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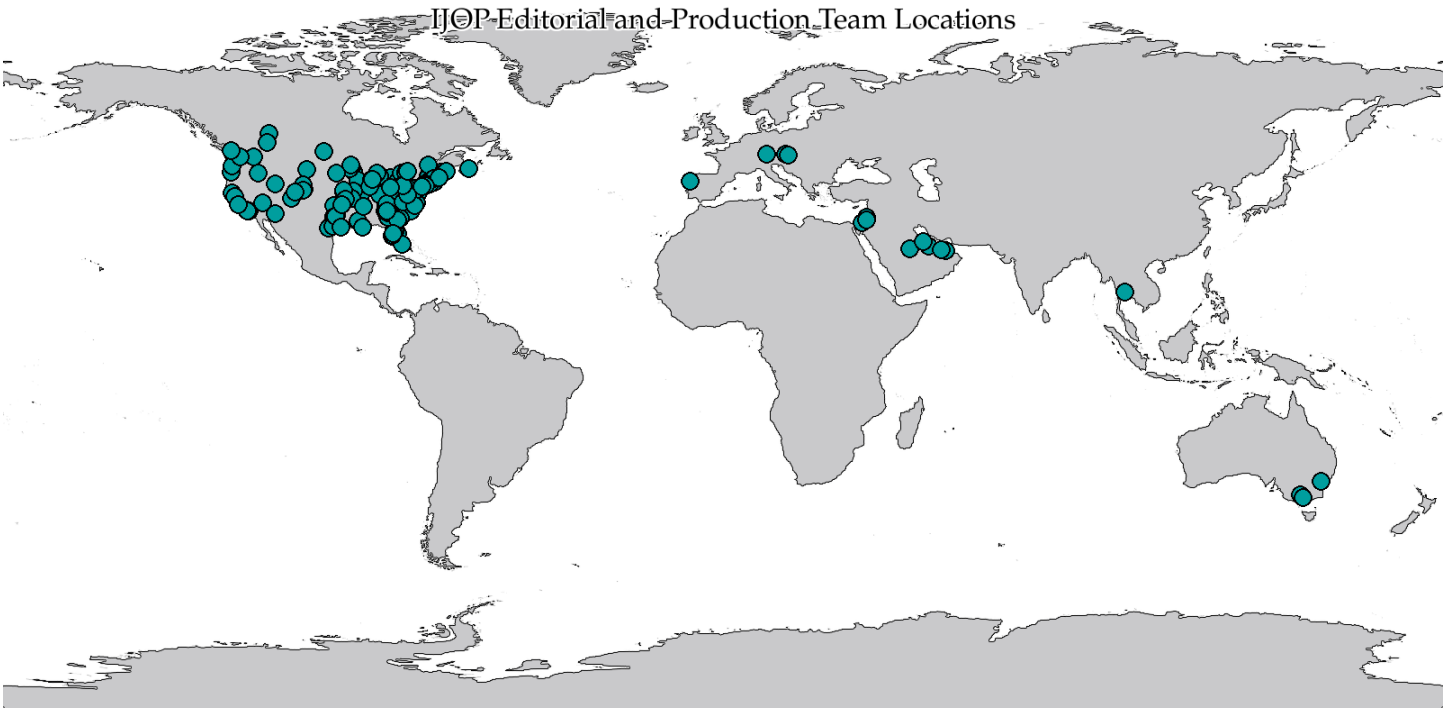

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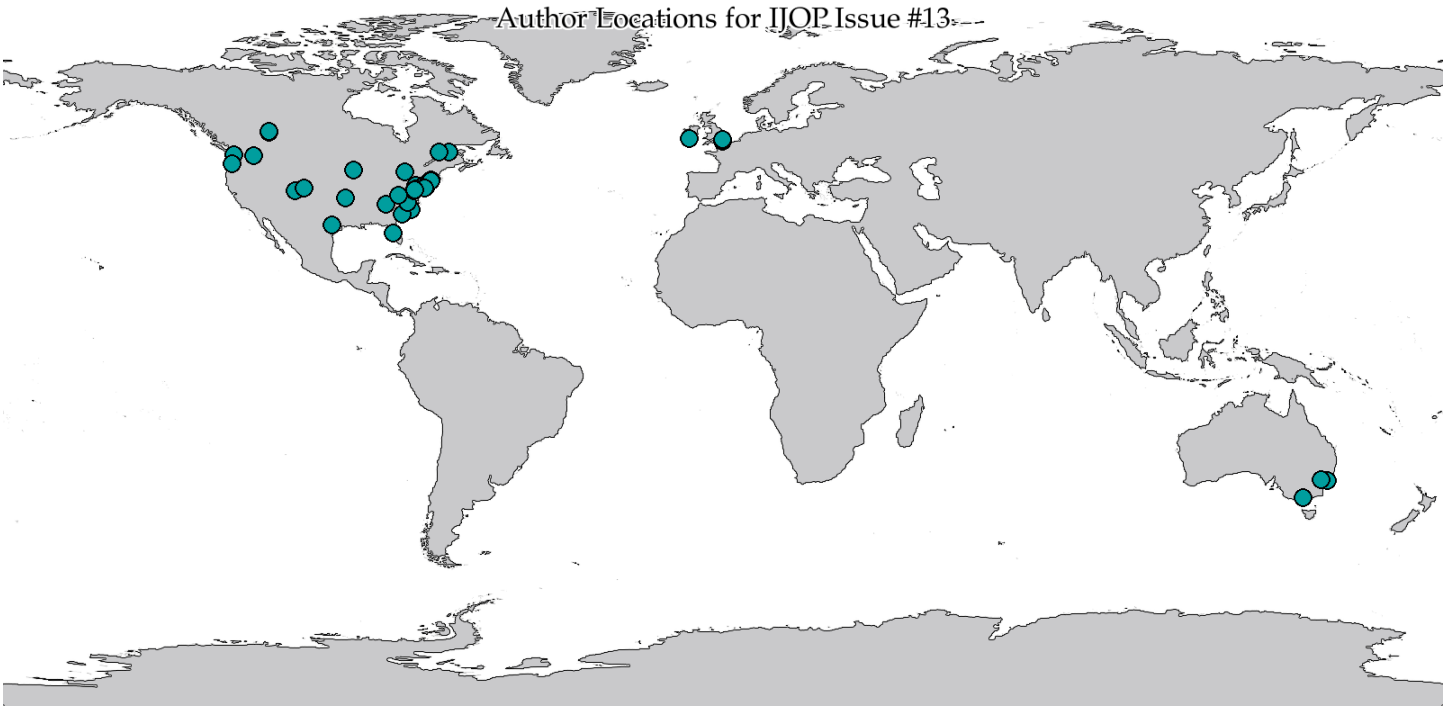

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RESEARCH REPORTS

PREHOSPITAL PAIN MANAGEMENT FOR INJURED PATIENTS AT THE INTERSECTION OF SEX AND OBESITY: A RETROSPECTIVE OBSERVATIONAL STUDY

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ABSTRACT

Objectives: We investigated the association of obesity with analgesia administration and pain reduction for prehospital patients with traumatic injuries.

Methods: Using the 2022 ESO Data Collaborative, we analyzed emergency medical services (EMS) records for 9-1-1 transports of adult patients with injuries. Patients with primary impressions related to behavioral, neurologic, respiratory, and cardiac emergencies, Glasgow Coma Scale of < 15, non-alert on AVPU scale, or no race/weight documented were excluded. Weight status was categorized using the Center for Disease Control (CDC) Body Mass Index (BMI) thresholds, with BMI calculated from documented weight, race/ethnicity, and gender using CDC height averages. We analyzed the relationship between BMI category, analgesia administration, and pain reduction using bivariate and multivariable logistic regression.

Results: Of 482,592 patients in the analysis, 164,175 (34.0%) were classified as obese (BMI ≥ 30 kg/m2). Analgesia administration and pain reduction were more likely for patients with obesity (aOR 1.13, 95% CI: 1.10-1.17; aOR 1.06, 95% CI: 1.02-1.10) than those without obesity. Men with obesity were more likely than men without obesity to receive analgesia (aOR 1.21, 95% CI: 1.17-1.24) but women with obesity were not more likely than women without obesity to receive analgesia (aOR 0.97, 95% CI: 0.95-1.00).

Conclusions: Patients with obesity were more likely to receive analgesia by EMS than those without obesity, but this advantage did not exist for women. Limitations to this study include using a convenience sample and calculating a BMI from epidemiological data on average height. Further research should explore the mechanisms underpinning the treatment advantage for men with obesity that does not extend to not women with obesity.

INTRODUCTION

Background

In the past several decades, the prevalence of obesity in the general population has climbed. Globally, over one-third of patients

are classified as overweight or obese (Chooi, 2018). In the United States, 73.8% of the population is estimated to be overweight or obese, and recent increases have been noted in adolescent youths, particularly non-Hispanic Black and Mexican American children (Li, 2022; Ogden, 2020).

People with obesity are more likely to face institutional discrimination, discriminatory employment practices, and lower levels of self-acceptance than people without obesity (Carr, 2005; Agerstrom, 2011; Flint, 2016). Even children with obesity experience stigma related to their weight, with lower levels of acceptance in the classroom for larger children (Latner, 2003). Weight bias has been described as the last socially acceptable form of discrimination in modern cultures today, with a profound obesity stigma alienating people and reducing their quality of life (Puhl, 2008).

This bias also extends into the health care setting. Patients with obesity have reported less time with physicians, lower levels of physician respect, negative tones from clinicians (Huizinga, 2009; Stone, 2012), and are less likely to receive colorectal or gynecological cancer screenings despite higher risk for disease (Ferrante, 2006; Amy, 2006). Health care clinicians have been shown to hold negative attitudes towards patients with obesity, holding a belief that patients with obesity are weaker willed than other patients and attributing the condition to a deficiency in their personality (Harvey, 2001; Schwartz, 2003; Brown, 2007; Pantenburg, 2012; Puhl, 2014; Phelan, 2014; Tanneberger, 2018). Despite evidence that willpower-focused approaches to patients with obesity are ineffective, clinicians continue to focus on personal accountability over more effective strategies for weight loss, likely exacerbating disparities (Owen-Smith, 2018).

While there has been significant research demonstrating the impact of obesity stigma and weight bias on employment discrimination, wage disparities, and hospital-based health care clinician bias, there has been less exploration of its role in the prehospital setting. One study found that injured female patients with obesity and severe pain were less likely to receive analgesia than any other demographic, but that male patients with obesity had a treatment advantage in the prehospital setting (Kennel, 2022). This study, however, was limited to a specific geographical region and has not been replicated in a national dataset. Several studies have examined other stigmatized conditions associated with bias in the prehospital setting, including race/ethnicity and socioeconomically disadvantaged patients who experience treatment inequities, but the investigation of patient size or weight bias influencing prehospital treatment remains understudied (Michael, 2007; Hewes, 2018; Crowe, 2023).

Aims

This study evaluated the association between a patient's weight status and the administration of analgesia and reduction of pain in the setting of a traumatic injury. Secondarily, it assessed whether this association is impacted by the intersection of race/ethnicity and gender.

METHODS

Study Design and Setting

This was a retrospective observation study using a large dataset (ESO Data Collaborative, Austin, TX) that has de-identified prehospital encounter data with hospital outcome information available that conforms to the National EMS Information System 3.4 standard (National EMS Information System, 2009). We report findings in alignment with the Strengthening the Reporting of Observational Studies in Epidemiology guidelines (von Elm, 2007). This study was deemed exempt by an institutional review board with a waiver of informed consent.

Selection of Participants

All prehospital patient encounters originating from a 9-1-1 call involving patients 18 years and older with a documented injury were included. Any encounters without patient transport to a hospital were excluded. Any patient with a primary or secondary impression related to behavioral health emergencies, shock, cardiac arrest, and obstetric emergencies were excluded because these conditions can be contraindications or may affect patterns of analgesia administration. Patients with an initial Glasgow Coma Scale score less than 14 or an initial A-V-P-U (alert - verbal - pain - unresponsive) assessment of responsive to verbal stimuli, responsive to painful stimuli, or unresponsive were also excluded as these patients may have a limited ability to communicate their pain or have experienced more serious injuries that required prioritization of life-saving interventions over analgesic administration. Prehospital encounters provided by basic life support (BLS) clinicians were excluded to limit the influence of scope of practice restrictions on analgesic administration. Lastly, patients without documented race and ethnicity and those without a documented weight were excluded as this was a factor in our BMI categorization.

Exposures

Our primary exposure was weight status defined using the Center for Disease Control (CDC) Body Mass Index (BMI) categories that identify patients with a BMI of <30 as underweight, healthy weight, or overweight and those with a BMI of 30+ as obese. BMI was calculated for each patient using data available from the EMS record coupled with the CDC height average following methodology established in previous work (Kennel, 2022; Centers for Disease Control and Prevention). First, we assigned each patient an approximate height based on their documented race/ethnicity and gender and then used the assigned height and the recorded weight to calculate an approximate BMI. We acknowledge that BMI is a poor indicator of health and use this solely as a proxy of patient size to determine the potential impact of weight bias on pain management. In analyzing disparities of care, we felt that the approximate weight listed by prehospital clinicians was a valid proxy to determining whether their perception led to a disparity in care. Patient race and ethnicity have been shown to influence EMS pain management practices (Hewes, 2018; Kennel, 2019; Crowe, 2023), so we included EMS-documented patient race and ethnicity into our analysis using the method and definition described by Crowe et al (2023). To better understand and isolate the impact of patient size in the context of social determinants of health, we included socioeconomic status (SES) of the geographic area where the EMS encounter occurred as a proxy for patient access to financial resources.

Socioeconomic status was measured using the CDC's Social Vulnerability Index for the EMS encounter scene location at the Census tract level (Agency for Toxic Substances and Disease Registry). Specifically, we used the CDC's socioeconomic status theme, which is computed using several measures including: the population below poverty, unemployment, income, and the proportion of the population without a high school diploma for each US Census tract. Socioeconomic status rankings were based on percentiles with values ranging from 0 to 1. Higher values indicate greater socioeconomic vulnerability. Previous work has linked higher values from the socioeconomic status theme to increased health conditions, treatment inequities, and worse health outcomes for individual patients (Crowe, 2023; Bevan, 2023; Herra-Escobar, 2022). For analysis, we classified encounters in the 1 to 25th percentile as Q1 (least vulnerable), 26 to 50th percentile Q2, 51 to 75th percentile Q3, and >75th percentile as Q4 (most vulnerable). We defined urbanicity using urban, rural, and super-rural distinctions linking patients to urbanicity by zip code.

We identified additional potentially confounding variables: age in years, sex, race/ethnicity, SES, urbanicity, initial pain score, and EMS transport interval. As shorter EMS transport times may be associated with clinician decision-making and choice to withhold analgesic administration in the prehospital setting and are also associated with urban settings where racial and ethnic diversity is increased, we included EMS transport interval as a potential confounder in our models. We defined EMS transport interval as the difference in minutes from the time the ambulance departed the scene of the encounter and arrival at the hospital (Browne, 2016).

Outcomes

Our primary outcome measure included any analgesic medication administered in the out-of-hospital setting by any route. Analgesic medications used by EMS clinicians in this dataset included opioids (fentanyl, morphine, hydromorphone), ketamine, nonsteroidal anti-inflammatory drugs (ketorolac, ibuprofen), and acetaminophen. Secondarily, in alignment with existing out-of-hospital pain management research, we analyzed a secondary outcome of a clinically meaningful pain reduction as a decrease of 2 or more points on the 0 to 10 pain scale between the final and initial EMS pain assessments (Crowe, 2023).

Statistical Analysis

To evaluate potential systematic differences in patient and encounter characteristics, we first described patients based on weight status according to BMI category calculated using race/ethnicity, documented weight, and gender. Then, we compared unadjusted rates of analgesia and pain reduction by BMI category. We then performed a multivariable logistic regression model to calculate adjusted odds ratios (aOR) and 95% confidence intervals (CI) for analgesia administration by weight category adjusting for race/ethnicity, gender, socioeconomic status, rurality, and pain score. We performed this same analysis for pain reduction. We excluded patients with missing data from the multivariable analyses. We also performed a sub analysis at the intersection of obesity with race/ethnicity and another sub analysis at the intersection of obesity with gender. We used Stata v15.1 (College Station, TX) for all analyses (Stata).

RESULTS

Characteristics of Study Subjects

We included 482,592 patients in the analysis (Figure 1). 34.0% (n=164,175) of patients were classified as obese. The mean age was 60 years (IQR 41, 79) and patients were 53.9% (n=260,108) female. Patients were 28.1% non-White (n=135,695). Nineteen percent (n=96,351) of patients were classified as living in rural or super-rural areas and 23.1% (n=111,357) were classified as living in areas in the most socioeconomically vulnerable quartile. 21.0% (n=101,101) received analgesia and of those with multiple pain scores (n=278,266), 27.7% (n=77,083) experienced a reduction in pain of at least 2 points. Descriptive statistics stratified by primary exposure can be seen in Table 1.

Main Results

When accounting for age, gender, urbanicity, socioeconomic status, EMS transport time, and initial pain score, patients with obesity were more likely to receive pain medication (aOR 1.13, 95% CI: 1.10-1.17) and pain reduction (aOR 1.06, 95% CI: 1.02-1.10) than those without obesity. Black non-Hispanic patients were less likely than White non-Hispanic patients to receive analgesia (aOR 0.57, 95% CI: 0.55-0.59) and experience a reduction in pain (aOR 0.70, 95: CI: 0.68-0.72).

Statistical models were also performed at the intersection of race/ethnicity and obesity. White patients with obesity were more likely to receive analgesia than White patients without obesity (aOR 1.04, 95% CI: 1.02-1.07), and Black non-Hispanic patients with obesity were more likely to receive analgesia than Black non-Hispanic patients without obesity (aOR 1.14, 95% CI: 1.09-1.20).

At the intersection of gender and obesity, men with obesity were more likely to receive analgesia (aOR 1.21, 95% CI: 1.17-1.24) than men without obesity. There was no difference

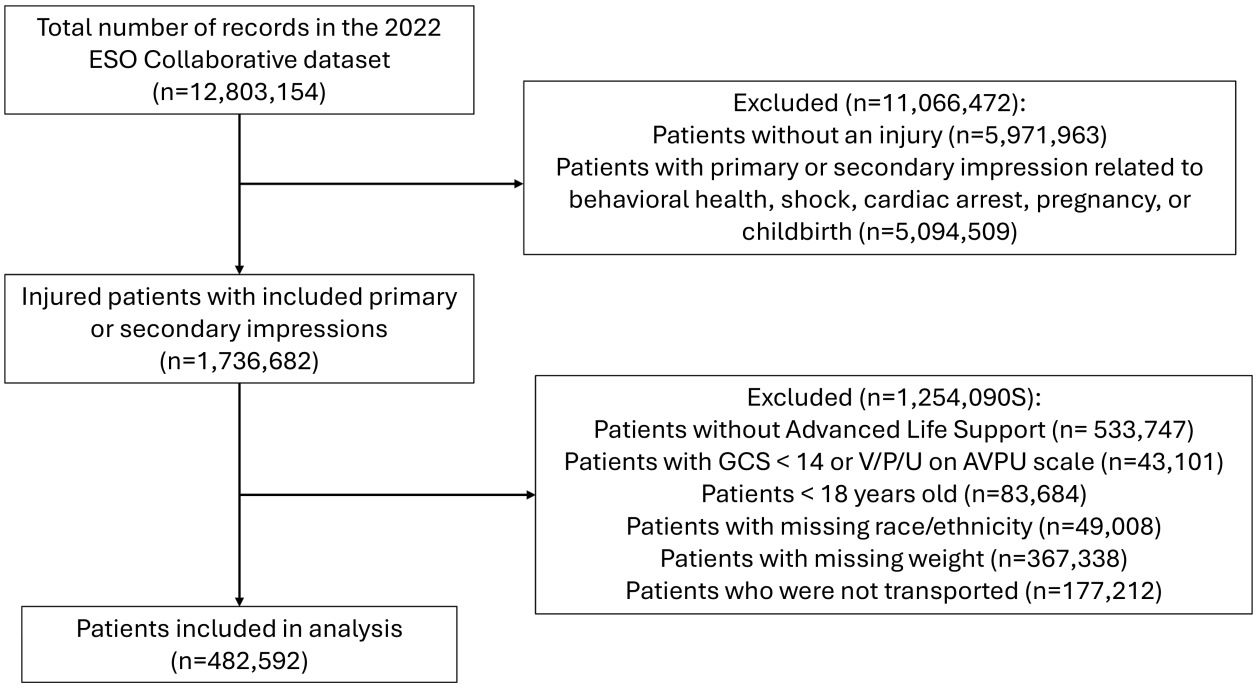

Figure 1. A flow diagram shows how the patient sample was selected for analysis.

Characteristic	Weight Status		
	All patients n=482,592	Patients without Obesity n=318,417 (66%)	Patients with Obesity n=164,175 (34%)
Age			
Median (IQR)	63 (41-79)	67 (41-82)	59 (40-72)
Gender			
Female	54% (260,108)	53% (169,913)	55% (90,195)
Male	46% (222,484)	47% (148,504)	45% (73,980)
Race/Ethnicity			
Black, non-Hispanic	15% (70,744)	13% (41,992)	18% (28,752)
Hispanic	11% (54,168)	10% (33,228)	13% (20,940)
Other	2% (10,783)	2% (7,921)	2% (2,862)
White, non-Hispanic	72% (346,897)	74% (235,276)	68% (111,621)
Census Region			
Northeast	7% (33,131)	8% (23,315)	6% (9,816)
Midwest	27% (117,649)	25% (75,830)	27% (41,819)
South	53% (242,756)	52% (155,800)	55% (86,956)
West	14% (64,945)	15% (45,758)	12% (19,187)
Urbanicity			
Urban	80% (386,079)	81% (257,829)	78% (128,250)
Rural	17% (80,321)	16% (50,263)	18% (30,058)
Super Rural	3% (16,030)	3% (10,216)	4% (5,814)
Scene Socioeconomic Quartile			
Q1	25% (122,460)	27% (86,548)	22% (35,912)
Q2	24% (117,669)	24% (77,589)	24% (40,080)
Q3	27% (130,301)	26% (83,348)	29% (46,953)
Q4	23% (111,357)	22% (70,382)	25% (40,975)
EMS Transport Time, min			
Median(IQR)	13 (8-20)	13 (8-19)	13 (8-20)
First Pain Score Category			
None (0)	16% (62,614)	17% (45,089)	13% (17,525)
Mild (1-3)	17% (69,479)	18% (47,758)	16% (21,721)
Moderate (4-6)	34% (133,615)	33% (86,771)	34% (46,844)
Severe (7-10)	33% (132,610)	31% (80,930)	38% (51,680)

Table 1. Patient and encounter characteristics stratified by weight status.

in analgesia rates between women with obesity and women without obesity (aOR 0.97, 95% CI: 0.95-1.00). Men and women with obesity had higher rates of pain reduction than those without obesity, but the odds ratio was higher for men (aOR 1.25, 95% CI: 1.21-1.28]) than women (aOR 1.1, 95: CI 1.08-1.13). Table 2 shows analgesia and pain reduction rates at the intersection of race and gender with obesity.

Figure 2 shows a panel of forest plots showing the adjusted odds ratios with the multi-variable models for patients with obesity overall and Figure 3 shows them stratified by gender.

DISCUSSION

We found that patients with obesity were more likely to receive analgesia and pain reduction than those without obesity when adjusting for confounders. This did not vary by race and ethnicity, with a persistent advantage for patients with obesity across racial and ethnic categories. At the intersection of gender, however, the treatment advantage of obesity was not present for women. These findings suggest that there is a treatment

Characteristic	Analgesia Administration aOR (95% CI)	Pain Reduction (2+/10) aOR (95% CI)
Weight Status		
Patients with obesity	1.07 [1.05-1.09]	1.16 [1.14-1.18]
Patients without obesity	Referent	Referent
Race and Ethnicity		
Black, non-Hispanic	0.56 [0.55-.58]	0.70 [.0.68-.0.72]
Hispanic	0.84 [0.82-0.87]	1.00 [0.98-1.03]
Other	0.79 [.74-.84]	0.88 [0.83-0.93]
White, non-Hispanic	Referent	Referent
Gender		
Female	0.99 [0.98-1.01]	1.30 [1.28 - 1.32]
Male	Referent	Referent
Obesity Status with Race and Ethnicity		
Black non-Hispanic with obesity	0.62 [0.60-0.65]	0.80 [0.77-0.83]
Hispanic with obesity	0.93 [0.89-0.97]	1.19 [1.14-1.24]
Other with obesity	0.83 [0.74-0.93]	1.10 [0.96-1.19]
White, non-Hispanic with obesity	1.04 [1.02-1.07]	1.16 [1.14-1.19]
Black non-Hispanic without obesity	0.54 [0.53-0.56]	0.72 [0.69-0.75]
Hispanic without obesity	0.82 [0.79-0.85]	0.99 [0.96-1.03]
Other without obesity	0.79 [0.73-0.85]	0.87 [0.81-0.93]
White non-Hispanic without obesity	Referent	Referent
Obesity Status and Gender for Male Patients		
Males with obesity	1.21 [1.17-1.24]	1.25 [1.21-1.28]
Males without obesity	Referent	Referent
Obesity Status and Gender for Female Patients		
Females with obesity	0.97 [0.95-1.00]	1.1 [1.08-1.13]
Females without obesity	Referent	Referent

Table 2. Multivariable generalized estimating equation odds ratios and 95% CI for analgesia administration and pain reduction (defined as a decrease by 2 or greater on documented pain scale) with adjustments for race/ethnicity, gender, rurality, socioeconomic vulnerability, and initial pain score. We did not adjust for initial pain score in the pain reduction model.

advantage for pain management of patients with obesity, but that the advantage is gendered. While men with obesity were nearly 20% more likely to receive analgesia than men without obesity, women with obesity did not receive any advantage or disadvantage based on weight status. We hypothesized that patients with obesity would be less likely to receive analgesia than their not-obese counterparts, but these findings reveal the opposite. Given the large body of research demonstrating discrimination in the hospital setting for patients with obesity, it remains unclear why this did not also translate to prehospital analgesia administration. One potential mechanism for this could be weight concordance between EMS clinician and the patient. Several studies have demonstrated that EMS clinicians have high rates of obesity, cardiac disease, and metabolic syndrome (Tsismenakis, 2009; Hegg-Deloye, 2015; Brice, 2019; Cash, 2019; Supples, 2023). If there is concordance between EMS clinicians and patients with obesity, perhaps it mitigates disparities in treatment, as suggested in previous literature (Kennel 2022). It is unclear whether this weight concordance may be different for men and women.

Racial disparities were also present in these analyses, further validating previous work demonstrating that non-White patients receive disparate pain management (Hewes, 2018; Kennel, 2019; Crowe, 2023). Patients who were non-White and obese still had a treatment advantage when compared to their non-obese counterparts of the same race and eth-

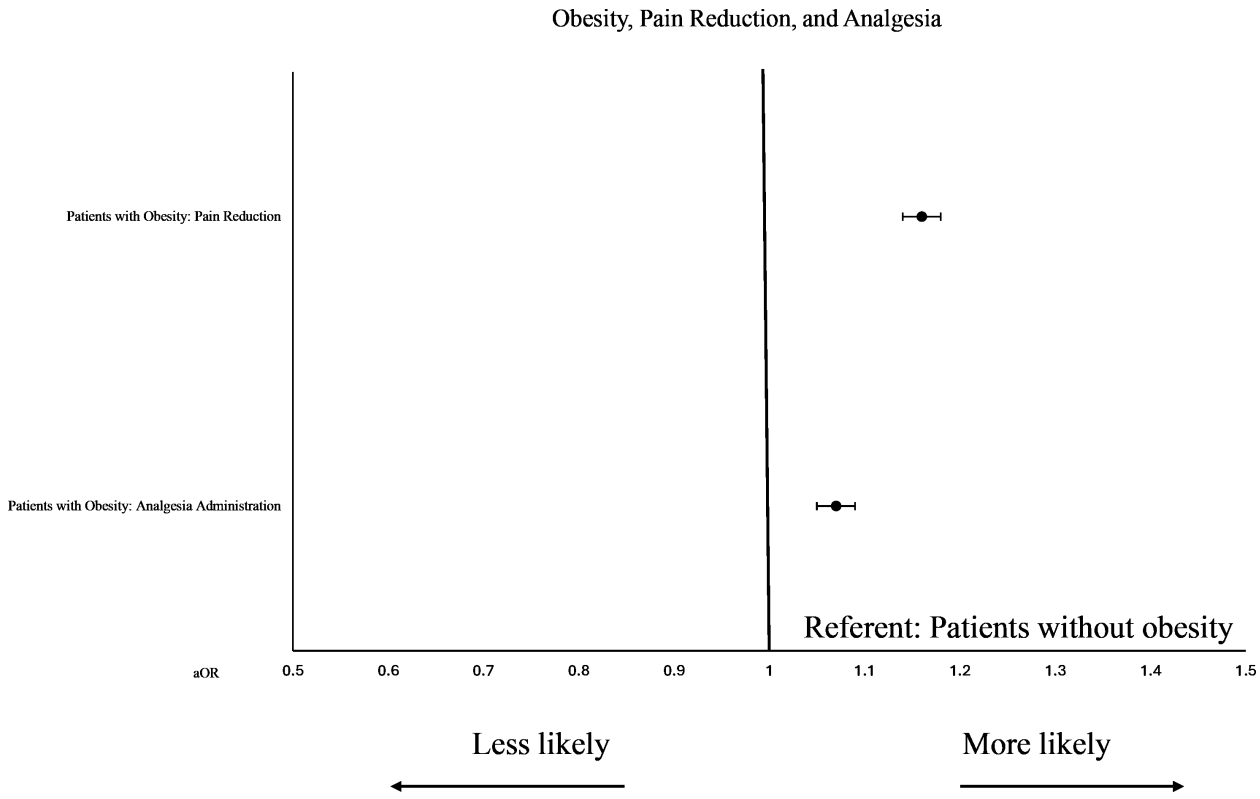

Figure 2. A forest plot represents the primary outcomes stratified by patients with and without obesity. The adjusted odds ratios (aOR) reflect the likelihood of the event on the y axis and the listed referent.

nicity, but the advantage varied more for Black non-Hispanic patients than with White non-Hispanic patients, demonstrating that the intersection of race/ethnicity with obesity had a different impact on our outcome variables. Further research in health care inequities should more consistently explore the intersections of race, ethnicity, gender, and SES when evaluating treatment disparities.

Our results indicated that obesity provided a treatment advantage for men, but no advantage for women that was consistent with past literature (Kennel, 2022). Several hospital-based studies have also shown that the influence of obesity stigma can be more profound for women, as clinicians are more likely to encourage weight loss at lower BMI scores than men, and women with obesity were more likely to be described as "cold" and "defensive" than men with obesity (Puhl, 2008; Anderson, 2001; Fikkan, 2012). This gendered weight bias also extends outside of health care settings and has been seen in wage disparities, and women with obesity are less likely to be hired for public-interfacing jobs when compared to their male counterparts with obesity (Sinall, 2015).

It may be tempting for EMS clinicians and leaders to review the results of this study, among others, showing disparities in care and not know where to start in effectively addressing the difficult problem of health care inequity. A recent position statement from the National Association of EMS Physicians describes why health equity should be a strategic priority for EMS systems, how to examine quality metrics for disparities, and how to implement improvement strategies to tackle inequities in prehospital care (Farcas, 2024). We urge readers to use these tools to evaluate and combat disparities in their own systems, tackling difficult problems like underperformance in ECG acquisition for women, undertreatment of females with obesity in pain, and underdiagnosis of stroke

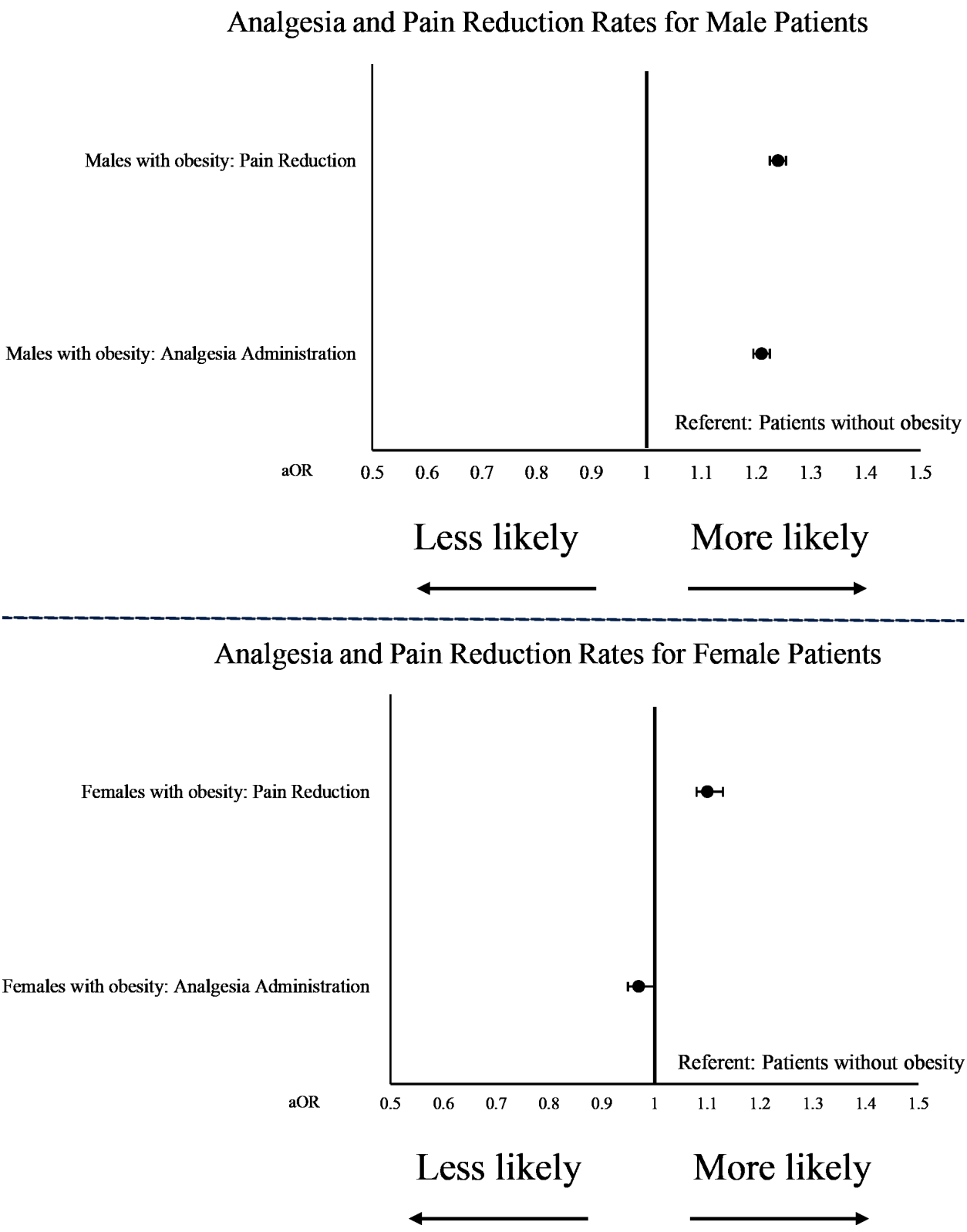

Figure 3. A forest plot represents the primary outcomes stratified by patients with and without obesity for men and then for women in a panel. The adjusted odds ratios (aOR) reflect the likelihood of the event on the y axis and the listed referent.

in female patients the same way they would improve system performance in everyday issues like rapidly decompensating patients, house fires with multiple patients, and patients with difficult airways.

LIMITATIONS

There are several limitations to this study. We used a convenience sample of injured patients in the ESO Collaborative dataset, which does not contain all the EMS responses in a given year and has an uncertain degree of missingness that may bias results and limit generalizability. Additionally, we calculated an approximate BMI by taking the weight in kilograms documented in EMS patient care records and calculating a BMI based on the average height by race and sex. This is not an accurate representation of the patient's health or actual BMI but rather serves as a proxy for the clinician's perception of the patient's weight. The methodology used to approximate BMI has been established in previous studies on disparities in patients with obesity (Kennel, 2022; Kennel, 2018). The weight recorded in the EMS records are rarely taken from a recent weight and are likely crude approximations based on EMS clinician judgment. While documented weights may be inaccurate, the focus of our study was on the potential disparity in care based upon the clinician's perception of patient weight, not the literal weight of the patient. To validate this proxy for weight status, we analyzed ICD-10 codes for patients with discharge information available in the dataset for diagnoses related to obesity. We found that 74% of patients with this diagnosis (n=1,340) were classified as obese by our inferred BMI. Furthermore, we compared our calculated rate of obesity at 34% to 42% in national CDC data, showing that our sample was a conservative estimate of the national population (Stierman, 2021).

Another limitation of this study and prehospital research more broadly is data quality. We could not know precisely the weight or height of the patient but instead rely on approximate weights recorded by prehospital clinicians. Future efforts should be made to improve the quality of EMS data by using stretchers with the ability to assess weight, direct analysis of defibrillator files to assess resuscitation quality, and more.

Additionally, the race and ethnicity designation in the prehospital records are also based on EMS clinician perception, not the patient's reported identity, and are subject to missingness and error. Refusals of pain management were unable to be distinguished due to feasibility, but previous literature demonstrates that refusal of care does not appear to be a mediating variable for disparities in prehospital pain management (Crowe, 2023).

CONCLUSIONS

In summary, these findings show that patients with obesity were more likely to receive analgesia and have a reduction in pain than those without obesity. When looking at the intersection with gender, men with obesity received this treatment advantage but women with obesity did not. Further research in health disparities should examine the intersections of race, gender, and other identities subject to bias and the possible role of clinician concordance in mitigating disparities. EMS leaders should gain visibility to and address inequities in their own systems for patients with obesity.

DECLARATION OF GENERATIVE AI IN SCIENTIFIC WRITING

We did not use a generative artificial intelligence (AI) tool or service to assist with preparation or editing of this work. We take full responsibility for the content of this publication.

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RESEARCH REPORTS

AN INTERPRETIVE DESCRIPTIVE STUDY ON THE IMPACT OF NEGATIVE WORKPLACE BEHAVIORS ON PARAMEDICS ACROSS AUSTRALIA AND CANADA

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Keywords: mental health, psychological wellbeing, bullying, harrassment, organizational culture, emergency medical services, EMS, paramedicine

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ABSTRACT

Introduction/purpose: Workplace bullying and harassment are pervasive issues that have detrimental effects on the well-being and productivity of individuals. A literature review conducted for this study demonstrated that workplace bullying and harassment was under researched amongst paramedics.

Methods: A qualitative interpretive methodology was implemented, involving convenience sampling which resulted in six working paramedics from Australia and Canada becoming participants. Individual semi-structured interviews were conducted with each participant, lasting approximately one hour. This allowed for a deep exploration of the personal experiences and perspectives by the paramedics. The interview data collected was thematically analysed using Braun and Clarke's (2006) six-step framework. By utilising this method, this study contributed to a better understanding of impacts of workplace bullying and harassment amongst paramedics.

Results: Two core themes were identified from interview data which were the impact of negative behaviours and organisational culture. The research identified some impacts that workplace bullying and harassment can have on paramedics.

Conclusion: This study explores workplace bullying, harassment, and organisational culture within the paramedic profession. Through interviews with six paramedics, the research highlights the varied nature of negative behaviours, disparities, and effects on job satisfaction, performance, and mental health. Organisational culture such as power dynamics, diversity, and generational change was found to influence workplace behaviours.

INTRODUCTION

Overview

This paper was derived from an honours research project that examined the management of bullying and harassment in the workplace and the coping mechanisms employed by paramedics, over a period of 18 months. The decision to embark on this project stemmed from the recognition of a limited body of research in workplace bullying and harassment in paramedicine.

The research question guiding this study was: What is the impact of workplace bullying and harassment amongst paramedics, and how does organisational culture affect it?

Literature Review

Prior to beginning this study, a literature review was conducted exploring workplace bullying and harassment within the paramedicine profession, focusing on the experiences of paramedics in Australia, Canada, the United Kingdom, and the United States. The literature uncovered a limited body of research, with only four peer-reviewed studies identified. Further research was required to comprehensively address these challenges and ensure the holistic well-being of paramedic professionals.

Rationale

Paramedicine, as an emerging profession, has a dearth of literature in workplace bullying and harassment. This research was aimed at filling this gap by further identifying some of the impacts of workplace bullying and harassment and organisational culture's role in these issues. This research focused primarily on Canadian and Australian paramedics' workplaces.

Outcomes

This study's outcomes built on the information identified by the literature review and shed light on the impacts of workplace bullying and harassment and organisational culture. Participants shared varied insights, utilising their own definitions, and highlighted a notable shift in paramedicine culture and its impact on these issues. While this research offers valuable insights, this research used small sample sizes which were unable to be generalised to the greater population but rather provide examples that the population can resonate with and build on. This underscores the need for further exploration to gain a more comprehensive understanding of these complex challenges in the paramedicine profession.

METHODS

The chosen methodology was a qualitative interpretive description (Thorne et al., 1997). This approach recognised the multiple subjective realities experienced by participants, creating relevant themes that identified the impact of workplace bullying and harassment and impact of organisational culture. Terms throughout this paper were not explicitly defined by the researchers, as participants described these concepts based on their own experiences and understandings.

Rationale for Cross-Country Analysis

This research focused on paramedics in Australia and Canada. The choice to include both countries stemmed from the aim of obtaining a broader perspective on workplace bullying and harassment in paramedicine. Despite geographical distance, these countries share similar cultural and healthcare workplace backgrounds (Dixit & Sambasivan, 2018), making them likely to have encountered comparable issues in this context.

Recruitment Strategy

In accordance with ethical considerations, approval was obtained prior to recruitment efforts (Appendix A). The study was advertised on social media platforms (Facebook, Twitter, LinkedIn) and paramedic notice boards (specifically, the Australasian College of Paramedicine (2023) and the McNally Project for Paramedicine Research in Canada (2023)), that led participants to provide information in a Google Form. Thirteen individuals responded to the Google Form, with six meeting the inclusion criteria and proceeding to participate in the study. Convenience sampling was used (Elfil and Negida, 2017), which recruited six qualified paramedics who have experienced workplace bullying and/or harassment based on availability. This sample size was determined following the guidance of Braun and Clarke (2019), which suggested that six participants is appropriate for a thematic analysis. Participants who volunteered for this research and provided their information in the Google Form, were provided with a consent form (Appendix B) and information sheet (Appendix C). Participants were then given a pseudonym as they were anonymised. Table 1 provides details about the participants including their pseudonym, length of service, and country of work.

Pseudonym	Length of service	Country
Jules	10 - 20 years	Australia (Rural)
Mary	>20 years	Canada (Metropolitan)
Alex	<10 years	Canada (Metropolitan)
Mark	<10 years	Australia (Metropolitan)
Kelly	10 - 20 years	Canada (Rural)
Robin	>20 years	Canada (Metropolitan)

Table 1. Participant table.

Data Generation Procedure

Semi-structured interviews lasting approximately one hour were conducted. These interviews asked questions that addressed the research question and allowed participants to divulge relevant information and co-construct themes (Thorne et al., 1997). The semi-structured interviews enabled deeper insights into participants' lived experiences by asking open-ended questions and probing further based on their responses (Peters & Halcomb, 2015). To maintain integrity of the information, interviews were recorded using Zoom© and manually transcribed to ensure accuracy. The transcripts were subsequently deidentified to ensure participant confidentiality. Post-interview, each participant was provided a debrief statement (Appendix D and Appendix E) specific to their country, which identified support services.

Data Analysis

Thematic analysis, as recommended by Braun and Clarke (2006), was used to analyse the data collected during the study. This method involved six key steps as shown in Table 2.

Thematic analysis is an efficient approach when working with qualitative data and is a widely accepted method for data analysis (Braun & Clarke, 2006). By employing this methodology, the researchers gained a comprehensive understanding of paramedics' experiences with workplace bullying and harassment and identified organisational culture's role. To enhance trustworthiness, the analysis involved ongoing reflexive discussions and debriefing. Triangulation of findings was supported through the inclusion of multiple researchers during analysis, helping to mitigate individual bias.

Braun and Clarke (2006) six step method	What was done for this study
Familiarisation with the data	Researchers reviewed the transcripts and gained understanding of the paramedics' experiences.
Initial coding of data	Identifying patterns and noting relevant quotes. These patterns were then provided an initial code.
Generating themes based on the coded data	Patterns and quotes were categorised into themes.
Reviewing and refining themes	A review of themes ensuring they accurately reflect the data. Any discrepancies or overlaps were identified and refined.
Defining and naming the final themes	Themes were defined based on the understanding of the data.
Writing the report based on the thematic analysis	The final report was created around the defined themes. The report presented a narrative, integrating quotes and examples from the coded data to support and illustrate each theme.

Table 2. Braun and Clarke's (2006) six-step thematic analysis.

FINDINGS

Upon analysis of the data, two major themes emerged. These were the impact of negative behaviours, and organisational culture.

Impact of Negative Behaviours

The theme of negative behaviours and their impact was based on participant descriptions and definitions of what they considered to be a "negative behaviour." Often, participants described these behaviours in terms of their impact on personal well-being, mental health, and job satisfaction and performance, which is why they are discussed together. Overall, this included types of behaviours that occurred in different settings, the impact of these behaviours, and any support available.

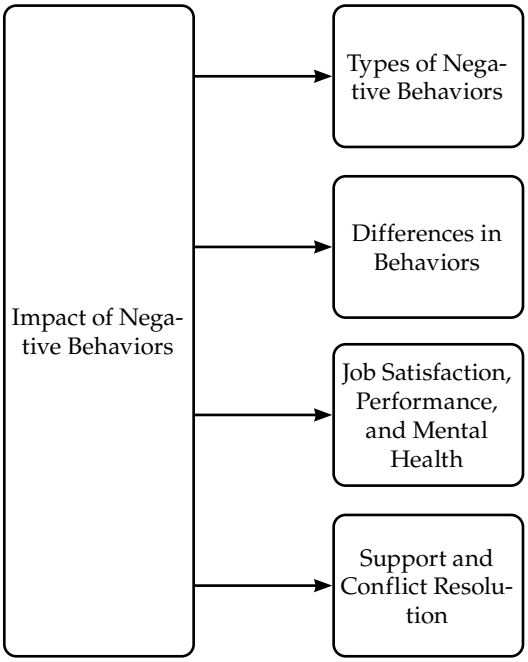

Figure 1. Impact of negative behaviors.

Negative behaviours and their impact varied between settings. These included regional, rural/remote, and metropolitan areas. The variation suggested that contextual factors related to location may have influenced the manifestation of negative behaviours. One participant pointed out that in regional areas, staff frequently stayed in the same station for longer and were less accepting of newcomers:

> *The bigger regional towns definitely have had their staff there for a very long time so the bullying culture hasn't had time to be replenished or replaced. - Jules (Australia)*

Another participant underscored the self-perpetuating nature of such cultures, stating:

> *It's definitely a self-reinforcing culture because you have a relatively small group of people in the station, and how those people behave and interact with each other will create a culture that sustains itself and that can be very hard to change. - Mark (Australia)*

These statements suggested that staff in the service or the same station for longer were set in their ways. A poor workplace culture then tended to imbed these practices that were often seen as negative.

Disparities in behaviours between people of different genders and stereotypes also existed. Some participants reported that female and LGBTQIA+ (lesbian, gay, bisexual, transgender, queer (or questioning), intersex, and asexual) people experienced different behaviours compared to their heterosexual male counterparts. For instance, one participant stated:

> *Bullying towards females tended to be more verbal, and the bullying towards males would start verbal, but it could end quite severely. - Jules (Australia)*

This quote indicated that both males and females are bullied within the service, although behaviours varied. Another participant stated in regard to the difference in behaviours:

> *I've often suspected whenever I work with my female colleagues, they just cop a lot more than I do, constantly from everyone–from patients, from managers, from coworkers–just across the board. There's not a doubt in my mind that it's harder to be a paramedic and be female just because of the way that other people treat you. - Mark (Australia)*

This quote from Mark suggested that gender could influence behaviours. Mark particularly highlighted that bullying and harassment faced by paramedics was not only from people within the workforce but also from patients. This demonstrated disparities in behaviours towards individuals considered part of a stereotypical groups, such as people of colour, religious minorities, LGBTQIA+, and those of different ethnicities.

One participant stated:

> *Everyone who didn't fit into a mould. So if you were a religious minority, person of colour, or someone who didn't fit the general description of what a man was supposed to act like, they were definitely targeted. - Mary (Canada)*

Although this was initially the case, when diversity increased in paramedicine, this situation changed. Mary also stated:

> *When people start to interact more with other groups, they humanise other groups, so they don't attract quite the same behaviours as perhaps they did. You know, when you work with 50% women, we're not quite the unicorns that we were in the first place. - Mary (Canada)*

Mary highlighted the increasing diversity within paramedicine may reduce such behaviours.

The impact of negative behaviours on job satisfaction, performance, and mental health was mentioned by participants. Participants reported lowered job satisfaction, decreased performance, and effects on mental health due to their experiences of negative behaviours. When discussing job satisfaction, one participant shared her disappointment:

> *I would literally get in the car every day, and by the time I got home at night, I was in tears. - Jules (Australia)*

This example of poor job satisfaction was not unique amongst the participants. Mary expanded on the impact that this had on her performance stating:

> *It's hard to come to work every day when everybody hates you, when they don't want to work with you because they don't think you can do your half of the job, when they treat you like a horrible person just because of the skin you showed up in. - Mary (Canada)*

Such firsthand accounts display the debilitating effects of bullying and harassment on well-being and job satisfaction. It is important to note that all participants reported a decline in job satisfaction after experiencing workplace bullying and/or harassment. Three participants revealed negative experiences deterred them from asking questions, creating a significant hinderance to their learning process. One participant described the impact, stating:

> *If the person who's in a teaching role is in a critical frame of mind and responds to everything you do negatively, that's going to obviously create a disincentive for you to ever ask for assistance… I spent the next few weeks sitting in terrified silence, that I might accidentally do something to annoy these people who are in a position of power. That definitely put me on the back foot. - Mark (Australia)*

This underscores Mark's perception of the vital role of support in the mentorship process, enhancing the learning experience.

Participants indicated that the effects of negative behaviours not only affected them in the workplace, but also outside of the work environment. One participant expressing:

> *You go through a period where you're pretty angry, when you'd fight all the time in one place [work]; it's hard not to have that confrontational mentality elsewhere as well. - Mary (Canada)*

In this way participants reported that the experience of negative behaviours within the workplace resulted in negative attitudes towards family and friends, personal health, and lifestyle choice adversities. One participant shared:

> *It affected my want to go to work, like I would sit by the phone and want to call in sick every day. I lost 10 pounds because I wasn't eating from the stress of going to work, which I've never experienced in my life. - Alex (Canada)*

This participant expressed the desire of absenteeism from the situation and thereby the job. This comment displayed the nature of these issues, and how far the impact can extend.

Negative effects on mental health reported by participants included depression, anxiety, stress, and burnout. One participant shared:

> *I feel like I experienced my first ever anxiety attack, something that I hadn't dealt with before in my entire adult life… I think it just puts a lot more stress on an already incredibly stressful situation. - Kelly (Canada)*

This underscores the consequences that negative behaviours in the workplace can have and how these behaviours can impact mental wellbeing.

Lastly, participants expressed difficulties in accessing support services. Some participants noted a gap in the availability of support services, specifically around a decade ago. During interviews, participants expressed a lack of knowledge about the support

services for bullying and harassment that were available when they experienced these negative behaviours around that time. One participant stated:

> *There weren't any support services when I started. There was no such thing as EAP [Employee Assistance Program], or counselling, or any of that. It was back in the day; when you would push that feeling down low and pretend it never happened. Thankfully that's changed. - Mary (Canada)*

This quote highlights the current awareness of support services available for paramedics. It suggests that around a decade ago, there was minimal awareness of support services and a lack of guidance on how to manage these issues.

Overall, the analysis of negative behaviours and their impact reveals the complexity and multi-dimensional nature of this issue. It underscores the levels of negative behaviours, including different types of behaviours and the impact of these behaviours.

Organisational Culture

During participant interviews, a recurrent theme emerged about organisational culture which was made up of power differentials, generational tensions, and normalised culture and societal norms in relation to negative behaviours. This shed light on the complex interplay of factors influencing workplace bullying and harassment amongst paramedics.

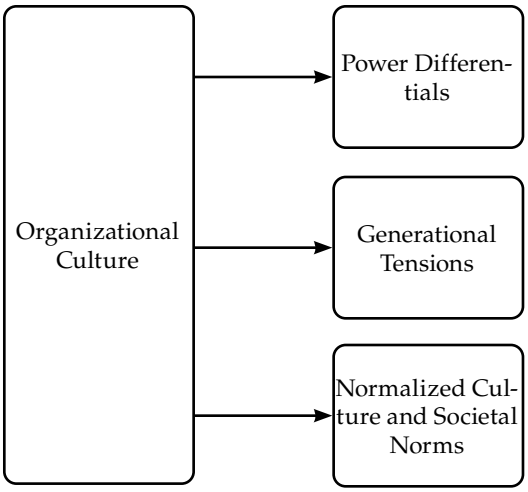

Figure 2. Organizational culture.

Power differentials were mentioned by participants as a contributing factor to negative behaviours. They underscore the significance of hierarchical power dynamics in precipitating negative behaviours. Participants recounted instances where individuals in positions of authority inappropriately exercised their power, resulting in the manifestation of bullying behaviours. Notably, some participants emphasised that it was uncommon to see negative behaviours from people hierarchically equal or below another person, with one participant mentioning:

> *There has to be an imbalance of power in order for one person to be vulnerable to another. - Mark (Australia)*

This indicated that perpetrators of negative behaviours tended to have power to negatively influence others.

In all six interviews, it was mentioned that negative behaviours in the paramedic environment were very common. It was a common sentiment amongst participants that bullying or harassment had been a prevalent experience over the course of their careers. One participant mentioned:

> *Culturally, in emergency services, there still is a fair amount of bullying that occurs even today. - Mary (Canada)*

This underscores the persistence of a culture that has normalised such behaviours.

Another participant stated:

> *My worry is that back then it was very open and in some ways, that watered it down a bit. And now, because it's not as systemic, it's gone a little bit more underground and a little bit more targeted, which I actually think can be more detrimental. - Jules (Australia)*

This participant emphasised their concern that due to existing social norms, such behaviours were still common, just less openly demonstrated, due to the pressures the perpetrator would face if the behaviour was more transparent. This highlighted generational tensions that emerged throughout interviews, shedding light on the conflicts arising from these differences in generational perspectives. Some participants mentioned a common culture of "eat your young." This was mentioned a few times in regard to why individuals may behave negatively towards newer paramedics. This culture was described as prevalent approximately a decade ago. However, participants also noted a positive shift over the years, driven by societal pressures and evolving norms with one participant stating:

> *As more people come in and the system's diluted a bit more some of the people who have been in the service for 30 to 40 years start to change how they're behaving because everybody else around them is behaving differently. - Jules (Australia)*

This demonstrates that old practices being phased out to align with current societal norms, and individuals who engaged in those practices are beginning to align with current societal norms. Individuals who engage in such actions more recently face social disapproval and rejection, contributing to a decline in the prevalence of such behaviours.

One participant mentioned:

> *You'll get some person who says something, and the young guys are looking at him going, that's not funny and that's not okay. - Mary (Canada)*

This demonstrated the social disapproval of these behaviours, and participants felt that this change had positively influenced the prevalence of such behaviours, making it less normalised. They attributed some of this positive shift to increased awareness and education, with one participant mentioning:

> *I think that as newer people come through and there is more training on bullying and dealing with those conflicts, it's being dealt with better. - Jules (Australia)*

This reflects the positive impact of heightened awareness and education on the effects of these behaviours. These changes in behaviours have addressed power differentials, generational tensions and normalised culture which have been altered to align with current societal norms.

DISCUSSION

This study investigated the relationship between negative behaviours and paramedic well-being, addressing their implications on job satisfaction, mental health, and patient care quality. The exploration spanned the evolution of negative workplace behaviours, the influence of diversity and education, and power dynamics within the paramedic profession.

Impact of Negative Behaviours

During this study, participants noted a significant effect on their well-being due to the impact of negative behaviours. The well-being of paramedics is intricately tied to their job satisfaction (Orgambídez et al., 2022), an aspect significantly affected by the prevalence of negative workplace behaviors. As evidenced by the experiences shared by participants in this study, negative workplace behaviors contributed to a complex web of challenges, amplifying the demanding nature of paramedic work. This discussion explores the multifaceted repercussions of negative behaviors on paramedics, with a focus on the enduring effects on job satisfaction, mental health, and organisational culture.

All participants in this study reported diminished job satisfaction as a result of their experience of negative workplace behaviours. Negative workplace behaviours as a key contributor to reduced job satisfaction was also documented (Khan et al., 2021). Furthermore, Al-Ali et al. (2019) stated a significant relationship between job satisfaction and both performance and job happiness. Participants in this study mentioned experiencing anxiety, depression, and burnout as additional outcomes of these behaviours. MN and El Mahalli (2020) agree that implications of low job satisfaction can extend further, manifesting as emotional burnout, heightened anxiety, and increased susceptibility to depression. This is particularly alarming in the context of healthcare, where practitioners are already predisposed to elevated levels of burnout (MN & El Mahalli, 2020).

The experience of negative behaviours at work was not isolated to immediate effects but extended to long-term consequences. Participants in this study reported contemplating absenteeism due to these behaviours. Absenteeism is common when there is a negative impact on job satisfaction (Lever et al., 2019). Additionally, participants recounted lack of confidence after experiencing negative behaviours. This confirmed findings of Ariza-Montes et al. (2014) who described negative workplace behaviours led to increased errors, decreased quality, and loss of productivity. In paramedicine, where confidence and quality of work are paramount for ensuring optimal patient safety, negative behaviours hinder these traits. Confidence is essential for effective decision-making and, if compromised, can impact the ability of paramedics to navigate high-pressure situations (Bijani et al., 2021). This not only diminishes their overall job satisfaction but also quality of care provided.

Participants in this study emphasised the demanding nature of paramedic work, characterised by traumatic events and heavy workloads, which was supported by Ariza-Montes et al. (2013) as amplifying the risk of mental health issues. Chen et al. (2022) emphasise that high-stress work, defined by factors like high job demands, low job control, and low social support, can trigger mental health issues over time. This is particularly relevant to paramedics who routinely encounter highly stressful situations in their line of duty. Tatar and Yüksel (2019) assert that negative behaviours within the workplace can lead to severe psychological harm including depression, anxiety, and post-traumatic stress disorder (PTSD). Meadley et al. (2020) highlight the multifaceted challenges faced by paramedics, including the risk of developing mental health problems, sleep disturbances, poor nutrition, and limited physical activity. Given these pre-existing complexities, negative workplace behaviours possess the potential to exacerbate these symptoms, detrimentally affecting the ability of paramedics to cope with the inherent stressors of their job. Mental health problems not only affect the well-being of paramedics but also

have a direct impact on their focus and performance (Hennekam et al., 2020). The stress induced by negative behaviours required additional effort from paramedics to adapt, leading to emotional exhaustion, decreased work satisfaction, and, ultimately, diminished performance (Khamisa et al., 2016).

The results of this study, underscore the need to address negative workplace behaviours, which significantly impact overall performance and well-being of paramedics. The study highlights the consequences of these behaviours, emphasising the heightened vulnerability of paramedics, already exposed to the demanding nature of their profession. Recognising the role of organisational culture, particularly the shared behaviours amongst paramedics.

Organisational Culture

Organisational culture plays a significant role in influencing the impact of negative behaviours on the well-being of paramedics. Participants in this study noted that when paramedics at the same station share similar mindsets, the organisational culture remains stagnant and resistant to change. This aligned with research indicating that organisational culture is a key factor in either facilitating or preventing uncivil and bullying behaviours (Carter et al., 2013).

Some participants of this study noted a growing diversity within the paramedic profession. Participants reported a positive association between increased diversity and reduced negative behaviours. Workplace environments with high diversity were linked to heightened worker engagement and greater acceptance of others (Sliter et al., 2014). As mentioned by participants, a stronger diversity minimised negative behaviours within the workplace.

Participants in this study mentioned a positive shift in organisational acceptance of negative behaviours over the years, highlighting an increase in the implementation of prevention measures for workplace bullying and harassment. They reported that this had contributed to a decrease in negative behaviours, which they felt were driven by potential consequences outlined in these prevention measures. The development and strict enforcement of anti-bullying measures emerged as crucial tools for reducing the likelihood of violence and cultivating a positive workplace culture in a study by Filipova (2018).

Moreover, the results of this study underscore the pivotal role of increased education and awareness in fostering diversity and reducing instances of negative behaviours within paramedicine. Drawing from the experiences of nurses, Skehan (2015) highlighted the benefits of education programs focused on conflict resolution and reducing negative behaviour within the workplace, noting a decrease in violence and aggression, contributing to a healthier work environment. Additionally, participants in this study mentioned experiencing negative behaviours from superiors. The impact of educational workshops showed that heightened awareness of lateral violence and improved assertive communication were associated with better working environments, reduction in turnover, and decreased incidence of lateral violence (Ceravolo et al., 2012). This demonstrates the importance of education programs in reducing negative workplace behaviours, and more particularly lateral violence.

Some participants highlighted gender as a contributing factor to negative behaviours, and others pointed out that near-equal gender ratios in paramedicine have resulted in reduced negative behaviours related to gender. Supporting these participant insights, Fink-Samnick (2016) suggests that the minority gender in a workplace is more likely to be bullied. Therefore, when equal gender ratios are achieved, it is plausible that instances of gender-related bullying become less common, aligning with participant claims in this study of evolving gender dynamics within the paramedic profession.

The theme of negative behaviours and how they impact workers is not new, but this research adds weight to the literature on this topic and relates specifically to paramedics in Canada and Australia. It provides a unique insight into their lives and the impact that bullying and harassment has on them. A positive sign is the change in organisational culture that some of these participants experienced with growing diversity in the workplace.

LIMITATIONS

This study's primary limitation is the small sample size of six participants. This limitation may affect the generalisability of findings to the broader paramedic profession and limit the diversity of experiences captured. Additionally, participants volunteered to take part in the study, introducing potential self-selection bias. These limitations underscore the importance of future research with larger, more diverse samples to enhance validity and provide a comprehensive understanding of negative workplace behaviours in paramedicine and their impact.

CONCLUSION

This research contributes to a further understanding of the impacts of workplace bullying and harassment as well as organisational culture on these issues. This research focuses specifically on the paramedic community, given the limited exploration of this emerging profession.

The research findings revealed key insights into workplace bullying and harassment among paramedics. In terms of the impact of negative behaviours, the study identifies varied behaviours across different locations, including metropolitan, regional, and rural/remote areas, with gender and stereotype disparities evident. The adverse effects of negative behaviours on job satisfaction, performance, and mental health are highlighted as crucial factors.

Exploring organisational culture, the study identifies power differentials, diversity, and generational change as influencers to workplace behaviours, underlining the importance of inclusivity and low acceptance of negative behaviours. These insights shed light on the complex dynamics that shape the work environment for paramedics.

This research not only enhances our understanding of workplace bullying and harassment but also delves into the intricate and evolving dynamics of this pervasive issue. This study illuminates the impacts of negative workplace behaviours on the participants, shedding light on their experiences.

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APPENDIX A: ETHICS APPROVAL

Dear Miss Knight,

Project title: Managing bullying and harassment in the workplace: Coping mechanisms and management strategies used by paramedics

Protocol number: H23533 (Please refer to this number in all contact or correspondence relating to this application)

Approved until: 03/05/2024

Final report due: 03/05/2024

Thank you for submitting your research proposal detailed above to the Charles Sturt University Human Research Ethics Committee.

Based on the guidelines in the National Statement on Ethical Conduct in Human Research the Committee has approved your research proposal.

You must report to the Committee at least annually, and as soon as possible in relation to the following:

- anything that might impact on the ethical acceptability of the project (including, but not limited to, adverse events, unexpected outcomes or additional information coming to light);
- amendments to the research design and/or any changes to the project (Committee approval required);
- extensions to the approval period (Committee approval required); and
- notification of project completion. If this research relates to a students thesis or dissertaiton a final report must be submitted at the point of submission for examination.

This approval constitutes ethical approval in relation to humans only. If your research involves the use of radiation, biochemical materials, chemicals or animals, separate approval is required by the appropriate University Committee.

Please contact the HREC Secretary on (02) 6933 4213 or ethics@csu.edu.au if you have any queries. Further information regarding human research ethics at CSU can be found at the HREC webpages https://research.csu.edu.au/ethics-and-compliance/human

The Committee wishes you well with your research.

Sincerely,

Presiding Officer,
Charles Sturt University Human Research Ethics Committee

APPENDIX B: CONSENT FORM

FACULTY OF SCIENCE | Nursing, Paramedicine and Healthcare Sciences

Charles Sturt University

353 Panorama Avenue
Bathurst, NSW 2795

Email: annabellaknight2003@gmail.com

CONSENT FORM

Managing bullying and harassment in the workplace: Coping mechanisms and management strategies used by paramedics

Researchers:

1. *Chief investigator – Student*
   Annabella Knight
   Bachelor of Paramedicine (Honours)
   School of Nursing, Paramedicine and Healthcare Sciences
   Charles Sturt University, Bathurst campus
   annabellaknight2003@gmail.com

2. *Primary Supervisor*
   Dr Judith Anderson
   School of Nursing, Paramedicine and Healthcare Sciences
   Charles Sturt University, Bathurst campus
   juanderson@csu.edu.au

3. *Co-Supervisor*
   Dr Graham Munro
   School of Nursing, Paramedicine and Healthcare Sciences
   Charles Sturt University, Bathurst campus
   gmunro@csu.edu.au

4. *Co-Supervisor*
   Dr Brian Sengstock
   School of Nursing, Paramedicine and Healthcare Sciences
   Charles Sturt University, Bathurst campus
   bsengstock@csu.edu.au

1. I agree to participate in the above research project and give my consent freely.
2. I understand that the project will be conducted as described in the Information Statement, a copy of which I have retained.
3. I consent to participating in a semi structured individual interview which will be audio and/or video recorded.
4. I understand that I am under no obligation to participate in this research project and that I can withdraw my participation up to two weeks post interview.
5. I understand that I may stop the interview at any time, and that unless I indicate otherwise any recordings will be erased. I also understand that I may refuse to answer any questions that I do not wish to answer.
6. I understand that the interview will take up to approximately one hour.
7. I have had the opportunity to have any questions I may have about the research answered to my satisfaction.
8. I consent that the data gained from this interview may be used in future projects.
9. I consent that other researcher may be able to cite this project if it were to be published.
10. I consent to the investigator/s contacting myself to arrange an interview and to forward a 1 page summary of the project findings upon completion of the project.
11. I understand that if I have any questions about the project, I can contact Annabella Knight via email at annabellaknight2003@gmail.com

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Charles Sturt University

353 Panorama Avenue
Bathurst, NSW 2795

Email: annabellaknight2003@gmail.com

Print Name: _____

Contact phone: _____ or Email: _____

Signature: _____ Date: _____

Please return completed consent form to Annabella Knight via email to annabellaknight2003@gmail.com

Charles Sturt University's Human Research Ethics Committee has approved this project. If you have any complaints or reservations about the ethical conduct of this project, you may contact the HREC Secretary on (02) 6933 4213 or ethics@csu.edu.au. Any issues you raise will be treated in confidence and investigated fully, and you will be informed of the outcome.

APPENDIX C: INFORMATION SHEET

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PARTICIPANT INFORMATION SHEET

Managing bullying and harassment in the workplace: Coping mechanisms and management strategies used by paramedics.

Researchers:

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   School of Nursing, Paramedicine and Healthcare Sciences
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Invitation

You are invited to participate in a research study on identifying the impacts of workplace bullying and harassment amongst paramedics and how is it managed by paramedics. The study is being conducted by Annabella Knight, a Bachelor of Paramedicine (Honours) student from the School of Nursing, Paramedicine and Healthcare Sciences at the Charles Sturt University. This study will be supervised by Dr Judith Anderson, Dr Graham Munro, and Dr Brian Sengstock.

Before participating in this study, it is important to understand why the research is being done and what it will involve. Please read the following information carefully.

Purpose of this study

V2

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The purpose of this study is to identify impacts of workplace bullying and harassment, and some strategies used by paramedics to manage it. It will explore the strategies used to manage workplace bullying and harassment by paramedics and the impacts that workplace bullying and harassment have on paramedics. The data from this study will be utilised for the Chief Investigator's honours thesis and possibly future studies such as a PhD. This study may be presented at conferences and used to assist in future research.

Why have you been invited to participate in this study?

You have been invited to participate in this study because you are an Australian/Canadian paramedic, and you are the ideal candidate for this study.

What does this study involve?

If you consent to participate in this study, you will participate in an interview with a duration of approximately one hour. This interview will take place via virtual platforms to avoid any Covid-19, environmental, or travel concerns. During this interview, you will be asked questions based on an experience you may have had or your perception of workplace bullying and harassment.

The interview will be recorded and transcribed to assist in data analysis. The interview responses will be de-identified to allow for confidentiality.

Are there risks and benefits in participating in this study?

Taking part in this study allows you to support the analysis of workplace bullying and harassment among paramedics and how it is managed.

The risk of participating in this study is that discussing your experiences may trigger distressing feelings. Participation of this study is voluntary and if you believe this could be a concern, then you may wish to not participate. If you do wish to participate, you do not have to discuss any distressing experiences unless you choose to. The researchers acknowledge that this could occur and have provided a debrief statement with relevant support services that you can access if you wish to. If you show any signs of distress whilst in the interview, support will be provided and if you would like the interview to stop, it will be ceased. If you would like to continue, then you may do so. Participants are also able to stop the interview at any time if they wish to do so.

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How is this study being funded?

There is no funding provided to support this study.

Will taking part of this study cost anything.

The interviews will be conducted over virtual platforms and will not incur any cost to you.

Can you participate then withdraw?

You may withdraw from this study and your data will be removed immediately. For this reason, data analysis will not begin until two weeks after the interview takes place. This is because once data analysis begins, the data will have been deidentified and you will no longer be able to withdraw it.

How will your confidentiality be protected?

The research team listed above will be the only people who have access to your details. These details will be secured on a password-protected computer. The data you provided in your interview will be transcribed then all your personal details and identifiable data will be deidentified. Participants will be assigned pseudonyms to ensure confidentiality is kept. If you are concerned that you may be identifiable, you do not have to share any personal information. If you have any further concerns, you may contact the above researchers for removal of any information or complete withdrawal of participation up until the point of data analysis which will be two weeks after the interview process.

If you do not withdraw, data will be stored securely as per Charles Sturt University's Research Data Management Policy. Data will be retained for at least 5 years on a secure online server. Only those listed on the research team will have access to this data for 5 years, and after this period, the data will be securely destroyed.

What should you do if you want to discuss this study further before participating.

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If you have any questions or concerns, please contact the Chief Investigator, Annabella Knight via email at annabellaknight2003@gmail.com . Additionally, you can contact any of the above researchers.

Charles Sturt University's Human Research Ethics Committee has approved this project. If you have any complaints or reservations about the ethical conduct of this project, you may contact the HREC Secretary on (02) 6933 4213 or ethics@csu.edu.au. Any issues you raise will be treated in confidence and investigated fully, and you will be informed of the outcome.

Conclusion

Thank you for considering this invitation. This information sheet is for you to keep and refer to in the future.

Disclaimer: Please do not provide specific evidence of bullying that could identify someone or an employer. Please do not mention names. Please do not provide information that could incriminate yourself in any way.

V2

APPENDIX D: DEBRIEF STATEMENT (AUSTRALIA)

FACULTY OF SCIENCE | Nursing, Paramedicine and Healthcare Sciences

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DEBRIEF STATEMENT

Managing bullying and harassment in the workplace: Coping mechanisms and management strategies used by paramedics.

Participating in this study carries the risk that distressing thoughts may arise from discussing your experiences. Although the research questions are not designed or intended to cause distress or discomfort, the researchers acknowledge that such outcomes are possible. Should the interview have provoked any distressing thoughts, please refer to this debrief sheet which contains details of available support services.

In case of questions or further information, please contact one of the members of the research team (see information sheet for contact information).

Australian support services:

- Beyond Blue
  - 1300 224 636 (24 hours, 7 days)
  - https://www.beyondblue.org.au/
- The Black Dog Institute
  - https://www.blackdoginstitute.org.au/
- MensLine Australia
  - 1300 78 99 78 (24 hours, 7 days)
  - https://mensline.org.au/
- Phoenix Australia – Centre for Posttraumatic Mental Health
  - https://www.phoenixaustralia.org/
- Head to Health
  - https://headtohealth.gov.au/
- SANE Australia
  - https://www.sane.org/
- Your local General Practitioner

If urgent support is needed, phone Mental Health Line (1800 011 511) for information on 24-hour counselling services in your area or 000 for emergency.

Charles Sturt University's Human Research Ethics Committee has approved this project. If you have any complaints or reservations about the ethical conduct of this project, you may contact the HREC Secretary on (02) 6933 4213 or ethics@csu.edu.au. Any issues you raise will be treated in confidence and investigated fully, and you will be informed of the outcome.

APPENDIX E: DEBRIEF STATEMENT (CANADA)

FACULTY OF SCIENCE | Nursing, Paramedicine and Healthcare Sciences

Charles Sturt University

353 Panorama Avenue
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Email: annabellaknight2003@gmail.com

DEBRIEF STATEMENT

Managing bullying and harassment in the workplace: Coping mechanisms and management strategies used by paramedics

Participating in this study carries the risk that distressing thoughts may arise from discussing your experiences. Although the research questions are not designed or intended to cause distress or discomfort, the researchers acknowledge that such outcomes are possible. Should the interview have provoked any distressing thoughts, please refer to this debrief sheet which contains details of available support services.

In case of questions or further information, please contact one of the members of the research team (see information sheet for other contacts).

Canadian support services:

- Mental health Helpline (24/7)
  - 1-866-531-2600
- Talk Suicide Canada (24/7)
  - 1-833-456-4566
- Hope for Wellness Help Line (24/7, for First Nations, Inuit, and Metis Peoples)
  - 1-855-242-3310 or connect to the online Hope for Wellness chat at https://www.hopeforwellness.ca
- Regional Warm Line (from 6pm to 12am, 7 nights per week)
  - 1-866-856-9276
- Wellness Together Canada
  - 1-866-585-0445 or text WELLNESS to 741741
- Call your local family physician, psychologist, mental health nurse or social worker. You may also want to contact another trusted professional such as a counsellor or spiritual leader.

If urgent support is needed, phone 24-hour Crisis Line at 1-877-841-1101 for information on 24-hour counselling services or 911 for emergency.

Charles Sturt University's Human Research Ethics Committee has approved this project. If you have any complaints or reservations about the ethical conduct of this project, you may contact the HREC Secretary on (02) 6933 4213 or ethics@csu.edu.au. Any issues you raise will be treated in confidence and investigated fully, and you will be informed of the outcome.

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RESEARCH REPORTS

VISUAL SEARCH WHILE AMBULANCE DRIVING: EFFECTS OF DRIVING CONTEXTS

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Keywords: work-related collisions, driving simulator, first responders, visual search strategies, emergency driving, intervention, emergency medical services, EMS, paramedicine

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ABSTRACT

This study aims to document the visual search of experienced ambulance drivers in different simulated driving task scenarios. The cohort consisted of 16 experienced paramedics (4 women and 12 men, aged 38 ± 8.3 years, 16 ± 9 years of experience). Each participant completed fifteen minutes of simulation driving tasks. Ten visual regions of interest and 12 driving situations, divided into three driving contexts (one non-urgent and two urgent), were selected. The findings suggested that the ambulance drivers' strategies were adaptive, assisting them in detecting potential hazards. It was observed that when the driving demands increase, experienced ambulance drivers had longer fixation times, more frequent scanning, and a greater variety of search patterns. The study also suggests that experienced ambulance drivers may employ similar visual search strategies to those used by other experienced drivers, as the literature shows. Tailored interventions should be developed to enhance this important skill.

Ambulance drivers are part of a group that can be defined as emergency vehicle drivers and are exposed to high risks of collisions due to secondary tasks such as speeding, necessary conversing, monitoring messages, violating normal driving rules under certain circumstances, and activating emergency equipment (Hsiao et al., 2018; Kun et al., 2015). An ambulance driver refers to the person who operates an ambulance, and this role is not limited to paramedics (e.g. EMT, firefighters). Ambulance drivers are also exposed to a higher risk of work-related collisions and road fatalities than the general population (Maguire et al., 2002) and other commercial or similarly sized vehicles (Delavary et al., 2023). For the past twenty years, several studies reviewed collisions involving ambulance vehicles (Custalow & Gravitz, 2004; Delavary et al., 2023; Delavaryforoutaghe & Lavallière, 2022; Maguire et al., 2002; Ray & Kupas, 2007; Sanddal et al., 2010; Watanabe et al., 2019). Unfortunately, there has been little progress in enhancing ambulance driving safety. Human factors continue to be the primary cause of ambulance collisions (e.g.

inadequate urgent driving training, lack of urgent driving experience, driver distraction) (Delavary et al., 2023). For many years, one important cause identified in the literature was the drivers' strategies of visual search (Chapman & Underwood, 1998; Crundall & Underwood, 1998; Mourant & Rockwell, 1972; Recarte & Nunes, 2003; Strayer & Johnston, 2001). It was documented that novice drivers, as well as high perception of hazards or high traffic density, and high level of cognitive workload or distraction, can lead to a reduction of visual scanning and a quicker fixation time (Chapman & Underwood, 1998; Crundall et al., 2003; Crundall & Underwood, 1998). Consequently, drivers cannot accurately detect or decode road information (e.g., interactions with other road users, road conditions, road signs) to adequately estimate collision risk (Mourant & Rockwell, 1972; Underwood, 2007). To our knowledge, no recent data is available on ambulance drivers' visual search patterns. Documenting these visual behaviors could be useful for improving ambulance driving safety through proper training interventions.

The aim of this study was to document the visual search of experienced ambulance drivers in different simulated driving task scenarios. More specifically, the visual search of the current study reported the average fixation time per region of interest (ROI) per driving situation, the average number of ROI changes per driving situation, the percentage of time spent per ROI in each situation, and the frequency of occurrence between each ROI per driving situation. It was expected that visual search would be more diverse and that horizontal scanning would be more important when approaching intersections or in areas with high traffic density compared to straight-line driving (Crundall & Underwood, 1998). It was also expected that changes would be observed when dispatchers called or when patients were being transported. Similarly to a study conducted by Crundall et al. (Crundall et al., 2003), where results showed an increase in fixation times in emergency and pursuit situations, it was expected that fixation times would be shorter and horizontal scanning would increase when patients were being transported.

METHODOLOGY

Study Design

This study employed a quasi-experimental design to evaluate visual search while experienced ambulance drivers drove an ambulance simulator through three simulated driving tasks: a non-urgent driving task and two urgent driving tasks (pre- and post-patient care intervention).

Participants

Recruitment emails were sent throughout the province of New Brunswick (Canada) with the cooperation of the Ambulance New Brunswick organization. Twenty-five paramedics volunteered for this project (n = 25). All experienced ambulance drivers recruited were paramedics. Among these paramedics, three left at the beginning of the data collection, three left after familiarization with the ambulance simulator due to simulation sickness and three were removed from the analysis due to equipment failure, resulting in data loss. Thus, a total of sixteen paramedics were considered in this study (n = 16). The cohort consisted of 4 women and 12 men, aged 38 ± 8.3 years (M ± SD), with 16 ± 9.0 years of paramedic experience. All paramedics took the day off before participating in the study to ensure they had a whole night's sleep.

Procedures

The assessment was conducted at the university's driving laboratory. Upon arrival, each participant was briefed on the data collection process, read an information letter, and signed a consent form approved by the university's research ethics board to participate in this study (approval number 1213-059). Afterward, all participants completed a demographic survey (sex, age, and years of experience). Before data collection began, participants were familiarized with the ambulance simulator through a 10-minute driving session, which allowed them to adapt to the simulated driving environment and controls. At this point, three participants prone to simulator sickness were excluded from the study (Mackrous et al., 2014).

Simulated Driving Tasks

The simulation driving tasks battery was developed in partnership with a paramedic instructor from New Brunswick ambulance services to ensure that the tasks were stressful and challenging. All participants underwent the same driving simulation. The simulation was divided into three sections. The first section was composed of 5 minutes of non-urgent driving (on a highway) followed by a second section consisting of 5 minutes of urgent driving to the location of a fictitious patient. Finally, the third section consisted of 5 minutes of urgent driving from the patient's location to the hospital. Simulated driving scenarios took place on clear days with full daylight and long-range visibility. The non-urgent driving occurred mostly on a highway with low traffic density (without potential risks of collisions). In contrast, both urgent driving scenarios were set in city environments with varying levels of traffic density, leading to an increased number of potentially conflicting situations with other road users. None of these scenarios required evasive maneuvers (e.g. hard braking, significant steering adjustments). Participants were guided through the driving simulations by a pre-recorded dispatcher's voice, which provided information along the route, whether heading to the scene or the hospital. Additionally, the dispatcher's voice delivered updates on the status of a fictitious patient. Since the call involved an unstable cardiac patient, urgent driving to the hospital (post-care) was accompanied by the added distraction and stress of a loud, irregular heartbeat noise from a cardiac monitor attached to a manikin. This protocol was fully detailed in a previous study (Tremblay et al., 2020;)

Apparatus

The driving simulations were conducted using a driving simulator (VS600M, Virage Simulation, Canada) with a virtual ambulance taking the form of a cube truck ambulance. The ambulance simulator consisted of a driver's seat, steering column, pedals, automatic transmission and a dashboard, all of which were mounted on a hydraulic three-axis motion/vibration platform that provides force feedback and vibration. Three 52' LCD displays provided a 180 front view with a 1920 X 1080-pixel resolution per display. Rear-view and side-view mirrors were simulated through these screens. It should be noted that the ambulance vehicle used in the simulation did not have a central rear-view mirror. One touchscreen (Elo Touchsystems 2700 Intellitouch USB) located to the driver's right provided additional control for the ambulance sirens. Two synchronized webcams (QuickCam Pro for notebook, Logitech, Switzerland) were installed on the driving simulator to record the 180 front view ('what the participant was seeing') and the partici-

pant's face (head, eye positions). The resolution and frequency of these video recordings were 640 X 360 pixels and 30 frames per second.

Visual Search while Driving

By analyzing the participants' head and eye positioning from the face video, it was possible to determine which regions of interest (ROI) they were focused on while watching and driving throughout the simulation (Lavallière et al., 2012). Ten ROIs were identified in the ambulance simulator. Nine ROIs were located within the driving environment of the participants (Figure 1), and one was identified as an 'indeterminate area' (IND), which was used when information was unavailable or impossible to extract.

The visual search analysis was done a posteriori. Throughout the driving scenario, 12 situations were selected and analyzed frame by frame to identify the start and end of each scenario, considering a specific distance for standardized evaluation between evaluations. Table 1 presents the 12 driving situations divided into three driving contexts (one non-urgent, two urgent ('en route', 'to the hospital')).

ANALYSIS

To report the visual search among experienced ambulance drivers in different driving situations, the current study compares:

- The average fixation time per ROI per driving situation.
- The average number of ROI changes per driving situation.
- The percentage of time spent per ROI in each situation.
- The frequency of occurrence of links between each ROI per driving situation.

Prior to conducting the inferential tests, a visual inspection of the frequency distribution histogram was performed, followed by the Shapiro-Wilk and Levene tests to evaluate normality and homogeneity of variance, respectively. This preliminary step confirmed the use of non-parametric tests throughout the analysis. Results were significant when

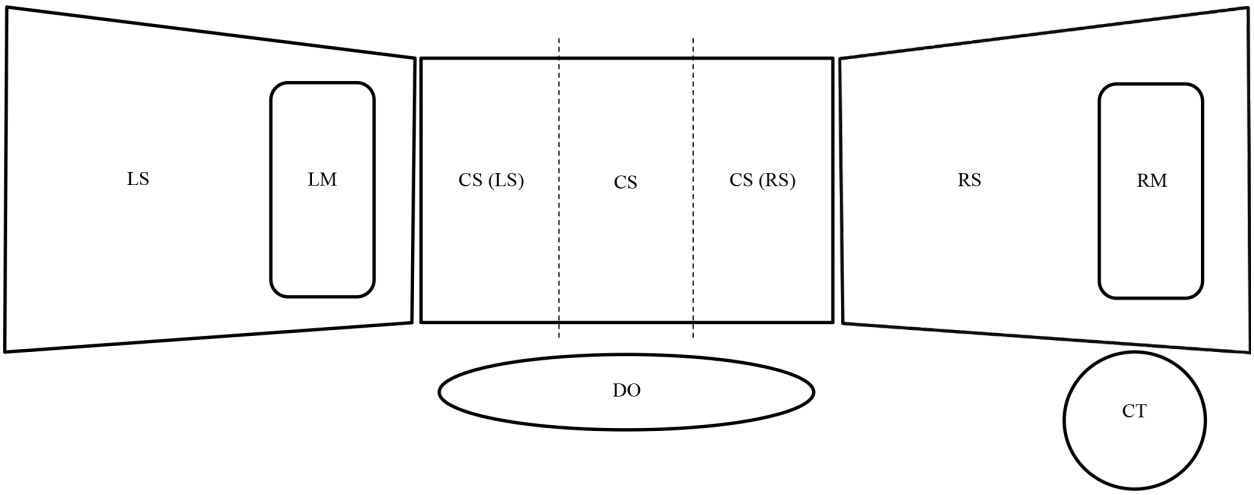

Figure 1. Scheme of the driving environment of the driving simulator divided into 9 regions of interest (ROI).

Note: LS: left screen, LM: left mirror, CS (RS): right section of central screen, CS: central screen, CS (LS): left section of central screen, RS: right screen, RM: right mirror, DO: area with the dashboard and the odometer, CT: command terminal (light and siren control).

the p was less than 0.05. Since Kruskal-Wallis tests could not be used due to missing data in some participants, this study proceeded with paired-wise Wilcoxon tests. Thus, Wilcoxon tests were performed on the first two objectives and chi-squared tests were performed on the third objective. More specifically, nine comparisons of interest were computed among the driving situations to compare similar situations as defined in Table 1:

- Straight line: 1 vs. 2, 1 vs. 8, 2 vs. 3, 2 vs. 8, 3 vs. 8.
- Pedestrian crossing: 4 vs. 12.
- Left and right turns: 5 vs. 10, 6 vs. 11.
- Red light: 7 vs. 9.

Driving situations		Context		
		Non-Urgent	Urgent	
#	Descriptions		'en route'	'to hospital'
1	Straight line without traffic	X		
2	Straight line without traffic		X	
3	Straight line with traffic		X	
4	Pedestrian crossing		X	
5	Left turn at an intersection		X	
6	Right turn at an intersection		X	
7	Red light at an intersection		X	
8	Straight line without traffic			X
9	Red light at an intersection			X
10	Left turn at an intersection			X
11	Right turn at an intersection			X
12	Pedestrian crossing			X

Table 1. Driving situations organized by context.

For the fourth objective, similarly to Olsen et al. (Olsen et al., 2005), a calculation of the occurrence frequency of the link between ROI was carried out for driving situations that were significantly different in the number of ROI changes. Missing data were due to malfunctions with video or simulator equipment; thus, some participants' video segments could not be used. The number of missing data per participant and per driving situation is provided in Appendices A1 and A2. Data were processed and computed with MS Excel version 16 and SPSS version 26.0.

RESULTS

Average Fixation Time per ROI per Driving Situation and Average Number of ROI Changes per Driving Situation

The duration of gaze on the ROI varies according to the driving situation and the driving context (see Table 2 and Appendix A for more details). There were several differences in straight-line driving situations (refer to Table 1 for a detailed description). In fact, there were three ROIs with notable differences between the straight line without traffic before (non-urgent) versus after dispatcher call ('en route') (LM, CS (LS) and DO). Also, four ROIs had notable differences between the straight line without traffic non-urgent context and the straight line without traffic 'to hospital' context (LM, CS(LS), DO and CT). Some differences were observed in gaze towards the central screen and the left side of the central screen between the two driving situations when approaching a crosswalk (CS (LS) and CS). The ROI with the most differences between driving situations were the left section of the central display. Three significant differences appear with a median fixation time value of 0.00 because the difference between them is in their third quartile (see Appendix A for more details). Table 3 shows that the average number of ROI changes per driving situation was significantly different only between the two left-turn situations and the two right-turn situations (see Appendix B for more details).

ROI	Straight Line					Pedestrian	Turns		Red Light
	1 vs 2	1 vs 8	2 vs 3	2 vs 8	3 vs 8	4 vs 12	5 vs 10	6 vs 11	7 vs 9
LS	0.00	0.00	0.00	0.00	0.00	0.00	0.31	0.00	0.00
LM	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CS (LS)	0.00	0.18	0.00	0.175	0.18	0.43	0.04	0.41	-0.28
CS	0.18	-0.66	-0.99	-0.84	0.16	0.59	-0.33	-0.13	0.04
CS (RS)	0.00	0.17	0.08	0.17	0.08	-0.16	-0.05	0.02	0.09
RS	0.00	0.00	0.00	0.00	0.00	-0.23	-0.27	-0.99	0.11
RM	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
DO	-0.48	-0.47	0.00	0.017	0.02	0.00	0.00	0.00	0.00
CT	0.00	0.24	0.00	0.24	0.24	0.00	0.00	0.00	0.00
IND	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Table 2. Median fixation time differences (in seconds) between driving situations related to ten regions of interest (ROI).

Note: Values are presented in the difference of median (in seconds). Grey shade values indicate significant differences ($p < 0.050$). CS: central screen, CS(LS): left section of central screen, CS(RS): right section of central screen, CT: command terminal (light and siren control), DO: area with the dashboard and the odometer, IND: indeterminate, LM: left mirror, LS: left screen, RM: right mirror, RS: right screen

Straight Line					Pedestrian	Turns		Red Light
1 vs 2	1 vs 8	2 vs 3	2 vs 8	3 vs 8	4 vs 12	5 vs 10	6 vs 11	7 vs 9
0	2	0	2	0	1	12	4.5	3.5

Table 3. Comparison of the average number of regions of interest (ROIs) that change per driving situation

Percentage of Time Spent per ROI per Driving Situation

The proportion of time allocated to each ROI varied according to the driving situation (Figure 2). Significant differences in these proportions were obtained in three comparisons:

1. The difference between the two pedestrian crossing driving situation:. The main differences were between the central screen and the left section of the central screen, which was viewed more in the 'to hospital' context and the right section of the central screen and the right screen, which was viewed more in 'en route' context.
2. The difference between straight-line driving situations without traffic in non-urgent context and straight-line driving situations without traffic in 'to hospital' context: The main differences were between the dashboard mainly observed in straight-line driving without traffic in non-urgent context and the right section of the central screen and the command terminal more observed in the driving section without traffic in 'to hospital' context.
3. The difference between straight-line driving situations with traffic in 'en route' context and straight-line driving situations without traffic in 'en route' context: Most of the differences were between the central screen and the dashboard, which were viewed more in straight-line driving without traffic, and the right section of the central screen, which was viewed more in straight-line driving with traffic.

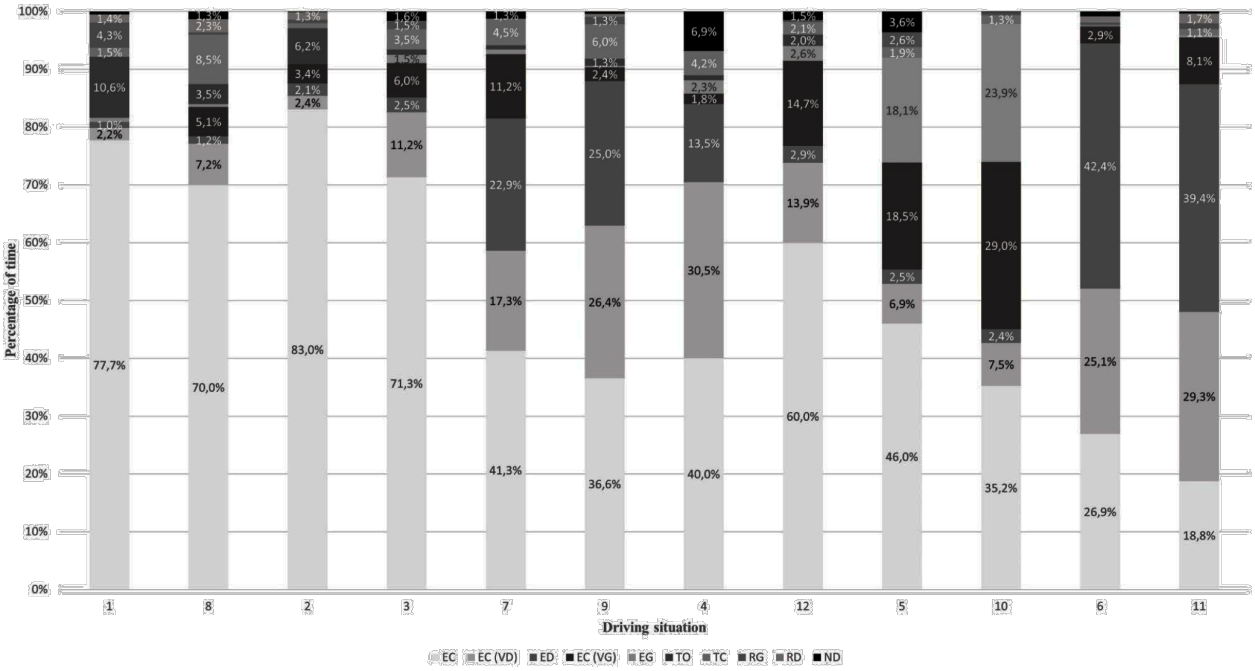

Figure 2. Percentage of time spent by ROI per driving situation.

Note: CS: central screen, CS(LS): left section of central screen, CS(RS): right section of central screen, CT: command terminal (light and siren control), DO: area with the dashboard and the odometer, IND: indeterminate, LM: left mirror, LS: left screen, RM: right mirror, RS: right screen. Values below 1% are not displayed on the figure.

Frequency of Occurrence of Links Between ROI per Driving Situation

Some links between ROI were specific to certain driving situations (see Figure 3). For example, return trips between the central and right screens were observed in both driving situations after patient recovery ('to hospital'), but not in both situations before patient recovery ('en route'). Certain links were also stronger in some contexts than in others. When comparing both left turns driving situations, we observed a link transfer when switching from driving 'en route' to driving 'to hospital' (such as the existing links between the central screen and the right screen) to new links such as the right screen to the left screen or the left screen to the dashboard. Additionally, when comparing two driving situations during a right-hand turn, it was noticed that some links present in 'en route' context disappear in favor of new links in 'to hospital' context. In both cases, the number of links increased between driving situations (three more between left turns and seven more between right turns). It is worth noting that the most significant number of links were found on the side where the driver was about to turn.

DISCUSSION

The aim of this research was to document experienced ambulance drivers' visual search in different driving situations on an ambulance simulator, and to study whether there was a difference in visual search according to work contexts (non-urgent vs. urgent). The results show that differences do exist between driving situations and that the contexts also influence visual search parameters. Overall, 13 significant differences were identified in average fixation time per region of interest across various driving situations. Nine of these differences concern straight-line driving situations. In these, fixation times

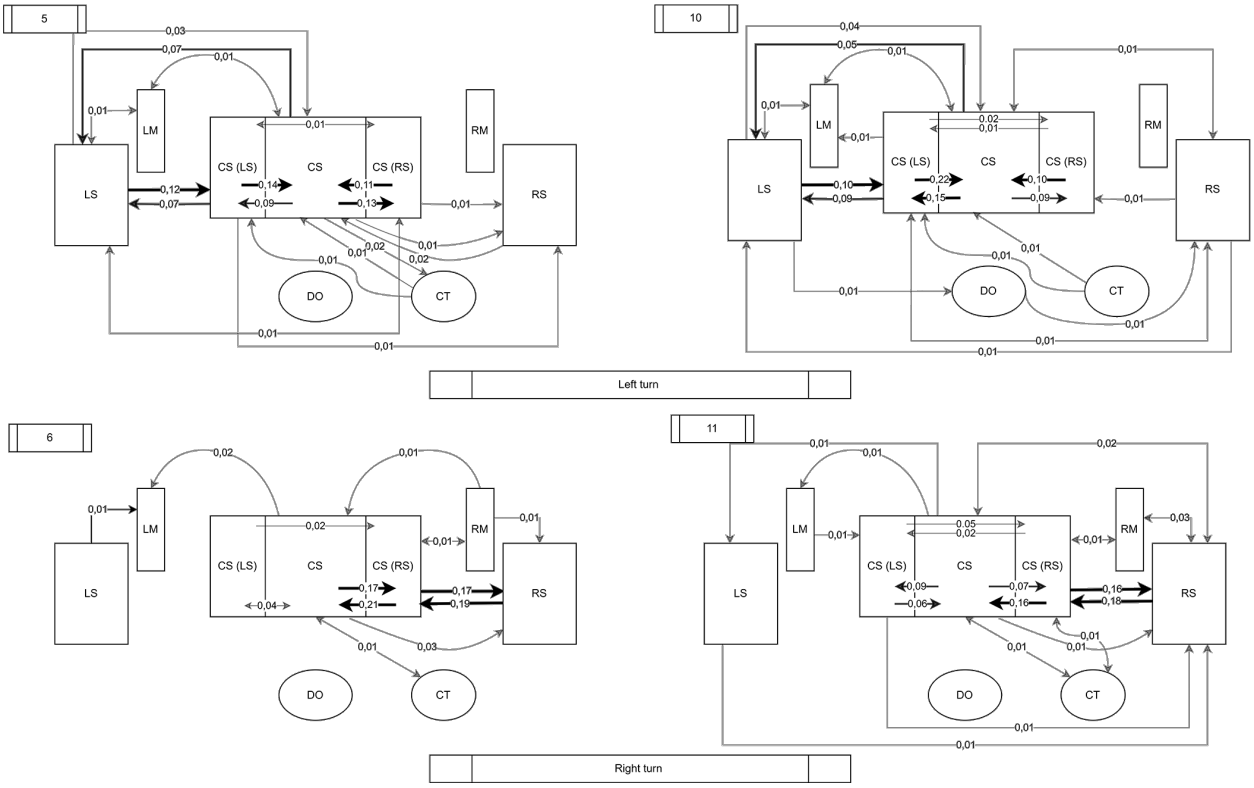

Figure 3. Frequency of linkage between ROIs as a function of driving situation.

Note. LS: left screen, LM: left mirror, CS(RS): right section of central screen, CS: central screen, CS(LS): left section of central screen, RS: right screen, RM: right mirror, DO: area with the dashboard and the odometer, CT: command terminal (light and siren control), IND: indeterminate (the link with indeterminate area doesn't appear).

decreased when the ambulance driver received the dispatcher's call ('en route') compared with before the call was received (two longer fixation times in the non-emergency situation compared to one longer fixation time in the 'en route' situation.), then increased when the ambulance drivers crossed a densely trafficked area (a longer fixation time in the presence of traffic) and remained higher when the patient had been recovered (a longer fixation time when driving 'to hospital'). Fixation times were similar for the 'en route' straight-line driving situation with traffic and the 'to hospital' straight-line driving situation without traffic. Of the five significant differences found in fixation time between situations in 'en route' and 'to hospital' contexts, three showed longer fixation times in 'to hospital' contexts. These results align with those of Crundall et al. (Crundall et al., 2003) and support our hypothesis, indicating that in emergency situations, all drivers presented longer fixation times compared to control situations (non-urgent) in an ambulance simulator. Horizontal scanning increased in 'to hospital' left- and right-turn situations compared with 'en route' situations. Indeed, an increase in the number of links and the creation of new links between ROI were also measured in these situations (Figure 3). These results also highlight that even in an urgent mode of driving.

In straight-line situations, the left-hand mirror and the dashboard/odometer were looked at the longest, in proportion of time (Figure 2), in the situation before the dispatcher is called. The right-hand mirrors and the control panel were most frequently used in the 'to hospital' context. Furthermore, the central screen was viewed at the highest percentage

in the 'en route' situation without traffic, while the right and left screens and the right and left sections of the central screen were viewed more when traffic was present. This indicates that when traffic is present, the time spent in peripheral areas increases, suggesting a search strategy with more scanning in these zones but a longer fixation time (Table 2) to detect potential hazards, as expected and demonstrated by Robinson et al. (Robinson et al., 1972). Regardless of the straight-line driving situation, the central screen zones (EC, EC (VG), and EC (VD)) remained the most viewed zones, although the percentage of time allocated to them varied.

Olsen et al. (Olsen et al., 2005) showed that in a straight-line on-road driving situation (highway context), participants mainly viewed straight ahead (85.9% of the time) and spent the remaining time scanning the area containing the odometer and dashboard (4% of the time). In comparison to this study, while the time spent viewing straight ahead (84.8% of the time) was relatively similar, the time spent scanning the odometer and dashboard in the pre-dispatcher driving situation was higher (14.9% of the time). This time difference may be explained by the fact that the ambulance drivers spent less time looking at the central screen and perhaps they had a poorer appreciation of their speed on the simulator, despite the pre-simulation adaptation period. Also, in the study by Olsen et al., the left rear-view mirror and the left window were slightly looked at, with 2.1% and 1.5% of the time spent looking at them, respectively, whereas these areas represented 7% and 1.4% of the time among ambulance drivers, respectively. The right-hand mirror and right-hand screen were scanned 2.7% and 1.9% of the time for ambulance drivers, respectively, compared with 0.24% and 0.06% of the time for the Olsen et al. (2005) study sample, respectively. Finally, this Olsen et al., showed that participants spent 4.7% of their time looking at their rear-view mirror. Compared to the current study, it can be hypothesized that the distribution of attention is different for ambulance drivers. Since they do not have a rear-view mirror, the drivers must rely on their side mirrors to stay aware of the situation behind them. This situation becomes even more complex considering the blind spots that exist in comparison to a standard-sized vehicle.

The differences in the number of ROI changes between left-turn and right-turn driving situations were significant ($p = 0.007$ and $p = 0.025$, respectively). For left-turn situations, the number of ROI changes is higher in the 'en route' context. However, the number of links between ROI is higher in the 'to hospital' driving situation (Figure 3). This rise may indicate an increase in the diversity of visual search patterns, despite the time spent on each ROI not being significantly different (Figure 2). In the case of right-turn situations, the number of changes is higher in the 'to hospital' context. In addition, after patient recovery, ambulance drivers make new links between ROI (Figure 3). In the case of left-turn situations, the links between the central screen and the control panel and between the central screen and the right-hand mirror disappear once the patient has recovered ('to hospital') (Figure 3). During left turns, ambulance drivers of the current study showed a higher percentage of time looking at the left and right sections of the screens than drivers aged 25 to 55 with at least 10 years of driving experience (Romoser et al., 2013). Indeed, they passed 39.2% of their time to watch left sections of the screen (LS, LM and EC (LS)) and 9.4% of their time to watch right sections of the screen (RS, RM and EC (RS)) comparatively to 30.5% and 7.7% Respectively for drivers in Romoser et al.'s study. This indicates that ambulance drivers had a greater scan of peripheral areas, providing them with a stronger sense of scanning hazardous areas outside their intended path of

travel than the general public. During right turns, in comparison to a study with drivers of all ages (18 to 80 years old) (Bao & Boyle, 2009) that were found to scan the left-hand section of the road was looked at for 35% of the time and the right-hand section for only 1% of the time, compared with less than 1% of the time for our ambulance drivers and over 42% of the time respectively. These differences can be explained by the fact that the two right turns are not identical. In the Bao and Boyle (2009) study, drivers turned right at a stop sign in a cross intersection, whereas in our study, ambulance drivers turned right at an intersection without a stop sign, in an intersection with only one street on the right (t-shape intersection).

Practical Implications

This study is the first of its kind to investigate visual search patterns in ambulance drivers while they are driving. Our observations indicate that experienced ambulance drivers adapt their visual search strategies in proportion to the driving demands. Among our cohort of experienced paramedics, we noted longer fixation times, more frequent visual scanning, and a greater variety of visual search patterns while driving in more demanding contexts, suggesting adaptive strategies related to the detection of potential hazards around the vehicle. The findings from our cohort are consistent with previous research, indicating that novice ambulance drivers should perform similarly to other novice drivers and can also be effectively trained. By using an ambulance simulator for training novice drivers, for instance, we ensured consistency, comparability and safety between scenarios used. Based on results from experienced drivers, it is reasonable to assume that optimal visual search patterns and strategies can be taught and practiced within a simulator.

Although the impact of the ambulance simulator on drivers remains largely unexplored, a recent study conducted in Germany found no negative training effects and some positive outcomes, particularly a reduction in speed that did not adversely affect driving times to operational sites (Prohn & Herbig, 2020). Given the cognitive load and occupational stress related to ambulance driving tasks, assessing and training in managing this cognitive load and stress could help mitigate their negative effects (Malone et al., 2024). For example, police officers who can often be compared to ambulance drivers due to stress, workloads, fatigue, and declining professional well-being (Bevan et al., 2022; Zimmerman, 2012), can undergo either standard or advanced driver training, depending on their position (Dorn, 2005). Advanced training for police officers encompasses all the elements of standard training, supplemented by practical training in high-speed driving techniques to achieve a high level of general proficiency. Additionally, advanced training places greater emphasis on hazard awareness and maintaining visual contact with the target vehicle, while sharpening observation skills to anticipate potential dangers. Advanced training for police officers enables them to make more confident decisions about speed than drivers with standard training (Dorn, 2005). Standard-trained drivers tend to overestimate their abilities and rate their chances of being involved in a collision lower than drivers with advanced training, while standard drivers are more at risk of being involved in a collision than experienced drivers (Dorn, 2005). For this reason, advanced training for experienced drivers should perhaps be extended to all emergency drivers. According to recommendations based on the needs of police forces (Tiesman & Heick, 2014), it would be beneficial to offer more regular training in the use of ambulance driving. Video or simulator-based training could already help improve ambulance drivers'

driving skills (Horswill et al., 2013). If this training were repeated over time with ambulance drivers, it would be expected to provide feedback on errors and improvements made by participants over time (Hua et al., 2016).

Future Research

Further studies are necessary to understand better the visual search and detection of road elements, particularly in comparing and documenting the peripheral vision of ambulance drivers across different situations and driving contexts. It would also be valuable to repeat these measurements with other first responders to determine if they share common visual search strategies, as well as whether these strategies are related to driving performance and safety issues. Additionally, there is an opportunity to utilize an oculometric system to lessen the workload associated with image-by-image analysis. It may be beneficial to explore potential enhancements to ambulance driving aids to improve visibility.

Study Limitations

The study involved a small sample size, and it would have been preferable to include a larger representation, particularly among a broader spectrum of driving experience (in terms of years (novice vs. experienced), as well as urban, suburban, and rural settings), as well as EMTs and firefighter drivers, to enhance the generalizability of the results. The authors exercise caution in making broad claims based on these findings, emphasizing that further research is necessary to validate these observations.

While simulations enable us to repeat and control driving conditions, it would also be beneficial to compare and confirm our results with a field study. Additionally, the simulation used was the same scenario for all participants, which introduces the possibility of bias from that protocol.

Manual extraction was conducted without validation by the oculometry system. However, this process followed the established best practices and recommendations for this type of protocol and data. The extraction was carried out meticulously by a research assistant under the supervision of experienced researchers. The authors acknowledge the potential risk of false-positive or false-negative errors occurring during this process.

CONCLUSION

The current study focused on documenting the visual search patterns of experienced ambulance drivers in relation to their work context and driving situations. The findings indicate that experienced ambulance drivers adjust their visual search strategies in response to driving demands. Specifically, when driving demand increases, drivers exhibit longer fixation times, more frequent scanning, and a greater variety of search patterns. It was suggested that these visual search strategies were adaptive and helped the driver detect potential hazards. The study also suggests that experienced ambulance drivers may use similar visual search strategies to those used by other experienced drivers, as demonstrated in the literature. These strategies can be enhanced through training, particularly by utilizing ambulance simulators that replicate urgent driving scenarios, thereby minimizing risks for ambulance drivers and other road users.

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APPENDIX A

Complementary data from average fixation time (in seconds) by driving situations related regions of interest (ROIs)

ROI	Percentile (th)	Driving Situations											
		1	2	3	4	5	6	7	8	9	10	11	12
n		16	16	14	15	15	16	16	14	14	14	14	11
Missing Value		0	0	2	1	1	0	0	2	2	2	2	5
LS	25	0.00	0.00	0.00	0.00	0.57	0.00	0.00	0.00	0.00	0.54	0.00	0.00
	50	0.00	0.00	0.00	0.00	0.74	0.00	0.00	0.00	0.00	1.05	0.00	0.00
	75	0.00	0.00	0.08	0.20	0.87	0.00	0.00	0.00	0.00	2.10	0.00	0.30
LM	25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	75	0.45	0.00	0.00	0.00	0.30	0.00	0.00	0.00	0.35	0.03	0.00	0.00
CS (LS)	25	0.00	0.00	0.00	0.00	0.35	0.00	0.18	0.00	0.00	0.39	0.15	0.21
	50	0.00	0.00	0.00	0.00	0.49	0.00	0.37	0.18	0.08	0.54	0.41	0.43
	75	0.00	0.37	0.28	0.13	0.67	0.33	0.49	0.34	0.32	0.62	0.55	1.00
CS	25	0.84	1.06	0.79	0.33	0.61	0.47	0.45	0.89	0.37	0.41	0.34	0.67
	50	1.68	1.85	0.86	0.42	0.91	0.58	0.52	1.02	0.56	0.58	0.45	1.01
	75	2.25	2.33	2.19	0.64	1.24	0.79	0.65	1.30	0.72	0.78	0.71	1.46
CS (RS)	*25*	*0.00*	*0.00*	*0.00*	*0.37*	*0.23*	*0.43*	*0.22*	*0.00*	*0.29*	*0.00*	*0.37*	*0.15*
	50	*0.00*	*0.00*	*0.08*	*0.48*	*0.30*	*0.53*	*0.33*	*0.17*	*0.42*	*0.25*	*0.55*	*0.32*
	75	*0.05*	*0.17*	*0.54*	*0.82*	*0.38*	*0.67*	*0.40*	*0.42*	*0.97*	*0.36*	*0.74*	*0.49*
RS	*25*	*0.00*	*0.00*	*0.00*	*0.22*	*0.00*	*1.15*	*0.26*	*0.00*	*0.56*	*0.00*	*0.75*	*0.00*
	50	*0.00*	*0.00*	*0.00*	*0.33*	*0.22*	*2.18*	*0.69*	*0.00*	*0.80*	*0.00*	*1.19*	*0.10*
	75	*0.00*	*0.03*	*0.07*	*0.42*	*0.50*	*2.57*	*0.88*	*0.00*	*0.99*	*0.11*	*1.52*	*0.30*
RM	*25*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
	50	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
	75	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.20*	*0.00*	*0.00*	*0.20*	*0.00*
DO	*25*	*0.10*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
	50	*0.48*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.02*	*0.00*	*0.00*	*0.00*	*0.00*
	75	*0.56*	*0.43*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.37*	*0.15*	*0.00*	*0.00*	*0.30*
CT	*25*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
	50	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.24*	*0.00*	*0.00*	*0.00*	*0.00*
	75	*0.00*	*0.00*	*0.18*	*0.00*	*0.30*	*0.00*	*0.53*	*0.65*	*0.58*	*0.00*	*0.00*	*0.00*
IND	*25*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
	50	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
	75	*0.00*	*0.00*	*0.05*	*0.17*	*0.07*	*0.00*	*0.13*	*0.03*	*0.00*	*0.00*	*0.00*	*0.10*

Note: CS: central screen, CS(LS): left section of central screen, CS(RS): right section of central screen, CT: command terminal (light and siren control), DO: area with the dashboard and the odometer, LM: left mirror, LS: left screen, RM: right mirror, RS: right screen.

APPENDIX B

Complementarity data from the average number of regions of interest changes related to regions of interest (ROIs)

Percentile (th)	Driving Situations											
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
n	16	16	14	15	15	16	16	14	14	14	14	11
Missing Value	0	0	2	1	1	0	0	2	2	2	2	5
25	3.25	3.00	4.00	7.00	13.00	7.00	9.00	4.75	*7.75*	*9.00*	*8.00*	*7.00*
50	4.50	4.50	6.50	10.00	23.00	7.00	13.00	6.50	*16.50*	*11.00*	*11.50*	*11.00*
75	7.00	6.50	8.00	12.00	25.00	10.00	18.75	9.25	*20.75*	*16.00*	*14.00*	*13.00*

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RESEARCH REPORTS

PERCEIVED BARRIERS TO PARTICIPATION IN EMERGENCY MEDICAL SERVICES RESEARCH

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ABSTRACT

Background: Research is essential to guide evidence-based practice in emergency medical services (EMS), but the barriers to performing EMS research remain poorly characterized. Therefore, this study aimed to identify barriers to EMS research participation using a survey of collegiate EMS affiliates.

Materials and Methods: The mixed methods cross-sectional survey was distributed virtually through the National Collegiate Emergency Medical Services Foundation's social media. Questions were multiple choice and free-text and asked about participants' training background, demographics, and perspectives on EMS research. Results were stratified by respondents' prior EMS research experience and compared via a Chi-Square test.

Results: Seventy responses were included. Mean age was 32±12 years. The population was predominantly male (60.9%) and white (86.8%). Educational levels and professional certifications were most commonly bachelor's degrees (56.5%) and EMT (38.6%), respectively. Thirty (43.5%) participants reported EMS research experience. Those with prior EMS involvement reported easier access to EMS research (p=0.008). Value of EMS research (p=0.56), barriers to participation (p=0.50), and resources to increase involvement (p=0.66) for EMS research were similar between groups. Open-ended responses on barriers to research revealed three themes: lack of research experience, temporal/financial limitations, and insufficient institutional support. Among those without EMS research experience, 91.2% reported interest in pursuing EMS research. In free-text responses, participants characterized current gaps in EMS research and offered solutions.

Conclusions: The most common barriers to EMS research were lack of research experience, financial/temporal difficulties, and insufficient institutional support. Understanding these barriers guides solutions such as structured research education for EMS providers, EMS research fellowships, and team-centered research approaches.

Relevant and current research is essential for the ongoing evolution and improvement of evidence-based medicine. Current and ongoing research is vital in both the prehospital and hospital settings (Djulbegovic and Guyatt, 2017). Despite a recent increase in prehospital research (Chua et al., 2021; Mausz and Cheskes, 2015), ongoing study is needed to address current limitations in narrow topic focus and common methods (Cavanagh et al., 2023). Prior studies have found data availability, regulations, funding,

and cultural barriers to contribute to difficulty in performing EMS research (Vianen et al., 2024).

With over 16 million patients transported in the prehospital setting for 911 responses annually (National Association of State EMS Officials, 2020), this relative paucity of literature in EMS affects an enormous population. The need for further EMS research is well characterized (Chua et al., 2021; Tate, 2015; Whitley et al., 2020; Jeppesen and Wiig, 2020; Lockey, 2017; Carpenter et al., 2011). A prime opportunity to expand research is through the involvement and mentorship of students and/or young professionals with interest in this field. However, there is a gap in knowledge of the barriers contributing to the lack of EMS research and involvement of interested young professionals. Improved understanding of barriers to EMS research can guide solutions aimed at increasing participation in EMS research.

Collegiate EMS providers are uniquely positioned at the intersection of academia and EMS, providing them a prime opportunity to contribute to EMS research. Collegiate EMS services provide emergency medical care at over 145 institutions throughout the country (Fisher et al., 2006). Emergency Medical Services provide clinical experience that can support college students in application to medical school and other healthcare programs, and this same motivation may drive research done by this population. Collegiate EMS-focused publications reflect the research interest of collegiate EMS affiliates (Friedman et al., 2019; Friedman et al., 2020; Friedman et al., 2022; Friedman et al., 2022; Monahan et al., 2021; Gaeta, 2020; Stefos and Nable, 2016; Jeffrey et al., 2017). Understanding barriers to further EMS research in this population will lay the groundwork for future study and interventions to improve EMS research more broadly. We hypothesized there were common barriers to performing EMS research. The aim of this study was to explore barriers to EMS research among collegiate EMS affiliates.

METHODS

A cross-sectional mixed methods survey was distributed for a one-month period in August 2022. The survey was distributed virtually through the social media platforms of the National Collegiate Emergency Medical Services Foundation, including Facebook (Menlo Park, CA) and Twitter (San Francisco, CA), with multiple groups resharing and distributing to attempt to increase responsiveness. The resulting convenience sample of participants was invited to complete a voluntary, anonymous survey coded through Qualtrics (Provo, UT).

The survey consisted of three sections: background and training, demographics, and perspectives on EMS research (Supplementary Figure 1). Participants were given unique questions based on prior EMS research involvement. Responses were excluded if participants did not consent to participation, were younger than 18, completed less than 30% of the survey, or reported no prior involvement with EMS. Question types included single-option multiple choice, multi-selection multiple choice, and free text responses.

Results were reported as n (%) for categorical variables and mean ± standard deviation for continuous variables. Perspectives on research were stratified by whether respondents had prior EMS research experience. Descriptive statistics were performed to compare groups using a Chi-Square test. All statistical analyses were performed using R statistical software version 3.6.2 (R Foundation for Statistical Computing) within RStudio

statistical software version 1.2.5033 (RStudio). All open-ended responses were reported, with modifications for grammar and brevity, and analyzed for shared themes by two authors (EL and KJ).

RESULTS

The survey received a total of 72 responses. Two responses were excluded based on the exclusion criteria, and 70 responses were included.

The demographic distributions of the study population are detailed in Table 1. The mean age of participants was 32 ± 12 years. The sample was predominantly male (60.1%), white (86.8%), and not Hispanic or Latino (90.5%). Most respondents reside in the eastern region of the United States (72.4%).

Variable	Survey Participants (n = 70)
Age	32 ± 12
Gender	
Female	27 (39.1%)
Male	42 (60.1%)
Race	
Asian	6 (8.8%)
White	59 (86.8%)
American Indian and Alaska Native	1 (1.5%)
Black	0 (0%)
Two or more races	2 (2.9%)
Ethnicity	
Hispanic or Latino	6 (9.5%)
Not Hispanic or Latino	57 (90.5%)
US Region of Residence	
East	50 (72.4%)
Midwest	11 (15.9%)
South	3 (4.3%)
West	5 (7.2%)
Continuous variables reported as mean ± standard deviation, and categorical variables reported as n (%).	

Table 1. Demographics of survey participants.

Educational background varied among participants (Table 2). Level of education ranged from some high school (1.4%) to doctorate degrees (14.5%), with a bachelor's degree as the most common (56.5%). All respondents were or had been certified at the state or national level as a healthcare provider. Sixty-four (91.4%) were currently practicing. There was a range of provider types represented, including EMT (38.6%), AEMT (7.1%), paramedic (28.6%), nurse (14.2%), nurse practitioner (2.9%), medical student (4.2%), resident physician (2.9%), and attending physician (1.4%). Mean duration of EMS involvement was 13 ± 11 years. Fifty-eight (85.3%) participants reported current or prior involvement with collegiate EMS.

Variable	Survey Participants (n = 70)
Highest level of education	
Some high school	1 (1.4%)
High school	5 (7.2%)
Trade school	3 (4.3%)
Associate's degree	3 (4.3%)
Bachelor's degree	39 (56.5%)
Master's degree	8 (11.6%)
Doctorate degree	10 (14.5%)
Highest level of training	
EMT	27 (38.6%)
AEMT	5 (7.1%)
Paramedic	20 (28.6%)
Nurse	10 (14.2%)
Nurse practitioner	2 (2.9%)
Medical student	3 (4.2%)
Resident physician	2 (2.9%)
Attending physician	1 (1.4%)
National- or state-certified healthcare provider	70 (100%)
Current healthcare provider	64 (91.4%)
Collegiate EMS involvement	58 (85.3%)
Years EMS experience	13 ± 11
Continuous variables reported as mean ± standard deviation, and categorical variables reported as n (%).	

Table 2. Educational and career background of survey participants.

Participation in EMS research was reported by 30 (43.5%) participants (Table 3). Ease of involvement in EMS research was the only EMS research perspective with significant differences between groups, with those having prior EMS research experience finding involvement easier than those without prior EMS research experience ($p = 0.008$). Those with and without prior research experience reported similar barriers to participation ($p = 0.50$) and resources that would increase involvement ($p = 0.66$) for EMS research.

Open-ended responses on barriers to participation in EMS research revealed three key themes: lack of research experience, temporal/financial barriers, and lack of institutional support (Figure 1).

Of those who participated in EMS research (Table 4), 9 (37.5%) used a state or national database and 13 (54.2%) used institutional data. Among those who answered "other", surveys and literature reviews were reported as data sources. Fourteen (58.3%) participants used data analysis software in their EMS research, including R (16.7%), SAS (12.5%), Stata (8.3%), and Python (8.3%). Participation was productive, with 18 (75.0%) reporting research output such as abstracts (20.8%), posters (12.5%), presentations (37.5%), and publications (41.7%). Career benefit of EMS research experience was equally divided, with 50.0% reporting a positive impact, and 50.0% reporting neutral or no impact. Among those without EMS research experience, 31 (91.2%) reported interest in pursuing EMS research.

Variable	Prior EMS research experience (n = 30)	No prior EMS research experience (n = 39)	P
Importance of EMS research			0.56
Very important	24 (80.0%)	26 (66.7%)	
Important	4 (13.3%)	7 (17.9%)	
Neutral	0 (0.0%)	1 (2.6%)	
Unimportant	0 (0.0%)	0 (0.0%)	
Very unimportant	2 (6.7%)	5 (12.8%)	
Ease of EMS research involvement			0.008
Very easy	1 (4.0%)	0 (0.0%)	
Easy	5 (20.0%)	0 (0.0%)	
Neutral	6 (24.0%)	8 (24.2%)	
Difficult	12 (48.0%)	14 (42.4%)	
Very difficult	1 (4.0%)	11 (33.3%)	
Barriers to EMS research			0.50
Lack of mentorship	7 (29.2%)	15 (45.5%)	
Difficulty accessing data	12 (50.0%)	15 (45.5%)	
Unaware of opportunities	14 (58.3%)	29 (87.9%)	
Lack of prior research experience	5 (20.8%)	16 (48.5%)	
Resources that would increase involvement in EMS research			0.66
Data access	15 (62.5%)	19 (59.4%)	
Data analysis support	12 (50.0%)	16 (50.0%)	
Mentorship	15 (62.5%)	27 (84.4%)	
Funding	17 (70.8%)	17 (53.1%)	
Categorical variables reported as n (%) and compared via Chi-Square test. Some questions allowed multi-selection, so percentages may sum to greater than 100%.			

Table 3. EMS research experience.

Theme 1: Lack of research experience
"No idea where to start"
"Not knowing where to look"
"Not sure where to start"
"Lack of methods education"
Theme 2: Temporal and financial barriers
"Unsure of funding resources available"
"Time restraints. I work multiple jobs to afford to live where I am"
Theme 3: Lack of institutional support
"Not in the urban core, busy but small service"
"No PI, or no instruction on how to be (or find) a PI; many EMS services do not have an IRB or the necessary relationships to "chair" the research (beyond, perhaps, the medical director)"
"Lack of EMS research unlike the multitude of nursing research"
"Lack of willingness to excel among leadership, lack of wanting to learn above what is expected"
"No opportunities available nearby"
"Lack of access to research institutions that care about EMS research"
Responses were grouped by theme in qualitative analysis.

Figure 1. Free-text responses on barriers to EMS research for survey participants.

Among the open-ended responses to general comments on EMS research (Supplementary Figure 2), participants characterized current gaps in EMS research and offered solutions, including more accessible Institutional Review Boards (IRBs), better patient follow-up, and improved connection of the EMS research community.

Variable	Survey Participants (n = 70)
Data	
National database	8 (33.3%)
State database	6 (25.0%)
Institutional data	13 (54.2%)
Other	6 (25.0%)
Software	
R	4 (16.7%)
SAS	3 (12.5%)
Stata	2 (8.3%)
Python	2 (8.3%)
Other	4 (16.7%)
None	10 (41.7%)
Outcome of research	
None	6 (25.0%)
Abstract	5 (20.8%)
Poster	3 (12.5%)
Presentation	9 (37.5%)
Publication	10 (41.7%)
Benefit to career	
Very useful	7 (29.2%)
Useful	5 (20.8%)
Neutral	7 (29.2%)
Not useful	5 (20.8%)
Very not useful	0 (0.0%)
Categorical variables reported as n (%). Some questions allowed multi-selection, so percentages may sum to greater than 100%.	

Table 4. Outcomes for survey participants with EMS research experience .

DISCUSSION

This mixed methods survey of EMS providers yielded new information about perspectives on and barriers to EMS research. The highly variable educational levels and clinical certifications of the participants provides a range of perspectives. The relatively high rate of participation in EMS research among this population, at 43.5%, reflects an increasing interest in EMS research. Even among those who had not performed EMS research, 91.2% reported interest in it. Finally, we identified key themes in the barriers to EMS research, including experience, resources, and institutional support. Together, these findings build a foundation to further EMS research participation.

Barriers to EMS research were similar between those with and without prior research experience. The most identified barrier on the multiple-choice response was being unaware of opportunities (prior EMS research experience: 58.3%, no prior EMS research experience: 87.9%). Lack of research experience was also commonly cited as a barrier, especially for those without prior EMS research experience (prior EMS research experience: 20.0%, no prior EMS research experience: 48.5%). These were reflected in four open-ended responses focused on lack of research experience. These findings align with literature from other fields, such as otolaryngology, medicine, and pharmacy, identifying research education as a key barrier to research participation (Eyigör and Kara, 2021; Nair et al., 2019; Murray et al., 2020). Structured research education programs have been characterized (Boninger et al., 2001; Ward, 2013) and demonstrated to be successful in increasing productivity (Ahmad et al., 2013). As such, design and implementation of structured research education programs in EMS may play an important role in increasing participation in EMS research.

The second theme of financial/temporal barriers continued among the multiple choice and open-ended responses. “Funding” was selected by over 50% of participants in both groups as a resource that would increase their participation in EMS research (prior EMS research experience: 70.8%, no prior EMS research experience: 53.1%), and two participants cited time and money as barriers in the free-text response. Time and funding have been well-reported to limit research participation in clinicians, agreeing with the findings of this study (Nair et al., 2019; Murray et al., 2020; AlSardi et al., 2021; Rubagumya et

al., 2019). Research fellowships specific to EMS may help address this barrier, providing both dedicated time as well as funding to perform, improve, and teach research (Cronholm et al., 2009; Carter et al., 2020; Wilson et al., 2019). These findings also demonstrate need and interest for access national databases to facilitate EMS research that can answer clinical questions.

Additionally, institutional support, such as data access and analysis, mentorship, and research resources were suggested to improve EMS research participation in both the multiple choice and free-text questions. Administrative difficulties and inefficient team communication have been described to limit research productivity (Sanjari et al., 2015; Chambers et al., 2021). Finally, the ability to navigate institutional hierarchy may also pose a challenge for those looking to gain research experience and unintentionally limit both the flow of ideas and collaboration among those without institutional ties. These resources are often accessible to providers with more training but may not be readily available for EMS providers interested in research. In this study, 85.5% of respondents did not have a doctorate degree, and multiple participants reported not having relationships with faculty involved in research, access to opportunities, or institutions with research focuses. This highlights the importance of identifying entry points to research participation for students.

LimitationsThe major limitation of our study is selection bias and convenience sampling. We suspect that people who are interested in EMS research, who find EMS research important, or who have had difficulty with getting involved were more likely to participate in the survey. We expect that our survey overestimates interest in EMS research and underestimates barriers and difficulty of involvement in research. Similarly, our survey was distributed to collegiate EMS affiliates who do not represent the broader overall population of EMS providers, as reflected by education levels and prior research experiences, which again may falsely increase apparent interest in EMS research. In addition, due to the nature of distribution through social media, it is unclear how many people viewed the survey and decided not to respond. Our study was also limited in racial and geographic diversity, which may impact the broader applicability of its findings. Finally, the small sample size may cause differences in groups to be statistically insignificant due to insufficient power and may limit conclusions that can be drawn from this study.

CONCLUSIONS

There is a shortage of EMS literature to guide evidence-based practice. This study used a mixed methods survey distributed to collegiate EMS affiliates to identify barriers to EMS research. Lack of research experience, financial and time constraints, and insufficient institutional support were identified to be the most common barriers to performing EMS research. Understanding these barriers can guide solutions such as structured research education for EMS providers, EMS research fellowships, and team-centered research approaches.

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RESEARCH REPORTS

A PHENOMENOLOGY STUDY INTO EXPERIENCES OF PARAMEDIC POSTGRADUATE INTERNS WITHIN THE IRISH NATIONAL AMBULANCE SERVICE

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ABSTRACT

Background: Transitioning from college to the workforce, paramedic postgraduate interns experience feelings of excitement but also feelings of anxiety and insecurity. These emotions come under the term transition shock, which has been identified with other healthcare professions. This study aims to explore the experiences of paramedic postgraduate interns as part of a two-person crew within the Irish National Ambulance Service.

Methods: This research employed a qualitative method using Gadamerian hermeneutics methodology. The data was collected through semi-structured interviews. Eighteen interviews were conducted between October 2022 and January 2023. Attride–Stirling's framework for thematic network analysis was used to identify themes.

Results: Three organizing themes of Emotions, Education, and Support emerged to form the overall global theme 'Experiences of the Paramedic Intern'. Participants stated that the Ambulance College prepared them well, however, education in mental health could have been better. Participants found that the college setting can be very different from the real-world complexities. There was excitement about starting their new role but also feelings of fear and worry and realization of the responsibilities the job entails. Previous life experience appears to benefit the participants in dealing with the emotional challenges of the job. Participants stated that introducing a support program may benefit new interns as they transition into the workplace for a period of time.

Conclusion: In this sample group of newly qualified paramedics, three themes of emotions, education, and support were identified from their experiences of being a postgraduate paramedic intern. Interns appeared to have mixed emotions starting their internship, highlighting that more education in managing mental health presentations may be beneficial. Also, the introduction of a clinical support system for new interns in the form of mentorship may also help ease the transition into paramedic practice.

Paramedics form an integral part of the healthcare system, providing out-of-hospital care in unpredictable and stressful environments with limited resources, and their scope of practice is continuously evolving (O'Hara et al., 2015; Perona et al., 2019). The out-of-hospital environment can be exceptionally challenging, especially for new paramedics first entering the workforce with little experience. New graduates have described the transition experience to the workforce as 'feeling out of my depth', 'nerve-racking', 'a big learning curve', and 'stressful' (Kennedy et al., 2015; Phillips et al., 2013).

BACKGROUND

Unlike many other jurisdictions, the National Ambulance Service (NAS) in the Republic of Ireland presently follows the traditional model of paramedic training, where a student paramedic's training commences with the National Ambulance Service College (NASC) in partnership with a university (University College Cork, UCC) that accredits the course. The Prehospital Emergency Care Council (PHECC) also accredits the paramedic program. PHECC is an independent statutory agency responsible for standards, education, and training in the field of prehospital emergency care in Ireland.

That is, they are employed by the ambulance service while completing their university obligations, unlike other full-time degree programs. During the first year of training, the education program comprises classroom-based learning in NASC, work-based learning in hospitals, and ambulance-based settings as a third person.

The second year of the program begins with what is classed by PHECC as a postgraduate internship (although the students are not postgraduate), facilitating a period of adaptation where the paramedic postgraduate intern enters the workforce on a relief roster where they will work as part of a two-person crew. Being on the relief roster means interns could work with a different paramedic every shift. The postgraduate internship aims to consolidate the intern's clinical knowledge and competence as a prehospital emergency care practitioner. While working, the student intern must complete reflective logs (jot forms) after each patient contact and assignments from the university. Furthermore, interns must successfully complete three on-the-road assessments to fulfil the PHECC requirements. At the end of year two of the program and completion of all PHECC requirements, the paramedic intern qualifies as a PHECC-registered paramedic. The third year of the program involves ongoing academic assignments from the university while concurrently working as a paramedic to complete their Bachelor of Science Honors degree. Currently, Paramedics in Ireland do not deliver Advanced Life Support (ALS) like in other jurisdictions. ALS is delivered by PHECC-registered Advanced Paramedics (Knox et al., 2014).

When a paramedic intern attains a licence to practice in Ireland, there is an expectation that they are ready to commence practice on the road as a qualified paramedic. Even though interns have undergone a rigorous training program, paramedic interns are novice practitioners or advanced beginners in a profession when they join the workforce (Benner, 1984; Graf et al., 2020b).

No research has been found focusing on the experiences and clinical development of paramedic postgraduate interns in Ireland. As such, this research aims to explore the experiences of paramedic postgraduate interns as they transition from college to the

workforce and identify opportunities to enhance this transition process for the benefit of patients and practitioners.

METHODS

Study Design

To meet the study's aim, an interpretive philosophy using a Gadamerian hermeneutic methodology was used to conduct this research (Gadamer, 1989). Utilizing a qualitative methodology that emphasized language and narrative for data collection allowed for a thorough exploration of the phenomena and facilitated the development of an understanding of meaning from the participant's perspective. Additionally, this methodology allowed the researcher to genuinely participate in the research process as a co-participant, as both the participant and the researcher may have individual perspectives on the phenomenon, given that the principal researcher is an experienced advanced paramedic and educator (Holloway & Galvin, 2023).

The template for semi-structured interviews was adapted from extant research examining the transition support for new graduate paramedics from a Canadian context (Huot, 2013) and the experiences of Australian and UK university students transitioning to practicing paramedics through a professional socialization pathway (Devenish, 2014; Devenish et al., 2016). An invitation was sent to Education and Competency Assurance Officers (ECAO), educational managers in Ireland's National Ambulance Service. Nine ECAOs from both NASC and the operational areas within NAS reviewed the proposed set of questions. Each participant was invited to give their views on the proposed questions relating to the subject matter. The interview guide enabled a structure and sequence to the questions posed while at the same time offering scope for development and clarification.

Reflexivity

The principal researcher has over 25 years of experience in the National Ambulance Service Ireland, including 9 years as an ECAO. The researcher has observed many new graduates entering the workforce overwhelmed and lacking confidence in their clinical skills and judgments required to provide safe and competent care. This experience in clinical practice and in the education of paramedics might prejudice some of the issues that the participants may be facing. While this background may influence the interpretation of data and questioning during interviews, the hermeneutic researcher acknowledges their biases instead of trying to eliminate them. Memos were made by the researcher throughout the research, making notes of ideas that occurred during the process of data collection (Appendix A). This process revealed underlying assumptions to the researcher, enabling the revisiting of research notes at various stages of data collection and analysis.

Participants

To be eligible for inclusion in the study, participants needed to have successfully completed their postgraduate internship year. A purposive sampling strategy was used in this study with a total of five classes invited to participate in this part of the research, consisting of 103 possible participants. These participants were emailed by their local

ECAO on behalf of the researcher. Participation in this research project was voluntary, and participants were free to withdraw at any stage.

Ethics Approval and Consent to Participate

Ethical approval was granted by University College Cork Social Research Ethics Committee (log number 2022-128).

Data Collection

The interviews were carried out between October 2022 and January 2023. The primary researcher conducted all interviews. Initially, only (n=10) participants replied and consented to participate in the research study. A further two participant requests were sought, and data collection ended when data saturation was reached. A total of 18 interviews were conducted. Where possible, interviews were conducted face-to-face (n=6), and the remaining interviews were carried out over Microsoft Teams (n=12) due to the geographical location of the participants. Before commencing the interview, written consent was obtained from each participant. Interviews lasted a mean time of 32 minutes. Interviews were audio recorded to ensure accuracy and transcribed verbatim by the primary researcher using Microsoft software and subsequently uploaded into NVivo12 to assist with data analysis.

Data Analysis

The thematic network analysis framework by Attride-Stirling was employed to analyze transcripts from the semi-structured interviews. This process involved consolidating quotations into 'codes', 'basic themes', and 'organizing themes', leading to a 'global theme' (Attride-Stirling, 2001). These were visually represented as web-like maps showing the prominent themes and their relationships (Figure 1). The primary researcher selected four transcripts and reviewed them in isolation with a co-author. Codes were generated,

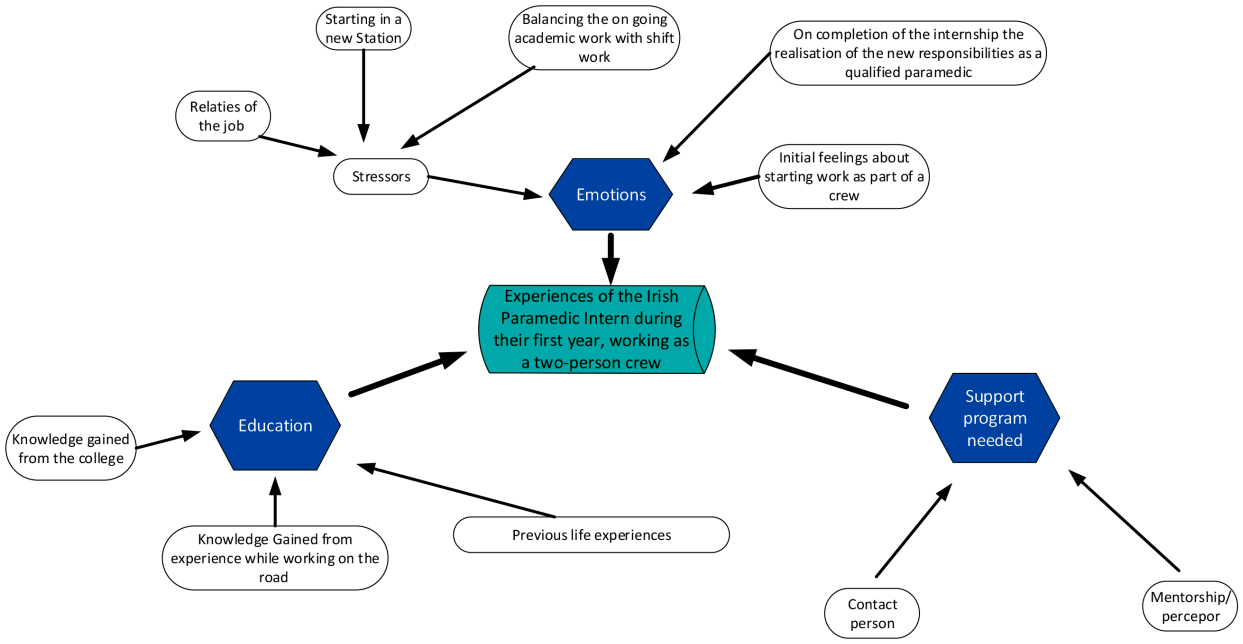

Figure 1. Emergence of the global theme: "Experiences of the Irish Paramedic Intern."

and once a consensus was reached between the primary researcher and the co-author, the remaining transcripts were coded, and data were collected.

RESULTS

Out of the 103 invitation emails, 18 participants (17.4%) were interviewed, reflecting a wide geographical area served by NAS. Most participants were men (61.1%). A total of 38.8% were already employed by NAS as Intermediate Care Operatives (ICOs) before starting the paramedic program. Their main responsibilities included inter-hospital transfers and lower acuity emergency calls. At the time of the interviews, most participants had completed their internship within the past six to nine months. Specifically, 33.3% had finished their internship in less than six months, 55.6% in less than nine months, and 11.1% had just completed the third year of the paramedic program.

Three organizing themes, emotions, education, and support, emerged to form the overall global theme of the 'Experiences of the Paramedic Intern'.

Participants are identified by participant number (e.g., P.1)

Emotions (Organizing Theme 1)

Emotions ranged from initial feelings of excitement at completing their first year of college/placements to stressors resulting from the realities of clinical practice and the ongoing academic requirements from NASC and UCC.

Initial Feelings About Starting Work as Part of a Crew (Basic Theme 1.1)

When participants completed the college phase of their training and transitioned to the workplace, there was a sense of enthusiasm and excitement experienced by the graduates as they were now eager to apply their knowledge in the practical setting. "I felt excited, you look at the board and you see your name next to a paramedic or an advanced paramedic… now you have your big boy pants on." (P.5)

Even though there was excitement about starting their postgraduate internship phase of their training, participants also acknowledged feelings of being overwhelmed, scared, and full of doubt and fear of being clinically inadequate and failing to provide appropriate care to their patients. "I suppose I was afraid [pause] I was afraid I let myself down, my family down, and ultimately do something that was detrimental to the patient, you know?" (P18)

Now that participants were about to be the second crew person (part of a two-person crewed ambulance), they expressed fear and apprehension about being on their own in the back of an ambulance as they started their clinical practice. "Will I make the right decision? Uh, am I going to do the right thing for this patient because this patient doesn't look on at the epaulettes, on my shoulders." (Interns have different colour epaulettes to qualified paramedics) (P.3)

Completion of the Internship (Basic Theme 1.2)

On the completion of their internship, participants were asked how they felt when they initially qualified as operational paramedics. A range of emotions was discussed, from excitement to pride in their achievement of having completed their internship. However,

feelings of being anxious and nervous were discussed, because there was an expectation for them to be preceptors for interns, despite still learning their roles and possibly being only slightly more experienced than their interns. "In the first week when I had them on (navy epaulettes worn by qualified paramedics) they gave me an intern. I was anxious because you are technically now responsible for everything " (P.10)

Stressors (Basic Theme 1.3)

Entering the workplace as an intern is challenging, particularly working with senior colleagues. One concern is encountering imposter syndrome, feeling both inexperienced and inadequate compared to seasoned paramedic professionals. Additionally, establishing effective communications and building relationships with colleagues was a challenging experience. "I found that stressful because I just didn't know if they trusted me? Can I trust them? Were they thinking 'What's this one like?'" [laughs]. (P11)

As the interns entered the second year of the paramedic program as operational paramedics, the adaptation to shift work was identified as challenging, especially when changing from days to nights on the roster. Additionally, trying to meet the academic requirements of NASC and the university (University College Cork, UCC) while balancing shift work and family commitments was an exigent experience. "Night shifts… they're not nice". (P5)

> *It was a stressful year because you have the workload, you have your jot forms, your UCC stuff, your portfolio to put things together and also you still have your home life … if I can put it on a scale like… zero to 10 as you say. I'll put at least a seven or eight on busyness and stress. (P10)*

When the student paramedics started the internship, the realities of the paramedic role soon became apparent. At college, their focus was on dealing with high acuity calls, such as trauma, cardiac arrest, and life-threatening scenarios. Whereas most calls they attended were to patients with a non-life-threatening, low acuity illness or injury. Due to the perception and the lack of preparation for low acuity work, participants expressed frustration, as they felt patients in these categories would benefit from an alternative pathway instead of having to go to the Emergency Department by ambulance.

> *No, I didn't think that I'd be going into a 35-year-old man that had toothache, to be honest. But those things unfortunately have happened more than once. So yeah, there has been a bit of an eye opener and some of the low acuity calls, yeah. (P12)*

Education (Organizing Theme 2)

Education was derived from basic themes of knowledge gained in college, as well as from the experience of dealing with patient contacts on the road and observing and learning from their colleagues. Participants stated their previous life experiences had helped them with resilience and communication with patients.

College (Basic Theme 2.1)

Paramedics found that the college education provided a good foundation both in knowledge and skills, to enable them to carry out the necessary patient assessment and technical skills. However, during the internship, participants identified gaps in their training. Participants highlighted that more education in the area of mental health would be of

great benefit due to the high call volume in dealing with mental health crisis or patients who have a history of mental health issues.

> *We go and we spend a lot of time on cardiovascular stuff and other acute medical stuff and we spent a lot of time on trauma, but we don't spend a lot of time on mental health stuff…. it's just unfortunate…, you know, and we're probably doing as many mental health calls as we are chest pain calls, if not more…. At 4:00 a.m., there is no other service for them. So the ambulance service has to do it and these calls can be quite harrowing. (P.9)*

Paramedic students appreciated the rigor of the training program, despite acknowledging limitations the college had about what they could teach. What was clear from the findings is the discord between the reality of practice, where participants had to deal with complex scenarios involving real patients and the emotional challenges associated with them, unlike the classroom environment. "In the college, you deal with the mannequin. It's in one spot, and it doesn't move and it doesn't cry or get upset... I think the sort of emotional aspects is very hard to replicate in college." (P.1)

On-road Learning (Basic Theme 2.2)

As the internship progressed, the participants stated that the workplace provided valuable learning opportunities, allowing interns to develop and refine their clinical judgement. Paramedic interns identified that their patient management and clinical decision-making confidence levels increased as the internship progressed. The increase in confidence can be attributed to experiencing a wide variety of caseload types. "After six months, I suppose you're kind of going out, and I've dealt with it, I've done it, I've got through a call like this before. It will be fine." (P.2)

The use of reflection after calls was acknowledged as a beneficial method of learning that identified gaps in the participants' knowledge, highlighting areas for improvement. This would often be done in the back of an ambulance outside the Emergency Department or at the station, depending on who they were rostered with. However, interns realized not every paramedic wanted to engage in debriefing activities related to cases the intern had attended. "I like being on with a crewmate that does reflect… because I think it's a learning process." (P.7)

"I suppose some people, it's just not part of their thinking (reflection). You know, they don't really talk much about calls . . . there's not really much chat". (P.9)

Life Experience (Basic Theme 2.3)

Participants who were more mature, or had previous experience in healthcare, believed their previous life experiences were invaluable to building their resilience and coping mechanisms, especially when dealing with people in stressful and highly emotional situations.

> *I don't know if I'd be able to cope with what I've seen since I come out (on the road), if I was 20 years younger . . . would I be able to do it, I don't know whether I would have been mature enough to deal with it. [sigh] (P.4)*

Support (Organizing Theme 3)

Participants unanimously identified the need for some form of support to assist with their transition to the workplace. Findings indicate the first few weeks to months were identified as the most significant period of time.

> *There is nothing there at the moment, you have not a clue. Well, I did not have a clue anyway. I think you're going to these calls and if you could just have someone that says listen… the next time you do that, maybe consider this or whatever . . ." (P.4)*

Mentorship/Preceptorship (Basic Theme 3.1)

When asked to make recommendations about what support would look like from their experiences, participants offered several suggestions, which included on-road mentors/preceptors, who would be with the intern for the first couple of weeks into their internship.

> *I would say definitely yes, there should be a little bit more support. I suppose some sort of preceptorship or something. It's good having that knowledge there to support someone through their first little bit of their career. (P.2)*

Contact Person (Basic Theme 3.2)

As an alternative to on-the-road mentors, some participants suggested a contact person who could be at the end of the phone if issues arose during patient contacts, or they could meet regularly to discuss issues that have arisen. "Having someone who would check in with you on a regular basis or someone that's at the end of the phone that you can ring." (P.18)

DISCUSSION

Transitioning from college to practice is an essential milestone in a student's educational journey. It marks the shift from acquiring knowledge in the classroom to applying it in real-world scenarios. The term "reality shock" was initially used in the literature to describe a nurse's transition from college to practice, in which an initial honeymoon phase is present where new graduates are full of enthusiasm and excitement for a brief period (Kramer, 1975). The honeymoon period of excitement is rapidly replaced by feelings of being overwhelmed, scared, and full of doubt and fear. New staff are concerned about being viewed as clinically inadequate and failing to provide appropriate care to their patients (Duchscher, 2009; Kramer et al., 2013). Similarly, new graduate paramedics in the UK and Australia described their experience of transitioning into the workforce as feeling out of their depth, nerve-racking, a large learning curve, and being "thrown in the deep end" (Devenish et al., 2016).

Workplace dynamics can significantly stress new graduates as they navigate unfamiliar social norms and unwritten rules, leading to feelings of uncertainty (Duchscher & Cowin, 2004; Kramer, 1975). This study found that interns often worried about how colleagues perceived them and fear inadvertently offending others. In contrast, ICOs, who had prior experience with NAS before the paramedic program, were less likely to feel this way, as they were more aware of workplace dynamics.

Managing shift work posed significant challenges while also attempting to fulfil the academic requirements of their course and juggling family responsibilities and other social commitments. The challenges of shift work in the research confirmed findings similar to those of the nursing literature (Duchscher, 2009).

Frustration resulting from the high volume of low-acuity calls was another important finding in this study. The high volume of low-acuity calls was referred to as an "eye-opener" (P12) and something interns did not expect in the paramedic role. The majority of their training focused on high-acuity scenarios and not the reality of practice. The high proportion of low acuity calls is not unique to the Irish EMS over the past two to three decades, many ambulance services internationally have seen an increase in low acuity calls which can also increase the frustration among paramedics in the rise of unnecessary workload (Ericsson et al., 2022; Lowthian et al., 2011; Todd et al., 2022).

When dealing with patients, even though the college provided a good foundation of education, findings highlighted a discord in classroom content compared to the realities encountered on the road. Even with simulation, preparation for highly emotional situations is not easily replicated in the classroom environment. As new paramedics transition into the workforce, much debate revolves around the topic of the theory-practice gap (Lazarsfeld-Jensen et al., 2011). It can be described as the discrepancy between theory and practice, which becomes apparent to novice practitioners as they wrestle with the reality of practically applying their theoretical knowledge to the complexity of the workplace (Kennedy et al., 2015). As a result, this can leave the new intern in a stressful environment, as they have to make many clinical decisions for patients, including clinical judgments, treatment and transport decisions. Research has shown that graduates have a sound theoretical basis of clinical practice with well-developed practical skills (Reid et al., 2019b). However, knowledge gaps in human factors, including leadership, clinical decision-making and 'putting it all together', were identified as areas of weakness (Kennedy et al., 2015; Reid et al., 2019a; Williams, 2012). Another factor in the discord between the classroom and the reality of practice is the curriculum. The paramedic transition literature refers to a hidden curriculum, which can be more powerful than the formal curriculum, especially in emphasizing high acuity case types despite these forming the minority of the paramedic workload (Devenish et al., 2016).

Of concern to participants in this research was the lack of education in mental health emergencies, as paramedics are often the first point of contact for patients experiencing a mental health emergency. This is not unique to Ireland, as Parent 2020, in a scoping review into paramedic management of mental health emergencies in Australia, documented that paramedics perceived a lack of sufficient training in dealing with mental health emergencies. (Parent et al., 2020). However, Parent's research occurred before course accreditation through the Paramedicine Board of Australia and the Australian Health Practitioners Registration Agency (AHPRA) which highlights the need for engagement with mental health stakeholders and consumer groups in curriculum development, as per the program accreditation standards and the professional capabilities for registered paramedics.

When the participants began their internship, they described their patient assessments as slow and robotic, relying on the knowledge they had acquired in college. Wyatts (2003) described the novice practitioner's clinical decision-making as rigid and uncompromis-

ing, driven mainly by established guidelines. This can lead to interventions being initiated step-wise only after gathering all the necessary information (Wyatt, 2003). It needs to be acknowledged that graduates require time to develop their level of competence before they can master the skills and expectations of a competent practitioner (Benner, 1984).

As the internship progressed, participants noted that confidence in their patient assessment skills developed after about five to six months, especially when dealing with similar patient cases. Duchscher (2008) referred to this as the transition crisis stage, where graduates begin to confidently handle tasks and take responsibility for clinical decisions (Graf et al., 2020a). This confidence arises from the knowledge gained in college and practical experience with patients, as well as observing other practitioners work, thus encouraging development process through exploration, experience, and reflection (McHaney et al., 2018).

Many participants acknowledged that after attending to a patient, they would reflect on the experience and debrief with their paramedic crewmate either in the back of the ambulance or back at the station to identify what went well and what could be improved. It was clear that it depended on the intern/paramedic relationship with some staff members not wanting to debrief and reflect on calls. Unanswered questions and poor case debriefs have been negative factors that impacted the transition of interns to the workplace. At this stage in their career of independent clinical practice, reflective practice is an important tool for clinical development (Benner, 1984; Hanna et al., 2018; Howlett, 2019; Perona et al., 2019; Sandars, 2009). A possible solution is to have a dedicated colleague serve as a preceptor who interacts closely with the intern to discuss issues surrounding calls or station-level concerns, which is an important mechanism in their development (Duchscher & Windey, 2018; Huot, 2013).

Along with the challenges of dealing with the clinical aspects of the job and the academic requirements, interns have to deal with the soft skills that encompass the profession, for example, communication with patients. All participants in this research had previous experience working in other occupations or in a previous healthcare setting, such as ICO.

Participants stated that when they joined the ambulance service, they were older and had "life experience", meaning they had more resilience with the emotions of traumatic situations or could communicate with patients in challenging situations, such as bereavement. These perceptions were also identified in a study in Australia in 2011, where paramedic graduates who did not struggle with communication and patient interaction had some previous life experience or clinical background, such as nursing, before becoming a paramedic (Lazarsfeld-Jensen et al., 2011). Those with less life experience may need to develop maturity or the capacity to cope with their patients' stressful social realities, indicating that subtle attributes such as resilience, teamwork, maturity and the ability to communicate with compassion and without prejudice are lacking (Willis et al., 2010).

Participants in this research stated that easing the transition from college to the workforce is possible by supporting new practitioners through either mentorship, preceptorship, or clinical supervision. Reid et al. compared perceptions of Australian and UK paramedics regarding graduate preparedness and noted that no matter how long students spend in clinical practice, new graduates require a period of supervised practice essential for developing clinical decision-making skills and organizational understanding (Reid et

al., 2019b). Properly introduced support can reduce staff stress and burnout, fostering resilience in complex environments (Duchscher & Windey, 2018; Duchscher, 2009). New graduates who are less supported are more likely to feel overwhelmed, scared, self-doubt, and fearful, which was amplified within the first four months of the transition period (Wakefield, 2018).

After completing their internships, participants expressed relief and excitement about becoming qualified paramedics, despite understanding the responsibilities of their new roles with limited experience. Devenish described the postformal stage of socialization, where newly qualified paramedics enter a "second honeymoon phase," which is quickly overshadowed by the challenges of being clinical leaders and mentoring new interns (Devenish et al., 2016). Therefore, mentoring education should be included in undergraduate programs, as it's not guaranteed that these skills will develop in the field (O'Brien et al., 2013).

LIMITATIONS

The differences between working in a rural and urban setting could have been explored further, which could have provided valuable insights for interns acquiring experience in the prehospital setting. This has highlighted an area for further research.

CONCLUSION

In this sample group of newly qualified paramedics, three themes—emotions, education, and support — were identified from their experiences as postgraduate paramedic interns. Interns appeared to have mixed emotions about starting their internship, highlighting that more education in managing mental health presentations may be beneficial. Additionally, the introduction of a clinical support system for new interns, such as mentorship, may also help ease the transition into paramedic practice.

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APPENDIX A

Memo

Memo (P3) "Before these interviews I was aware of the lack of education surrounding mental health emergencies, but seeing the frustration in the participant surrounding significant issue being highlighted this warrants further discovery with other participants."

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RESEARCH REPORTS

GATHERING EVIDENCE FOR MODIFYING PARAMEDIC PRACTICUM WITH SIMULATION: A PAN-CANADIAN SURVEY

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ABSTRACT

Clinical practicum placements are a cornerstone of paramedic education, yet Canadian programs consistently face challenges in securing sufficient, high-quality placements due to workforce shortages, increasing student enrolment, and logistical constraints. Simulation-based education (SBE), particularly high-quality simulation (HQS), has demonstrated effectiveness as a partial replacement for clinical time in other health professions, but its role in paramedicine remains underexplored. This study conducted a national needs analysis to assess current perceptions, gaps, and opportunities for integrating HQS into paramedic training as a supplement or replacement for practicum.

A cross-sectional survey was distributed across Canadian paramedic programs and professional networks between March and June 2025. Fifty-seven respondents representing multiple provinces and diverse professional roles completed the survey. Quantitative data were analyzed using descriptive and inferential statistics, and qualitative data were thematically analyzed.

Findings revealed that while practicum remains highly valued, significant gaps exist, including inconsistent preceptor engagement, variable case exposure, and limited opportunities to assess rare, high-acuity, low-occurrence (HALO) events. Respondents reported that simulation is already widely used (88%), though fewer institutions are implementing HQS (63%). Simulation was most valued for teaching technical skills, assessment and diagnostics, and communication. A plurality of respondents agreed that HQS could replace some practicum time, with an ideal curriculum balance approximating 50% SBE and 50% practicum. However, real patient interactions, cultural complexity, and communication under stress were consistently viewed as irreplaceable. Barriers identified included student buy-in, instructor readiness, and resource constraints.

This study provides the first pan-Canadian evidence of educator and stakeholder perspectives on using HQS to modify paramedic practicum. Results suggest that HQS has significant potential to address gaps in practicum by standardizing learning opportunities and enhancing competency development. Future research should examine targeted competencies and best practices for systematically integrating HQS as a partial practicum replacement.

INTRODUCTION

Clinical practicum placements are a cornerstone of paramedic education, providing students with essential real-world experience necessary for developing clinical competence, deci-

sion-making abilities, and professional skills (Brown et al., 2025). Paramedic students rely on these placements to become ready to enter professional practice, while educators rely on practicum to assess student competence (Batt et al., 2025; Brown et al., 2025). However, paramedic programs in Canada and globally consistently face significant challenges in securing sufficient practicum spots for students. These challenges stem from logistical constraints, limited clinical sites, and growing student enrolment, factors that can jeopardize the quality and consistency of paramedic training (Bellefontaine, 2023; National Union of Public and General Employees (NUPGE, 2023).

Simulation-based education (SBE) may be a modality that can address the clinical practicum challenge. SBE involves using diverse modalities, ranging from standardized patient encounters and high-fidelity manikin simulations to virtual and screen-based platforms to provide learning experiences that replicate the clinical environment with appropriate verisimilitude for the level of learner (Bienstock et al., 2022; Oshust et al., 2025). Evidence from multiple healthcare disciplines, particularly nursing and medicine, demonstrates that high-quality simulation (HQS) can effectively replace a substantial proportion of clinical hours without compromising student competency or patient safety (Bogossian et al., 2019). HQS is SBE that is designed and supported by evidence-based best practices and guidelines with clear educational goals, facilitated by trained instructors, to enhance learner outcomes and ensure safety in healthcare training (Hayden et al., 2014). In a landmark study in nursing, it was found that up to 50% of clinical time for nursing students can be replaced with HQS (Hayden et al., 2014). Research in other professions, from medicine to occupational therapy, has similarly found the HQS can be used to replace clinical time (Bogossian et al., 2019). Simulation may provide advantages over traditional clinical time in certain areas, such as inter- and intra-professional communication and collaboration (Bogossian et al., 2019). Based on the accumulating evidence and professional consensus, using HQS to augment, supplement, or replace portions of practicum time appears to be a potentially viable educational method worthy of exploration in paramedicine (Bridge et al., 2022).

Despite findings in other healthcare disciplines, evidence directly addressing the feasibility and effectiveness of simulation as a replacement or supplement to clinical practicum in paramedicine is limited. A recent systematic review examining available literature specifically related to paramedicine found minimal research investigating practicum replacement with simulation (Violato et al., 2025). The three existing studies found suggested receptivity among paramedic educators and students toward partial replacement of practicum time with simulation, particularly in scenarios involving high-acuity, low-frequency events and critical interpersonal or communication skills (Violato et al., 2025). It was also found that simulation is currently being used to replace some portions of practicum experience or to fulfill competencies not met during practicum (Violato et al., 2025). However, the existing research is descriptive and lacks an in-depth examination of replacing clinical hours with simulation, leaving a significant gap in the evidence. The shortage of studies indicates a need for further investigation of HQS to replace practicum time in paramedicine. To guide investigation and design studies to directly investigate the replacement of practicum time systematically, it is necessary to understand current perceptions of the concept, gather insights, and determine what aspects of paramedic practicum are most amenable to replacement.

To address this knowledge gap and assess the potential for HQS replacement, the current study was designed as a national needs analysis to gather expert input from educators and stakeholders within Canadian paramedic training programs. Specifically, the objectives of this study are to:

1. Evaluate receptivity toward engaging in the implementation of simulation-based clinical replacement.
2. Understand perceptions regarding the effectiveness of current clinical practicum experiences, including perceived strengths, weaknesses, and overall adequacy for preparing students for professional practice.
3. Explore views on the effectiveness and utility of simulation-based education for both skill development and competency assessment.
4. Identify competencies considered by educators as either appropriate or inappropriate for replacement or supplementation via SBE, thus establishing clear targets for further research.

METHODS

Study Design

This study employed a cross-sectional survey design, distributed nationally, to conduct a needs analysis, specifically a gap analysis, to assess the current perspectives and educational needs related to practicum and simulation in paramedic education. The survey was used to identify if and how simulation could be used to replace clinical time in paramedicine. The survey was constructed de-novo to address the current state of clinical practicum and SBE in paramedic programs, an ideal state for the use of SBE, and gaps in clinical practicum and SBE for training paramedics. The survey was pilot tested with input from paramedic educators and was estimated to require approximately 20 minutes for completion. The survey included a combination of ranking, closed-ended, and open-ended questions designed to gather quantitative and qualitative data on perceived educational gaps.

Competencies and aspects of practice were derived from the 2011 National Occupational Competency Profile for Paramedics (NOCP), with a 2014 addition on the use of high-fidelity simulation to supplement evaluation of specific competencies in the clinical or preceptorship performance environments (Paramedic Association of Canada, 2011, 2014). There has since been an update to the NOCP competency profile that was not available at the time of development. The prior NOCP, generally, can be mapped to the new NOCP. To provide a common conception of the constructs being addressed, definitions were provided for simulation-based education, high quality simulation, and replacing practicum with simulation (see Supplemental Materials). Ethics approval was provided by the Northern Alberta Institute of Technology Research Ethics Board (REB#: 2024-27).

Sample and Distribution

Direct and snowball sampling targeted educators and administrators in paramedic programs across Canada. A search was conducted to estimate the number of paramedic programs in Canada. Programs listed on Accreditation Canada and CourseCompare.ca were extracted and cross-referenced, producing a list of 35 paramedic programs across Canada (Accreditation Canada, n.d.; Paramedic Programs, n.d.). Respondents from as many schools as possible were targeted, aiming for a response rate of approximately 50%

(16 schools) from at least six provinces. Distribution was extended beyond schools to include Colleges of Paramedicine, professional networks, and associations, as well as direct distribution to individuals. While a minimum of 16 responses was targeted, as many respondents as possible were included; as such no upper bound on responses was set. Due to the use of snowball sampling and distribution through organizational emails, it is not possible to determine the exact distribution rate. It was expected that this sampling frame would adequately cover the range and diversity of paramedic programs in Canada and the different perceptions and experiences with simulation. The survey was administered using Qualtrics (Qualtrics, 2024). An invitation to participate, along with a link to the survey, was sent via email to potential respondents. Upon accessing the survey link, participants were first directed to an informed consent page. All participants provided informed consent. Data was collected from March to June 2025.

Data Analysis

Quantitative data were analyzed using descriptive and inferential statistics to identify patterns and trends related to using simulation to replace/augment clinical practicum. Qualitative responses were analyzed using thematic analysis to identify recurring themes and insights into the educational needs of the target population. Both data forms were synthesized to provide a comprehensive picture of the current educational landscape and potential areas where HQS can be most readily implemented.

RESULTS

Sample

Fifty-seven participants provided adequate data for inclusion in the study. The survey had an average completion rate of 77.7% (SD = 31.4%), ranging from 25% to 100%, with most incomplete items being constructed response items. Participants spent a median of 29 minutes completing the survey, indicating careless responding was not an issue.

Geographically, the majority of respondents were from Alberta (n = 24, 42.1%), followed by Ontario (n = 8, 14.0%), Manitoba and Saskatchewan (n = 6, 10.5% each), British Columbia (n = 5, 8.8%), Nova Scotia (n =4, 7.0%), New Brunswick (n = 3, 5.3%), and Quebec (n = 1, 1.8%).

An educational role related to direct instruction was reported by 82.5% (n = 47) of respondents, while 17.5% (n = 10) indicated another role in paramedic education. Other roles were categorized as regulatory and accreditation, instructional and curriculum development, leadership, and student coordination.

Thirty-nine (69.6%) participants reported currently practicing as a paramedic, while 17 (30.4%) indicated they were not currently practicing. Among current practitioners, most identified as on-road frontline paramedics (n = 20, 51.3%), with others serving in managerial, or administrative capacities (n = 11, 28.2%), supervisory roles (on road with PRU; n = 4, 10.3%), hospital-based emergency paramedics (n = 2, 5.1%), and industrial paramedics (n = 2, 5.1%). Of those not currently practicing, ten indicated previous paramedic practice, all as on-road frontline paramedics, with the last year of previous practice ranging from 2011-2023.

Respondents' primary employers were Public Post Secondary Institutions (n = 25, 43.9%), followed by a Public Health Service (n = 18, 31.6%), Private Paramedic Service (n = 4, 7.0%), Private Post Secondary Institution (n = 4, 7.0%), and other (n = 6, 10%). Other included regulatory colleges, integrated fire services, and graduate education. Fourteen respondents (24.6%) indicated currently working as preceptors. Of the 43 not currently working as preceptors, 36 (83.8%) had previously worked as a preceptor, with the last year of precepting ranging from 2005-2024.

Professions Trained

Respondents most frequently reported working at institutions that trained two (n = 20) or three (n = 15) professions, with others indicating training one (n = 11), four (n = 4), and five (n = 3) professions. Professions trained included Primary Care Paramedics (PCP, n = 49), Advanced Care Paramedics (ACP, n = 42), Emergency Medical Responders (EMR, n = 23), Critical Care Paramedics (CCP, n = 8), and Medical First Responders (MFR, n = 5).

Following a similar pattern, most respondents were involved in training PCP (n = 42), ACP (n = 29), EMR (n = 14), MFR (n = 5), and CCP (n = 3). Respondents frequently reported training multiple professions (n = 32), with twelve indicating only training PCPs.

Simulation Experience

Forty-three participants (76.8%) reported being involved in conducting simulations, with 40 (71.5%) participants involved in preparing simulations. Conducting simulations primarily involved facilitation pre/debriefing with other responses, including evaluation and assessment, and technical support. For those involved in preparing simulations, most respondents indicated being involved in simulation design and writing, followed by coordination and scheduling. Other responses included oversight and leadership, quality assurance, and review.

Current State

Practicum Experience

Participants indicated that the average number of weeks of practicum for students they instruct was 10.7 weeks (SD = 7.13, Median = 10.0, Range = 0 -25). Participants were evenly split (23/23) on whether this was an adequate number of weeks, with a mean ideal number of weeks of practicum being 15.7 weeks (SD = 7.79, Median = 15.0, Range = 2-25).

The value of practicum for teaching aspects of paramedic practice was rank-ordered (Table 1). The value of practicum for teaching various aspects of paramedic practice based on average rank was evenly distributed for most aspects of practice, with a difference of only 0.67 for the top 5. For the rank ordering of teaching and assessing different competencies, average ranks were again closely grouped, with consistent competencies comprising the top and bottom ranks across both areas.

When considering what could only be assessed during practicum and could not be assessed using HQS, Integration was most frequently indicated (n = 21), followed by Professional Responsibilities (n = 16), Transportation, Communication, Health Promotion, and Public Safety (n = 15). Assessment and Diagnostics (n = 6) and Therapeutics (n = 5), which were ranked as the competencies for which practicum was most valuable to teach

and assess, were the lowest ranked for only being able to be assessed in practicum, indicating that relative to the other competencies, these competencies may be more amenable to assessment in simulation.

Simulation Use

All participants agreed with the definitions of SBE and HQS that were provided. While 88.1% of respondents indicated that their institutions use SBE, according to the definition provided, only 62.5% thought that their institutions use HQS. Simulation-based education was estimated on average to comprise 34.2% (SD = 20, Median = 30, Range = 1-91) of the curriculum. The average amount of time spent on SBE during the program was estimated at a mean of 180 hours (SD = 185, Median = 160, Range = 0-800). The majority, 61.3%, indicated that the amount of time for SBE was inadequate, and 38.7% indicated it was adequate. No respondents thought too much time was spent on SBE. Most respondents (86.5%) indicated that if resources were not a constraint, they would increase the amount of simulation time, and 13.5% would keep the same amount of simulation time. No respondents would decrease the amount of simulation time.

The value of simulation for teaching aspects of paramedic practice showed a wider distribution of average rank than practicum, with Practicing the Technical Skills of Paramedicine being the highest ranked (Table 1). Like practicum, simulation was ranked as most effective for teaching and assessing Assessment and Diagnostics, with Transportation and Health Promotion and Public Safety being the lowest ranked (Table 2). Simulation was used for a variety of purposes within programs, with the most common being Experiential Learning and the least common being Competency Assessment, exclusive of Practicum (Table 3).

		Average Rank	Final Rank
Practicum	Practicing the communication skills of paramedicine	3.22	1
	Practicing the technical skills of paramedicine	3.72	2
	Understanding the practical day-to-day work of paramedicine	3.81	3
	Understanding expectations and requirements of paramedicine	3.89	4
	Understanding professionalism in paramedicine	3.89	4
	Practicing the interpersonal (emotional intelligence) skills of paramedicine	4.06	6
	Understanding how paramedicine operates in the healthcare system	5.42	7
Simulation	Practicing the technical skills of paramedicine	1.82	1
	Understanding expectations and requirements of paramedicine	3.24	2
	Practicing the communication skills of paramedicine	3.30	3
	Understanding the practical day-to-day work of paramedicine	4.12	4
	Understanding professionalism in paramedicine	4.79	5
	Practicing the interpersonal (emotional intelligence) skills of paramedicine	5.06	6
	Understanding how paramedicine operates in the healthcare system	5.67	7

Table 1. Value of practicum and simulation for teaching aspects of paramedic practice.

	Practicum			Simulation		
	Competency	Average Rank	Final Rank	Competency	Average Rank	Final Rank
Teaching	Assessment and Diagnostics	2.78	1	Assessment and Diagnostics	2.11	1
	Communication	3.1	2	Therapeutics	3.14	2
	Therapeutics	3.73	3	Communication	3.61	3
	Professional Responsibilities	3.88	4	Professional Responsibilities	4.39	4
	Integration	4.23	5	Health and Safety	4.56	5
	Health and Safety	5.1	6	Integration	4.58	6
	Transportation	6.15	7	Transportation	6.58	7
	Health Promotion and Public Safety	7.05	8	Health Promotion and Public Safety	7.03	8
Assessing	Assessment and Diagnostics	1.9	1	Assessment and Diagnostics	2.17	1
	Therapeutics	2.9	2	Therapeutics	2.74	2
	Communication	3.5	3	Communication	3.57	3
	Integration	4.13	4	Professional Responsibilities	4.49	4
	Professional Responsibilities	4.75	5	Integration	4.54	5
	Health and Safety	5.5	6	Health and Safety	5.03	6
	Transportation	5.75	7	Transportation	6.31	7
	Health Promotion and Public Safety	7.58	8	Health Promotion and Public Safety	7.14	8

Table 2. Effectiveness of practicum and simulation for teaching and assessing competencies.

Use of Simulation	Frequency of Responses
Experiential Learning	26
Preparation for Clinical Practicum	22
Meeting competencies not met during Practicum	21
Formative Evaluation	20
Summative Assessment	18
Competency Assessment exclusive of Practicum	18

Table 3. Uses of simulation in paramedic programs.

Ideal State

Amount of Training

A variety of perspectives emerged on the ideal balance between simulation to clinical experience in paramedicine training. The most frequently cited ratio was 1:2, followed by 1:3 and 1:1. In only three responses, simulation was dominant.

When asked the extent to which simulation could be used to develop the professional competencies required for entry to practice, respondents most frequently indicated Quite a Bit and Somewhat (n = 15, 40.5% and n = 16, 43.2%). Participants rarely used the extreme ends of the scale with Completely (n = 3), Not At All (n = 1), and A Little Bit (n = 2) infrequently used.

Respondents indicated that the ideal percentage of SBE for their program would be approximately half of curriculum time (M = 47.5, SD = 15,6, Median = 50, Range = 20-83) with the mean ideal number of SBE hours being 217 (SD = 181, Median = 235, Range = 3-500), almost 40 hours more than the estimated current mean hours of SBE time.

Replacing Practicum Time

Respondents' opinions on whether some practicum time can be replaced with HQS showed varying levels of agreement to disagreement. Fifty percent Somewhat Agreed or Agreed that simulation can replace some practicum time, while 39.5% Somewhat or Strongly Disagreed, 10.5% Neither Agreed nor Disagreed. For the professions for which HQS could most effectively replace some clinical time, responses were approximately evenly distributed across professions: EMR (16), ACP (14), PCP (13), MFR (13), CCP (10).

Gap

Practicum

A slight majority of respondents (58.6%) indicated that there are specific knowledge, skills, or attitudes (KSA) required for entry to practice that clinical practicum is unable to teach, with a broad range of KSAs indicated. Some of the most frequently noted included communication/interpersonal skills, HALO skills, professionalism, emotional intelligence, and cultural and contextual awareness (see Supplemental Table 1 for a full list of KSAs).

Of the respondents who thought there were KSAs that practicum could not teach, a majority (84.2%) thought that simulation could be used to teach some of those KSAs. Some of the most frequently noted KSAs amenable to simulation were communication and teamwork skills, decision-making, situational awareness, professionalism, and HALO events. Several responses emphasized that simulation is valuable because it removes inconsistency, particularly in exposure to rare events and for standardization of preceptor experience level (see Supplemental Table 2 for a full list of KSAs).

Aspects of practicum identified as challenges for students' learning included variable preceptor engagement, inadequate and inconsistent teaching, and a lack of exposure to different calls and "idle time." Assessment challenges included preceptors untrained or undereducated in assessment, a lack of exposure to assess rare or complex skills, and a "luck of the draw" for exposure to cases (see Supplemental Table 3).

Similar to the KSAs, the most frequent struggle for students on practicum was an inadequate opportunity to see certain cases, including HALO-type calls (e.g., intubation/ventilation, labour and delivery, MCI), followed by a lack of preceptor support/inadequate teaching by the preceptor. Conversely, repetitive and one-dimensional call exposure was also included as an issue. Stress management and face-to-face communication were also noted issues (see Supplemental Table 3).

A plurality of respondents (69.2%) thought that simulation could be a solution to many of the issues identified. The most frequent aspects of practicum that were seen to be irreplaceable with simulation were real patient interactions and rapport, communication with patients, families, or colleagues in real contexts, and exposure to emotional, cultural, and social complexity in real patient encounters (see Supplemental Table 4).

Simulation

Students struggled the most with buying into simulation, believing simulation would transfer to "real-life," and low-fidelity decreasing buy-in. Instructors struggled with cre-

ating adequate fidelity to obtain learner buy-in, troubleshooting IT issues, and familiarity with equipment, and facilitating pre-briefing and debriefing sessions. These findings highlight the challenges of technical execution affecting learner perception, emphasizing the need for alignment between the quality of simulation and student experience (see Supplemental Table 5).

The competencies most frequently selected that could never be replaced with simulation, in order, were Communication, Integration, Health Promotion and Public Safety, Assessment and Diagnosis, Therapeutics, Professional Responsibilities, Health and Safety, and Transportation. Respondents overwhelmingly emphasized that real human interaction, especially communication under pressure, cannot be replicated through simulation. Many stressed that simulated urgency lacks emotional and psychological impact, making certain kinds of judgment, empathy, and regulation impossible to fully teach outside of practicum.

When asked to list the biggest challenges that come to mind with replacing clinical time with HQS, respondents provided multiple responses with similar frequency, with the most frequent being: Lack of Real Human Interaction, Cost and Resource Constraints, Fidelity and Realism Issues, Limited Instructor Capacity, Student Engagement, and Buy-in. Least frequently noted was Inadequate Research and Benchmarking (see Supplemental Table 6).

Respondents most frequently Somewhat or Strongly Agreed (78.3%) that practicum offers learning that can not be replicated in simulation, to a lesser extent, respondents Somewhat Agreed (43.2%) or Neither Agreed nor Disagreed (27.0%) that simulation offered learning that can not be replicated in practicum. Almost half the sample (48.6%) Somewhat Agreed that some of the learning that occurs during practicum could be replaced with simulation, with only 18.9% indicating Disagreement. Correspondingly, 72.9% indicated some level of disagreement that clinical practicum alone is the only method that can adequately prepare paramedics for entry to practice, with 21.6% indicating Agreement.

In a free-response section, respondents overwhelmingly emphasized that HQS is a valuable educational tool, particularly for preparing students for rare, high-acuity scenarios and bridging classroom learning to clinical application. However, respondents opposed the idea of using simulation to replace clinical time, citing the irreplaceable value of real patient interactions, emotional complexity, and dynamic, high-pressure environments. Concerns were also raised about resource limitations, the need for realism, and instructor readiness. Overall, simulation is seen as a supplement, but not a substitute, for authentic clinical experience.

DISCUSSION

Though Alberta was most represented, responses were gathered from multiple provinces, providing a diversity of perspectives from across Canada. The professional and educational roles, as well as the professions trained, and experience in conducting SBE, indicate that the sample was appropriately positioned to respond to the survey questions. Responses to each section of the survey provide adequate information to address the study objectives:

1. There is an openness, though couched in a degree of skepticism, towards the idea that simulation could be used as a method to replace some clinical time, which is already being done, though it should not be a complete replacement.
2. Clinical practicum was perceived to be the most effective method of preparing students for professional practice, and while adequate overall, there were areas of weakness identified.
3. SBE was seen to be an effective instructional modality for skill development and competency assessment. The primary perspective was that the use of HQS should be increased.
4. Multiple aspects of practice, competencies, and KSAs were identified that can be appropriate to explore for replacement or supplementation with SBE.

Current State

Respondents believed that both the amount of time spent in practicum and SBE could be increased to improve training, though more participants thought the amount of time spent on SBE was inadequate compared to practicum. Similar rank orderings in the value of simulation and practicum for teaching and assessing the different aspects of paramedicine and competencies required were observed, though with a narrower average rank for practicum. Less dispersion in opinion for the value of practicum indicates that more value is placed on practicum for teaching and assessing each aspect and competency, while indicating where there may be greater value for simulation to be used to address current shortcomings in training. The areas where simulation was thought to be the best for teaching and assessment were technical skills, with the opportunity for repeated practice in HQS. Assessment and Diagnostics, Therapeutics, and Communication were the top three ranked competencies for both teaching and assessment in simulation and practicum. Based on the overlap, these competencies and related sub-competencies could be amenable to greater coverage through SBE, possibly for competency sign-off.

Based on reports of the uses of simulation in paramedic programs, many programs are using simulation for competency assessment, whether for meeting competencies not met during practicum or for assessment exclusive of practicum. Simulation is also being used for other forms of summative assessment, such as OSCEs, indicating that the systems and processes for high-stakes assessment in simulation exist.

Ideal State

With access to HQS, respondents believed that more simulation time should be offered, that it should make up half of the curriculum time, with nearly 50% agreement that HQS could replace some clinical time for all paramedic professions. Though there is disagreement about whether HQS could be used to replace some practicum time, and that the ideal is to maintain a greater ratio of practicum to simulation time, there is support in general for SBE and for using HQS to replace some practicum time. In an ideal state, some aspects of practicum could be replaced with simulation time.

Gaps

Several KSAs were identified that could be taught in simulation versus in practicum. The main value of simulation would be to address these KSAs in a manner that was more consistent in terms of exposure to cases and the level of proficiency of the precep-

tor overseeing the learner. The struggles students faced were reflective of the KSAs that were not addressed in practicum. Overall, respondents believed that simulation could be a solution to these challenges. Through these findings, a set of situations and skills was identified that could be explored for replacement with simulation.

Challenges existed for the use of HQS for both students and instructors, which is informative for how to improve or bolster the simulation experience if it is to be used for replacing clinical time. The challenges of buy-in for students and technical challenges for instructors reflect each other. If the challenges that instructors face, whether through better equipment or training, can be resolved buy-in for students may be increased. A major drawback of simulation identified for replacing practicum time were the affective components, particularly the stress of a real call and human interaction under pressure. With well-designed simulations in high-fidelity environments focusing on the primary relevant stressors of practice, the level of real-life stress may be approached in simulation. Overall, responses were somewhat ambivalent about what could be offered in simulation compared to practicum, though most did not agree that practicum is the only method that can adequately prepare paramedics for entry to practice. Simulation was acknowledged to offer learning that was not available in a practicum.

Implications

The findings from this study help to directly inform and guide future research as to which areas of practicum training are most amenable to simulation, and specific skills for investigation and the feasibility, efficacy, and best practices of using HQS as a clinical replacement in paramedic education. To continue to explore the use of simulation to supplement, modify, augment, or replace some amount of clinical time in paramedicine, appropriate aspects, competencies, and KSAs identified in this study can be selected for use in research that examines replacing practicum time with simulation. Technical skills, Communication Skills, Assessment and Diagnostics, and Therapeutics were areas of practice and competency identified where simulation was most useful for training and assessment. KSAs that were not effectively addressed during practicum, and that could be effectively addressed in simulation included cultural awareness, HALO events, interpersonal communication, professionalism, and respect.

Simulation could also offer a more standardized experience to ensure that learners are being exposed to a baseline level of cases and the required skills, as well as receive more consistent oversight and assessment from preceptors.

Future Directions

The findings from this study can be used to begin to focus further research on specific areas of paramedic practice and experience that can be investigated for replacement, in some form, in simulation. The identification of various aspects, competencies, and KSAs of paramedic practicum experience and practice allows for the beginning of the development of a curriculum and simulations that can be examined as a replacement for practicum time. Doing this does not imply that all, or even most, practicum time will be replaced with simulation, but rather certain competencies can be assessed through simulation, mitigating the need for the student to have the competency assessed in practicum. By obtaining competencies in simulation, it will allow the student and preceptor during practicum to focus on learning the holistic aspect of paramedic practice.

With the current constraints on available practicum time and experience, the idea of replacement may also be implemented as an augmentation to practicum time. When there are gaps or breaks between education and practicum, or breaks during practicum placements, simulation can be used to not only maintain competency but also assess competency so that students do not require repeated extensions or delays in completing their practicum. The unpredictability and challenges of pre-hospital practice have been previously identified as barriers to clinical experience during placement; the use of simulation may be one method that can help to standardize this experience (Cimino & Braun, 2023).

Limitations

There were two primary limitations to this study. 1) The sampling method leads to potential sampling bias; the convenience sampling meant that it is possible some opinions or perspectives were missed that may provide different insights to practicum and simulation. However, the narrow variance for responses, broad sampling frame, and demographic characteristics indicate a representative sample was likely obtained. 2) Though definitions were provided for the constructs addressed, it is possible that personal interpretation, primarily of replacing clinical time with high-quality simulation, may have skewed responses if respondents were interpreting replacement as a total replacement of practicum with simulation.

CONCLUSION

This needs assessment provides an understanding of the current state of practicum and simulation education for paramedics across Canada. A potential ideal state for the amount of simulation training and replacement of practicum time, and the current gaps in practicum and SBE were identified. Based on responses specific aspects of practicum can be selected for the development of further research that directly examines the replacement of some amount of practicum time with HQS.

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SUPPLEMENTAL TABLE 1

KSAs not effectively addressed during practicum.

Knowledge Area
Scope of practice (especially in hospital settings)
Job roles and professional responsibilities
Cultural awareness
Rare case knowledge (e.g., pediatrics, obstetrics, mass casualty)
Operational realities of paramedic work
How paramedicine fits in the larger healthcare system
Social/environmental determinants of health
Specific conditions in realistic patient contexts
Skill Area
Interpersonal communication (with patients, colleagues, and health teams)
High Acuity, Low Occurrence (HALO) technical skills
Tactical/non-violent crisis communication
Decision-making under stress
Situational awareness
Performing clinical procedures on real patients
Critical thinking
Death notification
Ventilation skills (e.g., using a BVM)
Working in chaotic/high-stimulus environments
Driving and transport navigation skills
Crisis management
Attitude
Emotional intelligence
Professionalism
Empathy
Resilience and adaptability
Respect (for peers, patients, organizations, public)
Emotional maturity
Patient-first mindset
Willingness to learn from real experiences
General positive personality traits

SUPPLEMENTAL TABLE 2

KSAs that could be addressed with simulation.

Knowledge Area
Cultural awareness
Social justice / hidden curriculum / bias awareness
Professional identity and role formation
Skill Area
Communication (general, team-based, and patient interaction)
Team dynamics and collaboration
Decision-making
Situational awareness
HALO (High Acuity, Low Occurrence) procedures
Tactical and respectful communication
Cricothyrotomy and advanced airway management
Integration (applying multiple skills in complex scenarios)
Stress inoculation (performing under pressure)
Attitude
Professionalism and identity development
Respect (for patients, team, system)
Readiness to learn from structured, consistent experience

SUPPLEMENTAL TABLE 3

Ineffective aspects of practicum for teaching and assessment.

Teaching Issue	Assessment Issue
Preceptor engagement varies widely (some disinterested or untrained)	Preceptors are untrained or undereducated in assessment practices
Lack of exposure to diverse or rare calls ("luck of the draw")	Inability to assess rare or complex skills due to limited exposure (e.g., obstetrics)
Wasted or idle time (e.g., offload delays, slow areas)	"Luck of the draw" limits what students are exposed to and can be assessed on
Time constraints / insufficient time in practicum	Subjectivity in assessment (e.g., communication, emotional traits)
Preceptor attitudes (e.g., mistreatment, overworked staff, poor interpersonal skills)	Skills are observed, but not adequately evaluated (checkbox-style assessments)
Lack of preceptor training or standardization	Lack of opportunity to demonstrate skills due to case variety
Low call volume or repetitive patient scenarios	Preceptors unaware or unclear about learning outcomes
Inadequate or inconsistent teaching of health & safety, legal, documentation	Inconsistency in preceptorship across placements
Checklist-driven learning (overemphasis on sign-offs)	Preceptors not hired or formally prepared for their teaching/assessment role
Lack of clarity around the term “clinical practicum” (vs. field practicum)	Wasted or idle time reduces number of observable performance events
Hospital placements (e.g., ICU, diagnostic imaging) not optimal for novice learners	Limited experience makes valid assessment of competence difficult
Driving skills not effectively taught	Personality traits or emotions difficult to measure objectively
Limited integration/teamwork opportunities due to individual performance focus	Inconsistent skill application across different call types
Simulation can deliver more consistent skill coverage than clinical practicum	Preceptor personality conflicts impacting fair assessment
Preceptor influence on learning (students mimic their preceptors)	Assessment inconsistency across sites (e.g., labor shortages, different resources)
Paramedics not adequately prepared to serve as expert clinicians/preceptors	Gender-based barriers in specific contexts (e.g., male students in L&D environments)
	Public health and health promotion not routinely assessed

SUPPLEMENTAL TABLE 4

Aspects of practicum irreplicable in simulation.

Irreplaceable Aspect
Real patient interaction and rapport
Communication with patients, families, or colleagues in real contexts
Exposure to emotional, cultural, and social complexity of real patient encounters
Interprofessional collaboration (e.g., with nurses, EMS, other providers)
Empathy, emotional regulation, and dealing with loss or death
Performing under real pressure or urgency
Working in dynamic, uncontrolled, or chaotic environments
Exposure to diverse settings (e.g., weather, base life, late-night shifts)
Fatigue management and stress regulation
Scene safety and hazard assessment
Hands-on clinical skills on real humans (e.g., IVs, airways)
Real-world integration of assessment, diagnosis, therapeutics
Performing procedures “in vivo” rather than on mannequins
Professional maturity and accountability
Experiencing consequences of real-world errors or decisions
"Job-readiness" and adaptation to the actual work environment
Exposure to mundane but essential aspects of practice (e.g., base life)

SUPPLEMENTAL TABLE 5

Instructor and student challenges with simulation.

Student		Instructor	
Challenge	**Count**	**Challenge**	**Count**
Buying into simulation	29	Creating adequate fidelity to create learner buy-in	27
Not believing that simulation will transfer to 'real-life'	21	Troubleshooting IT issues	22
Low fidelity decreasing buy-in	17	Facilitating debriefing discussions	16
Lack of instructor experience in facilitating simulation	17	Familiarity with equipment/technologies (e.g. manikins, software)	16
Pressure of simulations	13	Facilitating pre-briefing	14
Lack of experience doing simulation	10	Preference for other teaching and learning methods	13
Participating in debriefing discussions	7	Developing applicable scenarios	10
Applicability of scenarios	5	Buying into simulation	9
Team collaboration	4	Facilitating simulations	9
Other (please list)	4	Teaching team collaboration	6
		Believing that simulation will transfer to 'real-life'	6
		Other (please list)	3

SUPPLEMENTAL TABLE 6

Primary challenges to replacing clinical time with simulation.

Challenge	Frequency
Lack of Real Human Interaction	7
Cost and Resource Constraints	6
Fidelity and Realism Issues	6
Limited Instructor Capacity	5
Student Engagement and Buy-in	5
Lack of Industry and Institutional Support	4
Psychological and Situational Gaps	4
Augmentation vs. Replacement	4
Logistics and Implementation Barriers	3
Inadequate Research and Benchmarking	2

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REVIEWS

ELECTROCARDIOGRAM CHARACTERISTICS AS PROGNOSTIC INDICATORS IN PULSELESS ELECTRICAL ACTIVITY: A SYSTEMATIC REVIEW

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ABSTRACT

Background: The incidence of patients presenting with pulseless electrical activity (PEA) is increasing. Much existing research has focused upon guidance for the termination of resuscitation, rather than to identify indicators of survivability. ECG-based phenotyping of PEA may aid clinicians with prognostication during resuscitation.

Methods: Systematic literature searches for articles containing key words within the MEDLINE, EMBASE, and CINAHL Plus databases were undertaken to identify literature investigating the relationship between ECG characteristics and prognosis in PEA. Risk of bias assessments were performed for each included study.

Findings: Ten studies were identified, containing a total of 9,979 patients. A narrow QRS width was demonstrated to be associated with ROSC in four out of the seven studies investigating this component. An increased QRS amplitude was also associated with ROSC, however, this was only investigated within one study. The relationship between QRS rate and ROSC was variable. Assessing combined ECG components may offer some prognostic insight with the presence of P waves, a QRS rate < 60 and QRS width < 120 ms linked to an increased likelihood of survival. A moderate risk of bias was found within all included studies.

Conclusion: The presence of ECG component changes may assist decision-making with the ongoing resuscitation strategy for patients with PEA. Several studies had missing ECG or patient outcome data therefore were at risk of bias due to incomplete patient inclusion. Further prospective research is needed to evaluate the use of ECG components to identify subgroups of PEA with a high likelihood of survival.

INTRODUCTION

In comparison to other cardiac arrest rhythms, the incidence of patients presenting to emergency medical services with pulseless electrical activity (PEA) is increasing. An audit of 48,707 patients with out-of-hospital cardiac arrest (OHCA) by Bergstrom et al. (2018) revealed in 1990-1995 12.5% of patients presented with PEA, which increased to 15.5% between 1996-2000, 18.2% in 2001-2005, 19.8% in 2006-2010, and finally 21.6% In 2011-2016 ($p < 0.0001$). Numerous reasons for this increase have been

postulated, including increased beta-blocker and implantable cardioverter defibrillator use (Bunch et al., 2004; Youngquist et al., 2008), and the implementation of primary and secondary coronary artery disease prevention strategies decreasing incidence of ventricular fibrillation (VF) (Wang et al., 2009). Despite this, much existing research has focused upon the development of guidance for the termination of resuscitation, rather than to identify indicators of survivability (Coppola et al., 2021a).

PEA and asystole are often grouped together as "non-shockable rhythms" and consequently their treatment and associated outcomes are often reported together. There is now emerging consensus that differentiation should be made between these presentations to aid with the identification of patients with a favourable prognosis (Rabjohns et al., 2020; Elhalwagy et al., 2024). Furthermore, differentiation may also be possible in patients who present with PEA, as this represents a spectrum of underlying electrical and cardiovascular function (Elhalwagy et al., 2024). This ranges from pseudo-PEA–a low-output state with echocardiographic evidence of cardiac motion but no manually palpable pulses (Rabjohns et al., 2020), to "true PEA" with no mechanical cardiac activity (Elhalwagy et al, 2024). Point-of-care ultrasound (POCUS) is required to make a diagnosis of pseudo-PEA and is becoming frequently utilised in prehospital resuscitation. However, this is often limited to use by enhanced care resources and may not always be available in the initial stages of resuscitation. PEA differentiation through ECG-based phenotyping may provide clinicians with information to guide prognostication and decision-making during resuscitation, when other diagnostic tools are not available.

This systematic review aimed to determine and explore how ECG characteristics can serve as prognostic indicators in patients with PEA by identifying studies that examined the relationship between ECG features in PEA and clinical outcomes.

METHODS

This systematic review adheres to the Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA) guidelines (Page et al., 2021). Electronic searches for articles containing key words within the MEDLINE, EMBASE, and CINAHL Plus databases were undertaken. The search terms used are displayed in Table 1. Inclusion and exclusion criteria are displayed in Table 2. These terms were validated by ensuring articles already known to be relevant to the subject could be identified. All search results were imported into Mendeley™ reference management software. Following duplicate removal, titles and abstracts were screened to identify articles for full-text review. Articles were selected for final inclusion following full-text review. A full-text review of all selected articles was undertaken by one reviewer to determine articles for final inclusion. Instances of unclear eligibility were discussed with the second reviewer. When consensus on inclusion could not be established, a third reviewer was available to decide on inclusion. The flow chart in Figure 1 provides a schematic of the screening process. The findings of articles selected for final inclusion were subjected to thematic analysis and discussed within a narrative synthesis

Data Items

The following data items were collected from articles that were selected for final inclusion: study type, number of participants, ECG components assessed, outcome data.

Search	Terms
S1	'pulseless electrical activity' OR PEA OR 'electromechanical dissociation'OR EMD
S2	tachy* OR brady* OR rate OR complex* OR wide OR narrow OR QRS OR 'p wave' OR 't wave' OR activity OR ECG OR EKG OR electrocard*
S3	'ECG characteristics OR components
S4	'narrow QRS' OR 'narrow complex' OR 'wide QRS' OR 'wide complex'
S5	prognos* OR outcome OR surviv* OR mortality OR death OR ROSC OR 'return of spontaneous circulation'
S6	S5 AND S1
S7	S6 AND S2 AND S3 OR S4
S8	S6 AND S2 OR S3 OR S4

Table 1. Search strategy.

Included	Excluded
Case series, observational studies, randomised controlled trials, empirical research	Single-patient case reports
Adult patients	Neonatal or paediatric patients
English language	Animal studies
Within peer-reviewed journals	Use of non-standard ECG components
Published since 1 January 2014	Use of electrical or mechanical cardiac support during resuscitation
Describing ECG characteristics recorded during PEA cardiac arrest	Investigating the effects of medications
	Grey literature

Table 2. Inclusion and exclusion criteria.

ECG Component Normal Values

The following definitions were used: Normal heart rate (60-100 bpm), QRS duration (80-120 ms), PR interval (120-200 ms), QRS amplitude (3.0 mV), QTc interval (<500 ms).

Risk of Bias Assessment

The risk of bias of these studies was evaluated with the use of the relevant JBI risk of bias assessment tool for the study methodology (https://jbi.global/).

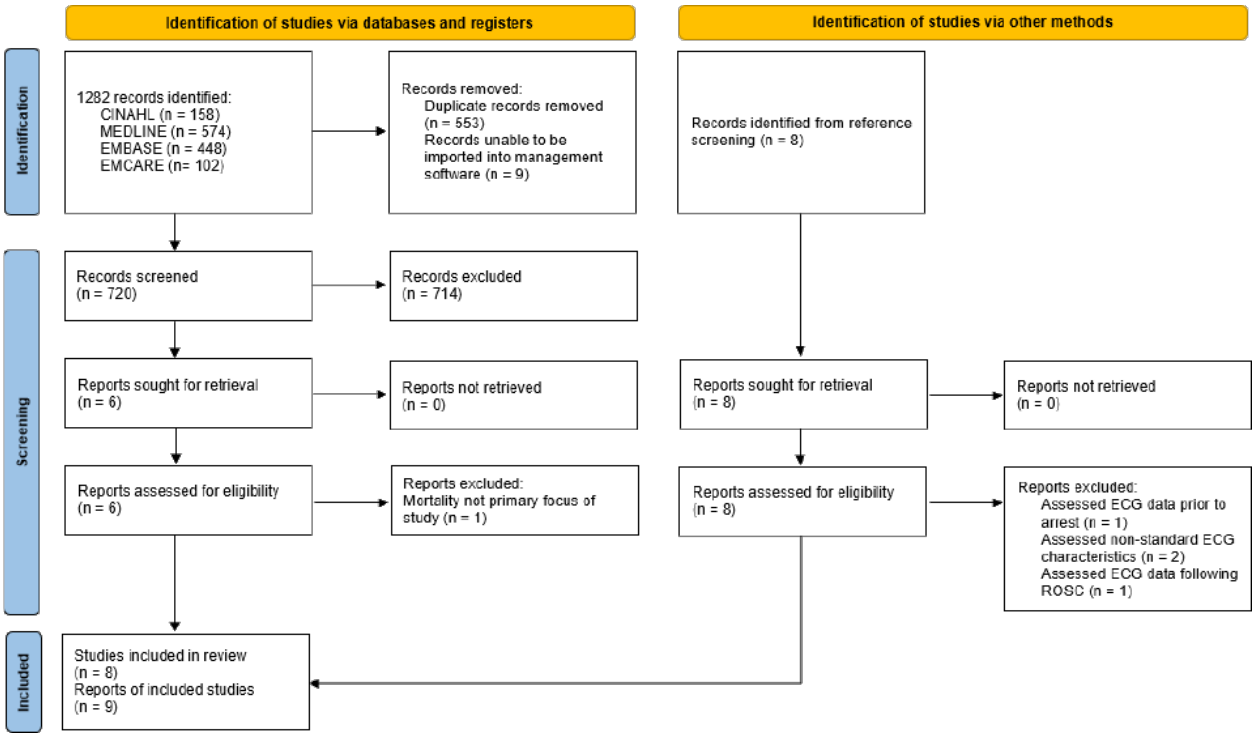

Figure 1: PRISMA flowchart.

Study	Study Type	Period	Sample Size	Setting	Age	% Female
Hauck et al. (2015)	Case series	2010 - 2013	262	OHCA	67 (mean)	48%
Bergum et al. (2016)	Case series	2009 - 2013	51	IHCA	75 (median [IQR 65–82])	43%
Ho et al. (2016)	Case series	2007- 2009	332	OHCA	71.8 (mean)	41.6%
Skjeflo et al. (2018)	Case series	2009 - 2012	74	IHCA	ROSC 65, No ROSC 78 (median)	24%
Weiser et al. (2018)	Case series	2013 - 2015	504	OHCA	70 ± 16 (mean ± SD)	45%
Nguyen et al. (2020)	Cohort study	2013 - 2017	176	IHCA	60 (mean)	30%
Kim et al. (2020)	Case series	2016 - 2018	576	OHCA	73 (median [IQR 61–81])	42%
Cournoyer et al. (2022)	Cohort study	2011 - 2015	7089	OHCA	70.7 (mean)	39.5%
Norvik et al. (2023)	Case series	2008 - 2021	298	IHCA	68 (median [IQR 57–78])	44%
IHCA = in-hospital cardiac arrest, OHCA = out-of-hospital cardiac arrest, SD = standard deviation, IQR = interquartile range, ROSC = return of spontaneous circulation						

Table 3. Study demographic details.

RESULTS

Study Characteristics

Application of the electronic database search strategy yielded a total of 1282 records. MEDLINE produced 574 results, EMCARE produced 102, and CINAHL Plus and EMBASE produced 158 and 448 results, respectively. After importing and duplicate screening using RefWorks™ (ProQuest, 2023), a total of 720 records were available for title and abstract screening. 714 records were removed via title and abstract screening. After obtaining the full texts of all articles, five were selected for final inclusion. One was excluded as mortality was not the primary focus of the study. Manual reference screening identified 8 additional articles, with four removed following full-text review. A total of nine reports from eight studies, comprising seven case series and two cohort studies, were identified. Study demographic details are displayed within Table 3. Two were cohort studies with comparator groups; Nguyen et al. (2020) compared patients with bradycardic and non-bradycardic PEA, and Cournoyer et al. (2022) compared the outcomes of patients with PEA and shockable rhythms. Bergum et al. (2016), Skjeflo et al. (2018) and Norvik et al. (2023) all reported on patients from the St. Olav's University Hospital cardiac arrest database. Five studies contained data on patients with out-of-hospital cardiac arrest, and four used data from inpatient cardiac arrest.

Risk of Bias

Overall, the risk of bias within all included studies was moderate. A detailed summary of their assessments is included within Appendix A and B. All but one study was unable to demonstrate complete inclusion of eligible patients due to missing data, and several were unable to clearly evidence consecutive inclusion of patients. The cohort study by Cournoyer et al. (2022) was the only study found to be at low risk of bias.

Synthesis

QRS Rate

The rate of QRS complexes was the most frequently evaluated ECG component of PEA, with nine reports assessing this (see Table 5). Four studies provided the QRS complex rates of survivors and non-survivors, and the remaining studies grouped results by variable intervals. The largest study identified was undertaken by Cournoyer et al. (2022),

Reference	Study aims (outcomes assessed)	Results/Findings	Study Strengths	Study Weaknesses
Hauck et al. (2015)	To determine if rate or QRS width correlated with outcome (STD with CPC 1 or 2)	• No statistically significant difference in HR or QRS width of survivors vs non-survivors	• Utilised a method that can be applied in the pre-hospital setting	• Retrospective. • 152 patients in initial database excluded due to missing data. • QRS >200 ms excluded. • Small total no. of survivors.
Bergum et al. (2016)	To evaluate the association between early ECG patterns and survival (ROSC, 1-hour survival, STD)	• No unique ECG patterns were associated with survival	• Prospective	• Single centre. • Small sample size.
Ho et al. (2016)	To assess the prognostic value of initial ECG characteristics (ROSC at admission, STD)	• No correlation found between ECG characteristics and survival	• Multi-centre. • Prospective enrolment	• Excluded trauma patients
Skjeflo et al. (2018)	To describe the development of ECG characteristics during ALS and their association with ROSC	• QRS width decreased and HR increased prior to ROSC • HR decreased and QRS width increased in those without ROSC	• Provides insight on dynamic changes to ECG components during resuscitation	• Single-centre, retrospective study
Weiser et al. (2018)	To evaluate the relationship between HR and survival (30-day survival, 30-day CPC 1 or 2)	• Higher initial HR (> 60) associated with increased odds of 30-day survival and CPC 1 or 2	• Adjusted for confounders. • Statistical significance reached	• Retrospective
Nguyen et al. (2020)	To determine the prevalence of bradycardic PEA and the relationship between this and respiratory arrest (survival of arrest event, STD)	• Bradycardic PEA arrests had higher STD than non-bradycardic PEA arrests.	• Used multiple hospital settings. • Comprehensive review of causes of arrest.	• Only one ECG characteristic assessed
Kim et al. (2020)	To investigate the relationship between QRS characteristics and outcomes (STD, STD with CPC 1 or 2)	• Narrow QRS and higher QRS amplitude associated with STD with good neurological function. • No difference seen in HR between groups	• Large sample size	• Undertaken in BLS-only system
Cournoyer et al. (2022)	To evaluate the association between initial PEA rate and favourable clinical outcomes (STD, STD with MRS 0-2)	• Higher initial HR is associated with STD and STD with good neurological function	• Multi-centre. • Large sample size.	• Non-cardiac aetiologies excluded. • Only HR assessed
Norvik et al. (2023)	To investigate how HR and QRS duration are related to the probability of ROSC	• Higher initial HR and increasing HR during ALS were associated with increased probability of ROSC. • Lower QRS width and decreasing QRS width during ALS associated with increased probability of ROSC.	• Multi-centre. • Prospective study.	• Difficulties in determining between episodes of ROSC/PEA without other signs of circulation may have overestimated ROSC

Table 4. Results of included studies.

which contained a total of 12,477 patients. These were grouped by rate in denominators of 20, from 1-20 up to > 120. A linear increase in odds ratio (OR) for survival with good neurological function was seen as QRS rate increased. Patients with a presenting QRS rate between 1 and 20 had an OR of survival with good neurological function (Modified Rankin Score 1-2) of 0.06 (95% CI [0.03, 0.11], $p < 0.001$). Conversely, those with a rate > 120 had an OR of 0.90 (95% CI [0.45, 1.81], $p = 0.77$), albeit this finding did not reach statistical significance. Interestingly, patients with a QRS rate greater than 100 shared a similar

Reference	QRS Rate	P Waves	QRS Width	QT Interval	QRS Amplitude
Hauck et al. (2015)	Assessed	Not Assessed	Assessed	Not Assessed	Not Assessed
Bergum et al. (2016)	Assessed	Assessed	Assessed	Assessed	Not Assessed
Ho et al. (2016)	Assessed	Assessed	Assessed	Not Assessed	Not Assessed
Skjeflo et al. (2018)	Assessed	Not Assessed	Assessed	Not Assessed	Not Assessed
Weiser et al. (2018)	Assessed	Not Assessed	Not Assessed	Not Assessed	Not Assessed
Nguyen et al. (2020)	Assessed	Not Assessed	Assessed	Not Assessed	Assessed
Kim et al. (2020)	Assessed	Not Assessed	Not Assessed	Not Assessed	Not Assessed
Cournoyer et al. (2022)	Assessed	Not Assessed	Not Assessed	Not Assessed	Not Assessed
Norvik et al. (2023)	Assessed	Not Assessed	Assessed	Not Assessed	Not Assessed

Table 5. ECG components assessed.

likelihood of survival with good neurological function to those presenting in shockable rhythms.

Weiser et al. (2018) compared the rate of QRS complexes recorded during the first 60 seconds of available ECG data with the neurological function (Cerebral Performance Category [CPC] 1-2) of survivors of PEA at 30 days following cardiac arrest. Patients were stratified into four groups: 10-24 bpm, 25-39 bpm, 40-59 bpm and >60 bpm. 504 patients with PEA were included in the study, and 32 (6%) survived with a CPC score of 1-2. No survivors with good neurological function were seen in those with a QRS rate of 10-24. The number of survivors from the remaining groups were 7 (4%), 14 (9%) and 11 (15%) respectively (p = 0.001). After adjusting for confounding clinical factors, the odds of survival with good neurological function increased by 0.48 (95% CI [0.3, 0.77], p = 0.001) per 20 bpm grouping.

Conversely to the studies reporting an association between a faster HR and survival, Nguyen et al. (2020) demonstrated patients with bradycardic PEA, defined as a rate less than 60, had a higher incidence of both ROSC and survival to discharge than patients with non-bradycardic PEA (66.7%, n = 44 vs. 55.5%, n = 61 and 33.3%, n = 22 vs. 14.5%, n = 16). Following multivariate analysis, bradycardic PEA had an OR of 3.31 for survival to discharge (95% CI [1.41, 7.79], p = 0.006).

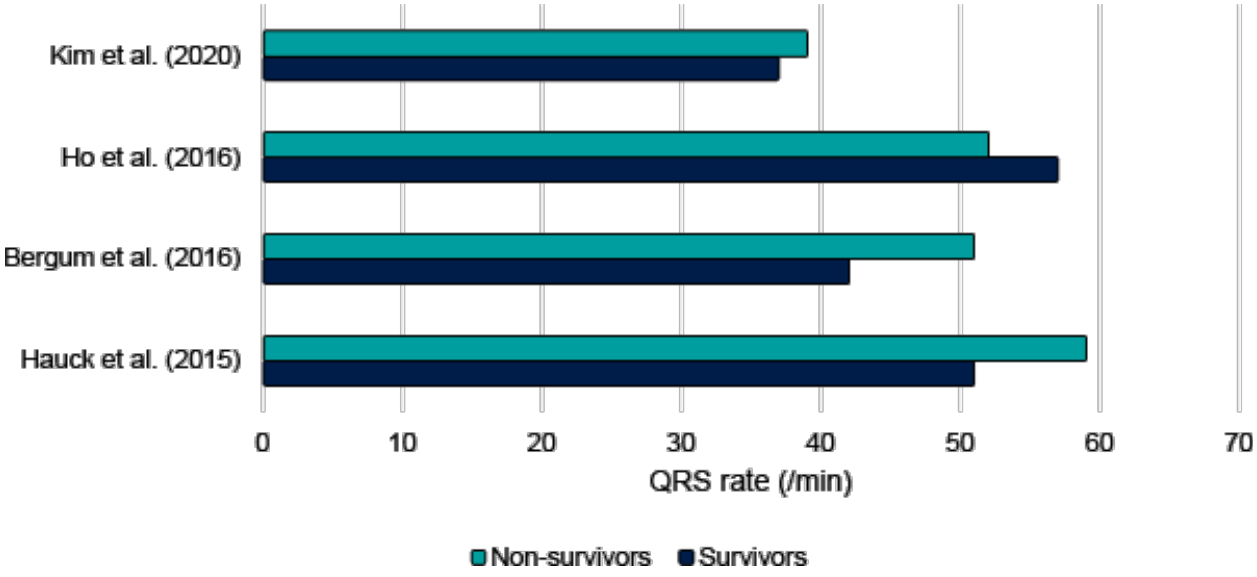

Figure 2: Studies reporting QRS rate (ungrouped).

In their analysis of 58 episodes of in-hospital PEA arrest, Bergum et al. (2016) reported a no-ROSC incidence of 60% (n = 35), with 29% (n = 17) 1-hour survival and 10% (n = 6) survival to discharge. The median QRS rate for those with no-ROSC was 51 (IQR 39-63), compared to 45 (IQR 41-54) in those who survived for 1 hour and 42 (IQR 34-94) in those who survived to discharge. Additionally, Hauck et al. (2015) also reported a lower QRS rate in survivors in 262 OHCA patients with PEA. Survivors were found to have a mean rate of 51 (95% CI [38.8, 63.2]) with non-survivors having a mean rate of 59.2 (95% CI [54.8, 63.6]).

A non-significant difference between the QRS rate of survivors and non-survivors was reported by Kim et al. (2020) in their evaluation of 576 OHCA patients. The median QRS rate for survivors was 37 (IQR 30-54) and 39 (IQR 29-55) in non-survivors (p = 0.770). Ho et al. (2016) also reported a non-significant difference (56.8 vs. 52.0, p = 0.53) in their study of 332 patients with PEA who were attended by EMS in Ottawa, Canada.

QRS Duration

QRS duration was assessed in seven studies. Three studies provided mean or median QRS duration, and four dichotomised their samples as greater or less than 120 ms. In their study of 576 patients Kim et al. (2020) reported survivors were more likely to have a QRS duration of less than 120 ms. 42 patients survived to hospital discharge, with 23 surviving with a favourable neurological outcome (CPC 1-2). 320 (55.6%) patients were found to have a median QRS width > 120 ms and 256 (44.4%) had a median QRS width < 120 ms. A QRS duration < 120 ms was associated with survival to discharge (71.4% vs 28.6%) and a favourable neurological outcome (69.6% vs 30.4%). After adjustment for variables, in patients with a QRS duration < 120 ms, the odds ratios for survival were 3.371 (95% CI [1.633, 6.960]), and 4.634 (95% CI [1.562, 13.144]) for survival with favourable neurological outcomes.

A prospective, multi-centre study of 332 patients by Ho et al. (2016) found no significant differences between the QRS duration of survivors and non-survivors (128.7 vs. 129.6 ms, p = 0.95). In patients with a QRS duration of > 120 ms the univariate odds ratio of ROSC

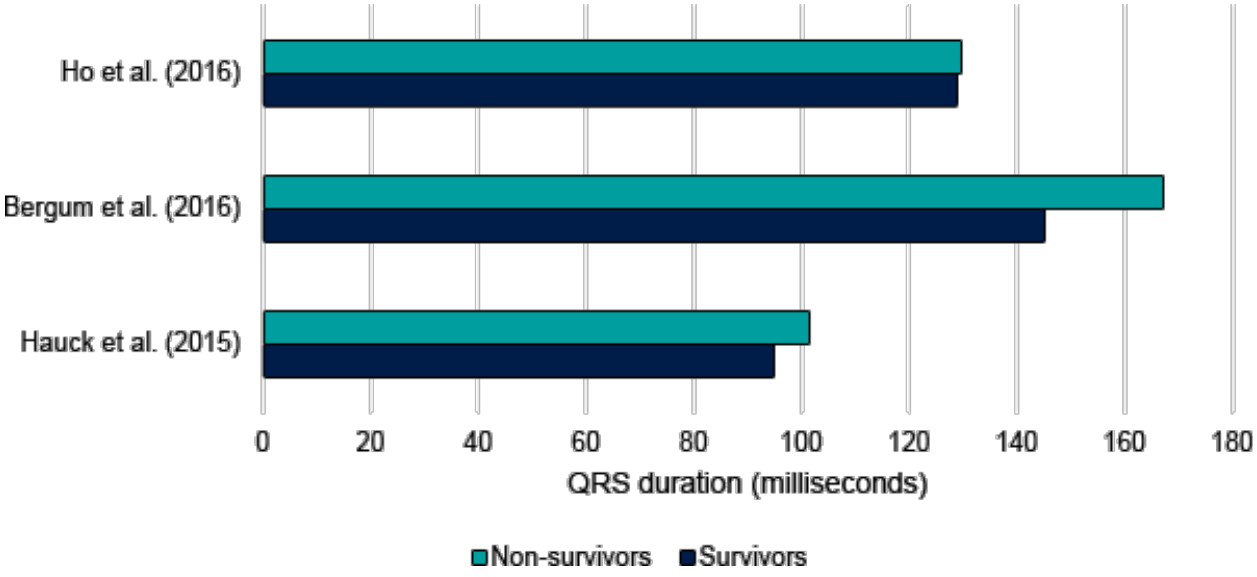

Figure 3: Studies reporting QRS duration (ungrouped).

was 0.67 (95% CI [0.41, 1.09], p = 0.11) and 0.98 (95% CI [0.38, 2.52], p = 0.97). Hauck et al. (2015) found the mean QRS duration of survivors was 94.8 ms (95% CI [79, 110.6]) compared to 101.4 ms (95% CI [95.3, 107.4]) in non-survivors. A similar finding of wider QRS widths in non-survivors was also demonstrated by Bergum et al. (2016), who reported a median QRS duration of 167 ms (95% CI [125, 209]) in non-survivors, 182 ms (95% CI [150, 235]) in those with 1-hour survival and 145 ms (95% CI [140, 174]) in those who survived to hospital discharge.

Changes in QRS Rate or Duration During Resuscitation

Skjeflo et al. (2018) studied 74 patients with in-hospital cardiac arrest and demonstrated decreasing QRS duration during ALS was significantly more frequent in patients who obtained ROSC compared to those declared dead. Patients from this study were also included in a larger multi-centre study of 298 patients analysed by Norvik et al. (2023), who extracted 559 ECG segments of PEA from ECG recordings taken during resuscitation and assessed QRS the duration within these to determine the likelihood of PEA transitioning to sustained ROSC (lasting > 20 minutes), temporary ROSC (lasting < 20 minutes) or other cardiac arrest rhythms. 145 segments ended with sustained ROSC, and 137 ended with temporary ROSC. This investigation found a decreasing QRS duration during resuscitation increased the odds of ROSC. The OR of ROSC was 1.26 (95% CI [1.13, 1.40], p < 0.001) per 40 ms decrease in QRS duration, with no differences seen between the QRS durations of patients who sustained a temporary or sustained ROSC.

Akin to the findings of studies investigating changes to QRS width during resuscitation, a similar relationship was seen between dynamic changes to QRS rate and patient outcome. When comparing the ECG characteristics of the initial monitored rhythm and final monitored rhythms of survivors, Skjeflo et al. (2018) found increasing QRS rate during resuscitation was a positive prognostic indicator for ROSC on scene. Finally, Norvik et al. (2023) found for every 40 bpm increase above 80 bpm, the OR of ROSC increased by 1.39 (95% CI [1.21, 1.58], p <0.001).

Other Components

An association between P waves and survival was demonstrated by Ho et al. (2016), who reported the presence of P waves in 67% (n = 12/18) of survivors and 52% (n = 163/314) of non-survivors. Conversely, a difference between survivors and non-survivors was not demonstrated by Bergum et al. (2016), who found P waves were present in 63% of patients with no ROSC, 76% of patients who survived for 1 hour, and 67% of patients who survived to discharge.

Bergum et al. (2016) was the only study to evaluate the QT interval and found a median QT interval of 494 (IQR 409-569) in patients with no ROSC, 540 (IQR 465-602) in patients who survived for 1 hour, and 528 (IQR 377-670) in those that survived to discharge. Similarly, median QTc intervals were 439 (IQR 376-508), 475 (IQR 426-509), and 513 (IQR 448-550) respectively.

Kim et al. (2020) found the median QRS amplitude of all survivors was 13 mm (95% CI [11, 18]) and was 10 mm (95% CI [7, 15]) in non-survivors. Subgroup analysis also revealed the median QRS amplitude of survivors with favourable neurological outcomes was

greater than the median of all survivors (16 mm, 95% CI [12, 19] vs. 13 mm, 95% CI [11, 18], $p < 0.001$).

Combined Components

Ho et al. (2016) assessed the survival rate of 332 patients when QRS rate and width were combined. The survival rate of patients with a QRS rate of 60 or greater, in combination with a QRS duration of less than 120 ms, was 7.2% (95% CI [1.1, 13.4]). In comparison, in patients with a rate of less than 60 and a QRS duration of greater than 120 ms, the survival rate was 3.7% (95% CI [0.5, 6.9]). This study also evaluated the outcomes of patients with these two groups with or without P waves. 27.8% (n = 5/18) of survivors had a QRS rate > 60, duration < 120 ms and P waves present, compared to 17.2% (n = 53/314) of non-survivors. Similarly, patients with no P waves, QRS rate < 60 and QRS duration > 120, made up 11.1% (n = 2/18) of survivors and 30.3% (n = 90/314) of non-survivors.

No statistical details were provided by Bergum et al. (2016) who displayed their findings in a scatter plot. No discernible differences were seen, with a tendency towards slower rates (< 60) and QRS durations of greater than 120 ms in both survivors and non-survivors.

DISCUSSION

This systematic review found there is inconsistency amongst the findings of studies investigating the utility of ECG characteristics as outcome indicators. Patients with a normal or "narrow" QRS duration (< 120 ms) during initial presentation may have an increased likelihood of ROSC compared to those with "wide" QRS complexes (> 120 ms). An association between increased HR and survival was observed in several studies, however the numbers of survivors were low overall, thus limiting the statistical precision of these findings. Contradictory results favouring a lower HR were also reported in several studies. Similarly, the presence of P waves produced variable results. An increased amplitude of QRS complexes correlated with survival in the single study that evaluated this component.

The results of this review partly reflect the findings of a systematic review and meta-analysis of the association between QRS characteristics in PEA and patient outcomes by Kim et al. (2024), who reported a wide QRS (> 120 ms) was associated with greater odds of mortality than a narrow QRS (< 120 ms) (OR = 1.86, 95% CI [1.11, 3.11]). Conversely, the odds of mortality for patients with a QRS rate < 60/min was significantly higher than those with a QRS frequency > 60/min (OR = 1.90, 95% CI [1.19, 3.02]), whereas our review found variability in the association between QRS rate and prognosis. Whilst their analysis provides valuable insight and an indication that some ECG components may have an association with patient outcomes, it did not include studies assessing other ECG components of PEA, the relationship between combined ECG components, or the relevance of dynamic ECG changes during resuscitation and patient outcomes.

Our previous review on the use of ECG component assessment in PEA demonstrated they should not be used to determine the aetiology or requirement for specific interventions (Gander and Laws, 2025). Nonetheless, dynamic changes occurring during resuscitation may hold some potential for use in clinical decision-making. Patients who display a pattern of increasing HR and decreasing QRS width may be more likely to obtain a

ROSC. Additionally, the presence, or development of, P waves may also indicate a higher likelihood of ROSC. These findings may support the theory that QRS width represents the "the underlying physiological state of the myocardium" as proposed by Skjeflo et al. (2019), and decreasing QRS width during resuscitation may therefore represent improving myocardial condition and function in response to treatment. Further research should explore the assessment of ECG components in PEA at regular intervals throughout resuscitation to determine their accuracy as indicators of an impending ROSC or the impact of ALS interventions on these. The inclusion of adult patients with a known or highly suspected cardiac aetiology may help to evaluate the relationship between myocardial condition, ECG components and prognosis.

This review partly supports the observations of a mixed-methods study by Coppola et al. (2021b), who explored how senior clinical advisors made decisions regarding futility and the cessation of resuscitation in patients with PEA. Participants stated that ECG morphology was one aspect considered when making such decisions, with narrow complex PEA considered to be associated with survival and wide complex bradycardic PEA felt to be an indicator of a poor prognosis. Our study supports the role of QRS width assessment as a factor to support decision-making, however, the predictive value of HR is less well defined due to small sample sizes and conflicting results within the literature. Although singular observations of QRS width do not provide an adequate indication of survivability, observation of the trajectory of QRS width throughout resuscitation, by comparing the presenting width of complexes in the initial rhythm with subsequent recordings, may provide an easily assessable source of information prognostic information for clinicians. This information should be interpreted in conjunction with other clinical findings when informing decisions regarding ongoing resuscitation. Additionally, ECG component assessment should not detract from the delivery of high-quality CPR and other procedures during resuscitation. Therefore, when possible, it is advised that these are obtained by obtaining a rhythm printout during pulse checks for interpretation after CPR is resumed.

An additional factor to consider in the relationship between ECG characteristics and survival is the presence of pseudo-PEA. As a degree of coronary perfusion is maintained in this state, it may be hypothesised that the presence of "normal" ECG components is more likely. This subset of PEA carries a higher survival rate than true PEA (Tsou et al., 2017; Elhalwagy et al., 2024). Therefore, it is possible some survivors of PEA had pseudo-PEA and thus contributed to higher survival rates in cases with ECG characteristics closer to normal values. Further studies should be undertaken using ultrasonography to evaluate the relationship between ECG characteristics and the presence or absence of mechanical cardiac activity.

When interpreted during resuscitation, QRS complex rate may also be influenced by other factors including the administration of medications. Adrenaline administration every 3-5 minutes is a recommended treatment for patients with PEA (Soar et al., 2021). Skjeflo et al. (2019) demonstrated patients with PEA who received adrenaline during resuscitation displayed a pattern of increasing HR prior to both ROSC and death. In cases of pseudo-PEA due to low cardiac output, the chronotropic and inotropic effects of adrenaline may improve systemic blood pressure and generate a palpable pulse. This may explain the correlation seen between increasing HR and ROSC in several studies.

Patients presenting with PEA often have a different clinical course and mortality rate to those with asystolic presentations (Norvik et al., 2022; Unneland et al., 2023; Elhalwagy et al. 2024). This review has highlighted several subgroups of PEA, such as those with narrow QRS complexes, have higher survival rates than others and may benefit from tailored resuscitation attempts. For example, if QRS duration represents the physiological condition of the myocardium, as proposed by Skjeflo et al. (2018), distinction between phenotypes of PEA stratified by ECG characteristics, may help to identify patients who will benefit from physiology-guided resuscitation. This may include titrated vasopressin or noradrenaline to augment cardiac output in cases of pseudo-PEA (Elhalwagy et al., 2024).

LIMITATIONS

Due to time and resource constraints, only literature published in the English language was included. Whilst this did not lead to the exclusion of any articles during the screening process, the use of English-language search terms may have led to the omission of relevant articles. Furthermore, due to time constraints, subject matter experts were not contacted to identify further literature. To aid with understanding practical application, this systematic review excluded reports utilising complex ECG component assessment that is not traditionally available to clinicians or easy to assess during resuscitation, such as techniques also involving transthoracic impedance or impedance circulation component assessment. This led to the exclusion of four studies that may offer further diagnostic or predictive insight. The inclusion of both IHCA and OHCA may have introduced significant clinical and methodological heterogeneity in several areas including patient presentation, bystander CPR, and intra-arrest diagnostics or treatments. This may therefore limit the comparability of findings across studies. Finally, the definitions of ROSC varied between studies. This may create additional inconsistency in the reported relationships between ECG characteristics and ROSC, as patients may have received additional interventions before the outcome was measured.

CONCLUSION

This review has found the QRS width and rate are the most frequently investigated ECG components in PEA. A narrow QRS width during resuscitation was demonstrated to be associated with ROSC in four of the seven studies evaluating this component. Studies evaluating the relationship between QRS rate and ROSC produced variable results. Combinations of ECG components may also offer some prognostic insight. A pattern of an increasing rate with decreasing QRS width during resuscitation was reported to be more prevalent in survivors. Additionally, a higher QRS amplitude was also found to be associated with survival within one study. The presence of these ECG changes may assist decision-making with the ongoing resuscitation strategy for patients with PEA. Overall, the level of evidence of studies included within this systematic review was low, due to their retrospective, non-comparative methodologies. Most studies were also at risk of bias due to incomplete patient inclusion due to missing ECG or patient outcome data. Further prospective research is needed to evaluate the use of ECG components to identify subgroups of PEA with a high likelihood of survival.

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APPENDIX A: RISK OF BIAS ASSESSMENT RESULTS – CASE SERIES

Reference	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Overall Risk of Bias
Hauck et al. (2015)	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	No	Yes	Moderate
Bergum et al. (2016)	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Moderate
Ho et al. (2016)	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Moderate
Skjeflo et al. (2018)	Yes	Yes	Yes	Unclear	No	Yes	Yes	Yes	Yes	Yes	Moderate
Weiser et al. (2018)	Yes	Yes	Yes	Unclear	No	Yes	Yes	Yes	Yes	Yes	Moderate
Kim et al. (2020)	Yes	Yes	Yes	Unclear	No	Yes	Yes	Yes	Yes	Yes	Moderate
Norvik et al. (2023)	Yes	Yes	Yes	Unclear	No	Yes	Yes	Yes	Yes	Yes	Moderate

- Q1: Were there clear criteria for inclusion in the case series?
- Q2: Was the condition measured in a standard, reliable way for all participants included in the case series?
- Q3: Were valid methods used for identification of the condition for all participants included in the case series?
- Q4: Did the case series have consecutive inclusion of participants?
- Q5: Did the case series have complete inclusion of participants?
- Q6: Was there clear reporting of the demographics of the participants in the study?
- Q7: Was there clear reporting of clinical information of the participants?
- Q8: Were the outcomes or follow up results of cases clearly reported?
- Q9: Was there clear reporting of the presenting site(s)/clinic(s) demographic information?
- Q10: Was statistical analysis appropriate? (Munn et al., 2020)

APPENDIX B: RISK OF BIAS ASSESSMENT RESULTS - COHORT STUDIES

Reference	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Overall Risk of Bias
Nguyen et al. (2020)	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Moderate
Cournoyer et al. (2022)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Unclear	Yes	Low

- Q1: Were the two groups similar and recruited from the same population?
- Q2: Were the exposures measured similarly to assign people to both exposed and unexposed groups?
- Q3: Was the exposure measured in a valid and reliable way?
- Q4: Were confounding factors identified?
- Q5: Were strategies to deal with confounding factors stated?
- Q6: Were the groups/participants free of the outcome at the start of the study (or at the moment of exposure)?
- Q7: Were the outcomes measured in a valid and reliable way?
- Q8: Was the follow up time reported and sufficient to be long enough for outcomes to occur?
- Q9: Was follow up complete, and if not, were the reasons to loss to follow up described and explored?
- Q10: Were strategies to address incomplete follow up utilized?
- Q11: Was appropriate statistical analysis used? (Moola et al., 2020)

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REVIEWS

BACHELOR'S DEGREE AS ENTRY-TO-PRACTICE: A LITERATURE REVIEW OF PARAMEDICINE AND OTHER HEALTH PROFESSIONS

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Keywords: diploma, transition, degree, allied health, professional education, emergency medical services, EMS, paramedicine

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ABSTRACT

Background: The evolving scope of paramedicine has prompted debate regarding the suitability of diploma programs as entry-to-practice, with increasing attention on transitioning to bachelor's degree qualifications. Other health professions have undergone similar shifts, offering valuable insights for paramedicine.

Objective: To examine the reported outcomes of transitioning from diploma- to degree-level entry-to-practice in paramedicine and comparable health professions.

Methods: A narrative literature review was conducted in July 2025 using four academic databases and hand searches. Elements of the PRISMA framework were adapted to illustrate the search and screening process. As the review was a narrative review no risk of bias assessment tool was used. Inclusion criteria were full text academic articles on degree transition published from 1980-2025; exclusion criteria were non-English, non-peer reviewed, and non-healthcare professions. Eighteen peer-reviewed articles met inclusion criteria, encompassing nursing, dental hygiene, respiratory therapy, and paramedicine. Data were extracted and thematically analyzed to identify positive and negative impacts of degree-level entry.

Results: Positive outcomes included enhanced patient care, expanded career opportunities, improved cognitive and clinical competencies, and strengthened interpersonal attributes. Reported drawbacks included increased financial and geographic barriers, extended program duration, and perceptions of limited necessity for practice. Paramedicine-specific literature was scarce, though evidence from nursing and dental hygiene indicated significant professional and clinical advantages.

Conclusions: Transitioning to bachelor's degree entry-to-practice offers potential benefits for paramedicine but may also restrict accessibility and exacerbate workforce challenges. Policymakers and educators should balance these factors, drawing on international and cross-disciplinary experiences, before adopting degree-based entry requirements.

INTRODUCTION

Over the past several years, paramedics have grown rapidly within their professional scope and responsibilities. What began as a soldier transport system has matured into a professional career that provides lifesaving emergency medicine (Makrides et al., 2022), while adjusting to aging populations, chronic con-

ditions, and technological advancements (O'Meara et al., 2017). A common concern in paramedicine is that advancements in the field have not only reached but surpassed the educational needs that can be addressed through a traditional diploma. One response to this rapid development is transitioning entry-to-practice education to a bachelor's degree (Egnatovich, 2022; O'Meara et al., 2017).

Countries such as Australia, New Zealand, and the United Kingdom have implemented higher paramedic education and observed benefits for both students and the profession overall (Brooks et al., 2018). Beyond paramedicine, other healthcare disciplines such as respiratory therapy (Becker & Nguyen, 2014), dental hygiene (DeRosa et al., 2021; Reid et al., 2021; Sunell et al., 2017), and nursing and midwifery (Jinks, 1994; Roets et al., 2016; Swindells & Willmott, 2003) have also explored the transition to support their growing scope and expectations. By transitioning from the traditional diploma, paramedic students could develop deeper theoretical knowledge and cognitive skills to enhance patient care and practical skills (Egnatovich, 2022). As Canadian and American associations for paramedicine call for and begin exploring the transition to degree programs (Caffrey et al., 2019), it is necessary to understand outcomes from countries and professions where the transition to a degree program has occurred. By examining findings from other countries and professions, Canadian and American paramedic groups, from colleges to schools, can make better-informed decisions about transitioning and prepare for potential outcomes that may occur post-transition.

A literature review was conducted to examine the available academic literature on the transition to a bachelor's degree program from other credentials, such as diplomas, certificates, and lower-level degrees, to inform policymakers, institutions, educators, and the paramedic profession in general about how paramedicine may be affected.

METHODS

Review Approach

The present study employs a literature review, an approach that seeks consolidation, summation, or synthesis of existing publications to identify what is known about a topic without necessarily including formal quality appraisal, exhaustive searching, and which is typically presented narratively (Grant & Booth, 2009). Narrative literature reviews are particularly appropriate for synthesizing evidence in fragmented or emerging fields where conceptual clarity is needed (Snyder, 2019). The literature review method was selected over more structured methods, such as a scoping or systematic review, for two reasons: 1) Inclusion; based on the narrow scope of the topic (degree transition) and subject (paramedicine), it was expected that much evidence exists outside higher levels of the "hierarchy of evidence." More stringent methods risk excluding relevant literature (Murad et al., 2016). 2) Utility; the review aims to gather information about the educational implications of transitioning to a degree program, rather than evaluate the effectiveness of an intervention. As such, formal critical appraisal may exclude relevant literature and descriptive and contextual insights relevant to informing educators, policy makers, and stakeholders about the decision to transition.

Search Strategy

A preliminary search of the literature was performed to develop key terms, leading to the inclusion of various professions in the search. The final search terms were based on plain-text keywords and Boolean operators (AND, OR). No controlled vocabulary (e.g., MeSH or CINHAL headings) was used. Table 1 presents the search terms and Boolean combinations used; all searches were performed on all databases. Database searches were conducted in: Medline (Ovid), CINAHL, PubMed, and Wiley Online Library in July 2025. Searches were limited to English-language, peer-reviewed, full-text journal articles published between 1980 and 2025. For searches returning more than 400 results, a practical screening limitation based on relevance saturation was set where the first 200 results were screened in chronological order. PubMed was not included in search 4 due to the retrieval of more than 2 million records. A review of references from selected articles, a hand search, and artificial intelligence, specifically ChatGPT (OpenAI, 2025), was also used to search for additional literature after the initial screening. ChatGPT was used after initial database screening to identify additional potentially relevant articles by suggesting titles or journals. All citations were managed using Zotero (Corporation for Digital Scholarship, 2025), which was also used for de-duplication. Ethics approval was not required for this study.

Inclusion/Exclusion Criteria

Inclusion criteria: academic articles addressing the transition to higher education in healthcare professions, full-text articles, and an article publication date range from 1980 to 2025. Exclusion criteria: non-English articles, articles not concerning healthcare professions, and articles that were not scholarly or peer reviewed were excluded (e.g., editorials, commentaries).

Extraction

Elements of the PRISMA framework were adapted to illustrate the search and screening process (Moher et al., 2009). Figure 1 presents the PRISMA flow diagram showing the number of records identified, screened, excluded, and included in the final synthesis. Three authors (CR, SN, JK) independently screened all identified articles' titles and abstracts for inclusion before comparing selected articles for retrieval and eligibility based on inclusion/exclusion criteria to determine a final set of articles for review. After the final selection of articles for review, three authors (CR, SN, JK) independently read articles to extract findings and themes, before engaging in an iterative review process with all authors to identify a final set of primary and sub-themes.

Because this was a narrative review, no formal critical appraisal tool (e.g., CASP or JBI) was applied. However, quality and potential bias were addressed through inclusion criteria and screening procedures. Only peer-reviewed, scholarly articles were included, and non-research or editorial pieces were excluded. Studies lacking sufficient methodological detail or providing weak or anecdotal evidence were categorized as "poor evidence" and excluded during screening. The review team also considered factors such as study design, sample size, and clarity of reporting when assessing the quality of included studies.

RESULTS

Eighteen articles were selected for review. The number of articles per profession was dental hygiene = 7, nursing = 7, paramedicine = 3, and respiratory therapy = 1. Two primary themes were developed: positive and negative effects of implementing a degree program. Positive effects were subdivided into four themes: improved patient care, improved career opportunities, improved cognitive and clinical practice, and personal and relational attributes. The negative aspects were subdivided into inaccessibility and a lack of necessity.

Search	Terms
1	bachelor's degree OR baccalaureate degree AND paramedicine AND effects AND associate degree
2	dental hygiene AND baccalaureate OR diploma AND associate degree AND education
3	respiratory therapy AND baccalaureate AND associate degree AND education
4	nursing AND baccalaureate AND associate degree AND education OR educational

Table 1. Search terms used.

Positive Outcomes

Improved Patient Care

Patient outcomes and care were heavily discussed in the nursing literature. Several studies found a relationship between a greater proportion of baccalaureate-prepared nurses in hospitals and reduced "failure to rescue," patient mortality rates, re-admissions, and length of stay (Aiken et al., 2003; Lasater et al., 2021; Melnyk et al., 2015; Simpson et al., 2012). One study on surgical nurses found that a 10% organizational increase in employment of higher degree nurses resulted in a 5% decrease in "failure to rescue" and mortality rates (Aiken et al., 2003). Another review found that nurses holding bachelor's degrees had more highly developed skills, such as professionalism, leadership, and critical thinking, which enhanced patient satisfaction and outcomes (Lane & Kohlenberg, 2010). One paramedic study found that advanced education was perceived to improve interpersonal "soft skills," potentially enhancing patient experience and operational efficiency (Egnatovich, 2022).

Improved Cognitive Skills and Clinical Practice

The improvement of cognitive abilities was identified throughout the literature as a key reason to transition to a bachelor's degree education (Egnatovich, 2022). A study of sixteen dental hygienists in Canada who had achieved diplomas before pursuing bachelor's degrees found participants reported growth of critical thinking, evidence-based decision-making, comprehensive care skills, and an increase in ability to use research in practice after completing their bachelor's degrees (Kanji et al., 2011). Confidence in critiquing research increased with exposure to scientific literature during the degree program, which facilitated communication with patients and more readily making informed practice decisions (Snyder, 2019). The same study found 86% of students agreed that bachelor's degree-level education leads to increased knowledge, and 85% agreed that critical thinking and research use are increased due to a bachelor's degree educa-

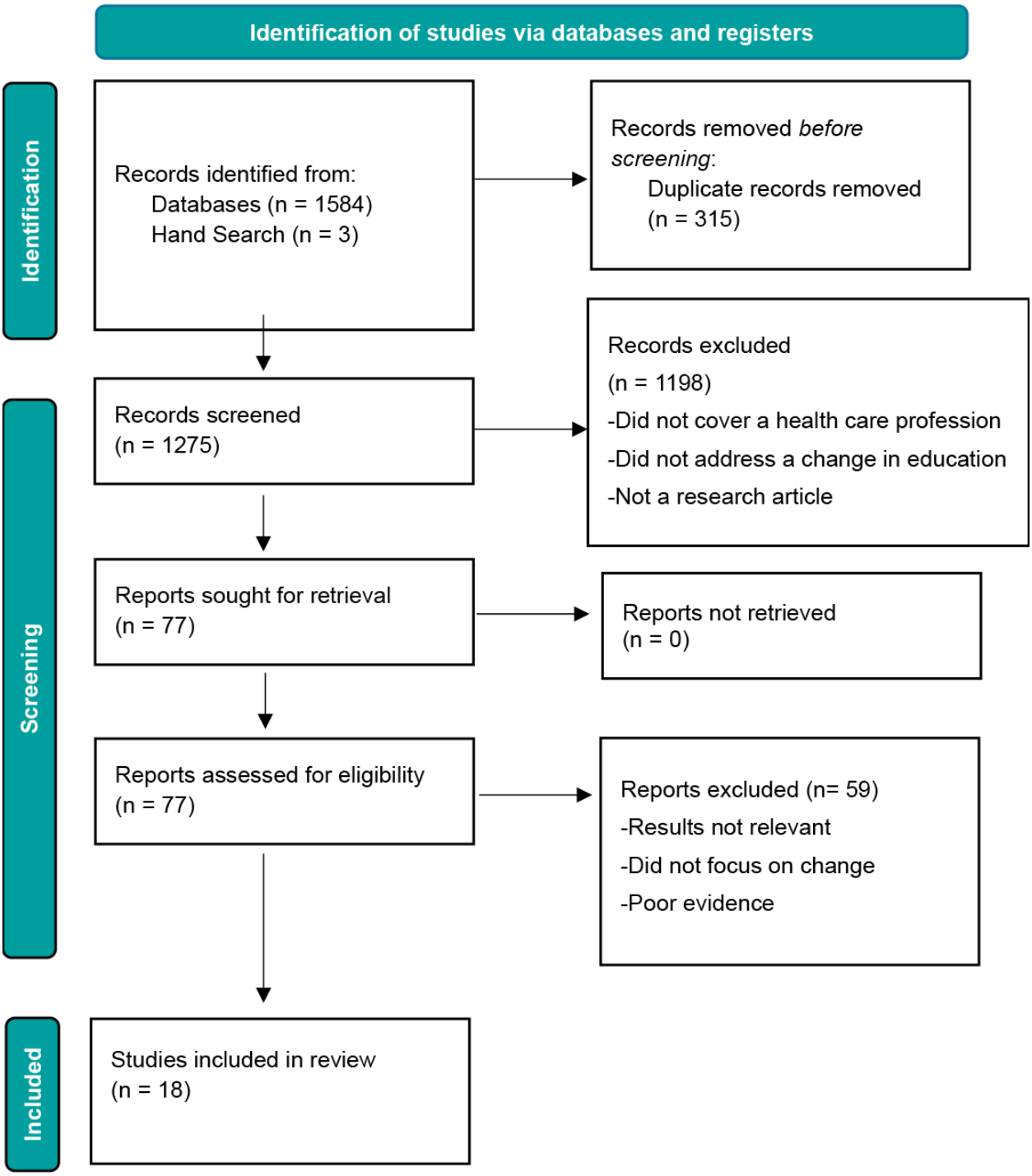

Figure 1. PRISMA diagram for literature search.

tion. Sixty-nine percent indicated that increasing their critical thinking skills was a factor in choosing a degree program over a diploma, while 83% stated wanting to increase their knowledge base contributed to their decision to pursue bachelor's degrees (Snyder, 2019).

A cross-sectional survey of nursing and midwifery graduates (completed an academic program) and diplomates (board-certified) in England (n = 448) assessed the differences between the graduates and diplomates using a measure of 42 different cognitive skills

and qualities (Swindells & Willmott, 2003). Skills assessed included problem-solving, evaluating care approaches, accountability, leadership, and teamwork. Of the 42 items, graduates scored significantly higher than diplomates on 21. Evidence-based practice (EBP) is using the most recent and relevant research with clinical skills and experience to improve patient care (Melnyk et al., 2015). In a survey of paramedics in Australia (n = 892) Simpson et al. (2012) found that 98% of respondents supported integrating EBP in practice, with higher support among those with a bachelor's degree (Simpson et al., 2012). The increased perceived value of and support for EBP was also linked to viewing research as important in paramedicine. The same survey showed that 97% of respondents viewed research as important in paramedicine, while 98% said they would change their practice based on research. Conversely, longer-serving paramedics were less likely to value research and the importance of participating in research. While most of the literature supported the advancement of cognitive abilities and skills, this theme was challenged in other research that found no differences in the cognitive abilities of diplomates and graduates (Clinton et al., 2005).

Personal And Relational Attributes

Interpersonal competencies emerged as a ubiquitous theme in literature. Bachelor's degree-prepared nurses scored significantly higher on networking and collaboration, adaptability, accountability, and teamwork compared to diploma-prepared nurses (Swindells & Willmott, 2003). Among diploma dental hygienists who completed a bachelor's degree, the most prominent change was increased self-perception of confidence and credibility (Kanji et al., 2011). Additional research with dental hygienists found that knowledge obtained from a bachelor's degree increased self-confidence, which was associated with improved ability, decision-making, and action-taking (Sunell et al., 2017). Literature for paramedicine was limited; however, one New Zealand study investigating anxiety among paramedic students found that those whose highest previous education was a diploma program had significantly higher anxiety than those with degree qualifications (Wills & Asbury, 2019).

Improved Career Opportunities

Career mobilization may become easier with higher levels of education in a desired profession. In dental hygiene, increased access to career opportunities was a key theme identified across several studies, with broader career opportunities in academia and research motivating students considering a bachelor's degree (Benbow & Kanji, 2019; Kanji et al., 2011; Kanji & Laronde, 2018). Students who completed their dental hygienist degree identified enhanced skill in retrieving scientific information (Kanji & Laronde, 2018). Bachelor's degree dental hygienists were more likely to practice or work outside the traditional clinical setting, such as public health and community practice. A study of 5 first-year Bachelor of Dental Science student cohorts (n = 127) in British Columbia found that 82% of students chose a degree program rather than a diploma due to access to broader career opportunities (Katyal & Kanji, 2021). A survey of dental hygiene students (n = 401) found that 75% of students counted expanded access to career opportunities and a better capacity to work with underserved groups as a motivating factor in pursuing a degree program rather than a diploma (Benbow & Kanji, 2019). Higher education has also been linked to greater access to leadership roles, higher salaries, and more advanced professional roles. Becker and Nguyen (2014) found that respiratory therapists with a bachelor's

degree (n = 3139) at entry-to-practice were more likely to have roles as educators (12%) and leaders (40%) than those with associate degrees (Becker & Nguyen, 2014).

Negative Outcomes

Inaccessibility

Across several healthcare disciplines, recurring critiques regarding the accessibility of higher education and how secondary factors impact individuals' decisions to pursue specific career paths emerged. One study investigating dental hygiene students' attitudes towards bachelor's degrees and factors that affected program choice identified three major concerns in choosing the program: proximity to the institution (74%), costs (68%), and time to completion (47.7%) (Reid et al., 2021). Proximity concerns have also been observed in nursing (Haron et al., 2014). Lack of time and finances is also a hindrance; in a survey of 61 nurses, 28 associate degree nurses indicated lack of time and finances as a reason for not pursuing a bachelor's degree despite seeing value in higher education (Thielmann et al., 2019). Lower socio-economic status (SES) individuals were less likely to complete a bachelor's degree compared to higher SES individuals and were more likely to base educational choices on available financial aid rather than credential type (Becker & Nguyen, 2014).

Lack of Necessity

The perspective of bachelor's degree education as unnecessary for practice emerged relatively frequently in the literature. Research with nursing students found that though bachelor's degrees are perceived as beneficial, alternative pathways are viewed as sufficient for entry to practice (Thielmann et al., 2019). Similarly, a 2021 survey of 384 dental hygiene students found 73.7% of respondents felt an associate degree was sufficient for entry to practice (Reid et al., 2021). Practicing dental hygienists also felt their associate degree adequately prepared them to practice (Anderson & Smith, 2009). A survey of Pennsylvania diploma and associate degree nursing students found that even if the state nursing board was to mandate a BSN degree within 10 years post qualification, 78.9% would still have enrolled in their current program, indicating they consider their educational level sufficient (Maneval & Teeter, 2010). A study in England assessed the competencies of 166 graduate and 188 diplomate nurses using a modified version of the Nursing Competencies Questionnaire and found almost no differences in competency between the two groups (Clinton et al., 2005). The authors argue that there is no difference in skills or competencies between diplomates and graduates and that attaining higher education is not a direct cause of improvement in practice. It has also been argued that higher education in paramedicine is only necessary for specialized practice, like community or flight paramedics (Caffrey et al., 2019).

Research has found that transitioning to higher education can impact workplace professionalism due to disparities between experiential learning and theoretical knowledge. A UK study investigating the effects of transitions to higher education in paramedicine found substantial tension between the pre-reform/transition and post-reform/transition individuals (Givati et al., 2018). In-depth interviews showed that pre-reform individuals felt that they were being pushed out by new academic recruits and expressed feelings of frustration and resentment if they were unable to pursue similar higher education. Conflict in practice was also highlighted; post-reform individuals who held higher-ranked

positions due to completing a bachelor's degree recalled instances of professional authority being disregarded by more experienced, though lower-ranked colleagues.

DISCUSSION

The literature review identified positive and negative outcomes of transitioning education/training to bachelor's degree-based education. Though paramedic-specific information was minimal, evidence from other health professions helps inform what outcomes may occur with different entry-to-practice pathways. Shifting towards a bachelor's degree can potentially have practice and professional benefits (Benbow & Kanji, 2019; Caffrey et al., 2019; Katyal & Kanji, 2021; Sunell et al., 2017; Williams et al., 2015); however, a bachelor's degree can be a time and financial impediment for potential students (Burke, 2018; DeRosa et al., 2021; Graf, 2006; Reid et al., 2021; Thielmann et al., 2019). It is imperative to consider the findings from all professions, with both the positive and negative outcomes presenting multiple considerations related to a transition in paramedicine.

The primary benefit of transitioning to a degree-based program is potential improvements to patient care. While the evidence found in this review for patient care is primarily from nursing, it may be inferred that similar benefits will exist for paramedicine when considered in conjunction with cognitive and clinical skills development and research engagement.

Better critical thinking and integration of relevant knowledge can improve patient safety and reduce errors (Kim & Kwak, 2024; Zhang et al., 2025) and may benefit clinical practice overall (Berg et al., 2023; Scott et al, 2021). Critical thinking relates to the ability to identify a patient's needs and find the appropriate response (Lawn et al., 2020). Students completing a four-year undergraduate degree program advance critical thinking skills through in-class experiences, such as curriculum and spending more time learning and interacting with faculty, and out-of-class experiences, with greater exposure to opportunities to develop critical thinking skills compared to shorter programs (Becker & Nguyen, 2014; Terenzini et al., 1995). With more education time, paramedics will have more knowledge and develop stronger systems of thought and cognitive skills such as critical thinking and problem-solving skills, which can result in deeper and better applied mental models and cognitive schemas that may lead to better patient care.

The development of knowledge and cognitive skills can also support patient care through engagement in EBP. Comprehension of available knowledge is crucial for implementing EBP, which is facilitated by teaching fundamental skills, including critical thinking, to understand and critique research. While evidence-based decision-making is not specific to degree holders (Kanji et al., 2011), higher education may facilitate a deeper understanding and utilization of research that advances overall EBP. Engaging with research can encourage professionals to challenge prior practices and link the academic and clinical sides of paramedicine. Relatedly, engaging in research and developing analytical skills may spur an interest and open doors to careers in education and research (Burke, 2018; Kanji et al., 2011; Kanji & Laronde, 2018).

Another potential benefit of a degree program is an increase in curriculum time to address current shortcomings in paramedic education. For example, with more curriculum time, topics such as empathy training and topics of psychological distress and mental health issues can be better addressed. Paramedicine has previously been urged to apply

empathy training to students due to a correlation between reduced empathy and burnout in nurses and physicians (Williams et al., 2017).

A key drawback of implementing higher-level entry-to-practice in paramedicine is the inevitable increase in tuition costs and financial burden that comes with the extended duration of a degree. Diplomas provide students with a more cost-effective approach to post-secondary education. Further indirect costs may also come from transitioning to higher education. Degree programs typically exist in larger post-secondary institutions in larger urban centers. Smaller post-secondary schools, such as community colleges, that exist in smaller communities and do not offer degree programs may discontinue programs, forcing more students to move to complete their studies (DeRosa et al., 2021). Relocation also adds costs like rent, transportation, and groceries. Moreover, diplomas allow students to enter the workforce earlier while gaining professional exposure.

Although higher education is often linked to a salary increase, an advanced degree is not necessarily related to a rise in salary or SES during the entrance-to-practice period (Becker & Nguyen, 2014). Salary increases often come from leadership roles, making it less beneficial for those who do not wish to pursue a leadership position. Earlier workforce entry can enable students to earn an income, which they can invest in further education if desired. The importance of the financial aspect of transitioning into a degree program and potential barriers to students entering the profession during a time of workforce shortages is important to consider (Canada Parliament House of Commons Standing Committee on Health, 2023).

While professional standards and scope of practice are set by colleges and regulatory bodies, the level of willingness to attain the requisite level of practice by a potential learner may limit the number of people who choose to pursue paramedicine as a profession. Pursuing a bachelor's degree may seem irrelevant if a student's desired career in paramedicine, or perception of paramedicine, only requires a fundamental understanding of basic knowledge and skills. Potential paramedic students who want to master skills and feel disinterested in academics might not enter the profession if a bachelor's degree is the standard for entry to practice. Experiential learning advocates may support current models, that after developing an adequate knowledge base, students should prioritize their skills and growth through practice-based experiential learning rather than further education (Dewey, 1997).

Another major consideration is the lack of educators with a bachelor's degree in paramedicine. A limited number of North American post-secondary institutions offer a Bachelor's of Paramedicine or similar, and none offer this degree via direct entry into the program post high school or equivalent. Those that do offer this program require applicants to be practicing paramedics. The only alternative is obtaining this education in a different country. This means only a small number of paramedics in North America hold this higher education standard (Caffrey et al., 2019). With a higher standard and requirement for practice, the requirement to be an educator will rise, necessitating a bachelor's degree to teach, which could escalate educator shortages. If a transition from diploma to degree programs is implemented, post-secondary institutions should thoroughly plan for an inevitable imbalance in faculty considered "qualified" to teach.

Limitations & Future Directions

There were three primary limitations to this review. 1) Lack of literature specific to paramedicine, of the 18 sources, only 3 were focused on the paramedic profession. 2) Search terms, databases searched, academic literature, and reviews not in English were not used in this literature review. 3) No systematic evaluation method of the research quality was used for this review. However, as a literature review intended to provide a higher-level perspective on transitioning to degree-based education, rather than examining specific or explicit outcomes, the current approach was deemed appropriate.

There is a significant need for further research in paramedicine regarding the shift to higher education and paramedic education in general (Caffrey et al., 2019). The articles found for this review were largely studies or surveys based on self-reported data, thus allowing for subjectivity. Further research and evaluation should take a holistic approach, including exploring students', educators', and programs' views, opinions, and experiences while understanding educational, practice, and performance outcomes. Additionally, measuring areas such as patient outcomes or cost changes is important to fully understand the effect of a shift to a bachelor's degree. If a transition is undertaken, rigorous change management must be implemented, paired with ongoing evaluation and assessment of the process and outcomes after transition.

CONCLUSION

Based on the results of this review, clear benefits and drawbacks to implementing higher entry-level education in a profession were identified across multiple professions. Though most of the evidence exists outside of paramedicine, the consistency of positive and negative outcomes across professions, including paramedicine, and global regions indicates that it is likely the findings of this review are applicable to paramedicine in general. The decision to transition to a bachelor's level for entry to practice must consider how factors such as patient outcomes, clinical and cognitive ability, personal and relational attributes, and professional opportunity weigh against factors of accessibility, equity, and necessity for safe practice. Based on the evidence identified, it is incumbent on the profession to weigh the benefits and drawbacks of transitioning to determine what approach will provide the best overall patient, professional, and societal outcomes.

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CASE REPORTS

UNCOVERING BRUGADA SYNDROME AFTER CARDIOVASCULAR INSULT THROUGH AMIODARONE INFUSION

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ABSTRACT

You could ask many pre-hospital providers which medication you routinely use for Wide Complex Tachycardia (WCT) and many of them will say amiodarone without an explanation. There are pros and cons to both amiodarone and lidocaine. Over the past ten to fifteen years there has been a push to administer amiodarone over lidocaine for stable Wide Complex Tachycardias. This may be due to increased efficacy in treatment of tachycardia and/or simplicity of dosing in comparison to lidocaine. Although amiodarone has become more favorable, its mechanism of action causes QT prolongation so should be used cautiously. This case explores a rare cause of Wide Complex Tachycardia precipitated by underlying Brugada Syndrome.

CASE REPORT

A 59-year-old male presented to EMS from a rehabilitation facility for heart problems. He was at the rehabilitation facility for physical therapy and occupational therapy following a myocardial infarction. The patient had complained to nursing staff that he was having shortness of breath and a productive cough that developed that morning. Staff at the facility had obtained lab work in the interim. Abnormalities that were noted included a potassium of 5.9. On EMS arrival, the patient was found to have an oxygen saturation of 96% on supplemental oxygen. Initial vital signs included a heart rate of 187, blood pressure 129/61, and respirations of 26. A 12 lead EKG was obtained and found to be a wide complex tachycardia, shown as Figure 1.

The initial EMS crew administered 6 mg of adenosine followed by 12 mg of adenosine, achieving a transient decrease in heart rate without change in rhythm. Medical Control at the hospital ordered amiodarone 150 mg and calcium chloride 1 g to be administered. After administration of amiodarone, the patient EKG converted to the rhythm shown in Figure 2.

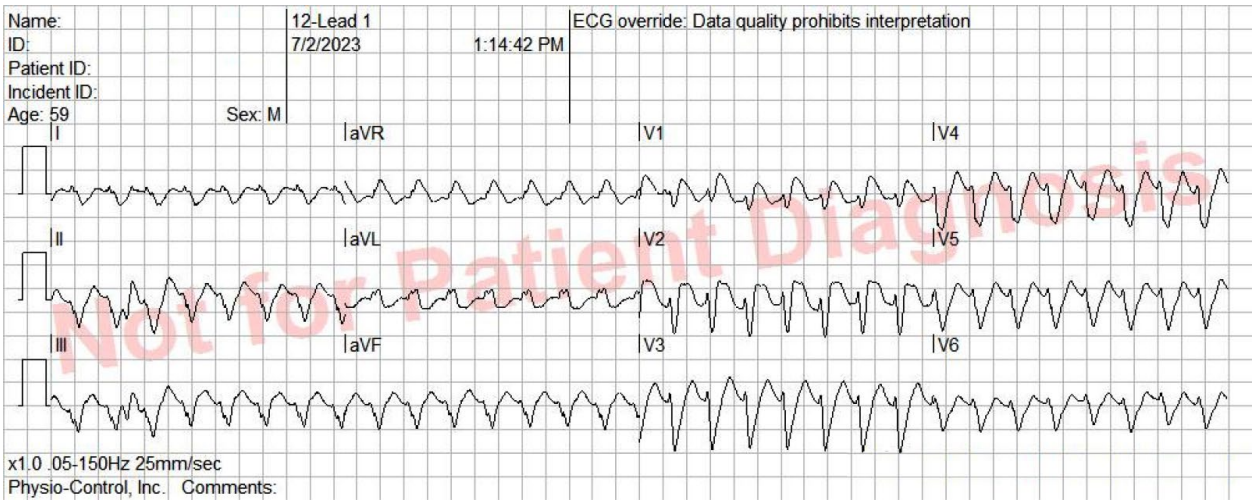

Figure 1. 12 lead EKG showing a wide complex tachycardia.

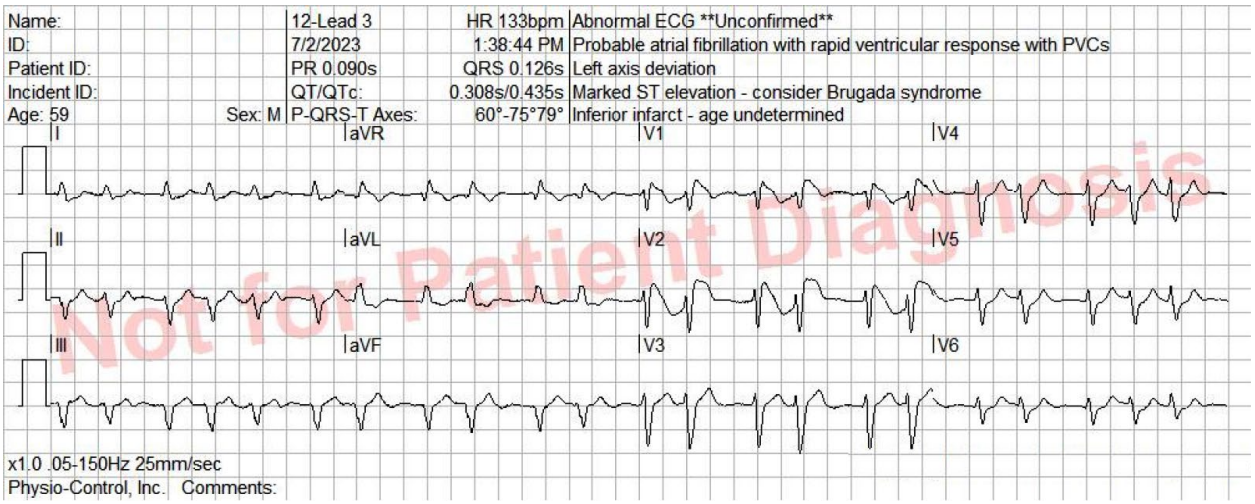

Figure 2. 12 lead EKG showing Atrial Fibrillation with Brugada Pattern in V1 and V2.

The patient was then transported to the hospital where he underwent evaluation by Cardiology and had an Automatic Implantable Cardioverter Defibrillator (AICD) placed. Upon review of the patient's record at the receiving facility, he had three stents placed in his left anterior descending artery (LAD) one week prior with normal EKGs post-revascularization. There was no family history of previous channelopathies.

DISCUSSION

Wide complex tachycardia (WCT) can be defined as a QRS complex duration of greater than or equal to 0.12 seconds, resulting in a heart rate that exceeds 100 beats per minute. For many patients, this condition may manifest symptomatically as chest pain, palpitations, shortness of breath, dizziness, nausea, and/or loss of consciousness. As Wide Complex Tachycardia has the potential to cause rapid deterioration, a methodical approach must be taken upon initial assessment to optimize care for these patients. Once hemodynamically stable, the first line diagnostic technique for this condition is to perform an electrocardiogram (ECG) with or without WCT algorithms to differentiate ventricular versus supraventricular causes of tachycardia (Kashou, 2020).

This distinction is important for guiding medical decision making and management. While there are many causes of WCT, ventricular tachycardia (VT) is the most common, comprising about 80% of all WCT cases (Garmel, 2008).

This patient presented to EMS from a rehabilitation facility after recently sustaining a myocardial infarction. Studies have demonstrated that patients with a history of cardiovascular disease are up to four times more likely to develop ventricular tachycardia (VT) compared to supraventricular tachycardia (SVT) (Garmel, 2008). One research study found that patients who had a history of previous myocardial infarction, recent episode of chest pain, or congestive heart failure demonstrated a positive predictive value of 95% for VT (Baerman, 1987). Based on history alone, this patient's recent cardiac event puts him at increased risk of developing WCT secondary to VT and should prompt further workup and treatment for this dysrhythmia.

In addition to causing QT prolongation, amiodarone also has the potential to "unmask" Brugada syndrome phenotype. Brugada Syndrome is a disorder that can predispose patients to an increased risk of fatal arrythmias and sudden cardiac death. This condition is characterized by ECG findings of ST-segment elevations in right precordial leads and right bundle branch block. A significant proportion of cases (15-30%) are associated with loss of function mutations in the SCN5A gene which codes for a voltage gated sodium channel. However, others, like this patient, discover Brugada syndrome incidentally because of interventions for VT (Robinson, 2019). Amiodarone has been proposed to reveal this condition through its hypothesized ability to act as a sodium channel blocker in vitro (Lalevée, 2003). Although Brugada syndrome has a wide spectrum of clinical presentations, its presence should prompt further evaluation and intervention to reduce the chance of fatal complications. This includes placement of an Automatic Implantable Cardioverter Defibrillator (AICD) and genetic screening for relatives to investigate their risk for developing Brugada Syndrome.

There are three general hypotheses behind Brugada syndrome: Repolarization, Depolarization, and Neural Crest hypothesis. In the Repolarization hypothesis, it is believed that a decrease in sodium current results in augmentation of ITo bypassing ionized calcium activity (Vlachos, 2020). This is likely what showed the pattern in this patient with amiodarone having underlying sodium channel blocking properties. In the Depolarization hypothesis, a right ventricular outflow tract obstruction exists. This coupled with depolarization phase will show the positive deflections seen on EKG (Nagase, 2002). In the Neural Crest hypothesis, during cardiac cell development there is inappropriate expression of neural crest cells causing aberrant expression in the cells resulting

in abnormal conduction in the right ventricular outflow tract (Cerrone, 2022). The last two hypotheses are less likely to have caused the presentation for this patient.

CONCLUSION

This case demonstrates the development of Wide Complex Tachycardia and subsequent Brugada Syndrome in a patient with known cardiovascular risk factors. Initial assessment of past medical history and medication regimens can aid EMS providers in identifying and managing the etiology of the patient's WCT. Additionally, amiodarone has been demonstrated as an effective agent for uncovering Brugada Syndrome as a consequence of treating WCT secondary to VT. As Brugada Syndrome can assume a variety of

clinical presentations, providers should be alert for signs and symptoms of this condition while administering amiodarone or medications with sodium channel blockade abilities. This incidental finding may also prompt additional investigations into alternative classes of antiarrythmics as potential treatment options for VT and can potentially guide hospital course for need for an AICD.

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CONCEPTS

AN OVERVIEW OF THE TREATMENT OF NAUSEA AND VOMITING AND AN ARGUMENT FOR THE PREHOSPITAL USE OF DIPHENHYDRAMINE

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ABSTRACT

Treatment of nausea and vomiting is among the most frequent treatments provided by out-of-hospital providers with the pharmacologic agents in common use displaying varying pharmacologies and potential interactions. The most commonly administered anttiemetic— ondansetron— targets only one of the four main nausea receptors, with the antidopaminergic agents targeting another receptor. This creates an opportunity for the use of diphenhydramine— an antihistamine with anticholinergic properties— as it targets the third and fourth nausea receptors, providing an inexpensive option for the treatment of nausea without requiring the expansion of supply chains or equipment lists. The following concept paper will provide an overview of the relevant pharmacology and an argument that diphenhydramine is logistically suitable for prehospital medicine.

INTRODUCTION

The treatment of nausea and vomiting is among the most common treatments provided prehospitally, with the NEMSIS database finding that ondansetron was administered to 9% of patients and nausea/vomiting being the sixth most common chief complaint afflicting 6% of patients (National EMS Information System, 2024). That an antiemetic is the third most commonly administered medication in the United States implies the large scope of the problem and the importance which prehospital clinicians place on treating nausea/vomiting. However, the literature supporting the efficacy of any of our current antiemetics is slim in the prehospital setting (Verma et al, 2019). The use of guidelines and literature from other domains of medicine is potentially beneficial, but this should be caveated that the development of evidence-based guidelines specifically devalues the use of literature on patients not part of the population being discussed in the guideline (Prasad, 2024).

PHARMACOLOGIC REVIEW

Nausea is typically induced by activation of receptors in the chemoreceptor trigger zone (CTZ) of the medulla oblongata, with several receptors relevant to prehospital emergency care, including the serotonin (5HT3), dopamine (D2), histamine (H1), and both the nicotinic and especially the muscarinic acetylcholine (M1) receptors. The treatment of nausea involves a combination of both treating the underlying causes of nausea and blocking the stimulation of these nausea receptors. Opioids have both agonist and antagonist effects on the CTZ, and the cytokine substance P's effects on the NK-1 receptor is relevant in the treatment of chemotherapy-induced nausea and vomiting (Zhong et al, 2021). The mechanisms by which these receptors may be stimulated are not entirely understood but the literature in post-operative care, oncology, obstetrics, and the limited research which has been performed in the emergency department setting provides guidance on treatment regimens and the efficacy of different solutions (Shaikh et al, 2016, Singh et al, 2015).

Serotonin is one of the most common causes of nausea, being released primarily from the gut and able to stimulate nausea both directly in the CTZ and through the stimulation of abdominal afferent neurons (Terry & Margolis, 2017). The primary antiserotoninergic medication in EMS is ondansetron, which can be administered intravenously, intramuscularly, or orally/oromucosally, and it is the first-line treatment for chemotherapy/radiation induced nausea, opioid-induced nausea/vomiting, and is highly effective in gastroenteritis (Aapro et al, 2021 Athavale et al, 2020). Ondansetron is a second-line medication in the treatment of morning sickness due to a mildly increased risk of oral cleft deformities when given to pregnant patients in their first trimester (Huybrechts et al, 2019).

Dopamine is a neurotransmitter affecting nausea both centrally in the CTZ as well as in the GI tract. Several classes of antidopaminergics are already in use both prehospitally and in the hospital. The butyrophenone class contains haloperidol and droperidol (both of which have an antihistamine effect at higher doses) while the phenothiazine class contains prochlorperazine (with antihistamine and anticholinergic effects at higher doses) (Farkas, 2024). Metoclopramide— a benzamide with an antiserotinergic side-effect profile— is particularly suited to the treatment of gastroparesis and migraines (Rao & Camilleri, 2009, Becker, 2015). While particularly effective in treating nausea of GI origin and potentially effective in nausea of all kinds, the side-effect profile of antidopaminergics limits their potential use. All the antidopaminergic medications have the potential to cause drug-induced parkinsonism with increased occurrence at higher doses and in patients who already have Parkinson's disease (Alvarez & Evidente, 2008). Of note, the immediate treatment of drug-induced parkinsonism may include treatment with anticholinergics including diphenhydramine (Vanegas-Arroyave, 2024).

Histamine and acetylcholine are two different neurotransmitters whose antiemetic benefits are primarily based in vestibular causes (i.e., motion sickness and vertigo) as well as being beneficial in pregnancy as a first-line pharmacologic agent (Paine, 2005, Committee on Practice Bulletins- Obstetrics, 2018). The treatment of motion sickness is of particular importance in EMS and prehospital medicine as vestibularly derived nausea can be caused by many factors inherent to ambulance transport. Motion sickness is likely caused by a mismatch between expected sensory inputs and actually perceived inputs,

such as unexpected changes in acceleration or direction (particularly when there isn't a fixed visual reference point) and may be exacerbated by stress or sitting backwards, all factors present in ambulance transport (Takov & Tadi, 2023). While the two neurotransmitters are distinct, they are grouped together in this article due to first-generation antihistamines having anticholinergic properties (Church & Church, 2013). More to the point, diphenhydramine — the medication focused on in the second section of this paper — is the prototypical first-generation antihistamine. Diphenhydramine is administered intravenously, intramuscularly, orally, or as an elixir — and its most clinically relevant side effects are sedation, dry mucus membranes, and decreased GI/GU motility (Sicari et al, 2025).

Of note, there are potential serious side effects of diphenhydramine, the most immediately dangerous being its potential to cause sedation that may impact the ability to drive safely after discharge (Verster & Volkerts, 2004). This is compounded when administered alongside the sedative antiemetics, especially droperidol and haloperidol, with diphenhydramine being concomitantly administered alongside haloperidol and lorazepam for sedation purposes greatly increasing its duration of sedation and potential side effects, notably hypotension (Jeffers et al, 2022). Patients should be advised against driving following administration of diphenhydramine for any purpose including as an antiemetic, with particular caution and need for monitoring in patients treated with both diphenhydramine and antidopaminergic medications. There is also a cumulative risk of Alzheimer's disease and other forms of dementia from patients taking anticholinergics of any sort, a risk that has largely contributed to diphenhydramine's being increasingly not recommended for regular treatment of allergies in favor of newer generations of antihistamines (Clark et al, 2025).

There are two further agents relevant in the treatment of nausea, with mechanisms not directly linked to the aforementioned receptors: isopropyl alcohol and parenteral fluids. While the mechanism by which inhalation of isopropyl alcohol vapors is unknown— and may be as straightforward as being a way to prompt patients to breathe calmly and distract from external stimuli— that does not change that the inhalation of isopropyl alcohol is clinically effective in the reduction of nausea (Amaya et al, 2023). Parenteral fluids similarly relieve nausea without having a pharmacologic effect on the patient, either through the treatment of dehydration as cause of the nausea or due to a placebo effect (Taylor et al, 2025, Egarton-Warburton et al, 2018).

LOGISTICS AND RESEARCH DISCUSSION

There are three main arguments supporting the use of diphenhydramine prehospitally in the treatment of nausea. The first, that it is especially suited for the treatment of motion sickness- has been discussed above, with the second being its ease of use in EMS systems. Diphenhydramine is already used prehospitally due to its role in the treatment of anaphylaxis and allergic reactions, which has several implications to the ease of its use for a second indication. Diphenhydramine is a medication which medical directors and paramedics are already familiar: they know the dosing of 25-50 mg for adults, the routes, and the side effect profiles. The training burden for familiarizing providers with a "new" medication would therefore be minimal, likely limited to a single continuing education class or video on the mechanism of action and how it is related to nausea.

From an agency perspective, the benefit of diphenhydramine's current widespread availability continues to manifest as the supply lines are already established for advanced life support agencies, with the only necessary change being to order an increased quantity the next time an order is placed. A cursory search of a nationwide EMS supplier found that one vial of diphenhydramine costs $2.42, while by comparison ondansetron costs $3.04, metoclopramide costs $6.68, haloperidol costs $7.40, prochlorperazine costs $7.50, and droperidol— currently only manufactured by a single company— costs $60.40 per dose (as of October 13, 2025), as much as an entire box of diphenhydramine vials (Bound Tree). While agency-specific cost breakdowns are beyond the scope of this article, the cost of stocking additional diphenhydramine can be readily offset by the potential decreased use of more expensive agents. On the other hand, diphenhydramine has occasionally been in short supply in the US, most recently in May 2025, due to one supplier discontinuing their generic supply It's possible that the increased use of diphenhydramine for another indication may exacerbate future shortages (Wheeler).

This is not a recommendation for agency supply departments to stock diphenhydramine as the sole antiemetic, rather it is a recommendation to include it in the list of antiemetics available on hand. Having multiple antiemetics for the paramedic to choose from prevents the situation in which a patient with a known hypersensitivity to one class having a delay in the treatment of their nausea until arrival at the hospital when another medication can be administered. In addition, the current recommendations from the post-operative literature and the obstetric literature for the treatment of nausea are to administer a second antiemetic of a different class should the first prove ineffective (Gan et al, 2020, Committee on Practice Bulletins-Obstetrics 2018). Regrettably, there is currently no consensus guideline available for prehospital or even emergency-department treatment of nausea and vomiting, and evidence is mixed on any interventions' superiority to placebo (Furyk et al, 2015).

Regarding prehospital literature, a recent meta-analysis published in Emergency Medicine Australasia found only seven pieces of original research on administration of antiemetics and found that none were particularly robust either in terms of methodology or sample size; consequently no conclusions as to the efficacy of any antiemetic either against others or against placebo could be drawn (Verma et al, 2018). Of the seven studies identified by Verma et al (2018), only one assessed diphenhydramine. This study, published in Prehospital and Disaster Medicine, found that in a sample size of seven patients who received diphenhydramine (out of a total of 22, with eight receiving metoclopramide and seven receiving placebo), the diphenhydramine group was indistinguishable from the placebo group at fifteen minutes and there were no statistically significant differences between the three at twenty-five minutes (Rubio et al, 2011). The lack of rigorous data from which guidelines can be based indicates a strong need for further research and severely limits the ability to draw conclusions or offer recommendations.

The current standard for developing evidence-based guidelines for EMS is the use of the multi-step GRADE tool, which evaluates literature based on "study design, risk of bias, inconsistency, indirectness, imprecision, and publication bias" (Martin-Gill et al, 2016, Prasad, 2024). Of note is the criteria of precision, which in this context refers to whether a piece of literature evaluates the population for which a recommendation is being developed. Outside of the recommendations from the obstetrics literature which pertain directly to the recommendation for diphenhydramine as a non-teratogenic agent

in pregnant patients, the reliance on literature outside of prehospital care weakens its already-low strength. GRADE's process for evaluating recommendations is a binary strong-weak system, in which weak recommendations are made due to low-certainty evidence, with weak recommendations providing variability in treatment options for patients (Prasad, 2024). In the same spirit, due to the aforementioned lack of evidence in nausea and emesis treatment prehospitally, this article can only weakly recommend diphenhydramine as a prehospital antiemetic until there are robust comparisons from which an evidence-based guideline can be drawn.

CONCLUSIONS

Given the varying mechanisms by which antiemetic medications work, and with the distinct possibility that they may not work or may not work better than placebo, the ability to provide multimodal treatment for nausea and vomiting is of great practical concern. Further research is needed to compare antiemetics administered prehospitally, and to reinforce what medications are most suited to treat which modalities in the prehospital arena. As a stopgap, the availability of medications of each class approaches the standard of care available to treat nausea. With the additional logistic benefits of diphenhydramine as an already-available medication in most ALS formularies, altering system protocols to permit its use may benefit patients due to its safety profile being comparable to that of the other second-line antiemetics and providers' existing comfort with the medication.

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IMPROVEMENT PROJECT REPORTS

MEETING PATIENTS IN THE FIELD: OPIOID USE INTERVENTION FROM EMERGENCY SERVICE PERSONNEL

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ABSTRACT

Introduction: Over the past two decades, the opioid epidemic has posed a major public health crisis in the United States, with significant economic, physical, and societal burdens. This quality improvement (QI) initiative aimed to address gaps in opioid use disorder (OUD) management by enhancing emergency medical services (EMS) personnel's ability to support medications for opioid use disorder (MOUD) access and connection to outpatient services.

Methods: The project was implemented in a small suburban fire department in Virginia. Using the Donabedian Model, Theory of Planned Behavior, and Knowledge-to-Action framework, a structured educational intervention was delivered to EMS personnel across four operational shifts. Pre- and post-intervention surveys assessed knowledge, attitudes, and confidence using validated tools. Paired t-tests and descriptive statistics were used for quantitative analysis, and thematic analysis was applied to stakeholder meeting notes and qualitative feedback.

Results: Post-training surveys showed statistically significant increases in EMS provider confidence. Confidence in identifying appropriate patients for MOUD increased by 24.9%, $t(28) = -5.01$, $p < .001$, and confidence in providing resources to patients with OUD increased by 37.5%, $t(28) = -4.93$, $p < .001$. Thematic analysis revealed six primary themes: improved training effectiveness, increased resource awareness, barriers to implementation, sustainability planning, community engagement, and enhanced data tracking.

Conclusion: This QI initiative demonstrated that brief, targeted EMS training on MOUD significantly improved provider confidence and readiness to support OUD patients. The project highlights EMS's potential to act as upstream intervention partners in the continuum of care. Broader implementation and system-level integration are recommended.

INTRODUCTION

Situated at the intersection of public health and hospital care, emergency medical services (EMS) personnel are often the first responders to opioid overdoses. National EMS data shows that the administration of naloxone by EMS personnel has continued to rise, with more than 207,000 naloxone administrations recorded in 2021 alone, a 43% increase since 2017 (CDC, 2023; NEMSIS, 2022). However, a persistent gap remains in EMS protocols and training for managing opioid use disorder (OUD) beyond acute

overdose reversal. While EMS providers are well-equipped to administer naloxone and manage immediate crises, many report limited formal education on the chronic nature of OUD and the use of medications for opioid use disorder (MOUD). In a recent evaluation of EMS personnel in Baltimore County, providers expressed a strong need for additional training on opioid overdose prevention, stigma reduction, and post-overdose care strategies (Ali et al., 2023).

This quality improvement project aimed to address that gap by delivering targeted education and developing system-level supports to expand EMS engagement beyond emergency stabilization and into the continuum of care for individuals with OUD.

METHODS

Setting and Participants

This quality improvement initiative was implemented in a small suburban fire department in Northern Virginia. The setting was selected due to its high burden of opioid-related calls and its commitment to collaborative public health strategies. EMS personnel at this department often serve as first responders to opioid overdoses, placing them in a critical position to bridge emergency care and ongoing treatment. All field paramedics and emergency medical technicians (EMTs) across four operational shifts (A–D) were included. A total of 29 EMS personnel participated in the training and evaluation components of the project.

Ethics and Institutional Review Determination

This project underwent review by the institution's research ethics authority to determine whether it met criteria for human subjects' research. Following consultation and submission of project materials, the initiative was formally classified as a quality improvement (QI) activity and therefore did not require full research ethics board (REB) approval. Participation in pre- and post-surveys was voluntary, anonymous, and included information about the purpose of the project, the option to withdraw, and the absence of anticipated risks. No patient-level data were collected, and no identifying information was obtained from EMS personnel. The QI designation is acknowledged as a limitation in the interpretation of findings, particularly concerning generalizability.

Project Design

The project was guided by two sequential Plan-Do-Study-Act (PDSA) cycles following established QI methodology (Taylor et al., 2014). The first cycle ('Cycle 1') focused on establishing baseline understanding and identifying operational gaps. Resources used to shape the intervention included the NACCHO First Responder Substance Use Stigma Toolkit, Washington State DOH stigma modules, and regional harm reduction guidelines. Cycle 1 also involved co-developing the educational curriculum, refining leave-behind materials, and piloting early variations of the referral QR code. The second cycle ('Cycle 2') used feedback from the initial trainings and stakeholder observations to refine content, streamline referral workflows, and prepare for broader adoption. This included updating documentation templates, troubleshooting Narcan distribution delays, and ensuring alignment with leadership priorities.

Stakeholder collaboration was central to the design and execution of the intervention. Meetings with EMS leadership, clinical mentors, and MOUD providers were held regularly to guide planning, adapt content, and ensure operational feasibility. Training sessions were delivered on-site over four consecutive days to ensure coverage across all shifts. Attendance was mandatory per department leadership, while participation in the pre- and post-surveys was voluntary.

Frameworks

Three frameworks informed project development and evaluation. Donabedian's Structure-Process-Outcome Model provided the overarching evaluation framework, emphasizing infrastructure readiness, intervention delivery, and provider-level outcomes (McDonald et al., 2007). The Theory of Planned Behavior (TPB) guided survey development and training content by addressing EMS personnel's attitudes, subjective norms, and perceived behavioral control related to MOUD referrals (Lamorte, 2022). Finally, the Knowledge-to-Action (KTA) framework supported evidence translation into practice and structured iterative feedback and adaptation (University of Illinois Chicago, 2024).

Measures

Quantitative measures included pre- and post-intervention surveys that assessed EMS personnel's confidence, familiarity, comfort, and attitudes regarding OUD and MOUD. Survey items were adapted from the validated First Responder Substance Use Stigma Measures Toolkit developed by the Washington State Department of Health and the National Association of County and City Health Officials (NACCHO, 2025). Following the intervention, participants also completed the Acceptability of Intervention Measure (AIM), Intervention Appropriateness Measure (IAM), and Feasibility of Intervention Measure (FIM) to assess the training's acceptability, appropriateness, and feasibility (Weiner et al., 2017).

Qualitative measures included field notes and transcripts collected during stakeholder meetings and post-training discussions. Observations captured reflections on training effectiveness, barriers to implementation, and suggestions for future adaptation.

Data Analysis

Quantitative survey data were exported from Qualtrics into Microsoft Excel for analysis. Microsoft Excel was selected as a practical and accessible tool for conducting descriptive statistics and paired t-tests, particularly given the small sample size and quality improvement context of the project. Paired t-tests were used to compare pre- and post-training responses for each survey item, with statistical significance set at $p < .005$. Two negatively worded items were reverse-coded to ensure consistency in directional interpretation. Descriptive statistics were also used to analyze responses from the Acceptability of Intervention Measure (AIM), Intervention Appropriateness Measure (IAM), and Feasibility of Intervention Measure (FIM).

Qualitative data were analyzed using an AI-assisted coding tool to support initial theme generation. The tool generated preliminary open codes based on recurring concepts within meeting notes and transcripts, which were then manually reviewed by two independent DNP-prepared reviewers. Reviewers compared code lists, identified areas of

discrepancy, and reconciled differences through discussion. For example, one disagreement involved whether comments such as 'I didn't know what the clinic did' represented a lack of resource awareness or reduced perceived behavioral control; the team ultimately created a merged subtheme to reflect both dimensions. The use of AI assistance accelerated the initial sorting of data, while human-based review ensured analytic rigor. Triangulation was conducted across meeting minutes, post-training discussions, and survey write-in comments to enhance trustworthiness and confirmability.

RESULTS

Quantitative Findings

A total of 29 EMS personnel completed both the pre- and post-training surveys, yielding a 100% response rate. Survey responses were rated on a five-point Likert scale (1 = Strongly Disagree to 5 = Strongly Agree). Paired t-tests were conducted using Microsoft Excel's Data Analysis Toolpak to evaluate changes across key domains: confidence, familiarity, comfort, and attitudes regarding OUD and MOUD. Statistical significance was defined as $p < .005$.

EMS personnel's confidence in identifying patients appropriate for MOUD increased by 24.9%, from a mean of 3.41 (SD = 0.66) pre-training to 4.26 (SD = 0.52) post-training, $t(28) = -5.01$, $p < .001$. Confidence in providing resources to patients experiencing opioid use rose by 37.5%, from a mean of 3.28 (SD = 0.69) to 4.51 (SD = 0.46), $t(28) = -4.93$, $p < .001$. Familiarity with MOUD and comfort in discussing treatment options also demonstrated statistically significant improvements (see Table 1).

Two survey items did not reach statistical significance (list survey items for clarity). Notably, both were negatively worded statements, which may have introduced response bias or participant confusion. This highlights the importance of clear survey construction and supports plans to refine evaluation tools in future phases.

Following the intervention, participants completed the Acceptability of Intervention Measure (AIM), Intervention Appropriateness Measure (IAM), and Feasibility of Intervention Measure (FIM). Responses were overwhelmingly positive, with more than 90% of participants selecting "Agree" or "Completely Agree" across all three domains, indicating that the intervention was viewed as acceptable, appropriate, and feasible for continued integration into EMS practice (see Figure 1).

Qualitative Findings

Thematic analysis was conducted on notes and transcripts from stakeholder planning meetings, post-training discussions, and ongoing implementation check-ins. Open coding, combined with a Theory of Planned Behavior-guided lens, revealed six major themes.

Participants consistently reported that the educational content improved their understanding of MOUD and shifted their perspectives on the treatability of OUD in the field. EMS personnel became more familiar with the MOUD clinic, peer recovery supports, and the local referral network. Several participants noted they "didn't know what the clinic did" prior to the training.

Survey Statement	Pre Mean	Post Mean	t(28)	p-value	Signif-icant?	% In-crease**	Interpretation
I am familiar with Medication Assisted Treatment (MAT) or Medications for Opioid Use Disorder (MOUD).	3.38	4.07	-3.58	<0.01	yes	20.4%	Significant improvement in MOUD familiarity
I am confident in identifying appropriate patients for MAT/MOUD services.	3.34	4.17	-5.01	<0.01	yes	24.9%	Significant gain in confidence identifying patients
I am confident in providing resources for patients with Opioid use Disorder (OUD).	2.93	4.03	-4.93	<0.01	yes	37.5%	Significant improvement in ability to provide resources
I feel comfortable effectively communicating with patients with Opioid Use Disorder (OUD).	3.59	3.97	-2.17	0.04	yes	10.6%	Moderate but significant increase in communication comfort
MOUD is effective at reducing overdoses.	3.41	3.9	-3.13	<0.01	yes	14.4%	Significant increase in belief in MOUD's effectiveness
MOUD is effective at reducing future crime.	3.14	3.83	-3.99	<0.01	yes	22.0%	Significant improvement in understanding MOUD's societal impact
*MOUD puts more drugs on the streets.	3.31	3.48	-0.76	0.46	no	5.1%	No significant change in attitude
*Persons who use heroin/opioids do not need to use MAT to get "clean."	3.1	3.38	-1.19	0.25	no	9.0%	No significant change
MOUD is a good investment for society.	3.52	4.07	-3.42	<0.01	yes	15.6%	Significant improvement in perception of MOUD's societal value

**Reverse-coded item. Higher scores indicate more favorable attitudes.*

***Percent increase calculated using reverse-coded values for negatively worded items. Percent increases represent the relative change in mean score from pre- to post-survey.*

Table 1. Pre- and post-intervention mean scores, paired sample t-test results, and statistical significance for EMS provider survey responses (N=29)

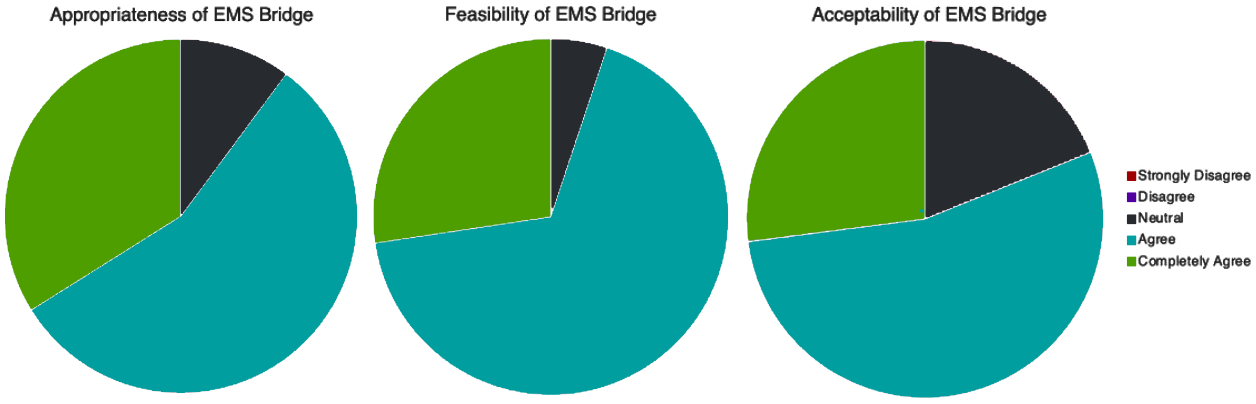

Figure 1. EMS personnel perceptions of the EMS Bridge Program's feasibility, appropriateness, and acceptability (N = 29)

System-level challenges were also identified, including delays in Narcan distribution, incomplete memoranda of understanding (MOUs), and restrictions on patient data sharing. These were perceived as primary barriers to full referral implementation.

Many EMS staff expressed interest in sustaining the initiative and incorporating OUD training into ongoing departmental education. Participants also valued the harm reduction focus of the leave-behind materials and expressed interest in outreach-based roles through community paramedicine. Additionally, staff emphasized the need for stream-

lined documentation processes, requesting integration of referral and Narcan tracking fields into existing EMS reporting software.

These themes align with constructs of the Theory of Planned Behavior. Improvements in attitudes toward MOUD, evolving departmental norms, and increased perceived behavioral control suggest greater readiness for behavior change.

Coder discrepancies were resolved through consensus meetings in which both reviewers compared interpretations and justified code assignments. When disagreements arose, such as classifying comments about confusion over treatment resources, the team revisited transcript excerpts together and examined contextual cues. These discussions led to the creation of blended subthemes, ensuring that themes accurately reflected EMS personnel's perspectives while honoring TPB constructs. This approach strengthened the reliability of the qualitative findings.

Integration of Findings

Quantitative and qualitative results jointly suggest that the intervention successfully enhanced EMS provider confidence, preparedness, and openness to adopting new OUD protocols. Survey improvements were supported by stakeholder feedback, which highlighted personal growth as well as structural needs for sustainability. Together, these findings indicate that targeted training combined with workflow-integrated tools has strong potential to shift EMS practice toward upstream intervention.

DISCUSSION

This quality improvement initiative demonstrated that targeted training for emergency medical services (EMS) personnel on opioid use disorder (OUD) and medications for opioid use disorder (MOUD) can significantly improve provider confidence, knowledge, and readiness to engage in upstream interventions. Statistically significant improvements across key survey domains—especially confidence in identifying appropriate patients for MOUD and providing resources—are consistent with prior evidence that EMS personnel are both capable of, and willing to, expand their role in addressing the opioid crisis when adequately supported (Ali et al., 2023; Barefoot et al., 2021; Hern et al., 2023).

The findings suggest that brief, evidence-informed educational sessions, when paired with operational tools such as leave-behind resource kits and referral QR codes, can meaningfully influence EMS personnel's attitudes and behaviors. These results align with evaluations of other EMS-led harm reduction efforts, which similarly found that targeted education contextualized to local practice, combined with practical pathways for action, increased provider readiness (Belden et al., 2024; Dahlem et al., 2021).

The Theory of Planned Behavior (TPB) provided a valuable framework for interpreting these changes. Post-training feedback reflected a shift in provider mindset, with participants describing an enhanced sense of responsibility to connect patients with ongoing treatment rather than focusing solely on immediate crisis management. Increased familiarity with community MOUD resources and growing support for post-overdose care reflect progress across all three TPB domains—attitudes, subjective norms, and perceived behavioral control—reinforcing existing literature that highlights the critical

role of stigma reduction and systemic support in facilitating provider behavior change (Ali et al., 2023).

The Knowledge-to-Action (KTA) framework similarly highlighted the importance of stakeholder engagement and iterative adaptation throughout the project. Regular meetings with EMS leadership, paramedics, and clinical mentors enabled the team to adjust the training content and workflows based on real-time feedback. This approach strengthened implementation fidelity and helped identify key operational barriers, such as delays in Narcan distribution and limited data-sharing infrastructure, that may have otherwise gone unaddressed. These experiences mirror findings from other EMS-based initiatives emphasizing the need for strong administrative support and ongoing quality feedback loops (Hern et al., 2023).

Donabedian's Structure-Process-Outcome model also framed the project's successes and ongoing challenges. Structural interventions—such as the introduction of updated leave-behind kits, referral QR codes, and stakeholder partnerships—produced measurable improvements in process outcomes at the provider level. Although patient-level outcome data could not yet be collected due to legal and technological barriers, the foundation for future outcome evaluation has been laid through planned documentation templates, reporting dashboards, and enhanced peer recovery integration efforts.

Findings should also be considered within the broader variability of EMS treatment authority across jurisdictions. While some EMS agencies are authorized to initiate buprenorphine or provide comprehensive post-overdose interventions, others may face regulatory or scope-of-practice constraints. Treatment availability, naloxone access, referral pathways, and MOUD clinic partnerships differ widely across states and regions. Future researchers should explore how models like the EMS Bridge Program can be adapted across diverse operational contexts and potentially standardized to support generalizability.

Overall, the results demonstrate the potential for EMS to serve as a critical bridge between overdose reversal and sustained treatment engagement. As public health approaches to the opioid epidemic evolve, integrating EMS personnel into broader systems of care will be essential to improving access to treatment and reducing overdose-related morbidity and mortality.

LIMITATIONS

Several limitations must be considered when interpreting the results of this quality improvement initiative. First, the project was implemented at a single suburban fire department in Northern Virginia, limiting generalizability. Although the department's high call volume and leadership engagement made it an ideal pilot site, broader implementation across diverse EMS systems—particularly in rural or urban settings—may reveal different challenges and outcomes.

Second, although all 29 EMS personnel participated in the training, the small sample size limits the statistical power of the quantitative findings. Future phases would benefit from multicenter participation and a larger cohort to strengthen external validity and allow for subgroup analyses.

Third, due to legal and technological constraints, patient-level outcome tracking was not feasible during the intervention period. At the time of implementation, formal data-sharing agreements and memoranda of understanding (MOUs) between the EMS agency and the outpatient MOUD clinic had not been finalized. As a result, the number of patients referred via the QR code and their subsequent engagement in treatment could not be monitored in real time. Addressing this limitation remains a priority for future project phases, with ongoing collaboration focused on secure data dashboard development and information-sharing agreements.

Additional logistical barriers included delays in distributing updated leave-behind kits containing naloxone and referral materials, which limited the synchronization of training with immediate field deployment. Furthermore, some survey items—particularly negatively worded statements—may have introduced participant confusion or response bias, potentially affecting internal consistency. Revisions to these items are planned for future iterations to improve reliability.

It is also possible that the Hawthorne effect influenced participants' survey responses, with EMS personnel reporting greater improvements in confidence and attitudes because they were aware of being observed and evaluated during the intervention period (Oswald et al., 2014).

While qualitative data collection provided important insights into implementation experiences, it was limited to field notes and informal discussions rather than structured interviews or focus groups. Expanding qualitative inquiry methods in future phases could deepen understanding of EMS perspectives and inform further adaptations to training and referral processes.

Finally, although the project underwent formal ethics consultation and was deemed exempt as a QI initiative, this determination limits the extent to which findings can be generalized or replicated using research-level conditions. The absence of patient-level data, restrictions related to data-sharing agreements, and voluntary survey participation further constrain interpretation. Future evaluations incorporating REB-approved protocols and patient outcome tracking could strengthen rigor and expand understanding of the program's impact.

Despite these limitations, the project successfully established a strong foundation for continued evaluation and expansion. The barriers encountered, particularly those related to legal infrastructure and referral tracking, underscore the importance of system-level alignment when implementing EMS-public health partnerships.

CONCLUSION

This quality improvement initiative demonstrated that equipping EMS personnel with targeted education and practical referral tools can significantly improve their confidence and preparedness to support patients with opioid use disorder (OUD). By addressing gaps in knowledge, reducing stigma, and enhancing perceived behavioral control, the intervention positioned EMS providers not only as emergency responders but as proactive agents in connecting patients to long-term care.

The project advances the role of EMS in harm reduction and public health, showing that with the right training, resources, and system-level support, field personnel are well-positioned to bridge the gap between overdose reversal and treatment engagement. Although full implementation of the EMS-to-clinic referral pathway was limited by infrastructural and legal barriers, the groundwork for sustainable change has been established through the development of leave-behind kits, a secure data tracking framework, and plans for ongoing quality assurance.

Implications for practice include the integration of OUD and MOUD education into routine EMS onboarding and annual recertification processes, as well as formal incorporation of referral documentation into existing EMS reporting systems. The initiative also highlights the importance of strong interagency collaboration, policy alignment, and the use of structured implementation frameworks—such as Donabedian's model, the Theory of Planned Behavior, and the Knowledge-to-Action cycle—to guide adaptation and scale.

Future efforts should focus on evaluating patient-level outcomes following EMS engagement, refining referral workflows, and expanding into community paramedicine models that allow EMS personnel to follow up with high-risk patients outside of acute emergencies. As overdose-related morbidity and mortality continue to pose critical public health concerns, integrating EMS personnel into long-term solutions remains essential.

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PERSPECTIVES

DEBATE: AN ASSOCIATE DEGREE SHOULD BE REQUIRED FOR ENTRY LEVEL PARAMEDICS

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EDITOR'S INTRODUCTION

This paper is the first for a new section of the Journal called Perspectives – a venue for the debate of topics of interest to the paramedicine community. A link to the video recording of the of the debate is shown elsewhere on this page. This paper is a transcript of that debate. More details on the format and the process used for conducting the debate, producing the video and generating the transcript are described in my opening remarks below.

-- M. Gunderson, Editor-In-Chief

DEBATE TRANSCRIPT

Mic Gunderson:

> Welcome to Perspectives: Debates in Paramedicine. Perspectives is a section of IJOP, the International Journal of Paramedicine, which is published by the National EMS Management Association here in the United States in collaboration with the Portuguese Pre-Hospital Emergency Society. I'm Mic Gunderson, the Editor-In-Chief of the Journal, and I'll be serving as the host and moderator for this debate, which will explore the arguments for and against the proposition that an associate degree should be required for entry-level paramedics. But before we get into the debate, let me provide a bit of background on our debate process so you can better understand what you're about to hear.

The format of our debates is different from what you may be accustomed to with the typical competitive debate format. Competitive debates are designed to determine which team won a debate. In contrast, we use a modified Socratic debate format. Socratic debates are designed to gain a deeper understanding on controversial topics by exploring them from different perspectives rather than just trying to prove the other side wrong.

Debates typically are done with live debate teams making their arguments and rebuttals in a back and forth through several debate rounds. That approach tends to place a lot of value on the participants' debate skills rather than the actual merits of the arguments and rebuttals. To place the emphasis back on the merits, we give the debate teams time to reflect on the other teams' arguments before their presentations, allowing them to adjust their arguments and craft their rebuttals accordingly.

So with that in mind, this debate was conducted asynchronously on 8 recording days across a two-week time frame. Before the presentations were recorded, a coin toss determined which team would be Team A and got to present first. The other team, Team B, got to have the last word with the final presentation and the final round. Each presentation and each debate round was recorded with just myself and one debate team member on a video interview platform.

So on day one, team A's first presenter was given up to 5 minutes to make their presentation for round one. Shortly after that recording was completed, it was shared online with all of the members of both debate teams. This allowed the other team to have time to huddle and consider making rebuttals or adjusting their arguments in the team's presentation be given on the next recording day.

On the second recording day, the five-minute round one presentation was recorded from Team B. This cycle was repeated for the round two presentations on day three and four.

Now, Ted Lee was the perspective section editor leading the organization of this debate. And he and I got together after the round two recording was released to the teams so that we could craft a question for each team to respond to in their round three presentations, which were recorded on days five and six respectively.

For the fourth round, each team made their final presentations where they could summarize and include any other counter-arguments or rebuttals if they so chose. These were recorded on the 7th and 8th recording days.

So after all eight video recordings were made from the four rounds of debates, the clips were edited together along with the introduction, between presentation transitions, and closing sections, to create the final product that you are now reading, watching, or listening to. A transcript was created from the recording and edited for clarity, and that transcript was then used to produce the article that appears in the Perspectives section of IJOP.

So now that you can understand the process used for the debate, you can appreciate that scheduling was a significant challenge in producing this event. This

impacted who was available to participate based on having sufficient availability during the time that was scheduled for orienting the teams to the debate process, conducting the team huddles between rounds, and the presentation recording sessions.

So a list of people that had shown interest in this debate topic and things like publications, conference presentations, or other mechanisms was put together. We also asked for some other suggestions from members of the IJOP editorial team. And from that list, we reached out to several individuals, engaged them as we could in the planning and scheduling, to finally end up with four people on the team arguing for the proposition, and two people on the team arguing against the proposition.

I need to point out something that is very important to bear in mind as you read, hear, or watch this debate. These are Socratic debates that seek to educate, not to choose a winning or losing team or argument. The people participating could probably argue very well for either team. With that in mind, I want to emphasize that they participated as individuals. What they presented may or may not reflect their own personal opinions, the positions of their employers, or the positions of any organizations that they may be affiliated with. They were asked to do their best to make arguments and rebuttals from a specific perspective, as members of the team arguing for the proposition or on the team arguing against the proposition - all with the objective of informing the audience on the topic through the format of a Socratic debate.

It is now my pleasure to introduce the distinguished members of our two debate teams.

On the team arguing AGAINST the proposition that an associate's degree should be required for entry-level paramedics, we have Lewis Imperatrice and Ed Bauder.

Lewis Imperatrice is an experienced paramedic, educator, and leader with over 15 years of experience in pre-hospital, 911, and critical care transport. In his current role as National Manager of Clinical Excellence with DocGo, Lewis manages BLS, ALS, and critical care EMS education, and clinical quality for DocGo EMS agencies in eight U.S. states. Lewis is a dedicated EMS educator, a featured lecturer at various EMS conferences, a published author, as well as affiliate faculty with the NAEMT and AHA. Lewis is a course director for the difficult airway course, as well as several other EMS education programs. Lewis continues to work clinically as a per diem paramedic with Hackensack Meridian Health's JFK EMS in New Jersey. Lewis is also a 2024 graduate of the NAEMT Lighthouse Leadership Program and now serves as a mentor with that program.

Also on the AGAINST the proposition team is Ed Bauder. He is a paramedic, educator, and healthcare leader focused on improving EMS through innovation and evidence-based practice. He is the founder of Overrun Productions, where he develops digital education and hosts the Overrun Podcast. With over 20 years of EMS experience, Ed has worked as a clinician, trainer, and conference speaker. His recent work explores leadership, choice architecture, and the use of new media in pre-hospital care. He's currently completing his PhD in Health Sciences at

Seton Hall University, studying how leadership and behavioral economics shape EMS practice and education.

On the team arguing FOR the proposition that an associate's degree should be required for entry-level paramedics, we have Sean Caffrey, Gregg Margolis, Mike Thomas, and John Todaro.

Sean Caffrey is the Chief Executive Officer of the Crested Butte Fire Protection District and a past president of the National EMS Management Association and the EMS Association of Colorado. He has over 35 years of EMS leadership experience and has spent more than two decades working in mountain resort areas of Colorado. Sean graduated from the George Washington University EMS degree program in 1992 and also holds a Master of Business Administration degree from the University of Denver. He's worked as a paramedic, a frontline supervisor, program manager, and senior executive. His experience includes multiple EMS organizations, the Colorado State EMS office, and the University of Colorado School of Medicine.

Gregg Margolis is the Director of Health Policy Fellowships and Leadership Programs at the National Academy of Medicine here in the United States. Prior to joining the National Academy of Medicine, Gregg served as the Director of the Division of Health System Policy for the Office of the Assistant Secretary of Preparedness and Response at the U.S. Department of Health and Human Services. Prior to his federal service, he held leadership and faculty physicians at the University of Pittsburgh, the George Washington University, and the National Registry of EMTs. In 2009-2010, he was the first paramedic to be a Robert Wood Johnson Foundation Health Policy Fellow, where he served as a health staffer in the U.S. Senate. Gregg holds a Ph.D. in Administrative Policy Studies from the University of Pittsburgh and has over 20 years of clinical experience as a field and flight paramedic.

Mike Thompson currently serves as the Chief of Government Affairs, Director of Safety, and Deputy Director of Human Resources for JanCare Ambulance, the largest ground EMS provider in the state of West Virginia, with additional operations in Durham / Raleigh, North Carolina - and with over 14 years of dedicated service at JanCare, Mike has played a pivotal role in advancing the organization's mission to deliver high-quality pre-hospital care across diverse communities. Mike holds a bachelor's degree in sports medicine, a master's degree in healthcare administration, and a doctorate in public health. His academic background and field experience uniquely positions him to lead in both operational oversight and strategic advocacy within the EMS sector. In addition to his leadership at JanCare, Mike is a board member of the American Ambulance Association, where he helps shape national policy and industry standards.

Rounding out the team is John Todaro. John is the director of Eagle Emergency Education Consultants and a senior advisor with Cambridge Consulting Group. His paramedic career spans 49 years, and he holds a baccalaureate degree in business administration and healthcare management - and associate's degrees in paramedicine and nursing. He is a nationally certified EMS educator, healthcare

simulation educator, and simulation operations specialist. In 2009, John was honored by the National Association of EMS Educators when he was awarded their prestigious Legends That Walk Among Us award. He is a charter member and past president of the National Association of EMS Educators and Florida Association of EMS Educators. John has presented at regional and national conferences now for over 41 years.

We are now ready to present the content of the debate. Again, a coin toss determined which team presented first, and that went to the team arguing against the proposition.

Presenting for the team arguing AGAINST the proposition that an associate's degree should be required for entry-level paramedics, we will now hear that team's round one presentation from Lewis Imperatrice.

Louis Imperatrice:

I don't believe that an associate's degree for an entry level paramedic should be required.

We know that there is a significant recruitment issue currently with paramedics throughout the country. And I think that by adding an associate's degree requirement for an entry level paramedic only creates an additional barrier to entry into the EMS profession, specifically on the paramedic level.

We know that associate's degree education is expensive. Times are tough when it comes to inflation, money, et cetera - and this is an additional financial barrier, as well as a time barrier.

We know that paramedic programs in general take anywhere from 12 to 18 months, sometimes two years. Adding the additional associate's degree is only going to bind us more timewise in getting these individuals into the entry-level paramedic field. So we're not in a position, in my opinion, to be adding additional barriers to entry into the paramedic field.

A recent article published in 2025 in the Biomed Central Health Research Consortium actually said that one of the biggest barriers to entry into the EMS field is cost and time. And by adding an associate's level degree to enter into the field of paramedicine only adds to that barrier of getting into the field of paramedicine.

We need paramedics on the street. We need paramedics staffing the truck. We can get them onto the truck through a certificate program in 12 to 18 months. Why do we need to add an additional time constraint and barrier to get them into the field, practicing their medicine and taking care of patients? So I believe strongly that an associate's level degree as an entry level paramedic is just an additional barrier that we have among many other barriers - financial, time constraint.

Some individuals - excellent, excellent clinicians – not good students - and are not gonna be successful in passing, and it's gonna be discouraging for them to get into the field.

Additionally, I think that a very strong point is that most of the learning we do when it comes to clinical learning is in the field. We learn this from experience. We learn this from continuing education classes, whether it be up-to-date alphabet courses, attendance at conferences, various CME or CEU educational programs that we attend. This is where the basis of our learning is. Medicine changes every day. You finish your associate's degree program. The medicine you learned over the course of that two years is probably outdated by the time you hit the field. Getting that baseline knowledge through this certificate program - enough to learn how to assess a patient, evaluate your assessment, and perform the basic clinical care that's under practice. And then, let the additional learning take place hands-on in the field in real time through up-to-date continuing education. That initial associate's degree, really, by the time you hit the field as a clinician in an entry-level position, is going to be null and void almost or outdated or just a baseline of learning - where the continuing education and the growth in our career happens in real time.

You know, I think that the barriers - that an associate's degree holds and constrains an entry level paramedic - as well as the fact that most of the learning, at least from my experience and clinicians that I work with, is done in real time in the field through continuing education. So I don't believe that a associate's degree is going to set an entry level paramedic up to be a better clinician or a smarter clinician or better prepared to work work in the field on that entry-level basis.

So those two points are really where I want to focus initially is - we don't need additional barriers, and continuing education occurs in real time as medicine changes, as the field changes, and as we as providers grow and become more experienced.

Mic Gunderson:

We will now hear the round one presentation from the team arguing FOR the proposition that an associate's degree should be required for entry-level paramedics. That presentation comes from Mike Thomas.

Mike Thomas:

Today we stand in strong support of the motion that paramedics should be required to obtain an associate degree. Let's begin with the fundamental truth - paramedics save lives. They're the first line of medical intervention in emergencies - administering medications, performing life-saving procedures, interpreting complex symptoms, and making rapid decisions under extreme pressure. The question before us isn't whether paramedics are essential. We feel that's undeniable. The question is, are we adequately preparing them for the increasing demands of this profession? And we believe that answer is no, not unless we raise the education standard to an associate degree. Now let's discuss raising those clinical and critical thinking standards.

Modern paramedicine is no longer about bandages and backboards. It requires advanced clinical knowledge, critical thinking, and diagnostic reasoning. An associate degree offers structured coursework in anatomy, physiology, pharma-

cology, and pathophysiology - all crucial for safe, effective patient care. In fact, research published in the Journal of Emergency Medical Services has shown that paramedics with a higher level of education perform better in clinical decision-making and patient assessment, especially in complex or high-stress scenarios.

We're not talking about adding unnecessary hurdles here. We're talking about giving paramedics the tools they deserve to do their job safely and competently. This debate is not about education, it's about outcomes. Paramedics with broader medical education are more likely to correctly identify strokes, sepsis, and other time sensitive conditions in the field. Conditions where every minute matters.

In some regions, expanded training has led to lower rates of hospital readmissions and better handoffs in emergency departments. When a person dials 911, they don't just want someone fast, they want someone skilled - and requiring an associate degree ensures a baseline of quality and consistency across this profession.

Now let's shift to paramedicine as a career and not a stepping stone. Requiring an associate degree sends a clear message. Paramedicine is a respected, skilled healthcare profession, not just a stepping stone or temporary job. Currently, many paramedics face burnout, low wages, and limited advancement. A degree requirement not only raises the bar for training, but also opens doors for better pay, professional development, and long-term career goals - including pathways to advanced roles such as community paramedics or critical care transport specialists. By investing in education, we invest in the workforce and help paramedics stay in the field longer with better support.

Furthermore, this team feels that alignment with current healthcare trends is of utmost salience. Nearly every other healthcare profession, from nurses to respiratory therapists, require at least an associate degree. Why should paramedics be the exception when their responsibilities are just as critical?

Healthcare is evolving. Paramedics are now being asked to do more, manage chronic conditions in the field, reduce ER overcrowding, and participate in mobile integrated healthcare programs. These new expectations demand a higher level of training - and a degree ensures paramedics can adapt to these expanded roles.

Now, let's talk about the elephant in the room-- access and equity. Now, some of you may and have argued that a degree requirement could limit access to the profession. And that's a valid concern. But here's something that is often overlooked. When we raise the education standard, colleges are forced to respond. And that's a good thing for all of us. So this challenge we can and should address through scholarships, partnerships with community colleges, tuition reimbursement, and flexible learning options. With a degree requirement in place, colleges and technical programs begin to allocate more resources toward paramedic education. That means updated equipment, better simulation labs, access to more experienced instructors, and stronger clinical partnerships with hospitals and EMS agencies. It means programs that prepare paramedics not just to pass the NREMT, but to thrive in the real world, high-stakes environments.

And remember, we aren't talking about current paramedics retroactively enrolling in associate programs. We are talking about the paramedics of the future. We shouldn't lower the bar because of barriers. We should break down the barriers so that everyone can reach the bar.

To conclude, requiring an associate degree for paramedics is not about gatekeeping. It's about respecting the complexity of the job, protecting patients, and supporting professionals in their development. When we elevate the standard of care, everyone benefits, paramedics, patients, and the healthcare system as a whole. Thank you.

Mic Gunderson:

So that completes our first round of the debate. We will now go into the second round and hear again from the team arguing against the proposition that an associate's degree should be required for entry-level paramedics. Presenting again for the Against Team, here is Luis Imperatrice.

Louis Imperatrice

So I appreciate the arguments made in regards to a degree for paramedics, and I actually agree that degrees do offer many of the benefits discussed. However, I believe the initial point of an associate's degree requirement for entry level paramedics was missed for two main reasons.

The first being, if a prospective paramedic attends an associate's degree program in paramedicine, the actual clinical content, the medicine, the skills, the assessment, are identical to that of a certificate paramedic - all in accordance with the national EMS education standards. You don't learn any additional clinical skills, whether you have an associate's degree, bachelor's degree, master's degree, et cetera. The additional education you receive from a degree program is entry-level college courses such as English, math, et cetera. Do these courses required to obtain your associate's degree make someone a better prepared entry-level paramedic? The answer is a resounding no.

As paramedics progress in their careers and want to grow into supervisory, managerial, or leadership roles, I agree - degrees specific to the career path, such as business degrees, public health degrees, emergency management degrees - they have an absolute place and an absolute benefit. But again, we have to remember, we're talking about entry-level paramedics here.

My second point is what type of degree are we actually talking about for entry-level paramedics? The question posed does not specify, and I'll use this example. Hypothetically, I have an associate's degree in English. I became a writer and decided this isn't for me. I want to be a paramedic. I attend an 18-month certificate program in paramedicine, pass my NREMT, and become a licensed paramedic. Is my English degree going to have any benefit for me as a clinician? Again, the answer is a resounding no.

So I can truly appreciate, and I do support degrees for paramedics as they advance in their career - and the benefit of these degrees is tenfold. However, the

folks on the opposite side of this argument need to remember we're talking about entry-level paramedics. So I believe my original point still stands. An associate's degree - whether in paramedicine, English, education, basket weaving, who cares - has no bearing on an individual entering the field as a day one entry level paramedic.

Many of the clinically skilled paramedics I know, many of my mentors in this field, are simply certificate paramedics. I think back to a quote from a former preceptor of mine. She said, "There's nothing wrong with being just a paramedic. Keep learning every day, keep an open mind, and love what you do."

I think the argument of paramedicine as a career stepping stone fails completely on its merits. Pay was mentioned, but this is a whole different argument because in many areas of the country, and I can speak specifically to where I work, entry-level certificate paramedics are entering the field at the same pay scale as nurses, with many of them few years into their career making close to, if not over, six figures as certificate paramedics.

So we have to remember that we're talking about these entry-level paramedics, and what we want entry-level paramedics to have is clinical competence to take care of a patient - and a degree does not teach you that. A degree teaches you the soft skills, the leadership skills, the finance, the budget, the management level skills of business. And if you think back for decades, there was never any type of nursing degree. There were certificate nurses who got their RN, went into the hospital, learned while they worked, and then advanced in their career through a clinical ladder. Only in the relative recent future or so have we seen nursing degrees and these requirements for nursing degrees. In fact, most of the nurses working in the hospital right now are probably certificate nurses, especially your senior nurses.

The research on this topic was already done. Jeffrey Ignatovich talked about this and wrote about this in his dissertation where he said that clinical skills are not taught through degrees in the field of paramedicine. They are taught through the National EMS Education Standards, which can be obtained by an entry-level paramedic through a certificate program. College degrees, according to Jeffrey's research, teach you the soft skills, the leadership skills, the managerial skills, and entry-level paramedics simply do not need this level of education to begin working as a paramedic. I'm not saying they don't need it. They don't need it to enter the field.

So I'll end this with a question. When you entered the field as an entry-level paramedic, did you have an associate's degree? And can you directly correlate with proof - your clinical success as an entry-level paramedic to your associate's degree? Or did you obtain your clinical excellence and experience through real life clinical practice and continuing education? And remember, we're talking about entry-level paramedics, not experienced paramedics who are growing through their careers in EMS.

Mic Gunderson:

We will now hear the round two presentation from the team arguing for the proposition that an associate's degree should be required for entry-level paramedics. Here's Sean Caffrey.

Sean Caffrey:

I'd like to thank the International Journal of Paramedicine and my colleagues on both sides of this discussion for participating in this important debate. As the lead author of the 2018 joint position statement on this topic, I've been asked to respond to a few of the arguments that have been made.

Let's start with what it means to be a profession. A profession isn't just a job. It's a field defined by specialized knowledge, rigorous training, experiential learning, standards of practice, and a commitment to the public trust. Professions like nursing, respiratory therapy, radiation technology, and others have long been recognized for meeting these obligations. Paramedicine is no different. To live up to the idea of professionalism, we must get past the notion that the goal is simply to find the cheapest, fastest way to put a patch in a seat. That might fill a roster, but it does not build a profession - and it does not improve care. The public deserves better, and so do the men and women who choose paramedicine as their career.

Paramedics, by and large, deliver advanced medical care in unpredictable, high-stakes environments. We make rapid, complex decisions, perform critical interventions, and integrate into the larger healthcare system. Increasingly, our role extends into critical care transport, interdisciplinary care teams, and helping patients navigate the healthcare system itself. These evolving trends show that paramedics are not only emergency responders, they are essential healthcare professionals whose scope continues to broaden. That combination of knowledge, adaptability, and accountability is what defines a profession. Because paramedicine is a profession, we have a responsibility to prepare our next generation to succeed. not just today, but in a rapidly evolving healthcare system. We owe it to our patients, our communities, and our field to ensure new paramedics have the education and critical thinking skills needed to carry them through an entire career.

An associate's degree is a realistic and appropriate baseline, but let's be clear about what kind of degree we mean. The most common path will be an associate of science in paramedicine, not unrelated fields of study. About 2/3rds of accredited programs already offer this pathway - and for many, the gap between a certificate and a degree is only a semester, or even less, of additional coursework. For those who suggest this somehow means we're requiring a degree in basket weaving or some other irrelevant discipline, that's simply a distractor put forth by the unserious. This is a serious discussion, and it deserves serious arguments, not distractions. As it turns out, there are no degrees in basket weaving. What we're talking about is a degree directly tied to paramedicine, which includes all of the content and prerequisites we already expect, simply organized and delivered as a degree program.

Furthermore, additional coursework matters. Classes in writing, psychology, and the sciences sharpen communication, broaden perspective, and strengthen the

decision-making. These aren't extras. They're essential tools for healthcare professionals who must lead and adapt over time. It is also important to understand that degree programs receive more institutional support than certificate programs. Colleges and universities provide better access to simulation labs, faculty development, financial aid, and student resources. This infrastructure, particularly in community colleges, is optimized to provide the education our workforce needs. This access to resources means students graduate more prepared and the programs themselves are ready to evolve with medical science.

Employers will benefit directly as well. Paramedics with degrees enter the workforce with stronger communication skills, a broader understanding of the healthcare system, and the confidence to take on complex roles. They are better equipped to meet today's challenges, from complex responses to integrated care models and public health crises.

In summary, this step is overdue. An associate's degree is an appropriate and realistic standard to advance our profession. It is a step from which other degrees and specializations can be built. That was the position of multiple national organizations in 2018, and it has become even more apparent today. It is time to make this standard a reality for the future of our profession and the patients we serve. Thank you.

Mic Gunderson:

That completes round two of the debate. For round three, each team was asked to respond to a question, which was, what does the future of paramedicine look like with your team's stated approach? Specifically, what does it look like for the individual clinician, the paramedic profession, the healthcare system, and for patients? As with other rounds, each team has 5 minutes for their presentation here in round three. We will first hear the response to the question from the team arguing against the proposition, which will be presented by Ed Bauter.

Ed Bauter:

Hey everybody, my name is Ed Bauter, and I'm really excited to be part of this debate here. So the first part, where we're talking about this degree program, we have to talk about how it affects the individual clinician. Right now, making an associate's degree program gives one on-ramp for providers to enter EMS. Where really what we're looking for is multiple on-ramps with paid up skilling so that we're not gatekeeping EMS as an industry. Now, this isn't to say that someone who gains a certificate can't later go on to an associate's program or to a bachelor's program or a master's program. But what we want to do, given the recruitment issues and retention issues, is to open up the availability for people to come in and become EMS providers. So going along with NASEMSO, we want to do multiple on ramps and then have different licensure accreditations and employer paid bachelor's or master's pathways.

We also want to have targeted curriculums that can lead to measurable outcomes. NREMT already leads the accreditation part here with pass rates, retention rates, and placement. We can codify simulation hours, have structured precepting. And

all of this is kind of a way to focus more on the EMS centric skills and not necessarily the broad scope of an associate's degree.

For the clinicians, we want to have better wellness and retention levers. So again, we want to be able to kind of focus this training on EMS and how it provides to the patients in the field and how it pertains to the actual providers. And then we also want to make sure that we have a stable job with growing demand. Again, we know that we have between 5% and 7% attrition, depending on where you look. So we want to make sure that we improve retention and we also improve recruitment so that we can kind of backfill the people that will be leaving.

As far as the profession is concerned, we want to professionalize by outcomes, not by abstract credentials. Which is to say that we wanna change the question from, do you have a degree? - to - Can your system prove safer, faster, and more accurate care as it pertains to NEMSIS and the national standards? Ambulance patient offloading time is something that fits into this and additional metrics here.

We also want to create ladders that can actually move people up in their career. So this is where the degree program really gets involved, where we can have someone who is certified and then they get an associate's, a bachelor's and master's and kind of move up that ladder into management.

And we also want data literate paramedics. So this is building a system that's built on QI, data use, and research literacy. There are elements into an associate's degree program that can build to this, but we want to really focus on how it affects EMS.

Then we lead into the healthcare system, where we know that there are shortages and churn, so we need to design the system around them. In an ideal world, we would have a perfect environment where we can build and fix everything at our whim - that is not necessarily the world that we're living in. So we need to address the current attrition and loss rates, and we need to build toward the future. So we need to work around the systems that currently exist.

One easy metric is to standardize and change the patient offloading times within the hospitals. This is something that's being worked on in California, and also publishing the offload performance as they do in Georgia. We can track these times and we can improve ambulance availability, which will improve patients receiving EMS care.

We also have to plan for demand growth and also we have to align our funding to real costs. So this is something that the system needs to deal with. It's not something that we can necessarily deal with.

But as far as the patients are concerned, which this is the priority here, shorter waits through this APOT standard where we're offloading people faster and getting EMS to the patients will change outcomes better than diplomas will have. We already see increased response times in different places like New York City, so we need to have more units on the road and more providers.

And then we also haven't even addressed rural access, where there might be people who are trying to become EMTs, become paramedics, who don't have the same availability that we might have in a suburban or an urban area. So we have to worry and look at what that is going to do to rural environments as well.

And then the big picture we need to look at is quality improvement for the patients and quality improvements for our systems.

So all of these things that I've talked about can work to improve EMS. From the provider side, we want to have these career ladders. We want to have good QI. We want to have a good EMS-specific training.

And then from a societal standpoint, we want to have organizations that have built trust within the community that may be attained through degree programs, but that's not necessarily the most important thing.

So the most important things here is we know that the supply of EMS workers is dwindling, so we have to work to build that up. We also have to work on ambulance deployment and offloading times. We have to build transparency for our outcomes and for credentialing, and we also have to work on career ladders for the providers that are entering EMS.

Whether or not we have a degree program, we have to work on a longer career opportunity for EMS providers, and that can start with a certificate, and it can build up to a degree program.

Thank you so much for listening, and I appreciate all your time, and I look forward to hearing your responses.

Mic Gunderson:

We will now hear from the team arguing for the proposition with reply to the question, what does the future of paramedicine look like with your team's stated approach? Specifically, what does it look like for the individual clinician, the paramedic profession, and the healthcare system, and for patients? Presenting on behalf of the team arguing for the proposition, here is John Todaro.

John Todaro:

Hi, I'm John Tonaro, and I'm here to talk about the future of paramedicine and what the vision is from our group.

So first off, establishing paramedicine as a profession through higher education, self-regulation, and professional representation is that goal for what we want to see with paramedicine in the future.

Now, there's a couple of things that are specific, and what I'd like to do is turn the question around and start with how the profession will affect patients.

So one of the things that we're going to see is paramedicine clinicians providing more patient-centered primary healthcare - doing things like health promotions, disease management, clinical assessments, even palliative care - based on needs-

based interventions for patients without transporting them to hospitals. This is gonna be, you know, pre-hospital.

We're also gonna see clinicians conducting medical, social, and even environmental assessments for patients to help with their preventative care. Paramedic clinicians providing primary care in public health deserts and in primary care deserts is something that we'd like to see in the very near future. And of course, the integration of advanced practice paramedics into the profession will help with patient care and expanding the role of paramedicine professionals in patient care.

Now, when we talk about the health care system, we want to talk about how important it will be to implement a more public health model for the provision of paramedicine care, because we want to be able to include all the continuums of health care, from clinical to academic to administrative.

The establishment of professional opportunities for paramedics in federal government, such as the US Public Health Service, is also a goal we'd like to see with a designated ranking within the Public Health Service. Advanced practice paramedicine professionals working as independent clinicians in primary care and public health agencies, especially in those areas, those desert areas where primary care and public health are hard to come by, we feel like advanced practice paramedicine practitioners would be able to help with that.

The profession itself - what do we see in the future for the profession? Well, we know that associate degrees are something we're very interested in for initial training, but bachelor's degrees as a required pathway for paramedicine supervisors, education and administrative specialty certifications is something we're looking for. We'd like to see paramedicine professionals have bachelor's degrees as a minimum requirement for those paramedicine supervisory and administrative and clinical opportunities. So we'd like to see those certificates, and we'd like to see the degrees flow into those certificates. Master's and doctorate degrees should be added as pathways for advanced practice paramedicine professionals in the areas of clinical medicine, education, and, of course, leadership and management.

One of the really important things we'd like to see is the expansion of the capacity of paramedicine research being done by paramedicine professionals and adding that to the academic community of health care.

We'd like to see a national standardized lifelong learning and continuing education requirement program that has maintenance on a national scale for national paramedic certification, as well as state licensure across all 50 states, the US territories, and the US military.

Now, paramedicine as a clinician is another issue. We already said we'd like to see associate degrees as the entry level requirement for paramedics with a minimum requirement of an associate's degree to sit for the National Registry. And we'd like to see that as a requirement.

We'd like to see bachelor's degrees as a pathway to paramedicine clinical specialties, community paramedicine, mobile and integrated healthcare, primary care,

critical care, flight medics, tactical medics, wilderness medics - all of those specialty areas. We'd like to see those embedded in the bachelor's degree program.

Of course, we'd like to see federal recognition and financial support of paramedicine as a component of healthcare - and representation in HHS, DHS, the United States Public Health Service, FEMA, DOD, et cetera, are all valuable components of this desire for paramedic clinicians to be recognized as paramedicine professionals.

One of the final things that I'd like to say is - it's kind of important to understand that we need to take action. Remember, Norman Vincent Peale said, "Action is a great restorer and builder of confidence. Inaction is not only the result, but the cause of fear." Perhaps the action you take will be successful, perhaps different actions or adjustments will need to follow, but any action is better than no action at all. We've had a very long time in the paramedicine profession here to discuss degrees, to discuss the advancement of the profession. It's time to act. And that is how we feel, that is what we see for the future of paramedicine. Thank you.

Mic Gunderson:

Thank you. Well, that completes round three, the question round. Now for the final round, round four. With the closing round four presentation on behalf of the team arguing against the proposition, here again is Ed Bauder.

Ed Bauter:

Hey everybody, welcome to the closing round of this debate. So just to clarify and to kind of round out this argument, our position is not anti-education. Rather, we're contending that entry-level paramedics should not be required to have an associate's degree, which is not the same thing as opposing higher education. Instead, we strongly support focused EMS-specific educational improvement, and there's evidence that shows that is supported in healthcare. So not so much that you just need an associate's, that this can be an associate's, and if we want to expand this program. But right now there's no EMS-specific evidence that suggests that generic degrees improve outcomes.

The National EMS research agendas explicitly identify this as an unmet need - and right now there's just no evidence to justify this policy. We do already see significant workforce bottlenecks and shortages. EMS is already facing really significant shortages and high turnover. This is per the Bureau of Labor Statistics. We have about 19,000 annual openings in EMS roles, and that's looking at, that's not even counting the 5% to 6% attrition rates that we see.

Also NAEMT and ASEMSO, they talk about high burnout pay and scheduling as problems and drivers of turnover, not lack of degrees. So we have these national organizations that are trying to build EMS that also don't necessarily support a degree as an entry level barrier.

Another concern where we already have problems with people not making enough money and pays pay scales not being sufficient is we have to worry about the barrier of payment into these programs. Do we have providers that are al-

ready working as EMTs that have the dispensable $4,000 to $12,000 on average that we see to get into a paramedic program? This can create financial and time barriers. And also if a program is two years long, what is that EMT going to do during that time to maintain their employment? So that this is another program that needs to be addressed.

I mentioned in the last video, there's also issue with rural EMS, where rural EMS has enormous staffing and financing problems, and degree mandates can risk closing that pipeline and shutting down entire departments. There's a difference between the system we would like to have and the system we do have. Adding this additional barrier poses the risk of agencies having to slow down their services or shut down their services because they can't provide enough providers that have associate's degrees.

What we've learned from nursing is, and nursing is probably our closest and best parallel, is that higher percentages of BSN prepared nurses correlates with lower patient mortality and better outcomes, which is great, but these are degrees in nursing itself, not in unrelated fields. So applying this to paramedicine, we would have to invest in paramedic-specific curricula, which has more simulation, more clinical preceptorship, and outcome-linked QA, not simply requiring just an associate's degree. So when we bring this point up, we know that there's already better alternatives that exist. We already have accreditation through NREMT and COAMPS. That they already are showing pass rates, job placement, and student satisfaction - we can strengthen those standards and immediately that would improve our quality.

We have to look at our patient offloading times as well and our operational concerns and use our system levers to actually activate these systems and improve how the system works. So I talked last time about APOD handoffs, better reimbursement through CMS is something that we have to have and we have to get more involved in lobbying and with the government, and we also have to have better wellness initiatives to have our employees stay longer and find out what these actual performance gaps are. And these are these specific training opportunities that we actually see.

In closing, our specific argument would be that our professionalization can be realized through outcomes, not necessarily through credentialing. The public and healthcare partners that trust EMS, trust EMS because EMS works. We can show safer, faster, more accurate care through transparent decisions and through dashboards, through NEMSIS or APOT reports. We can have professional status reports showing demonstrable results and not necessarily credentials disconnecting us from our practice.

So in general, requiring an associate's degree for entry-level paramedics is a blunt tool that risks worsening staffing shortages. It raises barriers, and it fails to improve care. The future in paramedicine lies in targeted, discipline-aligned education, similar to nursing's BSN model, combined with workforce investment, outcome transparency, and continued professional development.

Thank you so much, and we look forward to your responses.

Mic Gunderson:

Now we will hear the closing round four presentation. On behalf of the team arguing for the proposition, here is Gregg Margolis.

Gregg Margolis:

It is my honor to wrap up our team's strong support of an associate's degree as the educational standard for paramedics of the future. Thank you to the International Journal of Paramedicine and both teams for joining this lively debate. It's been really fun and I've learned a lot. But despite the many great points made by the other team, we remain convinced that an associate's degree in paramedicine is the appropriate educational preparation for an entry-level paramedic of tomorrow.

Let me start by clarifying a few things. First, this will not affect current paramedics in any way. This change will impact future generations of paramedics, not anyone in the field.

Second, we too are concerned about the current paramedic workforce short crisis, but we reject the notion that requiring an associate's degree will make it worse. In fact, we think that it may increase access and reduce cost of EMS education for many people.

Third, we are not denigrating anyone without an associate's degree. We have the utmost respect for many spectacular clinicians, problem solvers, and critical thinkers that we have in our profession today. Unfortunately, we believe that they've achieved excellence despite our educational system, not because of it.

Now, our colleagues on the other side have raised legitimate concerns that requiring an associate's degree might decrease access and increase the cost of paramedic education. We disagree. The U.S. community college system is the envy of the world, having educated millions and improved the lives and careers of countless Americans. According to the United States Department of Education, there are over a thousand community colleges in the U.S. with thousands more satellite campuses in virtually every county in the country. Community colleges have enormous resources and robust online educational offerings that make education much more accessible than certificate programs. Community colleges are designed to make education affordable. They offer reasonable tuition with many options for needs-based grants, scholarships, tuition assistance, student loans, and in fact, many students are able to earn their associate's degree at very low or no cost. And with all due respect to the much referenced and maligned basket weaving profession, we are deeply concerned about the implication that you need more math and education to make baskets than you do to be a paramedic. We believe that general education requirements like math, English, psychology, anatomy, and physiology are directly applicable to the job of a paramedic.

Finally, the other team acknowledges that the current paramedic training takes about 12 to 18 months. But most two-year degrees take about 16 to 20 months from start to finish. So the modest increase over what they're doing now, the paramedic of the future will have a recognized degree. And perhaps we should be more con-

cerned about how the current system cheats students out of valuable, transferable college credits should they desire to continue their formal education. So we think the workforce arguments are moot, and we didn't find anything offered by the other side to change our minds on this point.

So once we take the associate's degree as a barrier off the table, our argument boils down to two things, credibility and adaptability. Credibility, let's be honest. Our profession has long suffered from a lack of respect and recognition by our healthcare colleagues and many of our employers. We have been plagued by low pay, poor morale, high turnover, limited opportunities for advancement, difficulty recruiting, and dangerous working conditions. And while formal education won't solve all of these issues, we do believe it will help.

And adaptability. Yes, you can train the paramedic of yesterday using our current model. There are hundreds of thousands of examples of that. This proposal is about making our profession more adaptable and future ready. We believe that a broader educational foundation will enable our profession to take advantage of opportunities to improve the health of communities we serve. We're at the beginning of this trend with things like community paramedicine, mobile integrated health care, flight paramedicine, and others. And we see a bright future where well-educated paramedics will have multiple options for growth, upward mobility, increased career satisfaction, and greater earning potential.

We know this is a big change and it'll take time. We encourage you to take the long view. We propose a phased implementation over the next five to 10 years, but let's start now to forge a new future.

So in conclusion, despite the great points of our friends on the other side of this debate, we continue to believe that moving paramedic education into community colleges will increase access to education and that making an associate's degree the entry-level educational standard will improve our profession's credibility and the paramedics of the future will be more adaptable and be able to take advantage of opportunities to grow and succeed.

Thank you for listening and for keeping an open mind.

Mic Gunderson:

You have now heard from both teams arguing for and against the proposition that an associate's degree should be required for entry-level paramedics. In the pages of the Journal with the transcript of this debate, we have included references provided by members of both teams to help you further explore this topic. But this conversation is not over. We want to hear from you. What do you think about this?

For that, you're invited to join the discussion on this topic that has been started on the NEMSMA e-mail discussion groups, where hundreds of EMS professionals go to talk about issues confronting our discipline. Go to https://groups.google.com/g/NEMSMA.

All EMS professionals and other interested individuals can join this discussion group. There are no charges to join or participate. Once you're in the group, look for a message thread starting with 3543 in brackets and entitled, Perspectives Debate: An Associate Degree Should be Required for Entry-Level Paramedics.

Please keep your comments professional and courteous in line with the decorum of a professional and scholarly discussion forum, but please do make your voice heard. This discussion will be seen by people who make EMS policy decisions at the local, regional, state, and national levels. While presentations in this debate came from participants in the United States, this has implications for other countries as well. So please join the discussion and help shape policy by expressing your views in a venue that can truly make a difference.

On behalf of the International Journal of Paramedicine, I'm Mic Gunderson. Thank you for listening.

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To help paramedicine professionals to keep abreast of the literature in our discipline, the Paramedicine Literature Search provides the results of a standardized search of the PubMed database. This search results will include articles from journals that many paramedicine professionals may already be familiar with. The search strategy is also designed to include articles in journals they may not be commonly monitoring, such an article about ambulance care for cancer patients that appeared in an oncology journal.

The formatting of the Paramedicine Literature Search allows the reader to scan the titles of articles and click into the article link, when provided, for additional details.

The authors have made a diligent effort in designing of the search strategy to balance sensitivity (i.e., getting all relevant articles in paramedicine) with the specificity (i.e., excluding articles not relevant to paramedicine). The balance is imperfect. As a result, it should be noted that the results do not include every relevant article and includes some non-relevant articles.

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"paramedic"[Text Word] OR "paramedics"[Text Word] OR "prehospital"[Text Word] OR "pre-hospital"[Text Word] OR "emergency medical technician"[Text Word] OR "emergency medical technicians"[Text Word] OR "Ambulance"[Text Word] OR "emergency medical services"[Text Word] OR "fire-rescue"[Text Word] OR "fire-rescue"[Text Word]

Search Filter: Publication range of September 1, 2025 to November 30, 2025.

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International Journal of Paramedicine

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

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

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Authors need to register with the journal prior to submitting or, if already registered, can simply log in and begin the submission process.

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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 describing 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 previsouly 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. If there any dounbdt, authors are encouraged to submit QI projects to an IRB is to obtain their independent judgement of the need for IRB oversight.
- 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.