26.7) for the low position. In the seated position, the tipping angles were also smaller in the order of high, middle, and low position [11.9 (11.7–12.1) for the high position, 16.2 (15.3–17.0) for the middle position, and 20.2 (19.8–20.6) for the low position, respectively]. Additionally, it was observed that the tipping angles were smaller in the seated position at all stretcher heights compared to the supine position.

Conclusion: The risk of a stretcher tip was found to be greater in the high position compared to the low position and in the seated position compared to the supine position. It is recommended that EMS providers should lower the position of the stretcher as much as possible while ensuring appropriate patient monitoring and care.

INTRODUCTION

Transporting patients from the scene to the hospital is a crucial task for emergency medical service (EMS) providers. This task may need to be performed in unsafe locations such as the second floor of patients' homes, athletic fields, or traffic accident scenes. Patients must be transported to the hospital with-

out causing pain or worsening their condition, and EMS providers are responsible for ensuring safe and prompt transportation in all emergency cases. Accidents such as falls during transport can result in additional harm to the patient and can lead to civil liability for EMS providers.

An ambulance stretcher is the primary device EMS uses for transporting patients in the prehospital environment. According to the Fire and Disaster Management Agency in Japan, 21.6% of all accidents during prehospital field activities are related to stretcher operations (Fire and Disaster Management Agency, 2022). Previous studies have revealed that most stretcher tipping frequently occurs during loading & unloading the stretcher from the ambulance, followed by moving the stretcher (Wang, et al., 2009; Yutaka et al., 2021). To date, studies on stretchers have been limited to epidemiological research, and there has been no investigation into the risk factors associated with stretcher tipping.

To address this knowledge gap, we have conducted a mechanical simulation study hypothesizing that the stretcher height is associated with the risk of tipping during transportation. This study aimed to investigate whether the height of the stretcher is associated with the risk of tipping and to examine strategies to prevent the stretcher from tipping during transportation.

METHODS

STUDY DESIGN AND SETTING

This mechanical simulation study was conducted in the Hiroshima International University training room on November 15, 2022. The ethical review was waived due to the study design.

Power-PRO™ XT model 6506	
Height	36–105 cm (Measured from bottom of mattress at seat section, to ground level)
Length	206 cm
Width	58 cm
Weight	57 kg (Stretcher with one battery pack); 76 kg (Including mattress and restraints)
Maximum Weight Capacity	318 kg

Table 1: Main specifications of Power-PRO X

The Power-PRO™ XT model 6506 (Stryker, USA) was used in this study. The main specifications of the Power-PRO™ XT are presented in Table 1. The hydraulic system of the stretcher is powered by a battery, enabling the user to easily raise and lower the stretcher using a button.

For this study, a Rescue Randy Manikin (65kg, Simulaids, Inc. USA) was used to simulate the weight and balance of a typical adult male. The manikin was loaded onto a stretcher, and the combination was

placed on a board. The board was inclined at a gradient of approximately 1 degree per second.

Tipping was defined as the point at which the weight of the manikin caused one of the wheels to lift off the ground upon applying a specific angle. Tipping angles were measured using a digital inclinometer (DL270LV, STS, Japan) (Figure 1). The position of the



Figure 1: The tipping angles were measured by a digital inclinometer.

stretcher varied between supine, seated, high (96cm), middle (66cm), and low (36cm), and the angle of tipping was measured five times at each position.

STATISTICAL ANALYSIS

Data was represented as means with confidence intervals. ANOVA was used to compare means for tipping angles by stretcher height, including post hoc analysis with Bonferroni correction for multiple comparisons. Furthermore, a T-test was used to compare means for tipping angles between supine and seated positions by stretcher height. The Kolmogorov-Smirnov test confirmed normal distribution. Data was analyzed with EZR (Kanda, 2013) and P values of <0.05 were considered statistically significant.

RESULTS

TIPPING ANGLES BY STRETCHER HEIGHT

The comparison of tipping angles by stretcher height is shown in Table 2. There were statistically significant differences in the tipping angles between stretcher heights in both supine and seated positions. In the supine position, the tipping angles were smaller in the order of high, middle, and low position [mean (degree) (95% confidence interval (CI)); 12.4 (12.2–12.6) for

Position	Height			P-value
	Low (A)	Middle (B)	High (C)	
Supine position	26.3 (25.9–26.7)	18.4 (18.1–18.7)	12.4 (12.2–12.6)	<0.001
Seated position	20.2 (19.8–20.6)	16.2 (15.3–17.0)	11.9 (11.7–12.1)	<0.001

Position	P-value (Post hoc analysis)		
	A vs B	A vs C	B vs C
Supine position	<0.001	<0.001	<0.001
Seated position	<0.001	<0.001	<0.001

Tipping angles (degree) are presented as mean (95% CI).

Table 2: Comparison of tipping angles by stretcher height.

the high position; 18.4 (18.1–18.7) for the middle; 26.3 (25.9–26.7) for the low position, respectively]. Post hoc analysis revealed significant differences in tipping angles for all combinations. In the seated position, the tipping angles were also smaller in the order of high, middle, and low position [11.9 (11.7–12.1) for the high position; 16.2 (15.3–17.0) for the middle; 20.2 (19.8–20.6) for the low position, respectively].

TIPPING ANGLES BY POSITION

The comparison of tipping angles by position is shown in Table 3. There were statistically significant differences in the tipping angles between positions in all stretcher heights.

The tipping angles were smaller in the seated position compared

to in the supine position in all stretcher heights [supine position vs. seated position; 12.4 (12.2–12.6) vs. 11.9 (11.7–12.1) for the high position; 18.4 (18.1–18.7) vs. 16.2 (15.3–17.0) for the middle; 26.3 (25.9–26.7) vs. 20.2 (19.8–20.6) for the low position, respectively]

Stretcher height	Position		P-value
	Supine position	Seated position	
Low	26.3 (25.9–26.7)	20.2 (19.8–20.6)	<0.001
Middle	18.4 (18.1–18.7)	16.2 (15.3–17.0)	<0.001
High	12.4 (12.2–12.6)	11.9 (11.7–12.1)	<0.01

Tipping angles (degree) are presented as mean (95% CI).

Table 3: Comparison of tipping angles by position.

DISCUSSION

This simulation study found statistically significant differences in the tipping angles between stretcher height and position. The results indicated that the stretcher was likelier to tip in the high position than in the low position and the seated position than in the supine position. To the best of our knowledge, this is the first study to investigate the association between stretcher height and the risk of tipping.

Previous research on EMS and stretchers has been limited (Wang et al., 2009; Yutaka et al., 2021; Prairie et al., 2017; Armstrong et al., 2017; Studnek et al., 2012), with a focus on adverse events that occur during stretcher operations. One common adverse event is tipping the stretcher while in motion with a patient on it, indicating that patient transfer may be associated with a high risk of tipping. It is, therefore, essential to investigate the risks related to tipping to ensure the safety of both EMS providers and patients. Previous studies have attempted to identify the risk of tipping in patients being transported by EMS using epidemiological methods and interviews with EMS providers (Wang et al., 2009; Yutaka et al., 2021; Prairie et al., 2017). In contrast, the current study sought to understand risks by focusing on the height and position of the stretcher. The present study builds on these prior reports. It extends them by showing significant associations between the height and position of the stretcher and the risk of tipping in simulated conditions.

The mechanisms underlying our findings may be relatively straightforward. The risk of tipping a stretcher while stationary and not moving is determined by the height of the patient's center of gravity, the width of the stretcher's axle, and the angle of inclination. (Figure 2). As such, the higher the height of the stretcher and the seated position rather than the supine position, the higher the patient's center of gravity, resulting in a

decreased tipping angle. Additionally, the positioning of the Power-PRO XT's hydraulic assembly, combined with a patient at the stretcher's highest height, may contribute to raising the stretcher's center of gravity. Furthermore, when the stretcher is in motion, various factors come into play, such as the acceleration of the stretcher's movement,

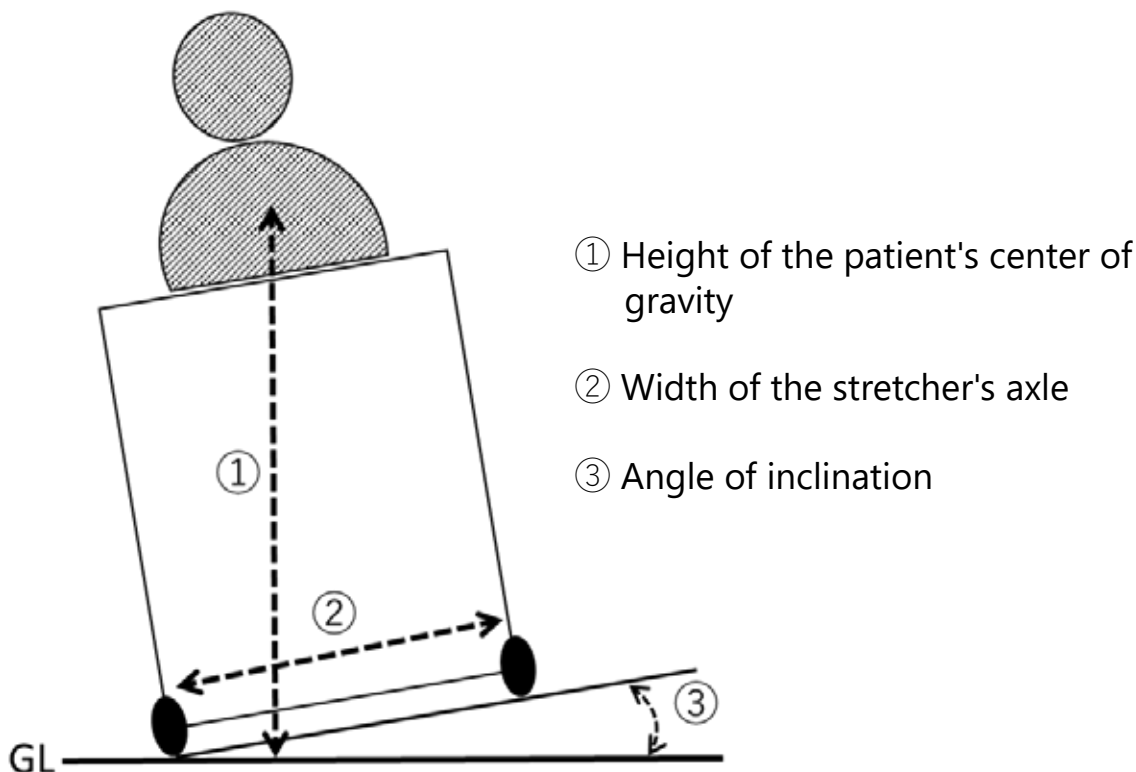


Figure 2: Factors associated with tipping.

changes in the patient's center of gravity due to body movements, and the slope and unevenness of the surface. As a result, increasing the patient's center of gravity further reduces the tipping angle.

The present study provides a strategy for reducing the risk of tipping during patient transport by EMS providers. Specifically, when moving a stretcher with a patient, it is recommended that the stretcher be positioned as low as possible without compromising observation or treatment. Expanding the width of the stretcher would also decrease the risk of tipping; however, since the width of the stretcher is already established as a standard, lowering the stretcher is deemed a practical solution for EMS providers to implement. A previous study reported that many EMS providers moved stretchers in the highest position (Yasuharu et al., 2013). The likely cause for this is that many ambulances require a stretcher to be loaded in a high position. By modifying the design of ambulances and the loading practices of EMS providers, the elevation at which the stretcher is loaded into the ambulance can be reduced, thereby reducing unnecessary positioning of the stretcher in a high position.

LIMITATIONS

Our study has several limitations. First, this study employs a manikin simulation; therefore, the results could be influenced by the manikin's weight, potentially leading to variations from real-world clinical scenarios. As such, the findings may vary if conducted with actual patients. Second, the study was conducted with the stretcher in a stationary position, and the results may have differed if the stretcher had been transported. Finally, the Power-PRO™ XT with the battery was used in this study, limiting the generalizability of the results to other types of stretchers.

CONCLUSION

The height and position of a stretcher have been found to be related to the likelihood of stretcher tipping. A stretcher is more likely to tip in a high position than a low position, and in a seated position than a supine one. Accidents, such as falls that occur during transportation of patients can result in further harm and expose EMS providers to potential civil liability. Therefore, to reduce the risk of tipping during patient transportation, EMS providers should lower the position of the stretcher as much as possible, while ensuring appropriate patient monitoring and care.

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RESEARCH REPORT

EXAMINING WORKFLOW FOR SIMULATED PEDIATRIC EMERGENCY MEDICAL SERVICES CARE

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Recommended Citation: Ozkaynak M, Zhan Z, Kothari K, Dolen C, Adelgais K: (2023) Examining Workflow for Simulated Pediatric Emergency Medical Services Care. *International Journal of Paramedicine*, (4), 15-27. <https://doi.org/10.56068/OVSW1364>. Retrieved from: <https://internationaljournalofparamedicine.com/index.php/ijop/article/view/2359>

Keywords: pediatrics, simulation, workflow, efficiency, emergency medical services, EMS, paramedicine

Received: August 13, 2022

Revised: June 28, 2023

Accepted: July 19, 2023

Published: October 12, 2023

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Funding Support: none

Competing Interests: none

Acknowledgements: The authors thank Suzanne Lareau for editorial support and the EMS practitioners for their participation in this study.

ABSTRACT

Purpose: The purpose of this study was to characterize emergency medical service (EMS) workflow in the care of children during simulated emergency, prehospital encounters.

Methods: This is a secondary analysis exploring high-fidelity videorecorded simulations, performed by EMS personnel. Two scenarios were used in 19 simulations which consisted of a 15-month and a 1-month-old with respiratory decompensation and shock requiring intravenous fluid, respiratory support, and medication administration. One trained investigator performed reviews of the videos of teams EMS practitioners, quantifying the sequence and number of tasks performed and time to completion of the simulated intervention. The variance in sequence of tasks was quantified using the Levenshtein distance. We quantified the proportion of time with no activity (idle time) and temporal overlap (team multitasking time).

Results: We identified 17 types of distinct tasks performed during the simulation. There was high variability across simulations in the sequences, types, and number of tasks performed. The number of team members involved in each video varied, ranging from three to six. Activities were frequently accomplished by one or two people, but sometimes these activities could require three. Team multitasking was noted in all scenarios, with a mean of 99% multitasking ratio (range: 52-202%). Mean proportion of idle time was 4% (range: 0-11%). Weight estimate, intravenous or intraosseous access (IV/IO), radio report, blood glucose level (BGL), medication administration, pulse check, and respiration check were observed in all videos. Other tasks were observed in only a proportion of scenarios with varying frequencies. The median number of differences in sequence of tasks between scenarios was 15.

Conclusions: We were able to identify many of the tasks used by EMS personnel and the duration of time to complete such tasks. This method of identifying and quantifying EMS tasks may be useful in workforce allocation, identifying strengths and weaknesses of team members, or evaluating a team member's readiness for the field.

INTRODUCTION

Workflow is a central concept in studying health systems and care delivery (Ozkaynak 2016). Understanding workflow is particularly important in designing, implementing, and evaluating

systematic interventions to improve patient and organizational outcomes (Ozkaynak 2016). Although workflow studies are common in clinic and hospital settings (Ozkaynak 2016, 2019, 2018, 2015), workflow in the domain of Emergency Medical Services (EMS) has not been fully explored.

EMS practitioners face challenges in their work due to uncertainties related to the type of patient, the environment in which they find themselves, and the pressure of responding rapidly. These factors could significantly affect the quality and safety of patient care in the field (Kaufmann 2020). Systematic informatics interventions, such as clinical decision support (CDS), may overcome some of these challenges (e.g., determining when and how to perform a certain procedure or treatment), however, understanding EMS workflow is an essential first step in developing such intervention (Ozkaynak 2016, Ozkaynak 2020, Zhang 2020). Workflow analysis for EMS practitioners can reveal many details of work such as, what activities are conducted, who is involved, and the temporal relationship of activities during an encounter. These details can inform the design, implementation and evaluation of systematic interventions that could improve the quality and safety of EMS care and ensure that the intervention is congruent with workflow.

The examination of EMS workflow is inherently challenging given the diversity of patient events and work environment. Traditional methods such as in situ observations or interviews, may not be feasible or effective to capture the subtle details of EMS workflow, given the infrequent occurrence of certain types of encounters, such as pediatric emergencies. Simulation, a common training method for emergency care and other providers (Hayden 2018), can be a valid and efficient way to recreate high risk events in a low-stakes environment and therefore can be a beneficial approach in capturing EMS workflow. Simulation also allows for a control of the environment, allowing for exploration of human factors and complexity in clinical care. Specifically, simulations of pediatric emergencies allow for the study of many critical events, such as the temporal sequence of events, that would otherwise be difficult or impossible to capture in a reasonable timeframe in “real world” settings given the low frequency of pediatric EMS encounters. The purpose of this study was to characterize workflow for EMS care during simulated pediatric emergencies, a low frequency, high-risk event in the out-of-hospital setting. We defined workflow as the sequence of performed activities and amount of time utilized to provide care to a patient by an EMS team (Ozkaynak 2019).

METHODS

STUDY DESIGN

This is a secondary analysis of a series of videotaped simulation conducted within a single EMS agency in the mountain region of the U.S. The simulations from the parent study were recorded in a 6-month period from September 2018 to March 2019 (Kothari 2020). The study investigators obtained IRB approval from the Colorado Multiple Institutional Review Board (COMIRB) through a secondary data analysis IRB application.

STUDY PARTICIPANTS

Participants were licensed EMS providers from one local EMS agency that served a population of 280,000 over 130 square miles. All participants were trained and certified with either Pediatric Advanced Life Support (PALS) or Pediatric Emergencies for Prehospital Providers (PEPP). All participants were active EMS and fire professionals that routinely respond to emergencies and met the state licensure requirement for their scope of practice and employment. The participating EMS agency routinely conducts mandatory quarterly education, designed to train on updated protocols and new clinical initiatives undertaken by the agency. The last series of pediatric trainings were conducted a year before these simulations and were part of a clinical initiative to introduce a new medication dosing program for children.

The teams of EMS practitioners participated in the simulations consistent with their typical composition when responding on scene. In general, teams were comprised 1-3 paramedics, and 1-3 EMT and AEMTs. Participation in simulation training took place at a central training center during the EMS professionals' scheduled shifts as part of their mandatory quarterly education. Individual stations went out-of-service to participate with their crews. Investigators of the parent study did not control for team composition.

SIMULATIONS

A random selection of videotaped simulations conducted as part of a separate educational study were reviewed and analyzed. We utilized the simulations conducted in the first part of the educational study (i.e., within the first 3 months) to capture baseline EMS workflow associated with a pediatric emergency. High-fidelity simulations consisted of two scenarios: a 15-month child with hypotensive shock and seizures and a 1-month old infant with hypoglycemia and shock, both requiring intravenous (IV) fluid, medication administration, airway management, and treatment of hypotension. In the scenario with hypoglycemia, the mannequin was set to have seizure activity if not treated with dextrose within 5 minutes of the simulation starting. The scenarios were constructed with expected activities based on the agency's EMS protocols. The content was identified to generate recognition and appropriate management of shock and respiratory failure. The "patient" was a high-fidelity pediatric mannequin with real-time tactile and auditory feedback. The simulation attempted to mirror standard paramedic practice. Each scenario was conducted with a high-fidelity mannequin made by Laerdal (TM). Two separate mannequins were used, one the size of an 18-month-old and one the size of a 1-month-old. The mannequins were controlled by a remote tablet that could change both an electronic monitor as well as sounds and tactile findings (i.e., pulse). The fidelity of the mannequins included pre-recorded verbal responses, cardiac sounds including a gallop, murmur, and rate; respiratory sounds including stridor, wheezes, rhonchi, and rales; pupillary changes including fixed, responsive, and unequal; facial coloring to indicate cyanosis; changes in tongue size; and motor activity such as seizure. The mannequin operator was present in real time watching the scenario and would indicate when an action was completed, thus resulting in an automatic change in vital signs or other high-fidelity simulation activi-

ty accordingly. The same computer operator ran all 135 scenarios in the parent study.

The EMS teams used their own training equipment organized in the manner of their own pediatric bags used in the field. They also had a mock drug box for use of controlled medications such as midazolam. The teams were provided with bags of crystalloid and ampules of dextrose that were the same as those used by the agency. The teams were oriented to the mannequin with the ability to assess heart and lung sounds, feel the tactile components (pulse, tongue size) and see the motor changes such that they could recognize these features during the scenario. The pre-briefing took 15 minutes and was conducted immediately prior to the simulation scenario. The simulation was conducted in a mock ambulance interior environment outfitted with cameras and microphones. Events and scripts were standardized, with changes in patient condition occurring at pre-determined intervals. Teams were asked to provide normal care following their protocols as they would in the field. This included a primary assessment with vital signs, oxygen administration, ventilatory support, intravenous or intraosseous access, and fluid and medication administration. Figure 1 shows an exemplar of the scenario timeline.

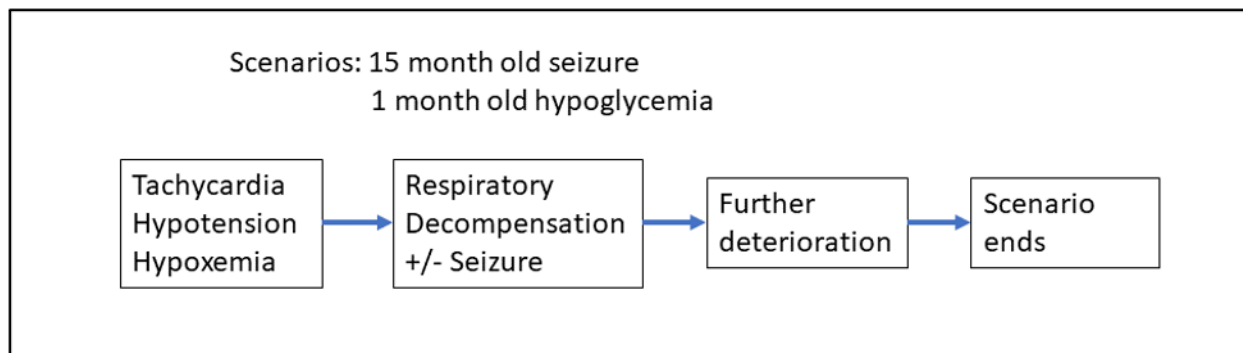


Figure 1. Projected Simulation Sequence

DATA ANALYSIS

All prerecorded videos (simulations) were reviewed by one of the authors (CD) for workflow analysis. The reviewer had prior EMS experience and was trained on analysis by an author (MO) with expertise in systems engineering and health informatics. The reviewer was instructed to review each of the videos and the videos were replayed as needed. The following outcomes were noted: activity type, time from the start and completion of the activity (time on task by the team), the provider(s) involved in each activity, and video duration.

We report on three building blocks of workflow: activities, roles, and sequence, as suggested in patient-oriented workflow approach (Ozkaynak 2019). Activities were defined as distinct tasks performed by one or more members of the team. We defined these activities after the simulations were video recorded but before observer watched the videos. Frequency of each activity performed during the simulation was captured along with the time at the start and at the completion of the activity. For activities that were repeated during the simulation, the number of times it was performed was captured by the video reviewer. We defined 'idle time' as the proportion of time when no record-

ed activity was being conducted. Non-idle time was the total time when there was at least one activity being recorded during a simulation. We defined team multitasking as simultaneous engagement in more than one task by team members and calculated team multitasking ratio. This was determined by the difference between the total video (e.g., simulation) time and the non-idle time divided by the non-idle time. We used this metric given its ease of interpretation. This metric shows the ratio of the time of multitasking when any activity was being conducted. If the score was 0% it meant there was no multitasking, indicating that the team was conducting only one task. If the score was 100% then it meant, on average, there was one additional task (a total of two activities) performed during the non-idle times throughout the simulation. Multitasking in this study was not an indication that multiple people were involved in the same activity, but instead denotes that two or more distinct activities were conducted simultaneously by the team.

For role analysis, we reported on the number of people involved in each scenario and in their steps. For the analysis of sequence, we utilized the Levenshtein distance (a string metric). The Levenshtein distance has been used in examining workflow in emergency departments (Ozkaynak 2012). Specifically, the Levenshtein distance is the number of changes in one string that is needed to create a new string. These changes could include a different order of elements or the addition and subtraction of different elements. In our analysis, we first coded each activity by a letter and then ordered the sequence of activities for each scenario thus creating a word for each simulation. We then calculated the Levenshtein distance (Pentland 2013) to identify the minimum number of changes in each simulation activity sequence (the corresponding word) required to match one simulation to another. A pairwise comparison matrix between each simulation was performed. We report the median Levenshtein distance with the interquartile range (IQR) between each pair of simulations over the total number of comparisons. Figure 2 illustrates an example of how Levenshtein distance is calculated.



Figure 2. Illustration of Levenshtein distance calculation. In this hypothetical example, the workflow for scenario 1 could be converted to scenario 2 in 13 steps. The underlined activities of scenario 1 (H and T) can be replaced to match scenario 2. Therefore, Scenario 1 can be matched to Scenario 2 by switching H and T. Other edits were changing or adding activities. S was the unique activity in Scenario 1. C and D are the unique activities in Scenario 2.

RESULTS

A total of 19 videos were analyzed, 12 were of the 15-month-old and seven were of the 1-month-old. Median time of each video was 10 minutes and 31 seconds (IQR 2 min-

utes, 4 seconds). There were between three and six EMS providers participating in each simulation with a median of four providers.

ACTIVITIES

A total of 17 distinct activities were captured (Table 1). The number of activities completed during each simulation varied between 16 and 21 for the 15-month scenario and 13 and 24 for the 1-month scenario with the median number of activities equaling

Activity name	Activity description	15-month-old scenario (n=12)			1-month-old scenario (n=7)		
		Number of times observed	Number of videos in which activity observed	Mean duration (min, max)	Number of times observed	Number of videos in which activity observed	Mean duration (min, max)
Basic Airway	Airway assessment, chin lift, opening of airway	4	4	69 (6, 194)	2	2	117 (47, 187)
BGL	Obtain blood glucose level using glucometer	12	12	82 (12, 307)	9	7	43 (3, 288)
BMV	Bag-mask ventilation: Application of mask on face, seal around face, ventilation using anesthesia or self-inflating bag	11	11	58 (8, 136)	7	7	36 (17, 63)
BP measure	Application of BP cuff, manual or machine automated cuff inflation	17	10	48 (4, 122)	10	7	61 (7, 455)
ECG (electrocardiogram)	Application of 3 electrodes to correct locations, connection to monitor	11	11	9 (3, 26)	5	5	39 (7, 142)
EtCO2	Application of ET/CO ₂ monitor to patient, connection to monitor	8	8	55 (23, 160)	1	1	6 (6,6)
IV_IO	Intravenous or intraosseous line placement	16	12	176 (25,440)	7	7	149 (68, 246)
IV fluid	Intravenous or intraosseous fluid administration	14	11	190 (41,588)	11	7	218 (68, 489)
Medication administration	Determining medication dose, drawing up medication in syringe, administration through IN, IO, or IV route	14	12	150 (41, 245)	9	7	106 (40, 269)
Oxygen delivery	Delivery of oxygen through face mask, nasal canula, bag mask ventilation	1	1	69 (69, 69)	0	0	
Oxygen measure	Application of continuous pulse oximetry, attachment of lead to monitor	11	11	73 (7, 161)	7	7	47 (2, 100)
Pulse check	Manual check of pulse in femoral, brachial, or carotid location	26	12	24 (3, 87)	16	7	22 (4, 53)
Pulse Oximetry	Application of pulse oximetry probe and connection to monitor	11	11	22 (9, 72)	7	7	17 (8,26)
Radio report	Delivery of summary of case and clinical care in prearrival notification to hospital	12	12	74 (55, 138)	7	7	56 (39, 83)
Respiration check	Listening to breath sounds during spontaneous respirations or ventilated breaths	33	12	6 (4, 10)	17	7	24 (7, 45)
Response check	Mental status assessment	7	5	39 (7, 429)	5	4	7 (3, 14)
Weight estimate	Use of length-based tape or asking for weight from caregiver	13	12	23 (5, 52)	7	7	13 (9, 19)

Table 1. Activities included in videos (All durations are in seconds)

18.5 for the 15-month-old and 18 for 1-month-old. Overall, not all activities were performed in every simulation, and some activities were performed multiple times in a single simulation. Median durations of the simulations were 653 and 593 seconds for 15 months and 1-month scenarios, respectively (Table 2). Median idle times (i.e., no team

member was performing any documented tasks) in a simulation was 18 and 10 seconds for 15-month and 1-month scenarios respectively. On average, 4% and 5% of idle time occurred for the 15-month and 1-month scenarios respectively.

	15-month scenario (n=12)	1-month scenario (n=7)
Mean number of activities, (min, max)	18.4 (16, 21)	18.1 (13, 24)
Median number of activities	18.5	18
Mean duration (min, max), seconds	653 (524, 849)	593 (438, 831)
Median duration, seconds	646	606
Mean idle time (min, max), seconds	24 (0, 63)	25 (0, 58)
Median idle time, seconds	18	10
Mean idle time ratio	4%	5%
Mean multitask ratio (min, max)	102% (52, 202)	94% (57, 155)
Median multitask ratio	96%	92%
min=minimum, max=maximum		

Table 2. Descriptive Statistics for Videos (n=19)

ROLES

The number of team member involved in each video varied between three and six.

	Number of times in 15 month scenarios	Number of times in 1 month scenarios
Activities that involved 3 personnel		
Basic airway	0	1
BMV	3	1
IV-IO	5	1
Medication administration	6	1
Oxygen measure	2	0
Pulse check	5	0
Respiration check	1	1
Activities that involved 2 personnel		
Basic airway	2	1
BP Pressure	3	0
BVM	4	1
ETCO ₂	5	0
IV Fluid	5	4
IV IO	4	4
Medication administration	4	4
Oxygen measure	4	1
Pulse check	2	2
Pulse oximetry	1	0
Respiration check	2	1
Response check	1	2
Weight estimate	5	1

Table 3. Activities involved multiple people

Activities were frequently accomplished by one or two people, but sometimes these activities could take three people (Table 3).

CONCURRENCE AND SEQUENCE

In two of the 15-month simulations, six activities were conducted concurrently at least once. In five videos (four in 15-month and one in 1-month simulations), at most, three activities were conducted concurrently.

Mean multitask ratio was 102% and 94% for 15-month and 1-month scenarios respectively. Only 12-55% (mean 36%) of the time did EMS personnel conduct one or no activity in a simulation. The minimum pairwise Levenshtein distance for both scenarios is 11 which means 11 activities would be edited to transform one simulation to another. The median pairwise Levenshtein distance for both scenarios is 15. The maximum pairwise distance was 18 for 15-month scenario and 19 for 1-month scenario (See Appendix).

DISCUSSION

Workflow analysis is critical to understanding complex systems such as the healthcare environment and is an important component to consider when implementing process improvement. To date, there has been limited workflow research in prehospital environments, particularly in the care of pediatric emergencies. In this study, we characterized workflow among teams of EMS practitioners, using a systematic approach in the evaluation of a series of simulations in which the patient's condition and environment were controlled. More importantly, we presented a method to study workflow for EMS work. We found a significant degree of variability; particularly in the number and type of activities performed in each scenario, the sequence of these activities, as well as the number of team members involved. Not surprisingly, we also found that EMS teams multitask continuously across the entirety of an out-of-hospital encounter.

What is notable about the degree of variability seen in the EMS team workflow between scenarios is the fact that the physical environment, equipment, and clinical features of the scenario were controlled suggesting that the variability seen is due to EMS provider teamwork and communication alone. Some variability may be due to the experience of the EMS practitioner, or their familiarity with other team members. Prior studies examining errors in out-of-hospital care strongly advocate for interventions to reduce known variabilities that can negatively affect safety and patient outcome issues (Herzberg 2019, Jones 2018, Meckler 2018, Ramadanov 2019). As an example, efforts to reduce variability in care such as "pit crew resuscitation" demonstrate improved outcomes for patients (Hopkins 2016).

Our study is the first use of Levenshtein distance to examine EMS workflow, and one of few studies that has used it in any healthcare settings (Ozkaynak 2013). It is potentially clinically relevant and shows a common degree of sequence variability seen in emergency care. This approach allows evaluation of the effects of various interventions (e.g., training, technology, etc.) on sequence variability by allowing pre and post comparisons without a need for a control group. Although safety and patient outcomes were beyond the scope of our study, our methodology can be used to measure the extent of variability in EMS workflow and provide a standardized metric that can be used as an outcome in intervention studies designed to streamline workflow and standardize care.

Team multitasking is assumed in prehospital care (Norri-Sederholm 2014); however, team multitasking can potentially lead to human error and patient safety issues because of confusing and coordination failures (Chisholm 2000). Our methods can be utilized in future studies to answer questions regarding the optimum number of team members in EMS care and best task sharing policies. Quantifying workflow and multitasking can

inform the design, implementation, and evaluation of communication or other team-based interventions that improve team performance and the outcomes of EMS work.

Our finding of the degree of multitasking in the setting of hands-on patient care demonstrates that EMS practitioners may not have the capability to use and interact with handheld computing devices such as those used to collect and document patient data and keep track of team activities. Prior studies examining this issue have made the same conclusion and suggest that degree of variability and multitasking in EMS teams necessitates novel interventions to support EMS providers (Chisholm 2000). For example, hands-free, semi-automated wearable technology such as smart glasses can be adopted to better support EMS workflow (Zhang 2021a, 2021b, 2022). Other studies demonstrate that interventions to improve teamwork¹¹ or integrate health information technology (HIT) (Zhang 2020) can improve EMS care.

During the brief moments of idle time, the subjects were not providing care to the patient. The nature of the reason behind the idle time was not directly analyzed, however, pauses in treatment is common to allow devices to calibrate (e. g., ECG recording) or to observe response to treatment (e. g., anti-seizure or glucose medication). The study investigator measuring time and duration of activities did include the time determining a dose of medication, drawing up the appropriate volume, and administration of the medication all as an activity.

Our previous study which focused on inefficiencies and patient safety issues using the same dataset highlighted that EMS teams failed to perform certain tasks due to “lack of closed-loop, directed communication”, “inappropriate or lack of task sharing and coordination”, and “lack of situational awareness.” This is similar to other studies examining EMS teams in simulation where a number of tasks are not completed (Lammers 2009). In fact, even when using a checklist, EMS teams can fail to do up to 50% of tasks (Alphonso 2017). Variability in workflow and team multitasking can lead to these issues if EMS teams are insufficiently supported.

Computerized decision support technologies have been utilized in other healthcare settings to prompt clinicians to perform certain interventions or collect information (Jaspers 2011), and HIT interventions have been shown to improve decision making by EMS personnel. However, smooth integration of HIT to workflow has been identified as a challenge⁸ and requires methods to evaluate workflow to facilitate integration of interventions. We found very little idle time in each scenario suggesting that HIT must be integrated into existing activities but not increase the number of activities that must be completed or performed by the EMS practitioner, yet be sufficiently flexible to accommodate the variability in workflow.

Studies demonstrate that interventions informed by workflow analysis during design, implementation and evaluation phases can possibly lead to better health outcomes (Ozkaynak 2016, Zhang 2020). This study presents a systematic approach to examine EMS workflow so that intervention designers, implementers, and evaluators can use it to inform their work.

Future research should include the design of participatory or non-participatory field studies to confirm these findings. Qualitative studies may identify the factors that influence the degree and extent of multitasking and its consequences. These types of studies can also evaluate factors associated with the variability in type of activities conducted including their sequence, which team members are involved, and how this affects the quality and safety of care. Our study focused on activities, roles, and sequence. However, other work elements such as data flow could be integrated as well.

LIMITATIONS

The limitations of this study included the inherent difficulty in observing teamwork through video monitoring and the inability to fully understand the team member's motivation. Although all videos were assessed for audiovisual clarity, some team tasks may have occurred outside the visual field of the cameras and audio recordings may not have captured all verbal communication clearly. In addition, body language or non-verbal communication is more difficult to detect. Team member motivation is difficult to determine without audible cues. One cannot expect simulations to replicate how one would respond in the field, since mistakes made on a mannequin do not have the same consequences of those made during actual patient care. Teams and individuals performed tasks on occasion without verbalizing their plan of care.

Despite the great potential of simulations, de-contextualizing collaborative work by performing it in a laboratory setting, may affect not only the primary work activities, but also the background work that enable these activities. Within healthcare, the importance of, for instance, articulation work (Corbin 1993) (i.e., activities that are not a part of activities toward primary goal but makes primary goal activities possible) has been found to be critical to take into account in coordination of medical settings (Abraham 2013). This often subtle and highly contingent background work may be difficult to recreate in a simulated setting, which introduces the uncertainty that the problems observed may in fact be caused by the absence of normal routine.

This is a secondary analysis from a previous study. High variability in crew numbers and levels of licensure can be considered as a limitation, however team composition in simulations mirrored the exact composition of teams in the field as the participants were on shift at the time of simulation practice. Although some simulations did not require treatment of seizure activity, all tasks reviewed included essential aspects of prehospital care regardless of whether the patient had a seizure in the first 5 minutes. In addition, we intentionally chose only a fraction of the available videos for our analysis, but a larger sample size may have allowed us to find additional nuances in workflow not noted in the selection of videos that we did review. We did employ a single video reviewer which may skew our findings; however, our reviewer did undergo training and has a background in prehospital care.

The performance of EMS personnel is affected by many factors; however, the scope of this study was limited to workflow issues.

CONCLUSIONS

We were able to identify many of the tasks used by EMS personnel and the duration of time to complete such tasks. This method of identifying and quantifying EMS tasks may be useful in workforce allocation, identifying strengths and weaknesses of team members, or to evaluate a team member's readiness for the field. Additionally, our findings can inform the development of interventions, specifically the design, implementation, and evaluation of HIT and other teamwork interventions designed to improve the outcomes of EMS care.

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APPENDIX

Pairwise distances of the workflows for 15-month scenarios

	imklahikbnoefkjdjrd	ihkicimfjodikkbejk	bimbkkfjediefoenk	ihikbmgefkoedfjkb	tkdimelkgmhonekj	ihkicofjoigmanebji	ikmidogubetkfaebkji	ihbokfjoegmfibe	ihbdmfjoagoyjkb	ihkbumiodigfkobekji	mbtdobhkfjcknifbjg	imbkatogedflekjij
imklahikbnoefkjdjrd												
ihkicimfjodikkbejk	16											
bimbkkfjediefoenk	18	14										
ihikbmgefkoedfjkb	17	13	15									
tkdimelkgmhonekj	17	12	16	15								
ihkicofjoigmanebji	18	15	15	15	14							
ikmidogubetkfaebkji	16	15	17	16	16	16						
ihbokfjoegmfibe	16	14	15	12	15	11	16					
ihbdmfjoagoyjkb	16	13	13	13	13	11	14	11				
ihkbumiodigfkobekji	17	11	17	17	15	15	15	15	14			
mbtdobhkfjcknifbjg	16	15	15	16	16	15	16	15	15	17		
imbkatogedflekjij	15	13	12	15	15	13	15	14	13	13	16	

Pairwise distances of the workflows for 1-month scenarios

	khidkbtflacimeogiggibej	ihfdtbogeikbmeanikj	bmithofgecjkbceo	ihibftekimoigekj	ktckideflmoghkjboeck	imktdheobfegj	khbtmdliceklfiokgj
khidkbtflacimeogiggibej							
ihfdtbogeikbmeanikj	18						
bmithofgecjkbceo	19	15					
ihibftekimoigekj	14	13	14				
ktckideflmoghkjboeck	18	18	16	16			
imktdheobfegj	17	15	11	12	15		
khbtmdliceklfiokgj	16	15	15	15	16	12	

Legend: These two tables show the pairwise comparison of the workflow extracted from simulations (n=12 for 15-month scenario and n=7 for 1-month scenario) In each table the first column and first row lists the simulations (e.g., first element of first column and first element of first row are same and show the first scenario etc.). The numbers represent the dissimilarity between the simulations at the corresponding row and the corresponding column. For example, in the second table, the dissimilarity between the simulation listed in the 4th column and the 7th row is 11. The smaller the number shows more similarity between the pair. For example, the dissimilarity between the simulation listed in the same column (4th) and the 8th row is 15. This means that the workflow on the 8th row is more different (15>11) to the workflow on 4th column.

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RESEARCH REPORT

THE MOST COMMON SELF-REPORTED REASONS FOR CALLING EMS: A CROSS-SECTIONAL SURVEY OF FREQUENT CALLERS IN ONTARIO

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Recommended Citation: Angeles R, McLeod B, Lee J, Mahmuda S, Stocic A, Howard M, Agarwal G: (2023) The Most Common Self-Reported Reasons for Calling EMS: A Cross-Sectional Survey of Frequent Callers in Ontario. *International Journal of Paramedicine*. (4), 29-39. <https://doi.org/10.56068/ALAS3711>. Retrieved from <https://internationaljournalofparamedicine.com/index.php/ijop/article/view/2440>.

Keywords: frequent callers, frequent callers, emergency medical services, EMS, paramedicine

Received: October 19, 2022
Revised: August 23, 2023
Accepted: August 23, 2023
Published: October 12, 2023

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Declaration of Interests: none declared

Funding: This study was funded by the Ontario Paramedic Research Consortium. The funders had no role in the design and conduct of the study; collection, management, analysis, and interpretation of the data; preparation, review, or approval of the manuscript; and decision to submit the manuscript for publication.

Acknowledgements: We want to acknowledge the Ontario Paramedic Research Consortium and the Ontario Association of Paramedic Chiefs for providing the pilot funding for our research.

ABSTRACT

Background: Frequent callers of emergency medical services comprise a disproportionate percentage of emergency department visits. This study aims to describe reasons for calling 911 and associated socio-demographic factors among frequent callers in Ontario.

Methods: This was a cross-sectional research design. A mailed, self-administered survey was sent to EMS patients who were identified and recruited to participate as adult EMS patients (18 years or older) who called EMS over five times in one year in one urban Ontario location. The survey instrument was developed based on a prior qualitative study. Dillman's Total Design Method was used to implement the survey. Data was summarized using frequency distribution. Subgroup analyses were performed to assess for factors associated with reasons for calling in the past, reasons for calling in the future, and health services utilized.

Results: The survey participation rate was 30.88% (n=67): 47.8% were over 65, 50.70% were female, 85.1% were unemployed, and 38.8% lived alone. Most frequently reported reasons for having called 911 were inability to get up after a fall (41.8%), exacerbation of chronic medical conditions (37.3%), inability to get to the hospital (34.3%), experiencing severe pain (34.3%), and anxiety attacks (23.9%). Subgroup analysis showed significant associations: unemployment was associated with having called due to an alcohol or drug overdose (OR=6.50; CI: 1.16, 36.26); age over 65 had lower odds of calling in the future for alcohol or drug overdose (OR=0.06; CI: 0.01, 0.51), for serious allergic response (OR=0.22; CI:0.081, 0.740) or severe pain (OR=0.18; CI: 0.064, 0.518); age over 65 (OR=4.46; CI=1.24-17.41) had higher odds of using Community Care Access Centers; and male participants had lower odds of using telehealth (OR=0.19; CI:0.038, 0.97).

Conclusions: The study results show that the most frequent reasons for calling 911, as self-reported by participants, were calls related to falls, transport to medical care facilities, or anxiety attacks. More appropriate management of these non-urgent calls should be considered to free up ambulance services for more urgent calls.

BACKGROUND

Frequent callers of emergency medical services (EMS) comprise a disproportionate percentage of emergency department (ED) visits, representing a group of vulnerable and medically complex patients who contribute to significant healthcare costs (1–3). Within the Canadian ED literature, the 2.1–3.6% who are frequent callers (defined as seven or more ED visits/year) account for 9.9–13.8% of ED visits (4). Similarly, prehospital systems have experienced strain beyond capacity. In Ontario, ambulance use has increased by 40% from 2007 to 2017, representing 176,425 more patient transports, and between 2010 and 2017, a 22.4% increase in funding (5). Of all ambulance transports, frequent callers comprise 40%. (4,6–10) In a published study surveying EMS use, one-third of EMS dispatches are reported by researchers as non-medical emergencies (11). As such, this population of callers, typically those who call EMS 4 to 5 times or more within twelve months, represents an opportunity for optimizing health services and reducing costs to an increasingly overburdened health system (2,12).

Some current literature discusses frequent callers' reasons for calling emergency medical services, but the results have varied depending on the population and study location. There is a gap in the literature concerning frequent callers in the Canadian emergency healthcare system since most studies have occurred in the USA or the UK. The limited Canadian literature reports that frequent users of ED present more commonly than the general population with psychiatric and substance use-related complaints (6). Studies from the USA and UK present varied data, with some noting that chief complaints are similar to non-frequent callers and some noting distinct differences (6,13,14). Some common complaints among attendees include nausea and vomiting, chest pain, abdominal pain, anxiety, and shortness of breath (6,13,14). However, frequent callers are more likely to call due to chronic condition exacerbations in ambulatory care-sensitive diseases. (15) Chronic diseases that are more prevalent in frequent callers include asthma (16,17), chronic obstructive pulmonary disease, renal failure, sickle cell anemia (18), hypertension, diabetes, depression, renal failure (18,19), coronary artery disease, and stroke (15). Conversely, they were less likely to call for trauma or pregnancy-related reasons. (18,20) Some studies have further sub-stratified participants by age or number of calls. One study found that younger age was associated with calls due to alcohol intoxication, dependence, or withdrawal (18); however, another study reported that the association between frequent calls due to psychiatric issues or substance use was mixed (21). Despite frequent callers' overall higher acuity complaints (12) and increased mortality rates post-ED (22), persistent callers (over 20 times per year) were associated with lower acuity complaints and fewer visits that resulted in admissions (23).

Existing studies have primarily taken place in large urban American centers, with far fewer in mid-sized Canadian cities distinct in their universal health insurance, access to primary and ambulatory care, and disease burden. Additionally, most studies are conducted at the ED level, and the current literature needs more data at the pre-hospital EMS level (20). Given that 59.3% of frequent ED attendees arrive by ambulance, as opposed to merely 12% of the general population, studying frequent callers of 911 will contribute to reducing ED overcrowding (24). Describing this population's reasons for calling and access to non-emergency healthcare services will assist in meeting the needs

of this medically and socially complex population with targeted health service planning.

This study aims to determine socio-demographic factors associated with a group of frequent callers in Ontario and to describe their reasons for calling 911, attitudes towards EMS, and healthcare services use.

METHODS

RESEARCH DESIGN

This was a cross-sectional study of community residents in one urban municipality who call 9-1-1 frequently.

PARTICIPANTS

Participants were residents of an urban City in Canada who were 18 years of age or older and had called 911 at least five times between April 1, 2015 and March 31, 2016. A pool of eligible participants was generated from Paramedic Service Electronic Medical Records using a query identifying residents who met these criteria. We aimed to survey 100 participants (n) from this target population. The sample size was based on estimating 95% confidence intervals of proportions with a 10% margin of error, and assuming that 50% of all frequent callers call 9-1-1 for non-emergent service, a conservative estimate for computing sample size for this survey.

DATA GATHERING PROCEDURES

The survey instrument was developed based on qualitative research conducted in a sample of frequent callers of EMS done before the current study. (26) We also included questions assessing the participants' perceptions of emergency health care (comprehensiveness, continuity of care, satisfaction). The survey questionnaire was revised based on face validation and reliability assessment results. Dillman's Total Design Method was used to implement our mailed self-administered survey. We first invited participation in our surveys to all qualified participants, excluding those already participating in phase 1. The participants were given a letter introducing our study objectives and instructions about the survey return procedure, the self-administered survey, a pre-stamped return envelope, and a \$5 gift card. The second mail-out took place a week after the initial mail-out, and it consisted of reminders to participants to complete the survey and return it using the pre-stamped envelope. A final mail-out occurred three to seven weeks after the initial mail-out with a replacement introductory letter, instructions for returning the survey, the survey questionnaire, and a pre-stamped envelope. The second and final mail-out was only done if participants did not respond after the first mail-out. If the participant mailed the survey back, another \$5 gift card was sent to them.

Ethics approval was received from the Hamilton Integrated Research Ethics Board to conduct the research.

OUTCOMES

Data collected included demographic data, reasons participants called 911 in the past and when they might do so in the future, health services most frequently utilized, method of transport to emergency care, and access to/satisfaction with outpatient healthcare.

DATA ANALYSIS

Categorical variables were analyzed using descriptive statistics. Chi-square calculations and odds ratio with 95% confidence intervals were used via Statistical Package for Social Sciences (SPSS) version 20. Dependent variables in the analysis included: reasons for calling in the past and future and health services utilized. Independent variables included age, sex, living situation, and employment status. The reference category for each independent variable in the odds ratio calculation was selected as the lower risk category (i.e., age under 65, female, employed, living with somebody).

RESULTS

DEMOGRAPHICS

400 residents who called 911 for EMS 5 or more times in the urban area during the one-year study period were identified. The response rate was 30.88%. A demographic survey (Table 1) revealed that 47.8% of participants were over 65. Our total resultant sample size was 67. Gender was equally distributed. A significant percentage (85.1%) were unemployed. Regarding living arrangements, 58.2% lived with someone, while 38.8% lived alone. Only 23.9% of participants were normal weight or under; the rest were overweight, obese, or declined to reveal their weight.

REASONS FOR CALLING

The most frequently reported reasons for having called 911 in the preceding year were being unable to get up after a fall, being unable to get to the hospital, experiencing a chronic medical condition exacerbation, experiencing severe pain, and experiencing an anxiety attack (Table 2). The least frequently reported were feeling alone and afraid, feeling lonely, significant bleeding, or severe allergic responses. These actual reasons differed slightly from the potential reasons why individuals would call in the future. The top reasons included heart attack, falling and being unable to get up, chronic medical exacerbation, injuries/broken bones, and significant bleeding.

PERCEPTIONS OF EMERGENCY MEDICAL SERVICES

Participants reported high levels of satisfaction with EMS services (83.5%), with many reporting that the information paramedics provide helps calm them down (74.7%) and that they feel better after paramedics arrive on the scene (71.7%). Over 44% felt better simply after calling 911. Interestingly, 46.3% had never tried to use non-emergency services in the past, 43.3% said that the non-emergency services they had used previously were not adequate for their needs, and 59.7% stated they would use non-emergency

Variable		Frequency (%) (N=67)
Age (yrs)	18-24	1 (1.5)
	25-40	7 (10.4)
	41-64	27 (40.3)
	65-74	15 (22.4)
	75 and older	17 (25.4)
Sex	Male	33 (49.3)
	Female	34 (50.7)
Employment Status	Employed	9 (13.4)
	Not employed	57 (85.1)
	Declined to answer	1 (1.5)
BMI	Underweight (<18.5)	3 (4.5)
	Normal Weight (18.5-24.9)	13 (19.4)
	Overweight (25.0-29.9)	17 (25.4)
	Obese Class I (30.0-34.9)	10 (14.9)
	Obese Class II (35.0-39.9)	6 (9.0)
	Obese Class III (>= 40.0)	3 (4.5)
	Declined to answer	15 (22.4)
Living Arrangement	Lives alone	26 (38.8)
	Lives with someone	39 (58.2)
	Declined to answer	2 (3.0)

Table 1. Demographic Data

Reason	Frequency (%)
Could not get up after a fall	28 (41.8)
Could not get to the hospital	23 (34.3)
Chronic medical condition leading to medical emergency	25 (37.3)
Severe Pain	23 (34.3)
Anxiety attack	16 (23.9)
Heart Attack	11 (16.4)
Injuries or broken bones	10 (14.9)
Vomiting and diarrhea	9 (13.4)
Alcohol/drug overdose	7 (10.4)
Fainting and dizziness	7 (10.4)
Felt alone and afraid	6 (9.0)
Bleeding and significant blood loss	5 (7.5)
Felt lonely	3 (4.5)
Serious allergic response	1 (1.5)

Table 2. Reasons for Calling 911 in the last 12 months

addressing minor and major medical issues. Concerning minor medical issues, the most frequently answered modes of transportation were by having somebody drive them (49.3%) and by ambulance (44.8%). A secondary proportion answered they would utilize public transit (22.4%). Only a small minority responded that they would drive their vehicle (9.0%) or walk or bike (4.5%).

services in non-emergency situations if they knew about such services. Lastly, 41.8% believed the paramedics' role was to help in emergency and non-emergency cases, while 68.7% believed EMS should only be used as a last resort (Table 3).

HEALTH SERVICES

The majority of participants had accessed their family physician and urgent care services in the past year (86.6% and 56.7%), but few had accessed specialized outpatient clinics (26.9%), walk-in clinics (23.9%), telehealth services (16.4%) or community comprehensive care programs (9.0%). Concerning community services, less than half had accessed community social programs, assisted transportation services, or Meals on Wheels.

Besides accessing emergency services, participants also had good access to outpatient non-emergent healthcare (Table 4). The majority of participants answered "yes" in response to whether they visited a particular healthcare provider (HCP) when they were concerned about their health (89.6%). Additionally, 53.7% answered "often" or "almost always" in response to how often they visit their HCP. Satisfaction levels were also high at 68.7%, answering "satisfied" or "very satisfied."

ACCESS TO HOSPITAL

Patients were surveyed concerning how they would go to the hospital when

However, when addressing major medical issues, a much greater percentage answered that they would call an ambulance (91%) than all other transportation forms. The second most frequent answer was having somebody drive them (16.4%).

ASSOCIATIONS

Statistical analysis was done to assess if participant characteristics were associated with reasons for calling 911 or using other healthcare services. Few significant associations were found. In terms of reasons for calling 911, being unemployed was associated with having called due to an alcohol or drug overdose both in the past (OR=6.50; 95% CI: 1.16-36.26) as well as calling in the future (OR=4.27; 95% CI: 0.96-19.03). Age over 65 had lower odds of calling in the future for an alcohol or drug overdose (OR=0.06;95% CI: 0.01-0.51). Older participants had lower odds of calling in the future for a serious allergic response (OR= 0.22; 95% CI=0.08-0.74) or for severe pain (OR=0.18; 95% CI=0.06-0.52). In terms of using health services, male participants had lower odds of using telehealth (OR=0.19; 95% CI=0.04-0.97), age over 65 had lower odds of using specialized outpatient clinics (OR=0.33; 95%CI=0.09-1.01). Unemployment (OR=0.10; 95%CI=0.01-1.02) and age over 65 (OR=4.46; 95%CI=1.24-17.41) had higher odds of using Community Care Access Centers.

DISCUSSION

Our results are consistent with the current literature, which shows that this population of frequent callers is more medically and psychosocially complex (21,27). 37.5% of participants in this study reported calling for chronic medical disease exacerbations, representing overall poor control in the community. This is consistent with current literature, which reports high rates of chronic disease among frequent callers (12, 19, 27). However, literature suggests that it is not merely the presence of a chronic disease diagnosis that may push one toward recurrent calls to 911 but other factors adding to the complexity. In fact, 44% of Canadians overall have been diagnosed with a chronic medical condition (2016) (28) but are not frequent callers of EMS and make up merely 2.1-3.6% of the Canadian EMS transport population (4).

	Characteristic	n	Percent (%)
License	EMT	417	37.5
	Paramedic	695	62.5
Gender	Female	398	35.9
	Male	671	60.3
	Other	42	3.8
Compensation	Paid	473	42.5
	Volunteer	107	9.6
	Paid and Volunteer at least 20 hours/week of	532	47.9

Table 3. Perceptions of EMS

Variable		N (%)
Do you visit a particular healthcare provider (HCP) when you are concerned about your health?	Yes	60 (89.6)
	No	7 (10.4)
How often do you visit the HCP?	Almost never	3 (4.5)
	Seldom	9 (13.4)
	Sometimes	19 (28.4)
	Often	26 (38.8)
	Almost always	10 (14.9)
How satisfied or dissatisfied you feel about the care from above HCP	Very dissatisfied	7 (10.4)
	Dissatisfied	6 (9.0)
	Neutral	7 (10.4)
	Satisfied	26 (38.8)
	Very satisfied	20 (29.9)
	Did not answer	1 (2.5)

Table 4. Access to Outpatient Healthcare

We hypothesize that due to the psychosocial complexity of our population, they are more prone to exacerbations of chronic medical illnesses and manage them more poorly than the general population. Psychosocial factors such as social support and socioeconomic status play a role in the control of chronic diseases such as hypertension (29), COPD (30), and diabetes (31). poverty (32), substance use disorders (33), and psychiatric illnesses (34) are associated with poorer control of chronic medical illnesses. Additionally, patients with comorbid chronic medical conditions with mental health disorders have higher acute care requirements (35). This is particularly relevant to our study, as 85.1% of participants were not employed, and 38.8% lived alone and were, therefore in the lower socioeconomic bracket, with less access to healthcare resources that can be used to support chronic disease management in the community. Participants may have lower financial capacity to manage their medical issues or to develop beneficial lifestyle habits such as diet and exercise, which prevent chronic illness. Low-income status may also be related to the fact that nearly half of our participants were over 65 years old and likely to be dependent on pensions. However, the fact remains that their low-income status may result in higher EMS service use. Similarly, 10.4% of our study's participants called due to an alcohol or drug overdose, and 23.9% called due to an anxiety attack. Such high rates suggest that participants called not only due to chronic medical illness but also to chronic illness exacerbations superimposed onto psychosocial complexity.

Poor functional status is another factor that may lower the threshold for calling EMS in our study population; 41.8% reported that they called due to falling and being unable to get up. Additionally, 34.3% answered that they could not get to the hospital because of having called EMS. This reflects a population with poor functional status who would be less equipped to manage acute exacerbations of medical conditions than the general population. Additionally, these individuals would likely have greater difficulty with transport to ambulatory outpatient care, even in non-emergency situations [36]. This means that their medical and psychiatric conditions may be poorer controlled at baseline. In our study, 85.1% were unemployed so this factor may be amplified with those individuals in our research; perhaps their difficulty accessing outpatient appointments led to unmanaged health conditions for which they called EMS.

Altogether, though, EMS and EDs are not well equipped and are under-resourced to meet the needs of frequent callers. Concerning psychosocial complexity, 23.9% of our participants answered that they have called for anxiety attacks, and 24.5% would call in the future for anxiety attacks. This is comparable to Ontario statistics from 2016/2017, which showed 22.7% of frequent callers called for mental health due to substance use (35). Qualitative data on studying frequent users of ED have noted that regardless of actual acuity, patients call or visit ED due to fear, anxiety, and desperation in response to physical symptoms (35). Patients often seek symptom interpretation and reassurance despite feeling satisfied with their care (29). Therefore, frequent callers may not truly require emergency services but cannot find the reassurance they need from other sources, such as traditional ambulatory care and social services or EMS. Services specifically tailored to these individuals could reduce frequent calls to EMS. Such programs could include frequent multidisciplinary follow-ups providing chronic medical disease management, health education, psychiatric care, and increased social support; patients

could be triaged at the level of dispatch for alternative services, thus rendering EMS attendance unnecessary. Secondly, a prevalent issue in our population was falling and being unable to get up. Because this does not usually require EMS activation, an urgent service could be established to address this need. Lastly, bolstering the mental health support and social services may greatly benefit this population.

Alternative models of care may provide increased quality of service for reduced health-care costs, such as those in which paramedics refer or manage patients to reduce non-acute transports to the ED (36). Some programs divert callers to telemedicine services, provide advice themselves, or refer patients to their regular outpatient follow-up (37). Similar models could be explored in Southern Ontario, but with a holistic view of patients to address non-medical issues such as poor mobility, low socioeconomic status, and social isolation.

Our study had some limitations. Since this was a self-administered survey, responses were subjective and were prone to recall bias. There was also a small study sample because of the small number recruited and relatively low response rate despite our best efforts. However, expanding recruitment beyond one year might lead to more recall bias and difficulty finding contact information. Given that this population was hard to reach, a 30% response rate was acceptable, which is at par with most mailed surveys. A larger sample size would be ideal, but the age and gender distribution was what we expected and a good sign that we reached a representative target population.

CONCLUSIONS

Among our frequent caller participants, the most common reasons for calling 911 were inability to get up after a fall, inability to get to the hospital for medical care, experiencing a chronic medical condition exacerbation, experiencing severe pain, and experiencing an anxiety attack. Most of these reasons for calling may be managed in non-emergency care settings. Most have accessed non-emergency health care services, including family physicians, urgent care services, specialized outpatient clinics, walk-in clinics, and telehealth services. However, over 40% still believe that the paramedic role includes attending to non-emergency care, possibly because they call 911 despite having access to alternative health care services. Overall, participants reported high levels of satisfaction with EMS services, with many reporting that the information paramedics provide helps calm them down and that they feel better after paramedics arrive on scene.

Based on these findings, we believe that the policymakers and leaders in healthcare delivery should review why frequent call 911 and implement a system to help frequent callers use more appropriate healthcare services. This may free up ambulance services to urgent calls and decrease the expense of using more emergency services for non-emergency conditions.

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RESEARCH REPORT

SOCIAL NEEDS IN THE PREHOSPITAL SETTING (SNIPS): EMS CLINICIAN ATTITUDES TOWARD ADDRESSING PATIENT SOCIAL NEEDS

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Recommended Citation: Berger D, Caldwell C, Robbins ME, Gurley A, Mann J. (2023). Social Needs in the Prehospital Setting (SNIPS): EMS Clinician Attitudes Toward Addressing Patient Social Needs. *International Journal of Paramedicine*. (4), 40-51. <https://doi.org/10.56068/BNJE9301>. Retrieved from <https://internationaljournalofparamedicine.com/index.php/ijop/article/view/2754>.

Keywords: social determinants of health, emergency medical services, superutilizer, superuser, social needs, EMS, emergency medical services, paramedicine, burnout

Received: April 18, 2023
Revised: August 1, 2023
Accepted: August 24, 2023
Published: October 12, 2023

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Declaration of Interests: none declared

Funding: This project received internal department support from the Penn State Health Emergency Department as well as support by the National Center for Advancing Translational Sciences, National Institutes of Health, through Grant UL1 TR002014 and Grant UL1 TR00045. The content is solely the responsibility of the authors and does not necessarily represent the official views of the NIH. Funding for gift cards was provided by the Penn State Health Department of Emergency Medicine

Acknowledgements: The authors thank Susan Boehmer for statistical support, David Locke for participant recruitment, Penn State Health Community Paramedicine Team for support, and Zhexi (Jersey) Lu for her inspiration to pursue the project.

ABSTRACT

Introduction: There has been interest in utilizing EMS to address patients' social determinants of health, which are thought to be the cause of many unnecessary transports, particularly for "super-utilizing" patients. However, existing research is limited regarding EMS clinicians' understanding of social determinants of health and attitudes toward potential interventions.

Methods: This cross-sectional study was conducted using an internet-based survey of EMS clinicians across the United States with multiple methods of recruitment. Descriptive statistics and Chi Square Tests analyzed the data.

Results: A total of 1,112 EMTs and paramedics completed the survey with 43.4% reporting familiarity with the term, "social determinants of health," and 87.7% screening positive for burnout. Greater than 60% reported willingness to use proposed interventions to address patient social needs. Those who reported familiarity with the term, "social determinants of health," were more likely to indicate willingness to utilize interventions and to believe they were responsible for addressing their patients' social needs. Burnout had no effect on clinicians' willingness to use resources.

Discussion: Respondents showed substantial interest in using the proposed resources to address patient social needs, suggesting that EMS clinicians may be receptive to expanding their scope of responsibility to include socioeconomic interventions. EMS clinicians familiar with the term "social determinants of health" were more likely to believe they were responsible for addressing patient social needs and more willing to use interventions, suggesting a potential benefit to more education on the topic. Burnout among EMS clinicians may not be a barrier to implementing such interventions.

Conclusion: Our survey suggests that EMS clinicians may be interested in helping to address their patients' social needs. EMS clinicians should be offered education on social determinants of health in their initial training and through continuing education. Partnerships with human services agencies will be important to ensure the effectiveness of prehospital interventions.

INTRODUCTION

With United States healthcare costs rising at an unsustainable rate, there has been significant interest in addressing the increas-

ing emergency department (ED) overuse. Among the 16% of patients brought into the ED by emergency medical services (EMS), up to 61% could potentially be safely treated outside of the ED (Gratton et al., 2003). Furthermore, approximately one-quarter of all ED visits were made by the same 4.5% to 8% of patients (Iovan et al., 2020).

The term “super-utilizer” is generally accepted to describe patients who accumulate a large number of ED visits or 911 activations for either low acuity or potentially preventable complaints. Colloquially known as “frequent fliers” by EMS, these patients often utilize a disproportionate amount of resources. For example, one California patient was reportedly transported by ambulance over 700 hundred times in a single year (Jones, 2019). One survey of frequent users of EMS services in Ontario found these patients suffered from higher-than-average rates of loneliness, social isolation, poverty, and food insecurity (Agarwal et al., 2019). It has been hypothesized that the use of EMS by many of these super-utilizer patients is a result of the negative impacts of social determinants of health (Agarwal et al., 2019; Hasselman, 2013; Iovan et al., 2020). For example, a patient with mobility issues and without access to a car may be forced to rely on ambulance transport to access medical services. Patients who are living without shelter, identity documents, or health insurance are often unable to obtain timely medical care and rely on the 911 system for their healthcare needs.

Social determinants of health are conditions in which a person lives and works that impact their health (Social Determinants of Health, 2023). Examples include the neighborhood in which a person lives (e.g., walkability, exposure to pollution, personal safety), economic stability (e.g., accessibility to healthy food options, ability to afford insurance/healthcare), and education access (e.g., ability to understand health-related outcomes). These concepts are largely entwined and may disproportionately affect certain populations.

Although EMT and paramedics (collectively: EMS clinicians) care for patients who are negatively impacted by their social determinants of health, little is known about EMS clinician knowledge of, or willingness to recognize and address patient social needs. A literature review performed on July 9, 2023, by searching the NIH database for articles with the keywords “EMS,” “survey,” and “social determinants of health,” found no previous studies specifically examining EMS clinicians’ attitudes toward engaging with patients’ social needs. A series of systematic qualitative interviews performed with clinicians operating within a single EMS system noted themes suggesting widespread awareness of the role social factors played in patient health and a desire to engage with reporting on social conditions in order to improve patient health (McCann-Pineo et. al., 2022). A survey of EMS clinician knowledge of domestic violence indicated that almost 60% of respondents had only “informal education” on the topic, while almost 85% desired more formal training (Mason et al., 2010). If a similar trend holds true with social determinants of health, there is a far-reaching potential for EMS clinicians to affect health outcomes by recognizing and helping to address these social needs, which may potentially reduce overutilization of the EMS system.

Current initiatives to address social needs have often been reliant on community paramedics, who are EMS clinicians who use skills within their scope of practice in non-tra-

ditional roles to connect patients with, or transport patients to, non-hospital services, and/or to provide preventative care (e.g., checking blood pressures for patients in non-emergency settings). How such community paramedics address social needs, and the extent to which these interventions are systematized, varies widely across different community EMS agencies (Choi, 2016). Some interventions that have so far been employed to address patients' social needs include using a social needs screening tool to gather data; providing literature to patients; placing referrals on patients' behalf to medical and social services; giving patients taxi/rideshare vouchers; transporting patients to an alternative destination, such as a primary care office; and/or using a nurse advice line (Allana and Pinto 2021; "American College of Emergency Physicians Board of Directors," 2015; Choi 2016; Agarwal et al., 2018).

Interventions do not necessarily translate into meaningful impact, as providing a resource to a patient does not ensure it is sufficient to address that patient's need or can ensure a long-term change in a patient's situation. Nevertheless, there is growing evidence that EMS attempts to address patients' social needs can positively impact patient health outcomes. Studies have supported expanding the scope of traditional community paramedicine, with one study showing that with as little as four additional hours of online training, community paramedics could successfully improve health outcomes of their patients (Agarwal et al., 2018). Since most community paramedicine programs rely on skills already permitted under the EMS clinician's scope of practice, courses could be offered as continuing education for responders who are not formally trained as community paramedics, without a change in laws ("American College of Emergency Physicians Board of Directors," 2015; Patterson & Skillman, 2013).

In fact, the 2012 National Consensus Conference on Community Paramedicine acknowledged that "many EMS personnel already perform these kinds of services whether formally or informally" (Patterson & Skillman, 2013). However, it is unknown if non-community EMS clinicians would view addressing patient social needs as part of their role. This study aims to capture EMS clinicians' current understanding of social determinants of health and attitudes toward potential interventions to addressing them. Secondary outcomes include identifying subgroups associated with lesser or greater willingness to address social needs.

METHODS

This cross-sectional study utilized an online survey open to EMS clinicians. This study was approved by the Pennsylvania State University Institutional Review Board. In addition to information about the respondents and their work environment, the survey also asked about willingness to utilize, and the perceived effectiveness of, various interventions to address patient social needs, including using a social needs screening tool; providing literature; placing referrals on patients' behalf; giving patients taxi or rideshare vouchers; transporting patients to an alternative destination, such as a primary care office; or using a nurse advice line. A sample of the question format is shown in Figure 1. It also included a question to assess EMS clinician familiarity with the concept of "social determinants of health" and assessed burnout via a two-question screener that was validated against the Maslach Burnout Inventory (Li-Sauerwine et al., 2020).

Select all that apply

If a SCREENING QUESTIONNAIRE were available that identified my patient's social needs that negatively affect their health, this would:

- Reduce 911 calls
- Reduce transports
- Improve patient health

If a SCREENING QUESTIONNAIRE were available that identified my patient's social needs that negatively affect their health:

- I would do this
- My coworkers would do this
- I already do this

Figure 1: Sample Question Format

An extensive recruitment campaign was undertaken, in which study team members attempted to contact the primary EMS agency in the two largest population centers and the EMS regulatory agencies in every US state and territory. Numerous additional EMS non-profit organizations and national EMS agencies were also contacted and asked to share the survey with their members. A social media campaign was conducted that entailed study team members sharing the flier on Facebook (Meta, Menlo Park, USA) and posting to EMS groups on Reddit (Advance Publications, San Francisco, USA). Articles on the study were shared with selected EMS-oriented media organizations. Respondents were given the option to enter a drawing for a \$50 Gift Card.

	Characteristic	n	Percent (%)
License	EMT	417	37.5
	Paramedic	695	62.5
Gender	Female	398	35.9
	Male	671	60.3
	Other	42	3.8
Compensation	Paid	473	42.5
	Volunteer	107	9.6
	Paid and Volunteer at least 20 hours/week of each	532	47.9
Agency Type	Transport Agency	771	69.3
	Non-Transport Agency	341	30.7
Area	Rural	195	17.5
	Urban Cluster	596	53.6
	Urban	321	28.9
Burnout	Screened Positive for Burnout	974	87.7

Table 1. Demographic Characteristics of Respondents

Study data was collected and managed using Research Electronic Data Capture (REDCap), a secure tool hosted at Pennsylvania State University. Data was analyzed using descriptive statistics and Chi Square tests.

RESULTS

A total of 1,112 EMTs and paramedics completed the survey. They averaged 36.4 years old (CI 35.8-37.1) with an average of 10.8 years in EMS (CI 10.3-11.4). Of respondents, 43.4% (n=483) were somewhat or very familiar with the term social determinants of health, whereas 56.6% (n=629) had not heard of the term prior to this survey. Complete demographic information may be found in Table 1.

Participants were asked to indicate their willingness to utilize potential interventions. Of participants, 63.5% (n=706) indicated they would utilize a questionnaire to screen

their patients for social needs. To address these needs, 66.9% (n=744) reported that they would distribute literature with resources, 64.6% (n=718) would make referrals on behalf of patients, and 62.1% (n=690) would transport their patients to medical destinations other than an emergency department. Furthermore, 64.7% (n=720) of participants would utilize rideshare or taxi vouchers for their patients and 60.8% (n=676) would utilize an advice line. Notably, 35.7% (n=397) of EMS responders identified themselves and their peers as responsible for addressing patient social needs.

DEMOGRAPHICS

Women were more likely than men to indicate willingness to distribute literature (p=.008), however, they were not more likely than men to indicate willingness to use the other proposed interventions. They were, however, more likely to report that they are currently utilizing all interventions with the exception of rideshare vouchers and referrals (p<.05).

EMS clinicians who screened positive for burnout were more likely to indicate willingness to make referrals on behalf of their patients (p<.001) but were not more likely than clinicians who did not screen positive for burnout to indicate willingness to use other resources. Clinicians who screened positive for burnout were more likely to indicate a belief that all resources except screening questionnaires and rideshare vouchers would reduce 911 calls, but not transports or improve patient health (p<.05).

Those who reported that they were familiar or very familiar with the term social determinants were more likely than those not familiar to indicate willingness to utilize all interventions except to distribute literature (p<.001). However, those who were not familiar with the term social determinants of health were more likely to report that they were already using screening questionnaires, alternative destinations, rideshare / taxi vouchers, or advice lines (p<.05). Those familiar with social determinants of health were also more likely to identify EMS as responsible for addressing patient needs (p<.001).

EMS clinicians familiar with social determinants of health were more likely to believe that all the proposed interventions would improve patient health. They were also more likely to believe that referrals (p<.001), transport to alternative destinations (p=.007), and use of an advice line (p=.003) would reduce 911 calls, as well as that rideshare vouchers would reduce transports (p<.001). Clinicians not familiar with social determinants of health were more likely to believe that a screening questionnaire would reduce transports than those who reported that they were familiar with the term (p=.04).

EMS clinicians who identified EMS as responsible for addressing patient social needs were more willing to use all of the interventions offered, with the exception of rideshare vouchers, and to believe all would improve patient health (p<.001). They also believed that all interventions, aside from screening for social needs and transporting to alternative destinations, would reduce transports (p<.05) and that use of screeners (p=.02), literature (p=.001), and referrals (p<.001) would reduce 911 calls.

DIFFERENCES BY OCCUPATION

Those who indicated that they primarily worked at a transport agency were more likely than those at non-transport agencies to indicate willingness to utilize all of the potential interventions ($p < .001$). However, those that worked at a non-transport agency were more likely to report that they currently utilize all of those interventions ($p < .001$). EMS personnel who worked for transport services were more likely to believe all of the proposed interventions, except the use of taxi or rideshare vouchers, would improve patient health ($p < .05$). However, those respondents were also more likely to believe that taxi or rideshare vouchers would reduce transports ($p < .001$).

Paramedics were more likely than EMTs to indicate willingness to utilize alternative destinations ($p = .002$) and rideshare / taxi vouchers ($p = .001$), however, they were not more likely to be willing to utilize other interventions or to report to be currently doing so. Additionally, paramedics were more likely than EMTs to believe that alternative destinations would improve patient health ($p < .05$), and somewhat more likely to believe that taxi or rideshare vouchers would reduce 911 calls ($p = .03$), and referrals would reduce the number of 911 calls ($p = .04$).

EMPLOYED VS. VOLUNTEER EMS CLINICIANS

Volunteer EMS clinicians were more likely than clinicians who did not volunteer at least twenty hours per week to believe screening for social needs would reduce transports ($p = .04$), and were less likely to report current use of an advice line ($p = .002$).

When compared with EMS clinicians who were both employed and volunteered at least 20 hours per week, volunteer EMS clinicians were more likely to indicate willingness to distribute literature ($p = .02$). Those who were both employed and volunteered were more likely to report that they currently make referrals ($p = .04$) or utilize an advice line ($p = .001$). Employed EMS clinicians who did not volunteer were more likely than those who were both employed and volunteered at least twenty hours per week to believe that screening for social needs ($p < .001$), distributing literature ($p = .02$), making referrals ($p = .0001$), or use of an advice line ($p = .02$) would reduce 911 calls. They were also more likely to report willingness to make referrals ($p = .03$) or utilize alternative destinations ($p = .03$), which they believed would reduce transports ($p = .006$).

DIFFERENCES BY AREA

When groups were analyzed by area, EMS clinicians in rural areas were more likely than those in urban cluster areas ($p = .003$) and urban areas ($p = .002$) to report that they currently screen for social needs, whereas EMS clinicians in urban cluster areas were more likely than their rural counterparts to believe screening will improve health ($p = .02$). EMS clinicians working in urban cluster areas were also more likely than those in rural areas to indicate willingness to distribute literature ($p = .04$), and more likely than their rural and urban counterparts to believe the literature would improve patient health ($p = .02$). EMS clinicians in both urban and urban cluster communities were more likely than those in rural areas to believe that literature would reduce 911 calls ($p = .02$,

$p=.02$, respectively) and reduce transports ($p=.03$, $p=.006$, respectively).

EMS clinicians in urban areas were more likely than those in rural and urban cluster areas to be willing to make referrals ($p=.006$, $p=.002$), and were more likely than those in rural areas to report that they are currently doing so ($p=.02$). Urban EMS clinicians were also more likely than their rural and urban cluster counterparts to believe referrals would reduce 911 calls ($p=.001$, $p=.002$). Rural EMS clinicians were less likely than urban and urban cluster clinicians to believe referrals would improve patient health ($p<.001$, $p<.001$).

EMS clinicians working in urban clusters were more likely than rural EMS clinicians to indicate willingness to transport to alternative destinations ($p=.02$), however, rural EMS clinicians were more likely to report that they were currently doing so ($p=.01$).

In regard to taxi or rideshare vouchers, both EMS clinicians in urban and urban cluster areas were more likely than those in rural areas to indicate willingness to utilize vouchers ($p<.001$, $p<.001$), however rural EMS clinicians were more likely to report already doing so ($p=.002$, $p=.03$). EMS clinicians working in urban clusters were also more likely than those in urban areas to report to be currently using vouchers ($p=.035$). Urban EMS clinicians were more likely than their urban cluster or rural counterparts to believe vouchers would reduce transports ($p=.002$, $p<.001$).

Urban cluster EMS clinicians were more likely than those in rural areas to report that they are already using an advice line ($p=.05$) and to believe an advice line could reduce 911 calls ($p=.002$) and improve patient health ($p=.01$).

EMS clinicians working in urban environments were more likely than those in rural communities to believe they were responsible for addressing their patients' social determinants of health ($p=.02$).

DISCUSSION

Using EMS clinicians to address patient social needs is not itself a new concept, with community paramedicine taking the lead. However, this study included only non-community paramedicine EMS clinicians, who make up the majority of the EMS profession. Therefore, this data demonstrates that an opportunity exists for EMS services to offer their non-community paramedicine clinicians resources to help them to address their patients' social needs.

Additionally, participants who reported greater familiarity with the term social determinants of health were more likely both to indicate willingness to use the interventions and to believe that the interventions would improve patient health. These participants were also more likely to identify EMS as a party responsible for addressing patient social needs. This sense of responsibility is consistent with findings from the interviews of EMS clinicians carried out by McCann-Pineo, who reported a universal belief by their study participants that "they had an ethical, moral, legal, and professional duty to serve as both witnesses to the presence of Social Risk Factors (reporting them whenever possi-

ble) and patient advocates (especially for those who are especially vulnerable because of the Social Risk Factors in their lives)” (McCann-Pineo et. al., 2022).

Although it is possible that those who were inclined to learn about social determinants of health were also more inclined to provide resources, offering additional training to EMS clinicians could further their understanding of how interventions regarding their patients’ situations can improve their patients’ health. Since EMS personnel are familiar with the community they serve and are often the only healthcare providers to see a patient in their homes, they are uniquely suited to recognize patient social needs and help address them, if properly trained.

EMS clinicians who screened positive for burnout were not less likely than others to indicate willingness to utilize most proposed interventions, suggesting that clinician burnout may not be a barrier to utilizing social needs interventions. In fact, it is possible that providing resources to EMS clinicians to address social needs may actually reduce burnout. One of the commonly cited factors leading to burnout, including among EMS clinicians specifically, is helplessness, or a perceived inability to address patients’ needs (Grigsby, 1988). Studies of primary care providers whose practices had more resources to address patient social needs reported higher job satisfaction (Pantell et al., 2019), higher levels of professional efficacy (Olayiwola et al., 2018), and lower rates of burnout (De Marchis et al., 2019; Kung et al., 2019; Olayiwola et al., 2018). If these findings are applicable to EMS, providing EMS personnel additional training and resources to address social needs also has the potential to help combat EMS clinician burnout rather than exacerbating it. This is especially important given evidence that burnout may be a factor leading to increased EMS personnel turnover and staff shortages (Beldon, 2022).

When analyzing EMS clinicians by gender, more women than men in EMS reported currently using most social needs interventions. It is unclear what implication this would have on implementation of programs to provide more training and resources on addressing social determinants of health. These findings may be because females compose a larger percentage of volunteer EMS positions than paid EMS positions, or that there may be a gender difference in a sense of altruism or responsibility to their community (Cash et al., 2021). Regardless of cause, there is an opportunity to capitalize on the nearly two-thirds of EMS clinicians who reported willingness to start using these social needs interventions, of which there was no difference between men and women.

Level of EMS clinician training and the type of agency (i.e., transport or non-transport) both had notable effects on willingness to use, current use, and belief in the effectiveness of social needs interventions. Compared to EMTs, paramedics were more willing to utilize certain interventions, particularly rideshare/ taxi vouchers, and transport to alternative destinations. In select cases, paramedics also demonstrated greater optimism for interventions to improve patient health or reduce 911 calls. Non-transport agencies were significantly more likely to already be using all of the social needs interventions. This points to contrasting perspectives, possibly due to differences in training, job responsibilities, scope of practice, and types of reimbursed care. While more research is needed to better understand these discrepancies, this data may help to inform potential interventions being considered by EMS services. Social determinants of health and relevant interventions could be an area of continuing education for EMTs, and transport

agencies could initiate social needs intervention programs, learning from existing efforts by non-transport agencies.

Although urban and urban cluster EMS clinicians exhibited willingness to perform social needs interventions, such as making referrals to resources or transporting to alternative destinations, rural EMS clinicians appear to be more active in the current use of interventions to address social needs compared to urban or urban cluster clinicians. For example, rural EMS clinicians were the most likely to already make referrals to social needs resources, transport patients to alternative destinations, and utilize taxi or ride-share vouchers.

The reported current use of interventions could result from many different factors. For example, rural services with longer transport distances may have more systems in place to reduce unnecessary transports and keep units in service. Additionally, the longer transport time may allow EMS clinicians more opportunities to perform interventions than an urban community with a local emergency department.

While rural EMS clinicians are more active in using social needs interventions, urban and urban cluster EMS clinicians were actually more likely to believe that they are responsible for addressing their patients' social determinants of health. These findings may be related to the similar finding that EMS clinicians working in urban environments were also more likely to believe some interventions would have positive effects, such as improved health of patients or reduced 911 calls. Qualitative studies could be utilized to further investigate this relationship between EMS clinician location, their willingness to address patient social needs, and their perceived responsibility in doing so.

Differences among volunteers and employees was another characteristic of EMS clinicians that raised questions. The results regarding current use of, willingness to use, and belief in the effectiveness of all social needs interventions was heterogeneous in nature when comparing EMS clinicians of various employment statuses. It could be speculated that the motives underlying volunteering, or the difference in experience between paid employees and volunteers, might influence EMS clinicians' perspectives surrounding social determinants of health; however, no clear trend emerged.

It is also important to note that this study assessed attitudes of EMS clinicians toward using interventions to address patient social needs and beliefs regarding their efficacy. It is possible that although groups of providers may believe an intervention may be effective at reducing EMS utilization or improving patient health, there is no certainty that their belief will align with reality. Although EMS clinicians have a unique knowledge of patients' living environments, they are unlikely to be able to address patient social needs alone. EMS clinicians must instead rely on care partners to address the needs identified with screeners and follow through on referrals made on behalf of patients. Thus, while EMS has the potential to improve access to resources, limitations of the human services network available in a patient's community may limit the benefit of any EMS intervention in some situations. Partnerships with human services agencies will be imperative to ensure the maximum effectiveness of any prehospital interventions.

Strengths of this study include a large sample size and respondents from across the United States with differences in certification, practice environment, and demographics. However, there are many limitations to this study, the most significant stemming from the fragmented nature of EMS. Researchers attempted to contact each state EMS agency individually and found that while some state EMS offices shared study information with all their certified personnel, most were unwilling to assist with, or did not respond to, inquiries from researchers. This pattern was consistent with private agencies, many of whom did not respond to inquiries or reported that they were concerned with burdening their employees by sharing study information with them. Although researchers shared the survey via multiple methods, it is likely the survey had limited and unequal exposure nationally.

Although some questions, such as those used to screen for burnout were validated, the remainder of the questions were written by study authors, as validated questions could not be identified. Future studies could consider the use of previously validated questions from other healthcare professions, should those questions exist.

These unvalidated questions included provider familiarity with the term “social determinants of health,” which was chosen to assess whether an EMS clinician had more formal knowledge than simply recognizing a relationship between environment and social risks. As providing the definition could have biased the survey responses, this study did not confirm the accuracy of EMS clinician perception of social determinants of health, so it is theoretically possible that an EMS clinician could have reported familiarity without truly understanding the term.

Additionally, the survey did not include Advanced EMTs (AEMTs) and lacked a selection for Washington D.C, although respondents could select “other” as an area. All responses were self-reported and certification numbers were not recorded or verified, so participants theoretically could have submitted multiple responses using different email addresses. As it was a voluntary survey, it is possible that its respondents may have held a stronger view on the issue and biased the responses.

CONCLUSION

This study provides important insight into the viability of non-community paramedic-trained EMS personnel in helping to reduce 911 calls and transports from super-utilizer patients through addressing their social needs. Currently the largest study to explore EMS attitudes toward addressing patient social needs, its findings that over 60% of respondents were willing to use the interventions proposed in this study supports the use of EMS clinicians as potential partners in addressing social determinants of health. Notably, EMS personnel who were familiar with the term “social determinants of health” were more likely to believe they were responsible for addressing patient social needs and willing to use interventions. Additionally, EMS clinician burnout was not found to significantly impact willingness to use these resources. As such, more education on social determinants should be offered to EMS clinicians both in their initial training and through continuing education. Furthermore, EMS services should consider offering resources to their EMS clinicians to help address their patients’ social needs.

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RESEARCH REPORT

IMPLEMENTING BODY WORN CAMERAS TO REDUCE VIOLENCE AGAINST AMBULANCE CREWS: A QUALITATIVE INVESTIGATION OF THE PERCEPTIONS OF AMBULANCE CREWS AND MANAGERS

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Recommended Citation: Gerressu M, Newman M, Bezemer J. (2023). Implementing Body Worn Cameras to Reduce Violence Against Ambulance Crews: A Qualitative Investigation of the Perceptions of Ambulance Crews and Managers. *International Journal of Paramedicine*. (4), 52-64. <https://doi.org/10.56068/EICW3180>. Retrieved from <https://internationaljournalofparamedicine.com/index.php/ijop/article/view/2681>.

Keywords: body worn camera, occupational violence, violence reduction, normalization process theory, ambulance crew, paramedics, emergency medical services, paramedicine

Received: February 13, 2023

Revised: July 30, 2023

Accepted: August 6, 2023

Published: October 12, 2023

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Declaration of Interests: none declared

Funding Acknowledgement: This research received internal grant funding from UCL Institute of Education.

ABSTRACT

Objectives: Following the launch of its 'Long Term Plan' in 2019, the English National Health Service (NHS England) started piloting body worn cameras (BWCs) in ambulance services. The rationale was that BWCs would act as a deterrent and facilitate the prosecution of assailants, thus improving the safety and wellbeing of ambulance crew. This paper explores views on the purpose and value of BWCs among ambulance crews and leadership staff who used them or were involved with their implementation.

Methods: We conducted a qualitative investigation with ambulance crew and leadership staff (N=16) in the first 7-10 months of the BWC pilot. Semi-structured interviews were held online between August 2021 and November 2021. Normalisation Process Theory was used to guide and structure the data analyses.

Results: There was only partial shared understanding between crew members and leadership staff on the purpose and value of BWCs. Drawing on their practical professional experiences of using BWCs, crews challenged the theory that BWCs function as deterrents while recognising their potential to facilitate prosecutions. Crews also highlighted technical, operational and social factors that are likely to mitigate the proposed positive effects of implementing BWCs.

Conclusions: Violence reduction policies for health services should take heed of the variation in theories of change put forward by different stakeholders. Further research is required to better understand the range of factors that affect the occurrence and management of assaults against ambulance crews. In addition, the operational challenges and cost-effectiveness of body worn cameras need to be examined relative to other interventions.

INTRODUCTION

Globally the prevalence of workplace violence amongst health care workers is high (Liu et al., 2019). In the UK, well-being of ambulance crews is among the lowest of all staff in the National Health Service (NHS), with high rates of burn-out and stress (NHS Staff survey, 2020). According to the 2020 NHS staff survey, 46.7% of ambulance trust staff reported experiencing bully-

ing, harassment, or abuse from patients, their relatives, or other members of the public in the last 12 months compared to the national average of 26.7% among NHS staff. Similarly, more ambulance trust staff reported at least one incident of physical violence from patients, their entourage, or the general public in the last 12 months (33.4%) compared to the 14.5% national average figure (NHS Staff survey, 2020).

One potential solution that has been put forward is the wearing of body worn cameras (BWCs). These are small video and audio recording devices that workers wear on the body or head with a variety of mounting options. While BWCs have only recently entered discussions about reducing violence against health professionals, they have already been widely adopted by police forces around the world (Lum et al., 2019). They were introduced on the assumption that recording officers and their interactants will deter both parties from displaying inappropriate behaviors in actual encounters. Furthermore, that relations between the police force and the general public would improve overall as awareness grows that an objective audio-visual record is being generated that can be used to hold people from either side to account (Lum et al., 2019; Ariel 2018a).

As with any proposed “solution” to a social problem, a key question to consider is whether the solution works, i.e., is effective at solving “the problem”. Research on the effects of the BWC in policing have found inconsistent results. These include both increased and decreased assaults on the wearers and questions have been raised about the rigour of existing studies. (Lum et al., 2019; Ariel et al., 2016; Ariel et al., 2018b; Wilson et al., 2022). A quasi-experimental evaluation of BWCs in mental health care settings reported mixed results in different ward settings, including an increase in low level aggression, a reduction in the severity of aggression and a reduction in the use of tranquilisers on patients (Ellis et al., 2019). However, this was a small-scale implementation with 50 cameras across 7 wards using a study design that provides only limited support for a causal claim. In the railway setting, a cluster randomized trial found a significant 47% reduction in the odds of an assault against study station railway employees wearing BWCs, compared to their control station counterparts (Ariel et al., 2019). Two systematic reviews of BWCs, one on their use across public sector services and the other on their impact on the incidence of violence on ambulance crew, identified poor methodological rigour across the current BWC evidence base and returned an “empty review” respectively (Wilson et al., 2022; Bruton et al., 2022).

The different operational contexts and social interactions of police officers, nursing staff within mental health in-patient care, and railway employees means the transferability of any impact across services cannot be assumed. It is therefore important that further evaluations are undertaken to clarify the impact of BWCs in different contexts.

In 2019 NHS England offered to fund a pilot of BWCs across the 10 ambulance trusts in England as part of its Violence Reduction Strategy, allocating a £8-£10m budget. While the policy paper announcing this initiative (Department of Health and Social Care, 2019) did not spell out a theory of change, it suggested that BWCs can act as a deterrent, preventing escalation (by increasing risks for perpetrators), and helping to facilitate the prosecution of those who verbally or physically attack ambulance crew.

The authors of this paper collaborated with one of the first Ambulance Trusts in England where BWCs were piloted. This paper presents the findings of the qualitative study of this pilot that aimed to explore views on the purpose and value of BWCs as well as the experience of using BWCs. Participants were sought among ambulance crews and leadership staff who had used them or supported their implementation, to help inform any potential further rollout of BWCs among ambulance crews in England and elsewhere.

METHODS

In the Trust where the study was conducted, BWCs were introduced at two group stations from among those with the highest levels of assault. Between 1st April 2019 and 31st March 2020, ambulance crews reported 139 physical and 81 verbal assaults across the two sites (Data available from internal reports provided by the ambulance Trust). A total of 329 crew members were based in the two stations that were equipped with BWC docking stations. There were enough BWCs (VB40 Motorola) for all ambulance crew (including those in the roles of paramedic, emergency ambulance crew, and assistant ambulance practitioner) on shift to sign one out with ID cards at the start of each shift. All crew were given a mandatory 45-minute training session (which two crew members refused). Ambulance crews were told that the cameras were being trialled “as part of a National Pilot to assess their impact in incidents of violence and aggression” Crew were given guidance that BWC were to be activated “when the wearer feels at risk of violence and/or aggression or when a situation escalates or is at risk of escalating and the wearer feels vulnerable or at risk, in order to either de-escalate the situation or capture evidence that might be passed on to the police.” The guidance also stated that “the decision to record or not record any incident of violence and abuse remains at all times of the trained user” and that “if the situation allows, a verbal warning should be issued to alert those at scene” (cited from guidance provided to staff by the Trust). Each BWC activation required the ambulance crew to complete a pre-existing NHS electronic form (Datix) used to officially report incidents of physical assaults and verbal abuse.

There were key individuals in the Trust advocating for the BWCs. The Health, Safety and Security Team, with funding from NHS England, ran the BWC pilot. A project manager was appointed, and two clinical team managers were identified to be BWC site leads to conduct training and to cascade it to other clinical team managers designated as BWC champions.

A wide range of qualitative data collection was planned but because of the protection requirements of the COVID-19 pandemic, they had to be modified or curtailed. Individual interviews were carried out on MS Teams to explore the beliefs and experiences of ambulance crews with access to BWCs and those involved in the process of introducing, implementing, and facilitating their use.

Interview participants were identified using purposive sampling. Ambulance trust staff working at the pilot sites (approximately 329 total) were informed about the interviews via e-mail and study posters in the ambulance stations. These included a thumbnail photo of the interviewer, MG (a female research fellow with over 15 years of qualitative

research experience). At one site, the BWC site lead sent the study information sheet (including MG's photo) to all crew members at the station. At the other, the BWC site lead provided the research team with the emails of those who expressed interest in the evaluation so MG could contact them directly. Similarly, the security management and violence reduction specialist provided the emails of individuals involved in the pilot implementation process. Subsequently, MG sent weekly reminders asking for volunteers directly or via the BWC site lead.

All interested individuals were offered the opportunity to be interviewed. Nineteen volunteers made initial contact with MG, via their site lead or in response to a direct study email reminder and were sent the study information sheet and consent form. Sixteen (approximately 5% of eligible sample) took part in interviews arranged via email, with three initial volunteers lost due to non-response after three e-mail attempts to schedule an interview. Interviews were conducted between August 2021 and November 2021 by MG using a topic guide. BWCs had been available at the study sites for 7 to 10 months. We were unable to interview any ambulance crew who refused to wear BWCs from the start of the pilot as they did not volunteer to be interviewed. We were able to recruit individuals in each category of our purposive sampling matrix (See Table 1) and we reached data saturation when no new themes about BWC were reported among the BWC users. Ethics approval was granted by the UCL IOE Research Ethics Committee (reference number 1532).

Participants were given the choice of audio only (N=5) or video recordings (N=11) on MS Teams while they were at their selected location (home, office, car). The interview files (duration 27-106 minutes) were transcribed by reviewing and correcting the MS teams interview captions. The transcriptions and interview fieldnotes were then coded inductively using thematic analysis by MG with a selection reviewed by MN. This produced disjointed themes.

The next step of analysis was informed by Normalisation Process Theory (NPT) to structure the themes. NPT focuses on action (social and individual), namely, what people do and how they work, and the mechanisms through which these actions are formed, in order to understand the embedding of complex interventions (May & Finch, 2009). NPT has been applied to analyse the implementation of complex health interventions, including new models of care for chronic and acute conditions, e-health and telehealth initiatives, and perioperative care, in a range of health care settings and countries including the UK, Canada, and the Netherlands (McEvoy et al.,

Primary Quotas	Number of Participants
Role	
Ambulance crew	10
Leadership staff/Clinical team managers†	3
Leadership staff/Implementation team*	3
Sex	
Male	10
Female	6
Age	
25-34	5
35-45	5
45+	6
Years of Experience	
Up to 5	3
6-10	5
10+	8
†Clinical team managers who were mainly office-based but also occasionally covered ambulance shifts and wore BWCs	
* Implementation team members included the Health, Safety and Security Team/IT department/Programmes and Project Directorate	

Table 1: Sampling frame

2014; Sutton et al., 2018).

NPT assigns four main constructs to the Normalisation Process. Coherence is the sense-making work people do individually and collectively when presented with operationalising a set of practices. It requires participants to invest in meaning.

Coherence	
The sense-making work people do as individuals and a collective when presented with operationalising a set of practices. It requires participants to invest in meaning.	
Component	Topic Questions
Differentiation	Is there clarity about how using BWCs is different to the usual ways of working?
Communal Specification	Is there a shared understanding of the aims, objectives and expected benefits of BWCs?
Individual Specification	Are individuals clear about how BWCs affect their ways of working and what their responsibilities are?
Internalisation	How do individuals perceive the value benefits and importance of BWCs?
Cognitive Participation	
The relational work that people do to encourage participation, build, and sustain practices around a new technology/complex intervention. It requires commitment investments from participants.	
Component	Topic Questions
Initiation	Who are the key people driving BWC use forward and getting people involved?
Enrolment	How do participants become involved in using BWCs Are participants open to working in new ways to adopt BWCs?
Legitimation	Are BWCs seen as a legitimate part of the role of Ambulance Crew? How are BWCs made to be valid additions to risk reduction?
Activation	Are participants willing to continue supporting BWCs?
Collective Action	
The operational work people do to perform the new practices and fit them into existing ways of working. It requires effort investment to be made by participants.	
Component	Topic Questions
Interactional Workability	How do BWCs fit in with/ impact existing ways of working and existing relationships?
Relational Integration	How are confidence in BWCs and accountability for BWCs increased? How do BWCs fit into existing relationships and how well are colleagues able to use them?
Skill Set Workability	What is the work allocation? Are BWCs assigned to those with the skills to use them?
Contextual Integration	How have BWCs been integrated into the Ambulance Trust (i.e., resource allocation, policies, procedures, availability of additional support)?
Reflexive Monitoring	
How a practice is understood and assessed by those using it in terms of use and effectiveness. It requires participants to invest in appraisals.	
Component	Topic Questions
Systemisation	What informs how people appraise success, and how is this information obtained?
Communal Appraisal	How do participants work together to appraise the intervention?
Individual Appraisal	How do participants evaluate the impact of the intervention individually?
Reconfiguration	Can participants modify aspects of the intervention and if so, how?

Table 2. NPT framework constructs and mechanisms. Definitions adapted for our study (May & Finch, 2009; Bracher & May, 2019)

Coherence is the sense-making work people do individually and collectively when presented with operationalising a set of practices. Cognitive Participation is the relational work that encourages participation, builds, and sustains practices around a new technology. Collective Action is the operational work people do to perform the new practices and fit them into existing ways of working. Reflexive Action is how a practice is understood and assessed by those using it in terms of use and effectiveness (Bracher & May, 2019).

Given we did not start out with NPT, our analysis consisted of an adapted framework approach (Ritchie et al., 2003) using NPT to index and chart the themes. This was initially compiled by MG, then checked by MN. Each of the NPT constructs were translated into a set of analytical questions, details of which are shown in Table 2. The NPT constructs and components are not mutually exclusive or discrete and although we identified themes in all four NPT constructs, our most insightful findings fell under coherence, the sense-making work.

RESULTS

The interviews suggest that there is only partial coherence within and between the views of the Health, Safety and Security Team (who were acting on behalf of the Trust and commissioned to undertake the pilot by NHS England), the clinical team managers, and the ambulance crews, about the purpose of BWCs and how they might help reduce assaults. In what follows we present three main points of contestation:

- What type and level of adjustments to working routines and proce-

dures do the BWCs require?

- How plausible is it that BWCs aid prosecution and deter assailants?
- Do BWCs affect the professional autonomy of ambulance crew?

WHAT TYPE AND LEVEL OF ADJUSTMENTS TO WORKING ROUTINES AND PROCEDURES DO THE BWCs REQUIRE?

Members of the leadership staff suggested that the BWC is a simple tool with protection benefits which did not require changing ways of working. Some crews agreed, suggesting using BWCs just involved clipping them on and activating them when needed. Others highlighted that BWCs do affect their way of working, e.g., in that they have to remember to sign out an additional “piece of kit” (with a potential detour at the start of shift depending on the docking station location), wear the camera, remember to activate it, return it at the end of shift, and complete an incident report for every activation. BWC users also all had to stand down for a mandatory 45-minute training session to ensure awareness of the equipment and processes highlighting how and when to use the BWC.

Some crews reported that BWCs had no impact on their ability to do their work on a day-to-day basis, apart from having to remember to sign them out and in. Others found BWCs uncomfortable to wear due to their size and weight and the impractical attachments onto their uniforms:

I click it onto the shoulder, it goes round the epaulette...but when I wear it, it pulls right down... and it's heavy...the alternative is one that clicks on to the shirt. I've tried that and it just pulls the whole shirt down. Or there's one that goes in the middle of your shirt, which again pull your shirt down in sort of a cleavage way, which again is not appropriate. (Ambulance crew, A1)

The 12-hour length of shifts added to the discomfort, and while discomfort did not dissuade any interview participants, many empathized with such complaints and mentioned colleagues who reported it as the reason for not wearing BWCs.

Concerns were expressed that suggested more serious negative impacts on their work, related to BWCs getting in the way of treating patients by interfering with the oxygen backpacks and sometimes swinging and hitting patients in the head, albeit not with force.

If you are wearing that body worn camera and you then put on that rucksack. Uh, it is either digging into you, or is being pushed so that it's (BWC) not even facing what you would be then encountering anyway. And so for my job, with my thoughts being that the person I'm encountering and...turning up to, being more important, the rucksack won over the camera... So I haven't worn it for a while... for me it was the bag or the camera and the bag is essential for the job so. (Ambulance crew, B6)

BWCs interfering with duties led one participant to stop wearing BWCs but others found that the perceived benefits outweighed the interferences they identified and they had already reported their concerns to management hoping for the provision of more practical BWC attachment options or smaller and lighter cameras (in NPT, this falls un-

der “reflexive monitoring”).

Crew members also noted that BWCs require adjustments to Trust procedures, which had not yet been considered. For example, the expectation for crews to be on the road within 10 minutes of starting shift was highlighted as a tight timeframe to add a voluntary additional task to, without adjusting expectations:

“So we’re supposed to be ready to go 10 minutes after the legal beginning of our shift. I can tell you that does not give us enough time to sign out drugs, make sure we’ve got the right ambulance, make sure said ambulance is roadworthy, make sure it’s equipped, make sure we have all our paperwork, put on a camera, sign out drugs, get someone to witness our morphine... We can’t do all this in 10 minutes, and now they’re scrutinizing us more and more, and what they don’t realize is, it’s things like body worn video that will go by the wayside. People won’t see it as a benefit for them, they’ll see it’s just another thing to do.” (Ambulance crew, B13)

HOW PLAUSIBLE IS IT THAT BWCs AID PROSECUTION AND DETER ASSAILANTS?

BWCs were introduced to ambulance crews by the Health, Safety and Security Team and clinical team managers as an additional tool to prevent or reduce assaults on them. The proposed theories of change included deterring potential attackers by a) making them aware they are being filmed, capturing evidence of their behaviors, and b) increasing the likelihood of prosecution. BWC footage evidence was expected to lead to more successful prosecutions of assailants. This in turn was expected to increase general awareness about the serious consequences of attacking ambulance crews and to improve the existing low sense of justice for crews who were victims of assault.

Ambulance crew and leadership staff shared understanding of the value of obtaining footage to provide evidence of assaults to facilitate prosecutions and to get justice for assaulted crews. Participants expressed disappointment about the absence of successful prosecution stories to share and celebrate during the pilot, considering it a missed opportunity to further promote this shared goal and to improve BWC use:

“I think there’s certainly a feeling among staff...that we’re not very good at... getting justice for when people get abused. Anecdotally, again, my impression is that the police without evidence of an assault taking place...they’re not that keen to actually do anything about it.” (Leadership staff, A2)

Some participants, who had previous experience of violence, agreed that the footage would help expose the level of violence and aggression which they suggested were sometimes excused by drugs and alcohol:

“Yeah, a lot of people have had lesser sentences because they’ve been under the influence of drugs or alcohol. And therefore were perceived not to be in control of their actions, which is incredibly disappointing when they’re really capable of doing quite a lot of damage... I think it’s really good that they’ll see [with BWC footage] the kind of build up to what’s happened.” (Leadership staff, A7)

An additional important benefit identified was the use of BWC footage as evidence against false accusations by patients of inappropriate ambulance crew behaviors (e.g.,

when self-defence is reframed as an assault by patients):

"I've experienced it myself where I've been assaulted, but I've ended up in a disciplinary hearing because I defended myself when I was assaulted, because somebody made a complaint that I defended myself." (Ambulance crew, A12)

Opinions about BWC visibility and activation functioning to deter violence were the aspect of the theory of change that was most incongruent between ambulance crews and leadership staff. Crews were sceptical about the idea that BWCs would help reduce or prevent assaults because potential assailants would be deterred by the fact that their actions would be captured on film. Some ambulance crew and leadership staff instead presented a more complex account of the "assaults" as a social phenomenon.

Ambulance crew with experiences of dealing with violence in the course of their work suggested that assaults were caused mainly by patients being under the influence of drugs or alcohol, or as a result of a mental health problem. This they argued would make assailants unaware or indifferent to the presence of BWCs. Furthermore, this would also mean a lack of concern about the possibility of prosecution:

"It (the need to activate BWCs) is with people with drug-seeking behavior or intoxicated people and being told that they're being filmed, these people don't care... law abiding citizens obey laws. People who aren't scared about police certainly aren't scared about a camera." (Ambulance crew, A12)

Violence was also explained from the perspective of assailants, who may be feeling frustrated and unable to control their circumstances and environment:

"I think it's a really complex kind of cause. I think most causes are of people just being frustrated and angry. Not necessarily at us as people, but just at the situation they're in and quite a lot of it...I think involves kind of drink, drugs and mental health and I don't think people set out to be deliberately violent towards us...I don't know that that is something that we can solve, unfortunately. I think when people are unwell or have called an ambulance for whatever reason, then I think, you know things just can just kind of escalate and they just feel out of control and just lash out." (Ambulance crew, B16)

Participants also highlighted the often-challenging operational conditions for crews (and other support services) that increase the frequency of circumstances where crews are vulnerable and where patients and family members are frustrated with the service while also decreasing crew ability to cope and manage violence situations. One such challenge was that problematic addresses are not flagged quickly and that other relevant information about the settings they are called to is not received in time. There was also a broader concern about fatigue and the need for more staff and resources across emergency services:

"You've got staff that are...constantly fatigued. Uh, without additional manpower, there's nothing you can do. Yeah, and it's not just us... The hospitals don't have the beds, they don't have the staff. The police don't have the manpower. Yeah, our area, there's two... maybe three patrol cars in our area at any one time. And we're in a very high crime area." (Ambulance crew, A12)

Some participants expressed concern that BWCs may exacerbate the risk of violence:

"I could also see that it might actually aggravate some people if they're already riled up and you start to say, "I'm going to record". You know? That could actually instigate violence that might not have happened in the first place." (Leadership staff, A7)

The ambulance crews also highlighted their agency in deciding whether any given event constituted an assault that needed to be recorded, and the mixture of moral and pragmatic reasoning they go through when making such a decision. Some participants said they would not activate the BWC or report assaults that they attributed to medical problems:

"Umm And the only people who have like remained violent (after using de-escalation techniques)... it's medical reason for it, so I wouldn't activate the camera in that situation anyway because...it's a medical problem that's going on, not, they're not being deliberately violent. It's not a criminal matter...so uh, low blood sugar levels and dementia, that kind of thing." (Ambulance crew, A5)

The decision not to report an assault was also seen as a way for crews to avoid providing footage of their own potentially aggravating role leading to an assault. This option was also offered as a way for crews to control the narrative of the assault and to counter fears of BWCs being used for surveillance while maintaining their other benefits:

"The option is always there if you're in a position and you've activated the camera and somebody pushes your buttons sufficiently that you respond back, and you realize afterwards, "Oh dear, I've overstepped", well if you don't datix it, it doesn't get reviewed anyway..."
"So just because you've activated the camera and you've done something wrong, it doesn't necessarily mean it's going to be seen anyway. It's only going to be seen if you want them to see it." (Ambulance crew, A12)

Other responses highlighted the potential for the actions of ambulance crew to mitigate or escalate a situation where there is the potential for violence. They identified crew-related factors that can contribute to the escalation, including lack of experience, inappropriate attitudes, frustrations with the job, frustrations with patients misusing the ambulance service for non-emergencies, and an inability to relate to patients:

"Some people, maybe not having enough experience or potentially come across as antagonizing... they will say what they feel they wanna say rather than actually grit their teeth and try to still act professional and do the right thing." (Ambulance crew B14).

BWCs were also proposed as potentially mitigating assaults by exerting a restraining function on the action of ambulance crews in addition to or instead of patients:

"If anything, actually, when the camera is activated and it's a fringe benefit, you're actually a little bit more aware of what you're saying yourself. So you become a little bit more self-aware and a little bit more self-controlled ...we are consciously more restrained in our actions and our words which in itself provides a benefit to the scene, because if we're more restrained, we're more likely to deescalate the situation." (Ambulance crew, A12)

DO BWCs AFFECT THE PROFESSIONAL AUTONOMY OF AMBULANCE CREW?

The study participants had all decided to wear BWCs. However, they reported distrust among colleagues, who had voiced suspicions that BWCs were being used by management to “spy” on crews as a hidden or unofficial agenda. These suspicions were attributed to an ongoing organisational division between the “operations” (crew) and “corporate” (management) teams.

In the context of the BWC pilot these suspicions were evident in the perception of some ambulance crew that BWCs had been introduced and implemented in a top-down fashion with little consultation, more for the benefit of management than the crews. Whilst respondents accepted a certain level of scrutiny, given the responsibilities of emergency medical care, they also shared personal and colleagues’ feelings about excessive monitoring, historical feelings of distrust and past bullying:

“...in a high pressure job like this we are called to account for our movements a lot... The level of responsibility needs... that we’re gonna have closer scrutiny than somebody who’s just doing an admin role. And I think that makes people feel like they’re being watched... I mean, you know it’s hard to divorce the notion of a camera from the Orwellian rhetoric of Big Brother, isn’t it?” (Ambulance crew, B13)

“There was definitely a bullying culture and I think some people still have that in their heads. But as I said it’s definitely not like that now.” (Ambulance crew, B16)

Whilst respondents claimed that they themselves felt confident that the Trust did not desire or have capacity to “spy” on crews, they did acknowledge the changes in ambulance service operations that may generate or contribute to such feelings:

“They’ve (older staff) had to sort of go from being completely independent, completely autonomous, to having all of these sort of safety things gradually creeping in ...they remember the good old days where...we weren’t being tracked...there was no GPS in the ambulance... I can understand why they would sort of be sceptical and why they would sort of fear anything that can then be used to sort of spy on them, because there is that constant pressure from management and control to try to reduce your times, turn around patients at hospital quicker and quicker and quicker and try and stay on scene less and try and transport them quicker.” (Ambulance crew, 15A)

DISCUSSION

As far as we are aware this is the first piece of published research on the implementation of BWCs in an ambulance trust. The study only had a limited number of respondents from the potential pool of ambulance crew who could have been using the BWCs during the Trust pilot. As such we should be cautious about assuming that views expressed are shared by other ambulance crew.

However, it is also the case that all the ambulance crew study participants claimed that they had in fact worn the BWC with some acknowledging that they were using them inconsistently. The fact that even these “early adopters” of BWCs expressed beliefs that indicate incomplete coherence between leadership staff and ambulance crew may be

instructive for the ongoing implementation of BWCs both in the Trust and in any subsequent nationwide implementation.

We were not able to obtain any reliable data from the docking stations or activation data from the devices to gauge uptake of the BWCs by ambulance crew in the pilot sites during our data collection period. It was difficult to establish how many people were wearing a camera at any given time and how many people had the opportunity to do so but chose not to. From April 2021 to January 2022 between 1 to 17 incidents of violence and assault were reported every month at the pilot sites with 0-6 of those incidents captured on BWC. This included 5 occasions when there was footage for at least half of the monthly incidents. Our impression based on the discussions we had with crew and leadership staff was that only a small proportion of those who were given the opportunity were wearing the BWC during the period of our evaluation and that intentional activation was rare. If these impressions of low uptake are right, then the lack of coherence would help explain it.

In the context of the Trust pilot, we were told about consultations that had taken place with crews and with trade unions about the BWC implementation and how supportive all actors were of the initiative. We were also told about actions taken to involve ambulance crew in the decisions about which type of BWC clips to purchase e.g., in relation to wearing with uniform etc. However, it would appear that despite these efforts, there was still a lack of coherence between the understanding of the Health, Safety and Security Team, clinical team managers, and the ambulance crews about the causes of violence against ambulance crews which in turn was linked to a scepticism amongst crews about the deterrent potential of the BWC. Furthermore, the ambulance crews' perceptions about the implementation of BWC appears to have been informed by and fed into an ongoing and historical narrative of suspicion about surveillance informed performance management in increasingly difficult operating conditions for ambulance crews.

CONCLUSIONS

As noted above, robust evidence does not exist to support the claim that BWCs will reduce assaults on health care staff. Large amounts of public money will be spent on the purchase of BWCs with The NHS Long Term Plan (Department of Health and Social Care, 2019) reporting £8-£10m set aside for 2019-2024. Given this level of investment and BWCs ongoing running costs, e.g., camera maintenance and write-off, data management, and software licensing, it is important that the impact of BWCs on staff assaults is robustly evaluated. In the absence of comprehensive use of BWCs by ambulance crew where they are implemented, it will not be possible to obtain robust data on impacts, thus undermining the purpose of the introduction of BWCs in the first place.

Our study participants reported opportunities to provide feedback about the practical use of the BWCs and described some practical changes that had resulted from feedback and monitoring. However, our results suggest that to embed the use of BWCs into routine operation by all ambulance crew (i.e. to move beyond mere "roll-out" of cameras across ambulance trusts to actual, routine activation in all threatening situations), more focused efforts on sense-making work between clinical team managers, the Health, Safe-

ty and Security Team and ambulance crew will be needed in order to establish a shared understanding of the purpose and value of BWCs. This will require examining the complex operational and social conditions that contribute to assaults on ambulance crew and the contested narratives about trust between managers and ambulance crew, performance, and surveillance. When this is taken into account, BWCs should be viewed as a more complex intervention requiring more extensive consideration than is implied in their promotion as a simple technological fix. To make evidence informed policy decisions on reduction of violence against ambulance crew, a worldwide healthcare concern, more research on psychological, social, legal, and economic implications is needed for both the BWC and alternative interventions, such as conflict management training.

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LITERATURE SURVEILLANCE

PARAMEDICINE CONTENTS: JULY-SEPTEMBER 2023

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Recommended Citation: Hogan LA, Buck B, McAdams J, Teed, SM: (2023). Paramedicine Contents: July-September 2023. *International Journal of Paramedicine*, (4), 65-67. <https://doi.org/10.56068/CLEZ2974>. Retrieved from: <https://internationaljournalofparamedicine.com/index.php/ijop/article/view/2945>.

Keywords: tables of contents, literature search, paramedicine, emergency medical services

Published Date: October 12, 2023

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Declaration of Interests: none declared

To help paramedicine professionals maintain literature currency in our discipline, the 'Paramedicine Contents' section shares the tables of contents of scholarly journals that are primarily focused on the paramedicine discipline.

In this first appearance of the 'Paramedicine Contents' section, we start with the contents from two of the most prominent journals in our discipline, *Prehospital Emergency Care* and *Paramedicine*.

PREHOSPITAL EMERGENCY CARE

VOLUME 27, NUMBER 6

Effect of Wearing N95 Mask on the Quality of Chest Compressions in Prehospital Emergency Personnel: A Cross-over Study. Liang Chen, Yang Shen, Shuangmei Liu. <https://www.tandfonline.com/doi/full/10.1080/10903127.2022.2095066>

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PARAMEDICINE

JULY-AUGUST 2023 (VOLUME 20, ISSUE 4)

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Undergraduate paramedic student competency assessment: A grounded theory study explaining how assessors in Australia and New Zealand determine student competency to practice. Anthony Clement Smith, Patrea Anderson, Michael Carey. <https://journals.sagepub.com/doi/abs/10.1177/27536386231165542>

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SEPTEMBER-OCTOBER 2023 (VOLUME 20, ISSUE 5)

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Lessons for the first two years of a new out of hospital airway registry in New South Wales. Martin Nichols, Pieter Francis Fouche, Thomas McPherson. <https://journals.sagepub.com/doi/abs/10.1177/27536386231175520>

'Send everyone, it's my son'- Combined Glaserian grounded theory and thematic analysis of paramedics attending their own families. Matt Wilkinson-Stokes, Marianne Kellermeier, Steve Whitfield. <https://journals.sagepub.com/doi/abs/10.1177/27536386231178961>

LITERATURE SURVEILLANCE

PARAMEDICINE LITERATURE SEARCH: JUNE-AUGUST 2023

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Recommended Citation: Morrissey BM, Maxwell S: (2023). Paramedicine Literature Search: June - August 2023. *International Journal of Paramedicine*, (4), 68-115. <https://doi.org/10.56068/BSWN2391>. Retrived from: <https://internationaljournalofparamedicine.com/index.php/ijop/article/view/2946>.

Keywords: literature search, paramedicine, emergency medical services

Published Date: October 12, 2023

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Funding Support: none

Competing Interests: none

Opportunistic Fungal Invasion in COVID-19 Pandemic: A Critical Review in Diagnosis and Management. Sharma A. *Avicenna J Med*. 2023 Jul 3;13(3):131-137. doi: 10.1055/s-0043-1770921. eCollection 2023 Jul. <http://doi.org/10.1055/s-0043-1770921>

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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.
- 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 separate files 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 Editors.
- Where available, URLs for each reference have been provided.
- The text is double-spaced in a 12-point font.
- Page numbers and line numbering is used for 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
 - <https://www.equator-network.org/reporting-guidelines/strobe/>
 - Systematic reviews
 - PRISMA and its extensions
 - <https://www.equator-network.org/reporting-guidelines/prisma/>
 - Study protocols
 - SPIRIT and the PRISMA-P extension
 - <https://www.equator-network.org/reporting-guidelines/spirit-2013-statement-defining-standard-protocol-items-for-clinical-trials/>
 - Diagnostic/prognostic studies
 - STARD and the TRIPOD extension
 - <https://www.equator-network.org/reporting-guidelines/stard/>
 - Case reports
 - CARE and its extensions
 - <https://www.equator-network.org/reporting-guidelines/care/>

- Clinical practice guidelines
 - AGREE and the RIGHT extension
 - <https://www.equator-network.org/reporting-guidelines/care/>
- Qualitative research
 - SRQR and the COREQ extension
 - <https://www.equator-network.org/reporting-guidelines/srqr/>
- Animal pre-clinical studies
 - ARRIVE
 - <https://www.equator-network.org/reporting-guidelines/improving-bioscience-research-reporting-the-arrive-guidelines-for-reporting-animal-research/>
- Quality improvement studies
 - SQUIRE and its extensions
 - <https://www.equator-network.org/reporting-guidelines/squire/>
- Economic evaluations
 - CHEERS
 - <https://www.equator-network.org/reporting-guidelines/cheers/>

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.

AUTHOR AND FUNDING INFORMATION FILE

AUTHOR PAGE

- 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.
- The email of all authors should also be included.
- If available, please include ORCiDs (<http://orcid.org>) numbers for each author.
- You also include social media handles (e.g., Facebook, Twitter, LinkedIn) for each author.
- 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>).
- If an author changes their affiliation during the peer-review process, the new affiliation information can be given to the Editorial Team and will be handled as any other manuscript revision. Please note that no changes to affiliation can be made after the pre-publication galley of the manuscript have been accepted for final publication.
- Identify one author as the corresponding author. They will be shown as such

when the article is published and will be the point of contact between the editorial team and the authors.

- If the work presented in the manuscript was presented at conference or published in abstract form, identify the name of the event, location, format, and date of presentation.
- Acknowledgements, where applicable, can be provided. Brevity is strongly encouraged.

FUNDING

- Please provide the details for any funding that supported the submitted work, to include all details required by your funding and grant-awarding bodies. The following template sentences are suggested:
 - For single agency grants: This work was supported by the [Funding Agency] under Grant [number xxxx].
 - For multiple agency grants: This work was supported by the [Funding Agency #1] under Grant [number xxxx]; [Funding Agency #2] under Grant [number xxxx]; and [Funding Agency #3] under Grant [number xxxx].
 - 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 identities 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) files that are submitted.
- Unless stated otherwise in the directions for a specific manuscript category, all submissions should include the following elements in the following order as a single document file, called the Main Document File.

TITLE

- 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

- Unless exempted or described differently in the directions for a specific submission category, abstracts **MUST** be limited to 300 words or less, including the section headers (e.g., Problem, Methods, etc.).
- 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 or short phrases 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 completion of the ICMJE Disclosure Forms for each author as described below. If there are no conflicts, please state 'none.'

PRIMARY MANUSCRIPT BODY

- 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.
- The manuscript should use a minimum of formatting. If there are multiple levels of heading and sub-headings, please indicate the heading level by placing (H1) directly after the heading text for the top level heading, H2 for sub-headings, H3 for sub-sub headings, etc.
- 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 (e.g., 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. They must be labelled sequentially, and referred to in the text. Table captions must include 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. Figure 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 resolution PDF, .jpeg, .tiff, or .png file formats, with a 300dpi minimum resolution.

REFERENCES

- Where applicable, the references for the manuscript come next. Use endnotes rather than footnotes. The APA style for reference marks and endnotes must be used.
- 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.
- Authors are responsible for the accuracy of all references, links and in text citations.

APPENDICES

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

ICMJE FORMS FOR DISCLOSURE OF 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 tables or figures, they would be each be uploaded individually for inclusion at the end of the article.
- For spreadsheets used to generate tables, upload them as individual files and clearly indicate which table they are associated with,.

- If there are any supplemental media files (e.g., spreadsheets, slide decks, audio or video files), provide links to where readers can access them. They must be readily accessible without passwords or other restrictions.

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 a specific 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.
- 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.
- 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 exchanges manuscripts in certain circumstances. Empirical investigations on clinical topics may be forwarded to *PEC* for their initial consideration with author consent.

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 would otherwise be appropriate in the primary research or improvement project manuscript. The primary paper's methods section may direct readers to a methodology paper in this category 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 for empirical investigations.

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 describ-

ing quality improvement projects.

- United States regulations do not require quality improvement activities to have Institutional Review Board (IRB) or Research Ethics Board (REB) approval. The distinction between manuscripts requiring or not requiring IRB/REB approval may be subtle. Manuscripts not requiring approval will generally be those which do not apply clinical treatments or diagnostic methods that have not been previously established in the literature. A manuscript that explores different ways to implement a clinical treatment or diagnostic method may not require approval.
- 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 process being examined; the process change(s) that were tested; the baseline process performance level; the methods used for conducting process tests and evaluating the results; the results, including the post-intervention performance levels; any confounding variables and balancing measures; and the process change 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.
- 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.