




An Integrative Systematic Review of Promoting Patient Safety Within Prehospital Emergency Medical Services by Paramedics: A Role Theory Perspective

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Abstract: Timely and effective prehospital care significantly impacts patient outcomes. Paramedics, as the frontline providers of emergency medical services, are entrusted with a range of critical responsibilities aimed at safeguarding the well-being of patients from the moment they initiate contact in the out-of-hospital environment to the time of handover at healthcare facilities. This study aimed to understand the multifaceted roles of paramedics in promoting patient safety within the context of prehospital emergency medical services. A systematic review with an integrative approach using the Whitemore and Knaff's framework was performed examining qualitative, quantitative, and mixed-methods research, then conducting data assessment, quality appraisal, and narrative research synthesis. Literature search encompassed PubMed (including MEDLINE), Scopus, Cinahl, ProQuest, Web of Science, and EMBASE, with the aim of retrieving studies published in English in the last decade from 2013 to 2023. To conceptualize the roles of paramedics in ensuring patient safety, the review findings were reflected to and analyzed through the role theory. The preliminary exploration of the database yielded 2397 studies, ultimately narrowing down to a final selection of 16 studies for in-depth data analysis and research synthesis. The review findings explored facilitators and obstacles faced by paramedics in maintaining patient safety in terms of role ambiguity, role conflict, role overload, role identity, and role insufficiency in the dynamic nature of prehospital care. It also highlighted the diverse roles of paramedics in ensuring patient safety, which encompassed effective communication and decision making for the appropriate management of life-threatening emergencies. The effectiveness of paramedics in playing their roles in promoting patient safety relies on acknowledging the contributions of paramedics to the culture of patient safety; training and educational initiatives focused on enhancing their decision-making abilities and both their non-technical and technical competencies; developing relevant guidelines and protocols; improving collaboration between paramedics and other healthcare peers; optimizing environmental conditions and equipment; fostering a supportive work environment.

Keywords: emergency medical services, healthcare, paramedic, prehospital emergency, patient safety, role

Introduction

Prehospital Emergency Medical Services (EMS) known as ambulance services or paramedic services has been defined as an

Integrated system of medical response that includes the full spectrum of response from recognition of the emergency to access of the healthcare system, dispatch of appropriate response, pre-arrival instructions, direct patient care by trained personnel, and appropriate transport or disposition.¹

Patients choose to utilize EMS because of limited access to primary care and perception of their condition's urgency influenced by the opinions of families, friends, or other healthcare professionals as they believe that EMS offers

necessary resources and facilities for their condition.² Also, worried family caregivers frequently reach out to EMS for immediate assistance when they observe concerning and unforeseen signs of disease progression or approaching death. This action establishes paramedics as the initial point of contact for care.³

Paramedic education and training varies globally, encompassing differences in curriculum, length of training, and entry requirements. Disparities extend to training programs' content, equipment utilization, and intensity. They cause variations in paramedic roles, impacting autonomy, authorized procedures, and collaborations with healthcare professionals. In general, paramedic education and training have traditionally focused on emergency medicine, with less focus on primary care and public health. In developed countries, paramedic roles are evolving due to factors like aging populations, increased chronic conditions, technological advancements, changing community expectations, and broader healthcare system challenges. Countries like the UK, Australia, and New Zealand are moving toward almost mandatory higher education for paramedics, typically through three-year bachelor's degree programs. These degrees offer the flexibility to incorporate a broader range of studies in primary care and public health. However, in countries without widespread access to bachelor's degrees in paramedicine, expanding paramedic education within the constraints of short entry-level programs seems nearly impossible.⁴ Transformations in ambulance services in the UK have caused transitions in the education of paramedics from in-house, apprenticeship-style training lasting several weeks to an academic model, now offered through university-based undergraduate programs.⁵ While diverse program variations intend to equip community paramedics for addressing a wide spectrum of population health and social needs, the training itself lacks clear description. This highlights the urgent need for the establishment of formalized training or education frameworks.⁶ Accordingly, initiatives seek to standardize and enhance paramedic education, training, and responsibilities for consistent, high-quality emergency care internationally.

Over the past few decades, the role of paramedics has undergone a substantial evolution,⁷ as they have been granted the authority to deliver crucial life-saving interventions, particularly with the access to advanced equipment and treatment options.⁸ The profile of paramedics encompasses roles such as clinician, health and social advocate, team member, educator, professional, and reflective practitioner. Additionally, the overarching theme of patient safety as the prevention, reduction, and mitigation of harm or potential harm to patients during the provision of healthcare is a core aspect present in all these roles.⁹

Various factors can impact patient safety, potentially leading to adverse events or near misses in the EMS context. These factors encompass systemic elements such as workplace culture, institutional policies, procedures, protocols, staff training, technological and engineering solutions, and ergonomic considerations. Also, human factors such as complacency, fatigue, task allocation, communication, judgment, and decision-making play critical roles in patient safety.¹⁰

The quality and safety of EMS has significantly improved in recent years, reflecting a heightened awareness of past safety issues and effective measures taken to address them.¹¹ Current patient safety recommendations in EMS encompass raising awareness regarding the principles of patient safety and adaptation of safety strategies from other healthcare disciplines.¹² Nevertheless, disparities in attitudes, roles, and responsibilities concerning patient safety within EMS result in cognitive dissonance among paramedics.^{13,14}

In the realm of prehospital care, a singular method for measuring and monitoring patient safety is unavailable. Monitoring systems have developed over time,¹⁵ but there is still the need to prioritize the integration of patient safety principles within EMS¹⁶ underpinned by studying and examining roles in ensuring a common approach to patient and staff safety.

Acknowledging the lack of integrated knowledge and understanding of how paramedics uphold patient safety in their practice, the aim of this review was to enhance our knowledge and assess the various aspects of their roles, from initial patient assessment to transport and handover, focusing on the measures and interventions implemented to ensure patient safety within the context of EMS. Therefore, our review question was: What roles paramedics have in the preservation of patient safety and prevention of errors and what are the requirements for playing those roles?

Materials and Methods

Design

A systematic review with an integrative approach was conducted. This methodological approach offers a comprehensive and rigorous means of synthesizing existing knowledge, thereby addressing complex questions and issues across various fields of healthcare. By integrating diverse sources of evidence, such as quantitative and qualitative data, the integrative approach ensures a more holistic understanding of a given topic, allowing for a multifaceted analysis.¹⁷ Integrative review synthesis is invaluable for both researchers and policymakers and contributes to the advancement of knowledge and practice. Following Whittemore and Knaff's (2005) framework,¹⁷ this review adhered to a five-step process: identifying the research problem; conducting a comprehensive literature search; evaluating data, which involved assessing quality; performing data analysis and synthesis using a narrative approach; and presenting the findings.

Protocol and Registration

To enhance transparency, ensure the integrity of the review process, and reduce the risk of publication bias, the review protocol in terms of review's objectives, methods, and analysis plan was registered under the PROSPERO ID: CRD42023435026.

The review protocol was created collaboratively by a diverse, multinational team, with each member contributing their expertise in study design, data analysis, and review topic, resulting in a dynamic and finalized protocol.

The review's objectives and approach were formulated using the PICo framework, as outlined below: P (Population): Paramedics with the educational degrees of associate, bachelor, and master involved in EMS; I (Interest): Roles as practical considerations, interventions and strategies in the context of patient safety culture as the prevention, reduction, and mitigation of harm or potential harm to patients during the provision of healthcare; Co (Context): EMS as emergency situations before a patient reaches a hospital or medical facility and during emergency transfer to hospital or between hospitals in the multi-disciplinary care context.

Search Process

The review was prompted by a noticeable absence of an integrated understanding of how paramedics contributed to patient safety, serving as a compelling reason for conducting this investigation. A team of researchers from Norway, Estonia, and Spain, each possessing specialized knowledge in patient safety, paramedics, EMS, and systematic review methodology, was assembled. Following the development of the review protocol, an extensive and all-encompassing search of the literature was conducted on various databases, including PubMed (which comprises MEDLINE), Scopus, Cinahl, ProQuest, Web of Science, and EMBASE, with the aim of retrieving studies published in the past decade, covering the period from 01 Jan 2013 to 30 Sep 2023.

To perform the search, search strings were formulated by translating Medical Subject Headings (MeSH) and thesaurus entry terms into terms compatible with all selected databases. Search queries were built using Boolean logic and truncation, including operators like AND/OR. Additionally, an initial search was conducted on the Google Scholar to identify relevant keywords associated with the review topic, drawing on personal research experiences. The expertise of a librarian was enlisted to provide guidance and consultation to ensure the accuracy of the overall search process. Various versions of key terms related to paramedics, EMS, and patient safety were employed ([Supplementary File 1](#)).

Furthermore, a manual exploration was performed in respected journals publishing articles on the review topic. Cross-references from the bibliographies of retrieved articles and current review papers were also performed for improving the search coverage. The gray literature encompassed contemporary profiles detailing paramedics' roles in EMS in the context of patient safety, which were retrievable through a Google search.

Selection of Studies

Inclusion and exclusion criteria: All original research studies employing qualitative, quantitative, and mixed-methods designs were considered for inclusion. Original and scientifically rigorous content were selected using the following criteria: studies focused on the review subject; in the context of EMS; paramedics; published in peer-review scientific

journals in English. Reviews, commentaries, letters, case reports, case studies, conference proceedings, and books were excluded. Additional studies focusing on pediatrics, child and neonatal care, investigations involving the participation of non-paramedic staff within EMS such as doctors and published prior to 2013 were excluded.

Screening: The results of the search were uploaded to the Rayyan online platform for systematic reviews. The systematic screening and selection of studies were carried out independently by two review authors (MV, MS) possessing expertise in systematic reviews, paramedics, and patient safety, in accordance with the eligibility criteria applied to the articles' titles, abstracts, and full texts. Subsequently, the review authors shared their findings and engaged in discussions to decide on the review next steps. They addressed disparities and reach a consensus. Additionally, in cases of disagreements, the perspectives of other review authors (MFVM, KI, JS, LL) were sought.

Quality Appraisal and Risk of Bias Assessment

It encompassed a thorough assessment of credibility, pertinence, and findings conveyed in the selected studies. The JBI Critical Appraisal Tools¹⁸ customized to suit the specific research methodologies of the studies including cross-sectional, cohort, quasi-experimental, and qualitative were used. Additionally, for cohort and quasi-experimental studies, the Risk Of Bias In Non-randomized Studies – of Interventions (ROBINS-I) assessment tool¹⁹ was also used.

Each author independently evaluated the studies using the checklist and furnished comprehensive explanations of his/her perspective on the studies' quality. A joint determination regarding whether to include or exclude studies in the research synthesis was made. This decision-making process entailed considering the importance, methodological quality, and potential bias, ensuring a rigorous and well-informed selection process.

Data Extraction and Research Synthesis

To gather and bring in data from the selected studies, an extraction table served as a tool for arranging, summarizing, and comparing the study results. Substantial variations in research methods, objectives, and outcomes across the selected studies hindered conducting a meta-analysis. Therefore, the review findings were presented in a narrative format.

To conceptualize the roles of paramedics in ensuring patient safety, the review findings were reflected to and analyzed through the role theory.²⁰ This theory helped identify how individuals perceived their roles, understood their functions, and recognize factors that either facilitate or hinder effective role performance.

Conway's Role Theory is a sociological framework about individuals' engagement in executing specific roles and how their roles influence their attitudes and behaviors. This framework can inform policymakers about the scope of practice for staff and guide decisions regarding education, training, licensure, and adaptation to new roles and expectations. Five categories for role constructs delineated within this theory^{21,22} are as follows:

- (a) Role ambiguity: Uncertainties and disagreements about role expectations cause confusion and miscommunication leading to neglecting important tasks.
- (b) Role conflict: Conflicting or incompatible role expectations when responding to various patient needs hinder fulfilling tasks.
- (c) Role overload: Insufficient resources to meet potentially overwhelming demands result in challenges in the provision of adequate attention and care.
- (d) Role identity: Understanding and internalizing role expectations, establishing norms for attitudes, behaviors, and thoughts are required for playing roles.
- (e) Role insufficiency: Barriers to fulfilling role expectations and obligations associated with roles cause the feeling of inability to play the role.

This integrative systematic review adhered to the guidelines outlined in the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) statement for its development and reporting ([Supplementary File 2](#)).

Ethical Considerations

Ethical approval was not required for this review study as it did not involve the inclusion of human samples.

Results

Search Outcome and Selection of Studies

The initial database search resulted in 2397 studies (see Table 1). After removing duplicate studies and excluding those deemed irrelevant to patient safety or those discussing the roles of healthcare staff other than paramedics within the context of EMS, as well as the screening of articles based on their titles and abstracts, and full-text appraisals, a final selection of 16 studies for data analysis and research synthesis was reached. For a visual representation of the search process, refer to Figure 1, which aligns with the PRISMA guideline.

Quality Appraisal

For cross-sectional studies,^{23–25} they appropriately provided descriptions of the criteria for sampling and recruitment, as well as the exposure and its measurement.

Experimental studies as a pilot intervention²⁶ and a clinical trial²⁷ indicated the presence of a causal relationship between variables, methods of sampling and group assignment, follow-up procedures, and measurement of outcomes.

For qualitative studies,^{28–34} the appropriateness of the research design, transparency in data collection and analysis, ethical considerations, and the credibility of the study findings were evident.

Regarding assessment for bias in the clinical trial study,²⁷ there was a minimal to moderate likelihood of bias in various factors, such as confounding, participant selection, intervention, data, measurement, and result reporting, across the selected studies.

As a result, all selected studies were deemed to have sufficient quality for inclusion in the data analysis and research synthesis.

General Characteristics of the Selected Studies

They were published in English, covering the period from 2013 to 2023. A summary of the chosen studies, encompassing information about the country, research objective, method, sample and setting, outcomes, key findings, and implications for patient safety, has been presented in Table 2.

Table 1 The Search Results

Databases From 2013–2023	Total Records of Each Database	Result of Title and Abstract Reading	Result of Full-Text Reading	Result of Quality Appraisal
PubMed (including Medline)	260	13	5	5
Scopus	666	11	4	4
Cinahl	445	4	1	1
ProQuest	498	10	2	2
Web of Science	96	0	0	0
Embase	432	19	4	4
Total of databases	2397	57	16	16
Duplications	635	–	–	–
Manual search/backtracking references	0	6	0	0

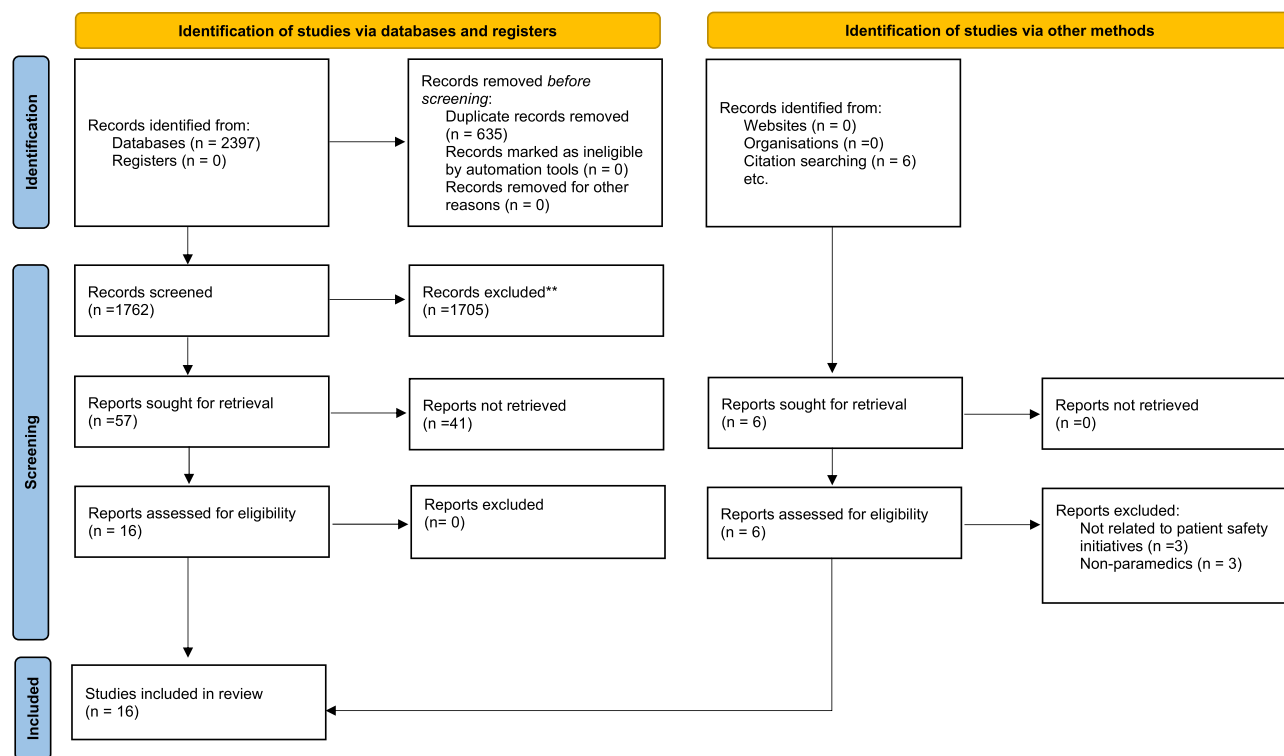


Figure 1 The search process.

Paramedics Role in Patient Safety

The review findings were reflected to the domains of role theory, as outlined in Figure 2. Specific examples from the studies were provided narratively within each domain for illustration.

Role Ambiguity

It was about the lack of adequate knowledge and skills, as well as guidelines and protocols, which contributed to role uncertainties and ambiguities among paramedics.

One notable example was the identification of risks for elder abuse during home visits by paramedics. However, there were no specific EMS protocols or training in place for reporting such cases.³²

Paramedics often felt confused and lacked confidence when dealing with patients experiencing complex partial seizures due to inadequate training and patient management guidelines. As a result, they had to rely on their clinical experiences to make decisions regarding the patient transport.²⁹

The algorithm for managing mental healthcare patients and obtaining their consent for care was deemed overly vague and simplistic, underscoring the necessity for a comprehensive improvement.³³ While hand hygiene and gloving were recognized as important practices, poor compliance with these measures was linked to insufficient competency-based training, particularly in understanding the potential transmission of infectious diseases.²³

Paramedics reported the need for unbuckling themselves within the ambulance for procedures such as cardiopulmonary resuscitations, intubation, inserting intravenous lines, restraining patients, retrieving supplies, and repositioning patients. This was seen as going against current practice protocols, which could potentially jeopardize their own and patient safety.³¹

Additionally, paramedic staff encountered challenges with emergency authorities who were unresponsive to their concerns related to patient care and failed to follow up on their reports.³² An unclear scope of responsibilities in handling aggressive patients and transporting involuntary patients exacerbated their role ambiguities.³³

These role ambiguities were linked to paramedic staff experiencing feelings of anxiety and vulnerability when making decisions about whether to discharge patients on the scene or transport them to ensure patient safety.^{29,32,33}

Table 2 The Characteristics of the Studies Selected for Research Synthesis in This Systematic Review

Author, y	Country	Design/Focus	Sample and Setting	Data Collection and Analysis	Outcome Measurement	Implication for Patient Safety
Burrell et al, 2013 ²⁹	UK	Qualitative/Decision-making process of ambulance clinicians in epilepsy as the neurological condition	15 ambulance Clinicians in south of London	Individual interviews, qualitative content analysis	Triage and assessment of patients with epilepsy	Need for robust training and guidelines for making decisions regarding the conveyance of patients with epilepsy
Ho et al, 2014 ³⁵	USA	Prospective, blinded observation/ Hand-sanitization by EMS staff	53 EMS providers during 258 patient contacts in an urban area	Prospective blinded observation during work shifts using a checklist	Hand-sanitization event	Need for improving precautionary hygiene practices, education, and provision of hand-hygiene equipment
Vicente et al, 2014 ²⁷	Sweden	Randomized controlled trial/ Transporting older adults directly to community or hospital by ambulance nurses	410 people in the intervention and 396 in the control in a suburban area	Number of individuals triaged to community, subsequent transfers to emergency department; inferential and descriptive statistics	Decision making by the ambulance nurse with the help of the prehospital decision support system	Optimizing resources and improving emergency care of older people
O'Hara et al, 2015 ³⁰	UK	Qualitative/Decision making by paramedics for care transitions	n=21, n= 57, n=10; 3 ambulance service trusts	Document review, focus group interviews (n=21), observing 57 staff across 34 work shifts, digital diaries (n=10); qualitative analysis	Key influences on transition decisions and potential risk factors	Skilled workforce to manage diverse patient needs, reduction of emergency department conveyance, access to patient care options as alternatives to emergency departments
Barr et al, 2017 ²³	Australia	Survey and qualitative/Self-reported behaviors and perceptions of hand hygiene and gloving practices	n=417, n=12 paramedics	Questionnaire survey, focus group interviews/thematic analysis	Acceptance and compliance with practice	Need for substantial improvement to reduce the risk of infection transmission
Reuter and Camba, 2017 ³¹	USA	Qualitative and survey/ Perspectives about health, safety, the work environment, and gaps in well-being	Five EMS groups, n=4, n=12, n= 103 within central and eastern Texas	Multi-phase, mixed methods: performance and experiences during individual task conditions, participants' shadowing observation, individual interviews, survey	Safety issues and current efforts to address them	System approach, eliminating redundancy or ill-cooperating equipment, efficient ergonomic solutions for EMS environments to be aligned with the workflow
Rosen et al, 2017 ³²	USA	Qualitative/Attitudes and self-reported practices of EMS providers surrounding identification and reporting of elder mistreatment	27 EMS providers, a single large, private, hospital-based ambulance service	Focus group interviews, qualitative content analysis	Elder mistreatment	The need for empowering EMS providers through training, communication, documentation, and feedback mechanism

(Continued)

Table 2 (Continued).

Author, y	Country	Design/Focus	Sample and Setting	Data Collection and Analysis	Outcome Measurement	Implication for Patient Safety
Sinclair et al, 2018 ³⁶	Canada	Survey and qualitative/Self-reporting of patient safety incidents	1153 paramedics in an Ontario region	Clinical scenarios, open-ended questions, survey and qualitative analysis	Barriers to self-reporting	Culture change to facilitate identifying patient safety threats
Hagiwara et al, 2019 ³⁷	Sweden	Retrospective survey/Incidence of adverse events prehospital care and factors contributing to them	30 prehospital medical records	Prehospital medical records, retrospective study	Actions or inactions by EMS staff	Prevention of deviations from care standards and incomplete documentation
Backman et al, 2019 ²⁸	Sweden	Qualitative/Nurse's decision making about patient's need for ambulance care	8 ambulance nurses, an ambulance station in northern central Sweden	Individual interview, content analysis	Differences in ambulance nurses' perception and patient's and relatives' perceptions of the need for ambulance care	Improved cooperation between different levels of care, need for experience, knowledge and dedication
Bury et al, 2019 ²⁴	Ireland	Survey/Knowledge, understanding about the implications and possible effects of an act in which a patient with capacity may validly refuse treatment in an emergency	85 graduates of advanced paramedics	Experience and awareness questionnaire, case scenarios, online survey	End-of-life and deliberate self-harm situations potentially requiring resuscitation	Changes in medical education, professional practice, and clinician-patient interactions
Larouche et al, 2019 ³⁸	Canada	Observation/Factors that may favor or inhibit the application of safe handling principles by paramedics performing full-body transfers of patients from a stair chair to a stretcher	45 patient transfers involving 35 different teams of paramedics	Observation, semi-structured interviews, observational field study and qualitative study	Safe handling principles	Training not by focusing on handling techniques but by focusing on compromise and the capacity to adapt work techniques based on the working context and the team-mate
Stander et al, 2021 ³³	South Africa	Qualitative/Responsibilities toward management of mental healthcare users and the community during behavioral emergencies	19 prehospital emergency care providers	Focus group interviews, grounded theory	Moral and medical responsibilities	Revision of legislation, better education, skill development and awareness of mental healthcare
Munjal et al, 2022 ²⁶	USA	Pilot intervention/Mitigating risks of care transitions to patient home through the transport PLUS intervention by EMS technicians	103 EMS technicians and 439 patient encounters	Fall safety assessment, discharge comprehensive assessment, pilot intervention	Acceptance of the Transport PLUS intervention by patients and accuracy of assessment by emergency technicians, 3-day and 30-day readmission or revisit	Preventative community paramedicine and patient acceptance
Thorvaldsen et al, 2022 ²⁵	Norway	Survey/Use of blankets, bandages, and Velcro straps to restrain patients in transit	400 ambulance service staff in a county	Questionnaire of applied coercion online survey	Use of coercion	Discussion about how ambulance services can be provided in a safe, secure, and caring way
Vahakangas et al, 2023 ³⁴	Finland	Qualitative/Paramedics' experiences of working in prehospital emergency care, regarding urgent hospital transfers and related skills	20 paramedics, discussion group on the Facebook	Individual interview, content analysis	Safe urgent hospital transfers	Organizational support, professional competence, interprofessional skills, standardized procedures

Abbreviation: EMS, Emergency medical services.

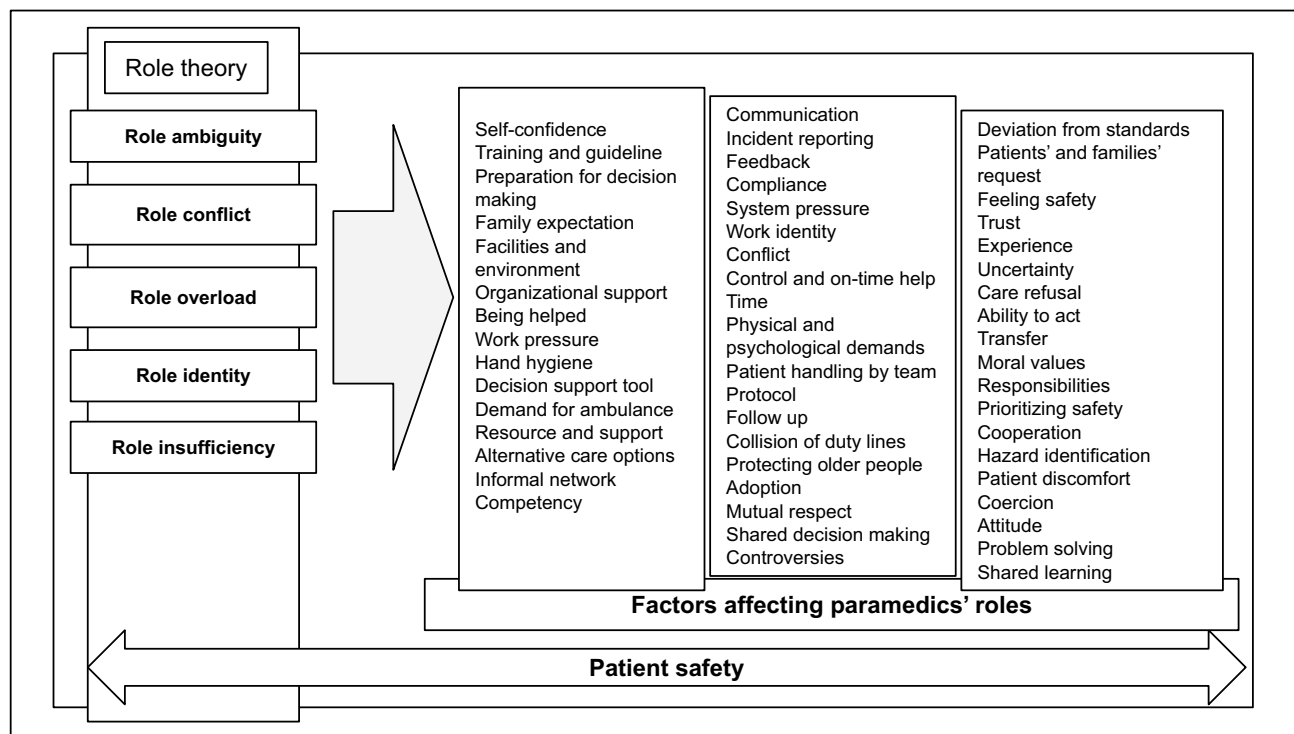


Figure 2 Factors influencing the roles of paramedics in patient safety in relation to the domains of the role theory.

Role Conflict

It stemmed from overlapping roles between paramedics and other healthcare professionals, challenges in collaboration with other clinicians, and difficulties involving patients and their families at the emergency scene.

One of the challenges in communication within the multidisciplinary team was the difficulty in interacting with social workers, which revolved around reporting observations of elder abuse during follow-up home visits perceived as being beyond the typical scope of paramedics' duties.³² Paramedics held the belief that addressing mental illness fell outside of their scope of practice, as they did not consider it in their role to enforce mental healthcare. Instead, they emphasized the responsibility to report their observations on the scene to the receiving facility, ensuring that patients received appropriate care.³³

On the other hand, having a colleague to rely on as a source of support in situations where there was uncertainty about the necessity for ambulance care for a patient created a sense of security.²⁸ Miscommunication among paramedics was identified as a source of conflict. This was particularly concerning when inexperienced staff did not fully comprehend the complexities of working in an ambulance. For instance, errors in conveying medication instructions from inexperienced staff had serious consequences, but qualified staff handled urgent hospital transfers professionally and competently.³⁴

Skills in cooperation, communication, active listening, and the ability to access written information from the patient's journal before or during the patient encounter were imperative for paramedics to report and receive critical information leading to the expedition of emergency operations and prevention of adverse events.^{28,34} However, to mitigate conflicts between paramedics and healthcare providers in emergency departments, what was lacking were mutual respect and collegiality, along with shared learning from incidents. They could foster better collaboration and understanding between them.³⁶

Challenging and conflicting situations arose when patients and their families insisted on ambulance care, even when it was deemed unnecessary by paramedics. They faced a dilemma while attempting to explain, in a language the patients and their relatives could understand, why ambulance care was not needed. This sometimes led to misunderstandings and tensions despite paramedics' good intentions.²⁸

Paramedics experienced pressure to play their roles when in a public setting where bystanders expected them to administer medications to the patient. When patients actively participated in the decision-making process regarding transfer to the hospital, it bolstered the confidence of paramedics in making transport decisions.^{29,33}

Role Overload

It was related to the EMS environment, availability of facilities and equipment, and work demands.

Paramedics raised concerns about the inadequacy of facilities to create a safe environment for patients' recovery, which would enable further investigation and treatment without the immediate need for transfer to emergency departments.²⁹ In certain situations, barriers to accessing appropriate alternative care options, particularly in rural areas, forced them to transport patients even when it might not have been the most efficient choice.³⁰

Inadequate organizational support for making clinical decisions for patients with epilepsy to avoid unnecessary transfers and mitigate liability added to their workload and work burden.²⁹ Paramedics experienced the heightened feelings of surprise, accomplishment, and uncertainty when they were tasked with transporting an emergency patient without the immediate presence of an attending physician.³⁴

The increased demand for ambulance services had a notable impact on the clinical decision-making process. Paramedics should have made decisions concerning a broader spectrum of primary care and psychosocial emergency cases. These cases were complex and time-consuming, necessitating a high level of skill and support to minimize the potential for errors, particularly in time-critical emergencies where response time targets, on-scene time, and conveyance rates were crucial.³⁰

Paramedics experienced a sense of being out of control of the situation when they had to wait for additional help to arrive. This delay in getting patients en-route to the hospital quickly added to their time constraints. It required a significant mental effort to efficiently organize patient care once the necessary support arrived.³¹

They also faced pressure due to the tension between service demands and the availability of resources. Disparities in access to specialist paramedics, vehicles, their proximity to where they were needed, availability of equipment and medications, as well as training on their usage, had the potential to influence decisions regarding patient care and occasionally resulted in adverse events. In some cases, the absence of basic equipment in vehicles hindered time-saving efforts during emergency situations.^{30,31,34,37} Several barriers to practicing hand hygiene during clinical cases were identified. These included a lack of access to suitable hand hygiene facilities with running water, limited availability of hand hygiene products, insufficient resources for drying hands before donning gloves, and potential skin reactions to alcohol-based products.²³

Stress and perceived work demands were also associated with equipment that functioned improperly and constraints related to time and organization.^{31,38} Paramedics viewed their job as time-consuming and emotionally and physically demanding. A range of emotions, including fear, frustration, apprehension, anger, and uncertainty were experienced when dispatched to emergencies involving mental health patients, as well as older and fragile patients being at risk of self-harm or harming others. The urgency of such situations left them with limited time for careful analysis and decision-making.^{31,33,38} Pressure also increased when patients declined care, especially when paramedics were concerned about the risk of patient injury or even death.²⁴

Role Identity

It indicated attitudes, behaviors, and cognitions that were necessary for fulfilling the role of a paramedic. They influenced adherence to protocols and guidelines, concentration on patient safety, having the sense of moral and caring responsibility, efforts to acquire knowledge and skills, and maintaining collegial relationships with other healthcare professionals.

Paramedics demonstrated their capability to adopt protocols and guidelines, particularly in the context of identifying potential elder mistreatment and fall hazards during home visits. They assisted other healthcare providers in elder protection.^{26,32}

They employed checklists and information transfer routines when interacting with different emergency departments,³⁴ followed guidelines and flowcharts, and felt possessing the ability to make a rapid clinical assessment at the first glance, which instilled the sense of confidence in their abilities.²⁸ Consequently, they adopted safe techniques for patient

transfers including adjusting equipment height to make use of gravity when moving a patient to a lower surface, ensuring a clear and properly positioned workspace before the transfer, and utilizing available equipment such as boards or sheets to reduce friction and facilitate sliding between the patient and surfaces.³⁸

Paramedics placed a strong emphasis on their moral and medical responsibilities toward patients,³³ and aimed at striking a balance between patient safety and patient choice when making decisions about whether transport the patient.^{29,33} They expressed a strong intention to self-report adverse events and near misses affecting patient safety.³⁶

They consistently acted in the patient's best interests and took steps to prevent further harm, promote health, and persuaded patients to agree to transportation, thereby saving them from the lengthy waiting times in the emergency room and helping arrange alternative care when needed.^{28,33} They gained patients' trust by providing clear information about their assessment and ensuring them to feel calm and safe before leaving them at the scene.²⁸

Paramedic staff possessed knowledge of a variety of treatment methods to respond promptly to a patient's condition, particularly when dealing with patients who had unstable health conditions during the transfer process.³⁴

They were capable of performing interventions, such as terminating a seizure, in accordance with the training they had received.²⁹ For urgent hospital transfers, paramedics recognized the need for intensive care competences, pharmacological expertise, situational driving skills, understanding the vehicle's technology, proficiency in map reading, and expertise in handling equipment. These competences contributed to creating a calm atmosphere during transfer ultimately improving patient safety.³⁴

Direct patient care was carried out after performing hand sanitizing and hand hygiene, especially in case of direct patient care and handover. It was crucial for protecting both paramedics and patients from spreading infections.^{23,35}

Maintaining up-to-date competence, especially for situations encountered infrequently, was emphasized.³⁰ Paramedics valued the ability to recognize and understand their own limitations and seek assistance when necessary, during patient transfer. Qualities such as humility, initiative, and strong problem-solving skills were considered essential in their role.³⁴ The importance of utilizing standardized decision support tools and algorithms to avoid the inappropriate use of emergency departments and to optimize patient transfer was emphasized.^{27,30}

Paramedics found that communication and sharing experiences with their colleagues enhanced their overall sense of safety.²⁸ In challenging situations or when facing difficult decisions, they engaged in consultations with informal peer networks and sought advice from colleagues and the patient's general practitioner.³⁰

They emphasized the importance of receiving timely, educational, and constructive feedback after self-reporting incidents.³⁶ An easy access to support for handling complex situations as a vital aspect of their professional development and well-being was highlighted.^{24,32}

Role Insufficiency

Barriers to training and practice alignment, coordination, effective dispatch system, and organizational support were reported by paramedics.

A mismatch between the training received by paramedics and the practical expectations of their role was identified. It encompassed the lack of adequate guidance for managing non-medical emergencies highlighting the need for more comprehensive education beyond medical-oriented training.^{29,33} Insufficient training on urgent hospital transfers and absence of collaborative exercises involving the multidisciplinary emergency team was also mentioned.³⁴ As a result, limitations in training, professional development, and skill-building impeded the competence and confidence of paramedics when it came to making complex decisions regarding patient transfer.³⁰ When existing guidelines restricted their capacity to assist patients, such as preventing them from administering medications, or if they encountered challenges in being dispatched to patients in alignment with their specialties, their sense of insecurity and frustration was heightened.^{28–30,34}

In situations involving multiple patients managed by several teams, achieving effective coordination and timely organization was often challenging.³¹ The absence of cooperation from the police when it came to transferring patients who did not consent for being transferred was a significant challenge.³³

Paramedics encountered challenges with the dispatching system, which at times provided inaccurate information about the type of emergency they should be prepared to handle.³³ Paramedics frequently received limited and misleading

information when dispatched to calls. Accessing and staying updated with information communicated through multiple channels proved to be challenging.³⁰ Also, the pressure to complete each clinical case within a short turnaround time hindered effective hand hygiene practices and reduced compliance to standards.²³ Additionally, non-conveyance decisions with the aim of reducing admissions to emergency departments were frustrating. The absence of access to alternative services or community resources often necessitated patient conveyance to the hospital.³⁰

Discrepancy in messages received from the organizational management and quality of paramedic services affected decisions regarding how to enhance the performance and capabilities of paramedics.³⁶ Following the implementation of the new act that granted patients the authority to refuse treatment and the enforcement of assessing patients' living spaces, paramedics expressed concerns about how to handle interventions and were uncertain about the appropriate course of action.^{24,26}

Challenges including the fear of legal repercussions in case of complications, pressure of meeting public expectations, limited on-scene access to patient information, and need for alternative care pathways instead of immediate transportation hindered their ability to carry out their duties effectively.²⁹ Paramedics were deterred from reporting incidents due to the fear of being suspected, terminated, or punished. Low confidence in organizational support in the event of an incident was due to the focus on assigning blame rather than promoting learning.^{30,36} The absence of constructive feedback on clinical decisions limited opportunities for paramedics to reflect and learn from incidents.³⁰

Adverse events frequently occurred because of deviations from the standards of care, such as performing interventions or administering medications that seemed to fall outside protocol, or failing to carry out interventions or provide medications that were within the standard of care. Additionally, incomplete, or unclear documentation contributed to adverse events.³⁷ For instance, paramedics resorted to coercion and not using a fastened seatbelt to ensure patient safety when patients were in transit.²⁵ Positioning around the patient and equipment, having the stretcher at a height equal to or higher than the stair chair, transferring the patient onto the stretcher, lifting the patient, adjusting the final height of the stretcher, repositioning the patient on the stretcher, and pulling up the patient's entire body were some examples of deviations from standard procedures.³⁸

Discussion

The objective of this review was to comprehend the role of paramedics in promoting patient safety within EMS, which was aligned with the role theory to identify factors that facilitated or impeded role performance.

Inadequate knowledge and skills, along with inappropriate guidelines and protocols for carrying out assigned tasks, posed barriers to paramedics in their efforts to maintain patient safety. While there is advocacy for the implementation of the role of paramedics, there is a lack of comprehensive information about the clinical contributions and responsibilities of paramedics in this context.³⁹ Paramedicine training programs should enable them to address a wide range of health and social needs related to identifying risks for hospitalization and readmissions, as well as home visits, medication management, and referrals to community services.^{6,40} Ambulance personnel express a desire for more opportunities to enhance their communication skills when dealing with families and to receive training about the safe and sensitive management of death scenes. They also emphasize the importance of taking collective responsibility for ensuring safety in their roles.^{41,42} Having a deeper understanding of medical knowledge and a clear sense of their roles and responsibilities in emergency situations can reduce paramedics' distress and enhance job satisfaction.⁴³

The curriculum analysis for EMS education in Sweden revealed an imbalance in course content related to professional practice, which included a significant emphasis on medical knowledge and a lesser focus on caring and contextual knowledge.⁴⁴ Paramedics should be equipped with non-technical skills, including but not limited to situation awareness, decision-making, communication, teamwork, leadership, stress management, and risk approaches. These skills are crucial for effective performance in emergency situations. The examination of clinical complaints and investigations into clinical errors are valuable tools for identifying required non-technical skills gaps in paramedicine practice.⁴⁵

The overlap between paramedic roles and those of other healthcare professionals hindered safe practice by paramedics, but collaboration with other clinicians had a significant role in shaping their safety roles. EMS procedures demand decisions and actions that require interactions between paramedics and physicians. There is limited scientific evidence about clinical decision-making and actions/inactions within EMS.¹⁰ It has been shown that paramedics can

determine preliminary diagnoses to a satisfactory level, but the level of precision varies depending on the type of illness or emergency. The peer-to-peer consultation system in case of non-access to physicians is an alternative strategy for preserving patient safety.⁴⁶

Our review findings indicated that the EMS environment, facilities, equipment, and work demands influenced paramedics' roles in ensuring patient safety. Frequent referrals and overcrowding are ongoing, significant issues with global implications, impacting both patients and paramedics.⁴⁷ The prevalence of work-related injuries among EMS professionals is three times higher than in other occupational sectors.^{48–50} Safety-compromising behaviors exhibited by paramedics are significantly associated with fatigue and organizational stress.⁵¹ The fast-paced environment of the emergency department where time pressure can amplify any initial disagreements between clinicians and patients or their surrogates, leading to distress for all parties involved.⁵² Applying ergonomic science to improve the work environment, institutional policies, technological or engineering solutions can improve patient and staff safety.¹⁰

The importance of attitudes, behaviors, and cognitive aspects, as well as the significance of concerns regarding patient safety and the moral and caring responsibility of paramedics were underscored. The symptoms of moral injury among paramedics are strongly connected to the feelings of guilt and shame, which can be manifested as social isolation and emotional numbing, reflecting the emotional and psychological impact of their work.⁵³ Paramedicine programs should aim to develop a patient-centered, safe, and responsive therapeutic relationship. Additionally, they should serve as a safety net during health exacerbations, offer health education, and promote accountability for patient well-being.⁵⁴ Paramedics should possess skills to collect pertinent cues and exhibit the capacity to form rapid clinical impressions. It involves an interconnected and dynamic interplay between conscious and subconscious information processing.⁵⁵ In situations with a higher risk of moral injury, social support and established relationships with colleagues are beneficial for paramedics, helping them cope with emotional challenges associated with practice.⁴³

Barriers to fulfilling expectations and obligations associated with paramedic roles included issues related to coordination, the dispatch system, and organizational support, all of which posed challenges to paramedics in playing their roles. Barriers to safe handovers between EMS and emergency departments are redundancy, poor recall, conflicting goals and perspectives, technological issues, information degradation, lack of standardization and training, delays, and absence of feedback mechanisms.⁵⁶ Communication between the EMS and the emergency department, both before and upon arrival, along with a written patient report, efficient teamwork, and a conducive learning environment, are essential for patient safety.^{57,58} The decision-making process for non-conveyance by paramedics involves competencies, experience, intuition, consideration of the patient's health status, their refusal, wishes, and utilization of supportive tools.⁵⁹ Careful assessment and on-scene treatment is essential to ensure patient safety and reduce unnecessary transfers to emergency departments.⁶⁰

Unsupportive workplace cultures have a detrimental effect on paramedics, impacting their mental health. This is exacerbated by inadequate feedback mechanisms, which hinder the opportunity to learn from mistakes.^{61,62} Patient safety events are often underreported and are most likely associated with issues in communication, checking/verification processes, and teamwork.⁶³ The primary shortcoming of EMS is the lack of receiving meaningful feedback that aims to improve both practice and system-focused interventions.^{64,65} Inadequate documentation and the improper utilization of information are primarily attributed to healthcare professionals and organizations as technical issues.⁶⁶ Staff should be encouraged and empowered to identify clinical errors and voice their concerns to help prevent individual feelings of shame and fear of potential consequences.⁶⁷

Strengths and Limitations

This is the first systematic review to integrate current international knowledge about the roles of paramedics in the improvement of patient safety and in relation to the role theory. Only 16 articles were discovered that specifically examined the roles of paramedics in ensuring patient safety. With patient safety being a paramount concern in healthcare, the limited existing knowledge hinders our ability to fully understand and improve safety protocols and practices specific to EMS.

Language bias might have affected this review focused on studies published in English language, potentially excluding relevant research in other languages. Selection bias was avoided in this review considering the inclusion studies from both qualitative and quantitative designs. However, varying quality of included studies and the challenge of

synthesizing data from heterogeneous sources with diverse study designs and methodologies could have influenced the research synthesis.

Future research is essential for bridging the existing knowledge gap and holding the promise of saving lives, reducing medical errors, and ultimately enhancing the quality of EMS. As EMS continues to evolve and face new challenges, there is a growing imperative to conduct comprehensive investigations that inform evidence-based strategies, enhance training, and bolster patient safety within this dynamic environment.

Conclusion

Our review findings shed light on critical factors influencing attitudes, behaviors, cognitions, and the ability of paramedics to play their pivotal roles in preserving and improving patient safety within EMS. The evolving role of paramedics in primary care and emergency settings necessitates further elucidation to maximize their clinical contributions and enhance healthcare delivery.

Paramedicine operates at the dynamic juncture of advancing technologies, diverse responsibilities, and intricate healthcare environments, necessitating a multifaceted approach. A comprehensive approach that systematically evaluates the entire patient flow system in EMS is required. In practice, it underscores the critical need for comprehensive training and education programs aiming at addressing decision-making, non-technical and technical skills for bridging the gap between theoretical knowledge and practical application, ultimately ensuring the safety and well-being of both paramedics and patients.

The development and implementation of standardized educational and training programs, and appropriate guidelines and protocols are equally essential to ensure that paramedics can perform their assigned tasks effectively and safely. Recognizing paramedics roles and capabilities and fostering collaboration between paramedics and other healthcare professionals can lead to more cohesive and patient-centered care.

Addressing the environmental and equipment-related factors in EMS is crucial to enhance the quality of patient care. A supportive workplace culture for paramedics indicates the significance of cultivating a work environment that is centered on continuous learning and development through robust feedback mechanisms based on patient outcome, peer assessment, and incident reporting.

The need for improved coordination and dispatch systems to facilitate the fulfillment of expectations and obligations associated with paramedic roles is highlighted. The intricacies of non-conveyance decision-making by paramedics, influenced by the myriad of factors related to professionals, patients, healthcare systems, and support facilities, underscore the need for well-defined protocols and competencies to safeguard patient care.

By recognizing and addressing these barriers and considerations, healthcare organizations and policymakers can take concrete steps to enhance patient safety and the effectiveness of paramedics in EMS.

Disclosure

The authors report no conflicts of interest in this work.

References

1. Millin MG, Hawkins SC. Wilderness emergency medical services systems. *Emerg Med Clin North Am.* 2017;35(2):377–389. doi:10.1016/j.emc.2016.12.001
2. Coster JE, Turner JK, Bradbury D, Cantrell A. Why do people choose emergency and urgent care services? A rapid review utilizing a systematic literature search and narrative synthesis. *Acad Emerg Med.* 2017;24(9):1137–1149. doi:10.1111/acem.13220
3. Blackmore TA. What is the role of paramedics in palliative and end of life care? *Palliat Med.* 2022;36(3):402–404. doi:10.1177/02692163211073263
4. O’Meara PF, Furness S, Gleeson RAY. Educating paramedics for the future: a holistic approach. *J Health Human Serv Administr.* 2017;40(2):219–253.
5. Givati A, Markham C, Street K. The bargaining of professionalism in emergency care practice: NHS paramedics and higher education. *Adv Health Sci Educ Theory Pract.* 2018;23(2):353–369. doi:10.1007/s10459-017-9802-1
6. Chan J, Griffith LE, Costa AP, Leyenaar MS, Agarwal G. Community paramedicine: a systematic review of program descriptions and training. *Cjem.* 2019;21(6):749–761. doi:10.1017/cem.2019.14
7. Eaton G, Wong G, Tierney S, Roberts N, Williams V, Mahtani KR. Understanding the role of the paramedic in primary care: a realist review. *BMC Med.* 2021;19(1):145. doi:10.1186/s12916-021-02019-z
8. Janerka C, Leslie GD, Mellan M, Arendts G. Review article: prehospital telehealth for emergency care: a scoping review. *Emerg Med Australas.* 2023;35(4):540–552. doi:10.1111/1742-6723.14224

9. Tavares W, Bowles R, Donelon B. Informing a Canadian paramedic profile: framing concepts, roles and crosscutting themes. *BMC Health Serv Res.* 2016;16(1):477. doi:10.1186/s12913-016-1739-1
10. Bigham BL, Nolan B, Patterson PD. Patient safety culture: clinical practice and systems oversight. In: Cone DC, Brice JH, Delbridge TR, Myers JB, editors. *Emergency Medical Services.* 3rd ed. New York: Wiley; 2021:413–423.
11. Shepard K, Spencer S, Kelly C, Wankhade P. Staff perceptions of patient safety in the NHS ambulance services: an exploratory qualitative study. *Br Paramed J.* 2022;6(4):18–25. doi:10.29045/14784726.2022.03.6.4.18
12. Hansen K, Boyle A, Holroyd B, et al. Updated framework on quality and safety in emergency medicine. *Emerg Med J.* 2020;37(7):437–442. doi:10.1136/emermed-2019-209290
13. Fisher JD, Freeman K, Clarke A, et al. *Health Services and Delivery Research. Patient Safety in Ambulance Services: A Scoping Review.* Southampton (UK): NIHR Journals Library; 2015. PMID: 25996021.
14. Mausz J, Donnelly EA, Moll S, Harms S, McConnell M. Role identity, dissonance, and distress among paramedics. *Int J Environ Res Public Health.* 2022;19(4):2115. doi:10.3390/ijerph19042115
15. O'Connor P, O'Malley R, Oglesby AM, Lambe K, Lydon S. Measurement and monitoring patient safety in prehospital care: a systematic review. *Int J Qual Health Care.* 2021;33(1):mzab013. doi:10.1093/intqhc/mzab013
16. Alburaidi AS, Al-Wathinani AM, Aljuaid MM, Almuhaidey AS, Goniewicz K. Sustainable resilience in healthcare delivery: a comparative study on safety awareness in hospital-based and pre-hospital ems in times of crisis. *Sustainability.* 2023;15(15):11593. doi:10.3390/su151511593
17. Whitemore R, Knafk K. The integrative review: updated methodology. *J Adv Nurs.* 2005;52(5):546–553. doi:10.1111/j.1365-2648.2005.03621.x
18. JBI. JBI critical appraisal tools. Available from: <https://jbi.global/critical-appraisal-tools>. Accessed February 15, 2024.
19. Sterne JA, Hernán MA, Reeves BC, et al. ROBINS-I: a tool for assessing risk of bias in non-randomised studies of interventions. *BMJ.* 2016;355:i4919. doi:10.1136/bmj.i4919
20. Utley R, Henry K, Smith L. Role-related frameworks. In: *Frameworks for Advanced Nursing Practice and Research.* New York: Springer Publishing Company; 2018:217–232.
21. Brookes K, Davidson PM, Daly J, Halcomb EJ. Role theory: a framework to investigate the community nurse role in contemporary health care systems. *Contemp Nurse.* 2007;25(1–2):146–155. doi:10.5172/conu.2007.25.1-2.146
22. Hardy M, Conway M. *Role Theory: Perspectives for Health Professionals.* 2nd ed. California: Appleton and Lange; 1988.
23. Barr N, Holmes M, Roiko A, Dunn P, Lord B. Self-reported behaviors and perceptions of Australian paramedics in relation to hand hygiene and gloving practices in paramedic-led health care. *Am J Infect Control.* 2017;45(7):771–778. doi:10.1016/j.ajic.2017.02.020
24. Bury G, Thompson A, Tobin H, Egan M. Ireland's assisted decision making capacity act-The potential for unintended effects in critical emergencies: a cross-sectional study of advanced paramedic decision making. *Ir J Med Sci.* 2019;188(4):1143–1148. doi:10.1007/s11845-019-01994-w
25. Thorvaldsen N, Bergem AK, Holst Ø, Häikiö K. Coercion in the ambulance setting. *Tidsskr nor Laegeforen.* 2022;142(14). doi:10.4045/tidsskr.22.0086
26. Munjal KG, Yeturu SK, Chapin HH, et al. Feasibility of the transport PLUS intervention to improve the transitions of care for patients transported home by ambulance: a non-randomized pilot study. *Pilot Feasibility Stud.* 2022;8(1):169. doi:10.1186/s40814-022-01138-5
27. Vicente V, Svensson L, Wireklint Sundström B, Sjöstrand F, Castren M. Randomized controlled trial of a prehospital decision system by emergency medical services to ensure optimal treatment for older adults in Sweden. *J Am Geriatr Soc.* 2014;62(7):1281–1287. doi:10.1111/jgs.12888
28. Backman T, Juuso P, Borg R, Engström Å. Ambulance nurses' experiences of deciding a patient does not require ambulance care. *Nurs Open.* 2019;6(3):783–789. doi:10.1002/nop2.255
29. Burrell L, Noble A, Ridsdale L. Decision-making by ambulance clinicians in London when managing patients with epilepsy: a qualitative study. *Emerg Med J.* 2013;30(3):236–240. doi:10.1136/emermed-2011-200388
30. O'Hara R, Johnson M, Siriwardena AN, et al. A qualitative study of systemic influences on paramedic decision making: care transitions and patient safety. *J Health Serv Res Policy.* 2015;20(1 Suppl):45–53. doi:10.1177/1355819614558472
31. Reuter E, Camba JD. Understanding emergency workers' behavior and perspectives on design and safety in the workplace. *Appl Ergon.* 2017;59(Pt A):73–83. doi:10.1016/j.apergo.2016.08.023
32. Rosen T, Lien C, Stern ME, et al. Emergency medical services perspectives on identifying and reporting victims of elder abuse, neglect, and self-neglect. *J Emerg Med.* 2017;53(4):573–582. doi:10.1016/j.jemermed.2017.04.021
33. Stander C, Hodkinson P, Dippenaar E. Prehospital care providers' understanding of responsibilities during a behavioural emergency. *S Afr J Psychiatr.* 2021;27:1545. doi:10.4102/sajpspsychiatry.v27i0.1545
34. Vähäkangas P, Nordquist H, Terkamo-Moisio A. Urgent hospital transfers - The experiences and required skills of paramedics. *Int Emerg Nurs.* 2023;67:101269. doi:10.1016/j.ienj.2023.101269
35. Ho JD, Ansari RK, Page D. Hand sanitization rates in an urban emergency medical services system. *J Emerg Med.* 2014;47(2):163–168. doi:10.1016/j.jemermed.2013.08.070
36. Sinclair JE, Austin MA, Bourque C, et al. Barriers to self-reporting patient safety incidents by paramedics: a mixed methods study. *Prehosp Emerg Care.* 2018;22(6):762–772. doi:10.1080/10903127.2018.1469703
37. Hagiwara MA, Magnusson C, Herlitz J, et al. Adverse events in prehospital emergency care: a trigger tool study. *BMC Emerg Med.* 2019;19(1):14. doi:10.1186/s12873-019-0228-3
38. Larouche D, Corbeil P, Bellemare M, Authier M, Prairie J, Hegg-Deloye S. To what extent do paramedics apply safe handling principles when transferring patients from stair chairs to stretchers? *Ergonomics.* 2019;62(10):1313–1326. doi:10.1080/00140139.2019.1641629
39. Eaton G, Wong G, Williams V, Roberts N, Mahtani KR. Contribution of paramedics in primary and urgent care: a systematic review. *Br J Gen Pract.* 2020;70(695):e421–e426. doi:10.3399/bjgp20X709877
40. von Vopelius-Feldt J, Bengler J. Who does what in prehospital critical care? An analysis of competencies of paramedics, critical care paramedics and prehospital physicians. *Emerg Med J.* 2014;31(12):1009–1013. doi:10.1136/emermed-2013-202895
41. Anderson N, Slark J, Gott M. How are ambulance personnel prepared and supported to withhold or terminate resuscitation and manage patient death in the field? A scoping review. *Austr J Paramed.* 2019;16:1–11. doi:10.33151/ajp.16.697
42. Koski A, Sumanen H. The risk factors Finnish paramedics recognize when performing emergency response driving. *Accid Anal Prev.* 2019;125:40–48. doi:10.1016/j.aap.2019.01.021

43. Murray E, Krahé C, Goodsmann D. Are medical students in prehospital care at risk of moral injury? *Emerg Med J.* 2018;35(10):590–594. doi:10.1136/emermed-2017-207216
44. Sjölin H, Lindström V, Hult H, Ringsted C, Kurland L. What an ambulance nurse needs to know: a content analysis of curricula in the specialist nursing programme in prehospital emergency care. *Int Emerg Nurs.* 2015;23(2):127–132. doi:10.1016/j.ienj.2014.09.002
45. Shields A, Flin R. Paramedics' non-technical skills: a literature review. *Emerg Med J.* 2013;30(5):350–354. doi:10.1136/emermed-2012-201422
46. Jensen JL, Al-Dhalaan F, Rose J, et al. Paramedic clinical consults with a paramedic or nurse in an EMS communications center compared to traditional online physician consults. *Prehosp Emerg Care.* 2022;1–7. doi:10.1080/10903127.2022.2152512
47. Verelst S, Wouters P, Gillet JB, Van den Berghe G. Emergency department crowding in relation to in-hospital adverse medical events: a large prospective observational cohort study. *J Emerg Med.* 2015;49(6):949–961. doi:10.1016/j.jemermed.2015.05.034
48. Becker LR, Spicer R. Feasibility for an EMS Workforce Safety and Health Surveillance System. National Highway Traffic Safety Administration. Available from: https://www.ems.gov/assets/EMS_Workforce_Feasibility.pdf. Accessed February 15, 2024.
49. Lawn S, Roberts L, Willis E, Couzner L, Mohammadi L, Goble E. The effects of emergency medical service work on the psychological, physical, and social well-being of ambulance personnel: a systematic review of qualitative research. *BMC Psychiatry.* 2020;20(1):348. doi:10.1186/s12888-020-02752-4
50. Rudman JS, Farcas A, Salazar GA, et al. Diversity, equity, and inclusion in the United States emergency medical services workforce: a scoping review. *Prehosp Emerg Care.* 2023;27(4):385–397. doi:10.1080/10903127.2022.2130485
51. Donnelly EA, Bradford P, Davis M, et al. What influences safety in paramedicine? Understanding the impact of stress and fatigue on safety outcomes. *J Am Coll Emerg Physicians Open.* 2020;1(4):460–473. doi:10.1002/emp2.12123
52. Simon JR, Kraus C, Rosenberg M, Wang DH, Clayborne EP, Derser AR. “Futile Care”—an emergency medicine approach: ethical and legal considerations. *Ann Emerg Med.* 2017;70(5):707–713. doi:10.1016/j.annemergmed.2017.06.005
53. Murray E. Moral injury and paramedic practice. *J Param Pract.* 2019;11(10):424–425. doi:10.12968/jpar.2019.11.10.424
54. Dainty KN, Seaton MB, Drennan IR, Morrison LJ. Home visit-based community paramedicine and its potential role in improving patient-centered primary care: a grounded theory study and framework. *Health Serv Res.* 2018;53(5):3455–3470. doi:10.1111/1475-6773.12855
55. Perona M, Rahman MA, O'Meara P. Paramedic judgement, decision-making and cognitive processing: a review of the literature. *Austr J Paramed.* 2019;16:1–12. doi:10.33151/ajp.16.586
56. Troyer L, Brady W. Barriers to effective EMS to emergency department information transfer at patient handover: a systematic review. *Am J Emerg Med.* 2020;38(7):1494–1503. doi:10.1016/j.ajem.2020.04.036
57. Dúason S, Gunnarsson B, Svavarsdóttir MH. Patient handover between ambulance crew and healthcare professionals in Icelandic emergency departments: a qualitative study. *Scand J Trauma Resusc Emerg Med.* 2021;29(1):21. doi:10.1186/s13049-021-00829-x
58. Pryce A, Unwin M, Kinsman L, McCann D. Delayed flow is a risk to patient safety: a mixed method analysis of emergency department patient flow. *Int Emerg Nurs.* 2021;54:100956. doi:10.1016/j.ienj.2020.100956
59. Ebben RHA, Vloet LCM, Speijers RF, et al. A patient-safety and professional perspective on non-conveyance in ambulance care: a systematic review. *Scand J Trauma Resusc Emerg Med.* 2017;25(1):71. doi:10.1186/s13049-017-0409-6
60. Paulin J, Kurolo J, Koivisto M, Iiro T. EMS non-conveyance: a safe practice to decrease ED crowding or a threat to patient safety? *BMC Emerg Med.* 2021;21(1):115. doi:10.1186/s12873-021-00508-1
61. Kennedy S, Kenny A, O'Meara P. Student paramedic experience of transition into the workforce: a scoping review. *Nurse Educ Today.* 2015;35(10):1037–1043. doi:10.1016/j.nedt.2015.04.015
62. Wilson C, Howell AM, Janes G, Benn J. The role of feedback in emergency ambulance services: a qualitative interview study. *BMC Health Serv Res.* 2022;22(1):296. doi:10.1186/s12913-022-07676-1
63. Venesoja A, Lindström V, Castrén M, Tella S. Prehospital nursing students' experiences of patient safety culture in emergency medical services—A qualitative study. *J Clin Nurs.* 2023;32(5–6):847–858. doi:10.1111/jocn.16396
64. Lydon S, Masterson S, Deasy C, O'Connor P. Progressing patient safety in the Emergency Medical Services. *BMJ Qual Saf.* 2023;32(10):562–565. doi:10.1136/bmjqs-2023-016184
65. Morrison L, Cassidy L, Welsford M, Chan TM. Clinical performance feedback to paramedics: what they receive and what they need. *AEM Educ Train.* 2017;1(2):87–97. doi:10.1002/aet2.10028
66. Hyvämäki P, Sneek S, Meriläinen M, Pikkarainen M, Kääriäinen M, Jansson M. Interorganizational health information exchange-related patient safety incidents: a descriptive register-based qualitative study. *Int J Med Inform.* 2023;174:105045. doi:10.1016/j.ijmedinf.2023.105045
67. Meadley B, Humar M, Salathiel R, McManamy T. Advancing paramedicine: error, accountability and patient safety. *Paramedicine.* 2023;20(6):214–218. doi:10.1177/27536386231189006